

SRS Document

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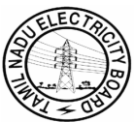
Technical Specification Sections



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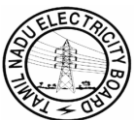
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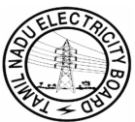
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SECTION - G1 : GENERAL TECHNICAL SPECIFICATION

1 INTRODUCTION

The Government of India in 10th Plan started Accelerated Power development and reforms program for reforms in distribution with following objective :-

- Reduction of AT&C losses
- Bring about Commercial viability
- Reduce outages & interruptions
- Increase consumer satisfaction

Considering the need for continuity and to rein in the losses of the utilities, need was felt to continue the initiative of APDRP in 11th plan as well. On review of the status and benefits achieved of APDRP, it was felt that to have sustainable distribution business, it is essential to give impetus to IT enabling of the sector on an integrated platform. The IT platform shall assist in capturing and validating the energy and revenue model to gather in a transparent manner with accuracy.

Considering the difficulties of domain expertise in IT area of the utilities and the experiences the utilities had, it was considered necessary to prepare SRS template, which shall provide the IT infrastructure for drawing the baseline data while addressing the need of IT back bone in the area of distribution business process to capture the benefits of the investments on sustainable basis.

2 INTENT OF SPECIFICATION

2.1 This specification intends to cover the following activities, services and works in respect of successful set up of IT infrastructure for collection of baseline data for energy and revenue of the identified scheme areas (town) and setting up of customer care center in the towns along with supply, installation, testing and commissioning of all necessary hardware, software and managing the facilities created under the scope of work for a period of 5 years after successful completion of acceptance test of hardware and software. Detailed scope of work under this package is listed at clause 3.0.

- a) Complete design, engineering, manufacturing, pre-assembly (if any), supply, installation, testing, commissioning and putting into satisfactory operation of all the equipment/devices, systems and sub-systems and providing services.
- b) Providing engineering data, drawings and O&M manuals for Owner's review, approval and records.
- c) Packing, transportation and insurance from the manufacturer's work to the site including port and customs clearance, if required.
- d) Receipt, storage, insurance, preservation and conservation of equipment at the site.
- e) Furnishing of mandatory, recommended spares, testing / calibration of equipments on FOR site basis.
- f) Data migration, User training and Operational Support at field level
- g) Satisfactory conclusion of the contract.

2.2 In addition to the requirements indicated in this section (Technical specifications), all the requirements as stated in other sections shall also be considered as a part of this specification as if completely bound herewith.

2.3 The Bidder shall be responsible for providing all material, equipment and services specified or otherwise, which are required to fulfill the intent of ensuring operability, maintainability and the reliability of the complete work covered under this specification.



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- 2.4 It is not the intent to specify all aspects of design and installation of associated systems mentioned herein. The systems, sub-systems and equipment/devices shall conform in all respect to high standards of engineering, design and workmanship, and shall be capable of performing continuous commercial operation.
- 2.5 Whenever a material or article is specified or described by the name of a particular brand, manufacturer or trade mark, the specific item shall be understood as establishing type, function and quality desired. Products of other manufacturers may also be considered, provided sufficient information is furnished so as to enable the Owner to determine that the products are equivalent to those named.
- 2.6 Bidder is requested to carefully examine and understand the specifications and seek clarifications, if required, to ensure that they have understood the specifications. Pre bid conference shall be held by utility to offer any clarifications against the queries raised by the various vendors, who have purchased the bid documents, to remove any doubts of the bidder and to remove any ambiguity in document. Such pre bid conference(s) should be held at least 15 days before the scheduled date of the opening of the bid documents at a place to be intimated by the utility. The procedure for organizing pre bid conference has been described in detail in "Section-ITB" of the Contract document. The bid should not include any sections like clarifications, interpretations and/or assumptions
- 2.7 Any deviation or variation from the scope requirement and/or intent of this specification shall be clearly mentioned under Deviation Schedule of the Bid Proposal Sheets irrespective of the fact that such deviations/variations may be standard practice or a possible interpretation of the specification by the Bidder. Except for the deviations/variations that are accepted by the Owner with or without financial implications before the award of the contract, it will be the responsibility of the Bidder to fully meet the intent and the requirements of the specification within the quoted price. No other departure from the specification except for the declared deviation indicated by the Bidder in his proposal shall be considered. Bids not complying with this requirement shall be treated as non-responsive and hence liable for rejection. The interpretation of the Owner in respect of the scope, details and services to be performed by the Bidder shall be binding, unless specifically clarified otherwise by the Owner in writing before the award of contract.

3 SCOPE OF WORK

3.1 PROJECT COMPONENTS -

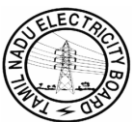
- (i) The scope of work under this contract covers setting up of IT infrastructure for collection of baseline energy and revenue data of the identified towns and setting up of customer care center therein. The scope covers setting up of IT infrastructure at data center & DR Centre and other offices of utility, which would form the platform for subsequent automation. This activity shall comprise fulfillment of the following tasks -
- (a) Establishment of data center & Disaster Recovery Centre at identified location
 - (b) Establishment of customer care centers at identified location
 - (c) Set up the Local Area Network and Wide Area Network
 - (d) Procurement & Installation of PCs, Servers, and associated hardware
 - (e) Creation of necessary IT infrastructure including LAN for identified Subdivision, division, Circle, Headquarter offices, Data centers, DR Centre and Customer care centers
 - (f) Integration of the entire IT infrastructure under the scope of this document
- (ii) **Hardware** : Supply, installation, commissioning and maintenance of all necessary hardware and networking equipments and its connectivity as specified in the detailed specification. As a part of the project, the vendor should procure the



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required hardware and build the infrastructure as detailed in the Specifications. The vendor shall take the responsibility to install the thin clients, desktops, necessary hardware/software at the sites defined in the bid proposal sheet. The Vendor shall give the time frame for procuring and delivering all the necessary hardware. Though the scope covers establishment of a common data center & DR centre along with associated hardware and software for selected towns, the bidder shall design and provide the hardware at data center & DR centre with suitable expandability for covering the entire utility area at a later date (Utility will specify the total consumer and asset base) along with a 7.5% per annum growth in consumer and asset base for next five years.

- (iii) **Networking** : The scope of work covers supply, installation, commissioning and maintenance of LAN at data centre, Customer Care Centre, Sub-division, Circle, Head Quarter and any other office of utility as per their requirement along with creation of VPN/MPLS based WAN solution. The vendor shall also provide necessary drawings and plan for installation, sizing, cabling, connectivity and the bill of material for the networking of all the locations specified herein.
- (iv) **GIS System Software and maps** - Supply, installation commissioning and maintenance of GIS software and latest satellites imagery maps for GIS based customer indexing and asset mapping in the specified town. The successful bidder shall provide the maps along with the certificate and rights in favour of owner from the source that these are the latest as on date of purchase which should be later to award date. The bidder should specify clearly the licensed software he proposes to use for the package.
- (v) **DGPS Survey and Indexing work** - Carrying out the necessary DGPS survey and creation of GIS based customer indexing and asset database as specified in detailed specification.
- (vi) **Meter data acquisition system** - Supply of necessary hardware, software and communication equipment in the Substations, DTs and select consumers in the towns for the purpose of centralized meter data logging.
- (vii) **Software** - Supply, installation and commissioning of Operating System at Server/Desktops, Database and application software along with source code (only for customized software solutions) and functionalities covering utilities Energy Audit, Data Acquisition, New Connection, Disconnection, Vigilance and Dismantling, MIS, GIS network management module with electrical network diagram of system further as detailed in the bid proposal sheet. The vendor has to supply necessary software solution for metering, billing, collection (MBC) if the same is not available with the utility. In case the required MBC and other standalone software solutions are already in place, the vendor has to integrate the same with the offered solution including design and supply of necessary middleware. Moreover the vendor has to link the GIS based customer index created by him to the existing customers etc. The bidder shall quote the unit price for additional licenses for database, standard application software, antivirus solution etc. (whether per processor license basis or per user license basis) for meeting the future requirement of utility.
- (viii) **Web Portal** - The scope includes the Development of Web Portal of Utility for real time customer services.
- (ix) Supply, installation and commissioning of automatic token dispenser machine and intelligent display management system at customer care centers.
- (x) Supply, installation and commissioning of Touch Panel based KIOSK for furnishing information on billing, payment, duplicate bills etc at customer care centers.
- (xi) Supply, installation and commissioning of cash/cheque collection Kiosk for automatically accepting cash and cheque payments from customers, to be installed at utility offices, customer care centers and any other location as per the requirement



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- (xii) Supply and installation of Point of Sale (PoS) terminals along with suitable cheque reader and bar code reader and application software to be deployed at payment collection centers.
- (xiii) Facility management services for IT infrastructure created for a period of 5 years and Annual Maintenance Contract of 2 years after expiry of warranty period of 3 years by the consortium partner/ equipment supplier.
- (xiv) The bidder shall submit offers for project components on turnkey basis for continuous and successful operation of the offered solution.
- (xv) The proposed solution must efficiently enable all required interfaces and integration, including integration with the existing software as detailed in existing IT infrastructure.
- (xvi) The proposed solution must also consider the following overarching functional requirements, analytical tools and capabilities:
 - a) Workflow Management
 - b) Document Management.
 - c) Data Warehousing.
 - d) Business Intelligence.
 - e) Integration Middleware
- (xvii) The vendor has to establish a disaster recovery center at the location specified by utility which should operate based on RTO & RPO defined in detailed technical specification.

3.2 SYSTEM DESIGN AND ENGINEERING

The Bidder shall be responsible for detailed design and engineering of overall system, sub-systems, elements, system facilities, equipments, services, including systems application software etc. It shall include proper definition and execution of all interfaces with systems, equipment, material and services of Owner for proper and correct design, performance and operation of the project.

Bidder shall provide complete engineering data, drawings, reports, manuals and services offered etc. for Owner's review, approval and records.

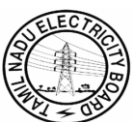
3.3 SUPPLY OF EQUIPMENT AND MATERIAL

The Bidder shall also be responsible for manufacture, inspection at manufacturer's works, supply, transportation, insurance, delivery at site, unloading, storage, complete supervision, installation and successful commissioning of all the equipment, systems and application software listed at Annexure-II (Bill of Quantities) to this specification.

Any item though not specifically mentioned, but is required to complete the project works in all respects for its safe, reliable, efficient and trouble free operation shall also be taken to be included, and the same shall be supplied and installed by the Bidder without any extra cost unless it is explicitly excluded as given in clause 5 of this section.

3.4 SPECIAL TOOLS AND ACCESSORIES -

The bidder's proposal shall include the list of special tools, testing equipments and accessories required during development stage, for day to day operation and maintenance of the system. All such tools shall be supplied by the bidder. The bidder should



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clearly bring out the list of such tools along with itemized price in the bid. However the prices of these special tools shall be included in the lump sum bid price and would be considered for the bid evaluation.

3.5 INSTALLATION & IMPLEMENTATION

- A) The bidder shall be responsible for installation of all identified hardware, equipment etc. at Data Center & DR centre, Customer care centers and Substations, DT locations, Utility offices and communication network covered under the specification. He shall be responsible for provision of all required manpower and tools/kits for safe, reliable, proper and correct installation and providing facility management services for IT infrastructure created for a period of five years. The Details of the locations are given in the **Geographical Scope of the Bid**.
- B) The successful bidder shall be responsible for installation and configuration of software, hardware and other equipments supplied to the satisfaction of the owner. This shall include but not be limited to :
- i) Installation of the software at Data center, DR centre and various other locations, completion of site survey work for customer and asset indexing and creation of digitized maps incorporating customer and asset information, Installation of data acquisition equipments at Sub stations, DTs, Select consumers and Sub division offices.
 - ii) Post Go-Live, the software vendor shall provide support to fix any bug related to implementation. The entire system would be considered as successfully installed when the software will run with actual live data at site for 3 months without any bugs (Bug is lacunae in the system that prevents/ delays an operation or performs a function within the system at suboptimal level/ at performance level lesser than that specified in this specification or provides incorrect operational data or provides incorrect results in any data format in the system) reported by the users.
 - iii) Demonstration of all the features of latest version of software;
 - iv) Acceptance testing of the system thus implemented to the owner's satisfaction.
 - v) However the minor defects, which do not affect the performance of the system, should not withhold the acceptance of the system. The Bidder shall rectify all the minor defects within a reasonable period of time.

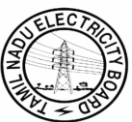
3.6 TESTING AND ACCEPTANCE PROCEDURES

Testing and quality assurance in software development is more rigorous since each component has to be more reliable, if it is to be reused. A system is tested at various stages of development and deployment. For example, each component is tested as a unit for checking the correctness of its own code. Further, the component is tested with its dependent components. After final release of the entire set of components, system is tested for the correctness of system functionality. Finally the components are further tested in simulated production load for performance and load analysis.

The Lead Partner along with consortium partners shall be responsible for the testing processes such as **planning** (includes preparing test plans and defining roles and their responsibilities), **preparation** (consists of preparing test specification, test environment and test data) and **execution** (includes testing at various levels like unit level, integration level, system level and production).

Test Plan

Test plans are prepared for each phase of testing. The initial test plan is created during the Project Planning phase. The initial test plan describes who performs which type of testing and when. Ideally master test plan covers all types of test i.e. from unit testing to production testing. The Lead Partner along with consortium partners is expected to submit the test plans to Utility for approval. Any changes made to the test plan during the project life cycle should be communicated to UTILITY for approval.



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Test plans contains following items:

- Roles and responsibilities of test team
 - Approach to testing
 - Function testing
 - Security testing
 - User Interface and reports testing
 - Concurrency testing
 - Performance and Load testing
- Test Scenarios along with entry and exit criteria
- Test specifications
- Suspension and resumption criteria

Test scenarios

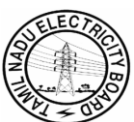
The Lead Partner along with consortium partners should prepare test scenario for each business scenario. A test scenario when executed should fulfill a business requirement as per the scope of business functionality. Test scenarios include following:

- Test Specification - During the test specification phase, the test cases are specified. It consists of description of the input, process to be executed and a prediction of output results.
- Test Environment - Component developer does unit testing and integration testing. Integration testing can be delegated to a specialized testing group. Each of the members in the testing group is provided with testing environment according to his/her role and responsibilities. Following is sample testing environment for testing:
 - A workstation
 - A set of tools and applications required on workstation like access to user interface, browser etc.
 - Access to centralized document database (where all the project related documents are maintained)
 - Access to testing tools and defect logging tools
 - Access to the central database or repository for development and unit testing (this database contains sample test data)
 - Access to deployed components
- Test Data - Test data is prepared for testing at each stage. The test data should be prepared in such a way that it covers basic path and every alternate path of the code. The basic path and alternate paths are prioritized to capture relevant data. Tools can also be used to generate test data.

Test Execution

The following testing steps are usually employed in the project lifecycle. The Lead Partner along with consortium partners expected to follow these steps.

- Unit Testing - In unit testing, each piece of code has to be rigorously tested. At this stage testing is done according to the priority of path of code. All the test results are logged in the defect logging tools. After every the completion of testing, code is corrected for defect logs. This process is iterative till criteria for successful testing is reached.



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- Integration Testing - Upon completion of unit testing, integration testing begins. The purpose is to ensure distinct components of the application still work in accordance to customer requirements. Test sets will be developed with the express purpose of exercising the interfaces between the components. This activity is to be carried out by the Test Team. Integration test will be termed complete when actual results and expected results are either in line or differences are explainable/acceptable based on client input.
- Incremental Integration Testing - Continuous testing of an application as new functionality is added.
- System Testing - System testing is performed when all the components are delivered to central repository prior to the release of the software. The testing is done on priority basis of business processes. All the defects are logged and assigned to respective component owners. The component and unit testing is performed after the correction of code. However, it may depend on size and type of individual test specifications. Impact analysis is useful to narrow down testing efforts by identifying critical test cases affected due to code change.
- Pre-Production Testing - Pre-Production testing is done simulating the production load. Test data is either prepared or generated from the tools. This testing is used to evaluate performance, load capacity and concurrency. Load testing tools can also be used for this purpose. Following special type of testing are done during Pre-production Testing Phase:
 - Regression Testing - The objective of regression testing is to ensure software remains intact. A baseline set of data and scripts will be maintained and executed to verify changes introduced during the release have not “undone” any previous code. Expected results from the baseline are compared to results of the software being regression tested. All discrepancies will be highlighted and accounted for, before testing proceeds to the next level.
 - Performance Testing - Although performance testing is described as a part of system testing, it can be regarded as a distinct level of testing. Performance testing will verify the load, volume, and response times as defined by requirements.
 - Load Testing - Testing an application under heavy loads, such as the testing of a web site under a range of loads to determine at what point the systems response time degrades or fails.
 - Installation Testing - Testing full, partial, or upgrade install/uninstall processes. The installation test for a release will be conducted with the objective of demonstrating production readiness. This test is conducted after the application has been migrated to the client’s site. It will encompass the inventory of configuration items (performed by the application’s System Administration) and evaluation of data readiness, as well as dynamic tests focused on basic system functionality. When necessary, a sanity test will be performed following the installation testing.
 - Security/Penetration Testing - Testing how well the system protects against unauthorized internal or external access, willful damage, etc. This type of testing may require sophisticated testing techniques.
 - Recovery/Error Testing - Testing how well a system recovers from crashes, hardware failures, or other catastrophic problems.
- Acceptance Testing - During the test scenarios definition, for each of the business scenario, an acceptance criterion is defined. Acceptance criteria include expected behavior of the s/w component and the expected results (data). Expected results form a part of the Exit Criteria. In addition to expected result and behaviors, some conditions are also specified in the exit criteria. They can be:
 - Number of bugs to be discovered for a functional module. This depends on size of the functionality and is an indicator of amount of testing done.



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- If any medium or low-priority errors are outstanding - the implementation risk must be signed off as acceptable by UTILITY and Lead Partner along with consortium partners
- All High Priority errors from System Test must be fixed and tested

Lead Partner along with consortium partners needs to get the acceptance criteria approved from UTILITY for all the functional components of the system. The Acceptance Criteria for each release into production environment will be agreed upon by Lead Partner along with consortium partners in consultation with UTILITY prior to release from Testing to production environment. After installation, if any bug is reported or there is non-compliance to requirements then a proper procedure should be followed. End-user should report (“Change Request”) to his/her supervisor about the bug that will in turn get forwarded to Project Manager (PM). PM will forward the List of change request to Lead Partner along with consortium partners. After the bug is fixed, it should be reflected in the production copy after testing it.

- **Performance Testing** - The bidder has to test and demonstrate the operational performance requirement as defined in the clause 9 of the specification after completion of entire scope. This will be part of acceptance testing. The system will be taken over by owner only after successful operational performance testing. The bidder has to arrange necessary hardware / software to demonstrate the performance testing.

Bidder should note that UTILITY can appoint a third party agency for conducting any part of above testing procedures (in addition to the testing carried out by the bidder).

3.7 GEOGRAPHICAL SCOPE

The Locations where the systems shall be implanted are as follows -
Please refer to Annexure-H of Section:G-6

3.8 TESTING, COMMISSIONING & SUCCESSFUL OPERATION

The scope includes testing and commissioning & implementation of all equipment, sub-systems and systems of the project and putting them into successful technical & commercial operation. The scope shall include but not limited to the requirements given elsewhere in the specification.

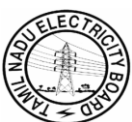
The bidder shall be responsible to provide all necessary testing and commissioning personnel, tools/kits, test equipment etc.

3.9 DATA MIGRATION SCOPE

Data to be migrated from its legacy systems as per requirement. The utilities’ Consumer database and MBC database if available shall be migrated in the system. Data to be migrated will be cleansed, rationalised, transformed (if required) and reconciled. Conversion programs may need to be written to handle this task.

The total data migration scope will be finalized by the owner with successful bidder. The following is the indicated list of the type of data to be migrated from the legacy/ manual system.

- 1) All Master Data - Must be migrated
- 2) All Open Transactions - Must be migrated
- 3) All transactions in the current financial year - Must be migrated



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- 4) Historical Transactions - No of years shall be decided by utility however at least 3 years historical data to be migrated Vendors must indicate how they propose to do this.

3.10 INTEGRATION SCOPE

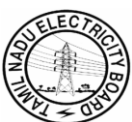
All required external systems shall be integrated on a continuous basis using an integration middleware layer. The scope of integration of external systems includes IT systems already existing and functional internal to the utility, but outside the present scope of work. The integration is expected to be on-line real time or batch where appropriate and shall operate in an automated fashion without manual intervention. The scope of external integration will be, but not limited to :

- Desktop applications
- Integration with existing messaging system
- The integration will use a continuous integration middleware layer as specified by the vendor. This integration middleware layer could then be used to undertake any future integration between applications. The integration middleware shall be based on Service Oriented Architecture (SOA) and shall use publish / subscribe mechanism. Purchaser does not want to build and maintain point to point integration.
- The integration middleware shall be open architecture based.
- Transactional as well as standing or master data to and from the offered system will be required to be interfaced.
- Data to be integrated must be validated by the developed interfaces.
- The data to be integrated will be mapped, transformed (if required) and reconciled automatically.
- All interfaces are to be self checking so that any exceptions or data validation errors are reported by the system. In addition, integration logs should be maintained that confirm the success or otherwise of the interface, complete with control totals.
- The mapping should be manageable through a GUI based administrative interface.

3.11 TRAINING FOR THE EMPLOYEES -

The vendor shall be required to organise following training for the owner's personnel:

- Professional Training - This is the training for the core Group of implementation team of the owner. This owner's team will comprise of members from all the Business Functions and IT. Each member would be trained in the relevant function / module. This Training would be required to be given to approximately 9-12 personnel of Owner. It is the responsibility of lead partner to deliver this training. Standard curriculum, designed and agreed by the owner for hardware, software and network preferably from the OEM partner or OEM's certified training partner shall be arranged for each group. The vendor is required to quote on per person basis for this training. The Purchaser will prefer if a portion of the training is conducted on-site.
- End User Training - The bidder will provide training to a owner's team on a "Train the Trainer" basis. The Owner's team so trained will then train all of the owner's end users. Refer the table below for the approximate staff size that will undergo training These training sessions will be required to be conducted at any of the sites.

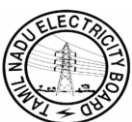


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- All trainings would be conducted by certified expert trainers of the SI and the OEM, incorporating industry best practices, courseware and pedagogy.
- ITIA will measure the efficacy of training(s) and incorporate changes as may be required.
- TNEB considers 'handholding' during post Go-Live as a part of the training needs.
- The recommended training material can be in paper / electronic media with courses on BPA software fundamentals, business process overview, job activity training, and delivery options being on-line, CBTs, instructor led class rooms, etc. The training material in paper/electronic format needs to be handed over to the utility and will be utility property.
- During the course of the implementation, the bidder is expected to complete / be involved in the following activities in terms of skill transfer :
 - Testing scripts should be prepared to test the business processes and scenarios of the new system.
 - The project team members will further develop these testing scripts into training documents.
 - Training material will be organised by functional process that will serve as the training documentation for a particular functional area.
 - Assist the Owner's team members in creating procedure documents for use in conjunction with the other training material. A procedure document will list all of the transactions necessary to complete a business scenario whereas a training document lists the steps to execute a transaction. Each step will be a transaction referenced in a training document. Procedures will be listed for all the online steps needed to complete a scenario.
 - In addition to functional training document binders and procedures, the project team members will create training courses and exercises. The training courses will contain all the training documents and necessary to train an end-user in his / her role. The training exercises will list common business scenarios and input data that the user will enter to practice with the newly developed BPA software.
 - Vendor will assist in administering training to project team members and / or power users, to "train the trainers".
 - Vendor should assist in administering training to the rest of the users / peers in functional areas based on the course documentation developed by the project team and vendor.
- The training will consist of a curriculum of courses to address the issues of system operation, business-wide application, changed business processes and the general use of the new system.
- Representatives from the successful vendor, Purchaser's implementation project and change management teams will be involved throughout in the development of training strategy, training material design and development, standards and training delivery to ensure that change management issues are incorporated, and that training strategies and materials are aligned to the requirements of the project and as business-specific as possible.
- The roll out of the training program will be coordinated with the overall project implementation strategy.
- All cost related to training will be borne by the vendor

Training needs and staff size (approximate):

S. No.	Training Need	Owner's staff size
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Technical		
1	IT Software This includes training needs on various technologies	60
2	Special training needs - ITIL, PMP, Defect management etc.	60
3	IT Hardware	60
4	Hardware systems - AMR, GIS, Digitizer/Scanners etc.	60
5	Networking	60 ¹
Functional		
6	Training on various modules	200 ²
7	End user trainings (Train-The-Trainer)	300 ³

¹ Considering there are approximately 1169 locations and a single person in charge of 20 locations each.

² At least 10 Employees per module to be trained.

³ There are about 6000 end users.

3.12 SUPPLY OF MEDIA -

Bidder shall supply two copies of media of all related software offered as solution against this specifications.

3.13 DOCUMENTATION SCOPE -

The following documents (one set each) will be required for smooth functioning of the system at data center & DR centre:

The successful vendor will provide ongoing product information for referential purposes and facilitating self-education by Utility personnel.

Key aspects that the vendor will be evaluated on but not limited to include :

What documentation is included in the standard license fee, for example:

- User manuals;
- System administrator manuals;
- Technical manuals;
- Installation guides;
- Business process guides;
- Program flow descriptions;
- Data model descriptions;
- Sample reports;
- Screen formats;
- Toolkit guides;
- Troubleshooting guides;
- Frequently asked question (FAQ) guides.

The clarity, comprehensiveness and accuracy of the documentation (an example document should be made available to UTILITY).

The media upon which documentation is made available (hard-copy, CD-Rom, etc).



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The frequency of documentation updates and distribution mechanism of the updates.

The ability for documentation to be customised for or by UTILITY.

Hard copy and soft copy of user manuals are expected to be provided by the successful vendor. These should include information on the application concepts in addition to transaction and field level documentation. Additionally the Technical Users Information manual provides information on the BPA software's table structures.

Vendor will be expected to assist in developing operational procedure manuals. If the user manuals are provided in Word format, the client should have the ability to customise their own manual to include specific business processes or operational procedures.

Vendors can also be required to provide context sensitive on-line help, which includes all materials provided in the hard copy manuals. Where possible, users should be able to add their own on-line help documentation.

4 OTHER SERVICES AND ITEMS

The scope also includes, but not limited to the following services/items described herein and elsewhere in specification:

- 1) Project management and site supervision
- 2) Interface coordination
- 3) Scope change management

4.1 PROJECT MANAGEMENT AND SITE SUPERVISION

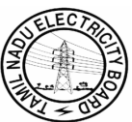
The bidder shall be responsible for the overall management and supervision of works. He shall provide experienced, skilled, knowledgeable and competent personnel for all phases of the project, so as to provide the Owner with a high quality system. Bidder should provide details of the proposed project structure identifying key individuals, e.g., Project Managers and their roles, including the number and location of proposed analysis/development personnel. Due to the expected impact on the business processes, it is extremely important that Owner should obtain a thorough understanding of the organizations and individuals proposed for the project and the roles Owner's staff would be expected to play. Bidder should also provide details of sub-Bidders likely to be involved. Indicate the number of full time equivalent staff that will be required from owner's side. Resumes or a personal profile should be provided for key personnel of his organization for the project.

It is desired to provide estimates of the required number of Owner's staff and identify the skills required. Provide details for the following:

- a. Number of Full Time Equivalent (separate IT and Business) required throughout the duration of the project
- b. Key roles to be included from the business
- c. Key roles to be included from IT

Bidder should provide details of governance roles including:

- a. Steering Committee
- b. Number and frequency



4.1.1 RISK MANAGEMENT

The vendor will also be expected to work with UTILITY project manager to regularly review and amend the list of risks and their mitigation strategies. Risk could be, but are not limited to, the following :

- Availability of Vendors,
- Availability of internal and external resources.
- Inadequate participation by UTILITY staff.
- Information required for the project cannot be provided in the planned timeframes.
- Not meeting Utility's expectations in terms of scope, timing and quality
- Project scope creep.
- Lack of project ownership.
- Inadequate internal project commitment.
- Timeliness of decisions on project issues.
- Not signing off project deliverables and providing project acceptance in a timely fashion.
- Project facilities are in place for the start and through to the completion of the project.
- The project workings and deliverables are lost due to system failure or human error.
- Logistic Delays

4.1.2 CHANGE MANAGEMENT

Vendors will be detail their change management methodology and activities for the total solution implementation. Vendors will be evaluated on their dedication to methodology and ability to stay focused on the business process change and expected outcomes / benefits.

4.2 INTERFACE COORDINATION

The bidder shall identify all interface issues with Owner and other agencies if any, and shall be responsible for such interfacing, coordination and exchange of all necessary information.

The bidder shall submit to the Owner all system layout & logic for review. The bidder shall list the detailed requirements of interface between Bidder's work and the material and services to be supplied by Owner.

4.3 SCOPE CHANGE MANAGEMENT:

Utility to finalize the scope change management procedure during development/ Implementation stage. The followings are the suggestive procedure.

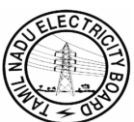
Change Request and Control Procedures

Qualification Scenario for initiating change control

- Utility defines additional requirement or changes for a feature
- Vendor's Project Manager, during the project, realizes that that additional features are required to be incorporated into the system and implementing the same will amount to an effort more than one person-week.
- Bugs, lacunae, non-compliance to specifications, discovered during the testing process cannot be treated as change request

Impact on Price

Vendor can quote person-day rate for such changes as part of price bid submitted.



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Change request approval process

1. Change request complying to above qualification criteria is initiated
2. A change request form is filled up. (A format will be supplied to vendor as part of the tender document)
3. Initiator (Utility or Vendor's Project Manager) fills up items number 3,4,5 in the form.
4. The vendor's project manager fills up items numbers 1, 2, 6, 7 and 8.
5. Project coordinator from Utility fills up 9,10, and 11
6. On approval by Utility, the project manager of vendor B1 proceeds with implementation.
7. In all respect, the decision of Utility's project owner is final and no appeals are permitted against it.

Change Request Form Format
<Name of Utility>

1. Project Name : Sub System Name: Module Name

2. Request Number & Date of Request

3. Requester

Requester Email Id/ Contact Phone Number

Requester Project Role: End User / Project Coordinator/Vendor PM etc.

Name, Designation and Signature of the Requester:

4. Subject/Reference

<Deviation reference to the scope viz. Name of Requirements Document, clause number, para etc.>

5. Description of Change

Problem definition

6. Proposed Changes

High level explanation of solution

7. Impact Analysis

Resources, Schedules and modifications as a result of the Change - locations where software needs to be updated - changes in database to be taken care of - impact on on-going training and handholding etc.

8. Effort Estimation

Number of person-days

9. Evaluation for Acceptance of Change Request

Evaluation Comments

Name, Designation and Signature of Evaluator

Date of Evaluation

10. Priority: High / Medium / Low

11. Approved: Yes / No

Name, Designation and Signature of Approver

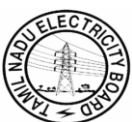
Date of Approval

Expected Date of Start of Work

Expected Date of Completion Work

5 SPECIFIC EXCLUSION:

1. All civil & architectural works, internal and external electrification, special electronic earthing for Server system, Air conditioning and ventilation, fire fighting system and Access control system required for Data center & Disaster recovery Center, Customer care centers, Sub Station buildings and various utility premises are outside the scope of the vendor,



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however vendor has to indicate the space requirement for Data center, DR centre, customer care centers, various server rooms and other equipments, heat load of servers & UPS etc, any other specific requirement, power supply requirement including standby supply requirement, so that the owner can provide the same as per bidder's requirement.

2. Manpower required for managing Collection centers and Customer care centers
3. Collection of cash from customers.
4. Supply of meters at sub station and DT Location
5. The vendor is not expected to address the following :
 - Reframe or establish IT processes within Utility;
 - Train on subjects other than that relevant for Utility's system implementation;
 - Address IT organization and governance related issues;

6 UTILITY'S CURRENT IT INFRASTRUCTURE

Refer Appendix-H of RFP Document

7 ARRANGEMENT BY THE CONTRACTOR

The bidder shall make his own necessary arrangements for the following and for those not listed anywhere else:

- Office and store.
- Transportation.
- Boarding & lodging arrangement for their personnel

The bidder shall also provide all the construction equipments, tools, tackles and testing kits/equipments required for pre-assembly, erection/installation, testing and commissioning of the equipments and system covered under the Contract. He shall submit a list of all such materials to the Engineer before the commencement of work at Site. These tools and tackles shall not be removed from the Site without the written permission of the Engineer-in-charge.

8 SOFTWARE TOOLS

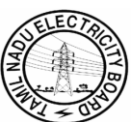
Software tools must be latest versions that are currently supported by manufacturer, if relevant. Software tools must be compliant with generally accepted standards and accommodate Utility's plan for the future expansion of systems. Utility also expects tools and automation to feature in the implementation so as to maximize the efficiency and quality of the implementation project.

9 WARRANTY, OPERATIONAL GUARANTEE, SYSTEM RELIABILITY WITH 'ON-SITE' SUPPORT

A) **Warranty** - Warranty shall be as mentioned in clause 26 of GCC of the RFP Document

B) **Operational Guarantees** -

- Operational guarantees should be given by the vendor, and written in the service / support contract / agreement with vendor. These include guarantee uptime standards and minimum downtime expected.
- System response times are dependant upon the hardware and network infrastructure deployed. The vendor is to quote for appropriate systems not limited to the tentative specification given with the bid.



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- The vendor has to offer specific response times as well as specific availability and reliability from its business process automation platform. The vendor will work with Utility and supply hardware to achieve the required operational performance. Specific operational performance requirements are :
- **Screen Operations Response Times**
 - Screen operations response times (end to end) are required of between 2-5 seconds. Screen operation response is defined as the time it takes for all characters to appear on the end user screen from a screen request and for user to get control over the screen.
- **Process Operations Response Times - Non GIS Processes**

Process operations response times (end to end) are required of no less than :

 - 90% of online update transactions of 2 seconds to commit transactions with sub second screen response times.
 - 90% of online simple query of 3 seconds.
 - 90% of online complex query 4 to 8 seconds.
 - Batch operation such as customer bill generation, Energy audit report Generation should not be more than 15 minutes for one sub division (approx 25000- 30000 Consumers in one subdivision) with peak load
 - Response time for processing operations defined as the time it takes for the process to complete from the time it has been requested to run. Peak load currently is between 10am to 12pm and 1pm to 3pm, mostly with on-line transactions and around 50 (to be modified as per requirement) concurrent users across the entire organization.
- **Process Operations Response Times - GIS Applications**

GIS Application response times are required of at least:

 - Schematic presentation with required filters on network components within 15 seconds
 - Load background map from Map Server located at data centre within 5 seconds (for a case of single user) to 25 seconds (for peak load condition, i.e. maximum concurrent users)
 - Load High/Low-voltage network on top of background map within 5 seconds (for a case of single user) to 15 seconds (for peak load condition, i.e. maximum concurrent users)
 - Load complete network in a defined area within 10 seconds (for a case of single user) to 30 seconds (for peak load condition, i.e. maximum concurrent users)
 - View properties after loading of schematics within 3 seconds
 - Creating changes in Customer & network entities (Add/Delete/Edit) in Geo database within 5 seconds (for a case of single user) to 20 seconds (for peak load condition, i.e. maximum concurrent users)
 - Simple query within 5 seconds (for a case of single user) to 20 seconds for peak load condition, i.e. maximum concurrent users)
 - Multiple/Complex query within 10 seconds (for a case of single user) to 30 seconds (for peak load condition, i.e. maximum concurrent users)

C) System Availability -

System reliability will more often be dependant on hardware, database, and communications availability. The vendor will need to clarify whether they require or impose any particular hardware and database management techniques or other requirements. The overall system availability (Both software and hardware combined) shall not be less than 99% at data center and 98% at remote location calculated quarterly.



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D) Annual Technical Support -

The Bidder shall provide support and maintenance of all the software supplied as solution for a period of three year from the date of installation of the relevant number of licenses of the software at UTILITY. This support shall be provided by trained and experienced personnel of the bidder. During this period, bidder shall be responsible for carrying out following activities:

- Provide free patches/ hotfixes/ updates/ upgrades/ notes etc. for Operating Systems, Databases or any security upgrade of the products to UTILITY as and when released by OEM.
- SLA Based Support through telephone/Fax/E-mail/ personal visit.

10 ANNUAL MAINTENANCE CONTRACT

<Deleted>

11 PRICE LOADING FOR EVALUATION OF BIDS

<Deleted>

12 PAYMENT TERMS

Refer SCC of RFP document

13 PROJECT SYNOPSIS

(Please refer to Annexure-H, Section:G-6)

14 BID SCHEDULE

<Deleted>

15 BASIC REFERENCE DRAWINGS

The following typical layout and connectivity drawings of the systems has been enclosed-

Drawing No.-1	Main Schematic and architecture of Central Data center along with connectivity with various locations/offices
Drawing No.-2	Schematic and Network Connectivity diagram for Utility head quarter offices
Drawing No.-3	Schematic and Network Connectivity diagram for Circle offices
Drawing No.-4	Schematic and Network Connectivity diagram for Division offices
Drawing No.-5	Schematic and Network Connectivity diagram for Sub Division offices
Drawing No.-6	Schematic and Network Connectivity diagram for Customer care centers

16 SPARES

The Bidder shall include in his scope of supply all mandatory and commissioning spares related to Hardware requirements. The bidder has to quote for the mandatory spares requirement for 5 years operation after warranty period. List of such spares along with the quantities shall be indicated in the bid and shall be considered for bid evaluation purpose.

All spares supplied under this contract shall be strictly interchangeable with the parts for which they are intended for replacement. The spares shall be treated and packed for long-term storage in the climatic conditions prevailing at the project site. Small items shall be packed in sealed transparent plastic covers with desiccant bags as necessary. The bidders shall attach the storage conditions requesting covered storage or storage under air conditioned environment as appropriate for certain classes of spares.



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Each spare part shall be clearly marked and labeled on the outside of the packing together with the description when more than one spare part is packed in single case. A general description of the contents shall be shown on outside of the case and detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purpose of identification.

Commissioning spares

The Bidder shall supply spares, which he expects to consume during installation, testing and commissioning of the system. The quantity of these spares shall be decided based on his previous experience, such that site works shall not be hampered due to non-availability of these spares. Bidder shall submit a complete list of such spares along with the bid, the cost of which shall be deemed to have been included in the lump sum proposal price of the package. The unused commissioning spares may be left at the site for use by the Owner, if so agreed at a cost to be negotiated.

No spares except commissioning spares will be used during the commissioning of the system before take over by the Owner. In case of extreme urgency, if spares other than commissioning spares are used by bidder for commissioning of the system, the same will be required to be recouped free of charges.

17 TIME SCHEDULE

Refer Appendix N of RFP Document

18 IMPLEMENTATION SCHEDULE :

Refer Appendix N of RFP Document

19 QUALITY ASSURANCE PLAN

The consortium partners shall have a comprehensive quality assurance program at all stages of manufacture/development/implementation for ensuring products giving reliable, trouble free performance. The bidders shall furnish the details of their quality assurance plan and test set up along with the bid. A detailed quality assurance program shall be finalized with the successful bidder during the award stage. However, the Quality Assurance Plan shall conform to the following standards -

IS/ISO/IEC 27001 - ISMS

IT Security, IT services (10 Standards) - All harmonized with ISO/IEC

LITD 16 - Standards on Computer Hardware

IS 13252:2003/IEC 60950

20 QUALIFYING REQUIREMENTS

Refer Section IV of RFP



INDEX-G2: Technical Specification requirement of Application packages

Sub-Section	Sl No.	Description	Page No.
G2: Part-A - Essentially Required by most Utilities for setting up an IT backbone for collection of baseline data, Energy Accounting / Auditing and establishment of Customer care centers	1	Introduction	3
	2	System Functionality	6
	3	Module : Meter Data Acquisition	11
	4	Module : Energy Audit	31
	5	Module : New Connection	34
	6	Module : Disconnection & Dismantling	39
	7	Module : GIS based customer Indexing and asset mapping	42
	8	Module : GIS based integrated network analysis module	84
	9	Module: Centralized Customer Care Services	103
	10	Module: Management Information System (MIS)	132
	11	Module : Web Self Service	141
	12	Module : Identity and Access Management system	144
	13	Module : System Security Requirement	158
G2: Part-B - Requirement based implementation of Commercial Processes like M,B,C for Utilities, who do not have such IT enabled systems	14	Development of Commercial Database of Consumers	164
	15	Module: Metering	166
	16	Module : Billing	172
	17	Module: Collections	182
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	19	Module: Maintenance Management	192

SECTION – G2: PART-A

APPLICATION PACKAGES REQUIRED
ESSENTIALLY FOR TNEB

1.INTRODUCTION -

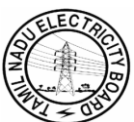
Traditionally Indian distribution utility's business processes are supported by the use of paper documents and folders passed from table to table and function to function. A few of utilities have IT enabled part of business processes, but they continue to run on existing business rules and systems.

GOI under APDRP has proposed to leverage strength of information technology for creation of authentic base line data and support utilities in IT enablement of their business processes. Energy Audit and Accounting would base on integrated IT solution by use of GIS indexing and asset mapping along with network analysis software. Single window customer care centers would be available at front end to interact with consumers, which will run through linking of back end business processes. The creation of IT infrastructure under System requirement specification template will enable utilities to integrate other business processes such as ERP, SCADA etc., at a later date as per the requirement of the utility, which are presently not in the scope of the SRS document. The proposed solution in the SRS document will create the building block of Enterprise Application integration. Therefore, proposed business process softwares should be process oriented and support workflow management.

Though it is preferable that utility should carry out Business Process Re-engineering, to assess, analysis, model, define and subsequent operational implementation of the core business processes of the utility. The solution provider should study the business process of the utility with or without BPR to provide procedural automation of business process.

Under competitive fast changing business environment coupled with reforms initiated in the sector, the proposed solution under the scope of this specification must be agile and adaptable to change to tackle corporatisation, competition, merger, demerger etc. The workflow system should be able to handle routing of documents, structured information handling, complex event processing, programmatic manipulation of information, and the ability to exchange information with web services and other external information sources.

The entire system specified in the document should be able to provide procedural automation of the existing business processes i.e work flow activities, invocation of appropriate human and/or IT resources



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associated with the various activity steps. The proposed solution should be able to respond to changes of user's need.

The document has been divided in different modules for purpose of specifying different kind of business activities for ease of understanding but each of the module is a part of one business i.e. the distribution of power by the utility. The workflow system should be able to interact between different processes and data base to carry out required task. For example, to carry out DT wise energy accounting and audit it is necessary for energy account module to extract information from GIS database for the no. of consumers connected to that DT and their identification no. The MBC module will provide the energy consumption of that given set of consumers for defined billing period and Data acquisition module will provide the energy consumption of that DT for said period. The difference between these two sets of input will generate DT wise energy loss.

Similarly the network analysis module will calculate technical loss for any given section of the network based on GIS based network information and load flow details in Data acquisition module to segregate technical and commercial losses.

The effort had been made to specify all such inter process interactions, however study of business process of the utility is required by the implementing agency to complete the understanding. However, Service oriented architecture would be preferred solution for work flow implementation.

SOA with its loosely coupled nature shall provide better flexibility in building applications and allow enterprise to plug in new services or upgrade existing services in a granular fashion to address the new and changing business requirements, shall bring better reusability of existing assets or investments and allow to create applications that can be built on top on new and existing applications without completely rewriting an application.

Service Oriented Architecture shall be implemented using standard set of technical specifications of Web Services to achieve a platform-neutral approach for accessing services and better interoperability.

- SOA should be approached based on business process as the driver and it should not be driven Purely from an IT perspective (i.e. reuse only).



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- The business process and its re-engineering would drive the abstraction of business process which in turn would drive the **identification of catalog of business services** i.e., services at high granularity.
- Also the variables in business rules embedded in these services should be configurable and not hard-coded.
- The scope of integration includes establishment of Business Services following SOA principles.
- The solution should have a catalog of business services that are at a high level of granularity (illustrated below in example, however an indicative list of service catalogue shall be provided which can be customized by the concerned IT consultant) to facilitate flexibility in business process.
e.g.: New connection module could have the following set of services, some of which could be common with other modules:
 - Request for New connection
 - Establish Customer (add/update; common with customer care module and web self-service)
 - Establish Service Contract (add / update)
 - Start Service Connection etc.
- In addition, the solution could also have lower level granularity of services to facilitate re-use of business functionality for the technical/IT Team. This is not mandatory but desirable.
- The Solution would ensure that the above is achieved in one of these ways:
 - The solution provides for all of the above “out-of-the -box”
 - Additional business services are created, say using wrappers around existing services, to create higher granularity of services

For Baseline data creation, IT enabling of distribution business will be required and the following applications as add on modules will be integrated on GIS platform. The BPA software should be modular in nature. The rate for each module should be quoted separately. Utility may implement in full or in parting phases the BPA software. The requirement of different modules for Business Process automation is detailed below.

Response Guide

Response	Definition
Compliant (C)	Functionality is included in the base product. No customisation ¹ is required. Provide an explanation - refer to comment field.
Explanation Required (ER)	Functionality is included with some limitations, provisions



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	or dependencies that require further explanation - refer to comment field.
Future (F)	Functionality is not currently included but will be available within the next 12 months (from date of submission of this proposal).
Customisation Required (CR)	Functionality is not included in the base product but can be provided by a customisation ¹ to the base product.
Non Compliant (NC)	Functionality is not currently included and will not be available within the next 12 months.
Comment	Comments to explain or qualify the response.

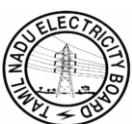
Descriptive Style Responses

Responses are required in a written form, providing a descriptive or informational response. Depending on the size and format of the desired response, respondents may choose to provide written responses in the comments column of make reference to attached documents. Attached documents must be in Microsoft Word, Microsoft PowerPoint, Microsoft Excel, Microsoft Project or Adobe Acrobat formats.

Customization - to alter the base product to meet the specifications of an individual organization, such that it becomes unique and can no longer be treated as a commercial-off-the-shelf product.

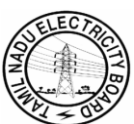
2. System functionalities:-

Requirement ID	Feature	Functionality	Criticality	Response	Comments
Sf.1	Modular Design	Applications, systems and infrastructure are to be characterized as service-oriented, component-based & reusable. The system will be modular in design, operations and implementation.	Vital	C/ ER/F/ CR/ NC	
Sf.2	System Architecture	The supplier is to balance the adoption of standards used by market leading vendors and products, and adherence to industry standards and open architectures. Systems are to be acquired, developed, or enhanced in such a way that business processes; application and infrastructure services and data can be shared and integrated across the Utility and with potential business partners.	Vital		



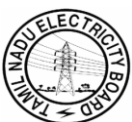
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Sf.3	Application architecture	Application architectures must be highly granular and loosely coupled. This is focused on loosely coupling systems compliant to Service Oriented Architecture to facilitate application recovery. This is to ensure that the failure of one component does not cascade to others. A tier can also be scaled to run separate applications to optimize performance.	Vital		
Sf.4	Web based design	All the application designed for this purpose shall be web based and the Purchaser at workstation shall be able to access through the latest available version of the web browser such as Internet Explorer, FireFox etc Any add-on required must be integrated with latest version released by the developer at the time of Bid opening	Vital		
Sf.5	Business Process Requirement	Application requirements will be based on Utility's business processes and the functional requirements that derive from them. The application system should empower the Business Users in defining the business processes by process modeling.	Essential		
Sf.6	Data base server	The applications must be capable of running in a clustered environment as high availability configuration of database server that will run multiple workloads.	Essential		
Sf.7	Basic System architecture and Unified Access framework	The applications system should have the built upon WS* specifications using open industry standards of web services using XML, SOAP, WSDL and UDDI and should have the unified access framework compliant to W3C portal specifications for people, process and information by integrating the backend applications with single sign-on feature, role based, request based and hybrid user type access, searching and collaborative environment.	Vital		
Sf.8	Directory service	Common enterprise wide directory services shall be leveraged by all access systems and services used by all the enterprise users and adhere to commonly accepted standards such as LDAP.	Vital		



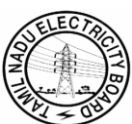
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Sf.9	Message based interface	As per the requirement, Interfaces between separate systems (both internal and external systems) will be messaged based compliant to W3C XML standard/OPC/DDE/ODBC interface.	Essential		
Sf.10	Application Integration	Integration technologies must be industry proven standards. They must be scalable in capacity and provide for extensive functionality. WS* based Web Services integration specifications shall be used from integrating disparate systems, such as : <ul style="list-style-type: none"> • Web Services Messaging Specification including SOAP • Web Services Reliable Messaging • Web Services metadata Specifications including WSDL • Web Services XML Specifications • Web Services Business Process Specifications including BPEL4WS • Web Services Management Specifications • EDIFACT and ANSI 	Essential		
Sf.11	Data Storage	Data is considered to be an utility wide asset and is to be shared across the utility. Data stores for transaction processing shall be kept separate from data stores for decision support.	Vital		
Sf.12	Data access	The applications will access data through business rules i.e. the applications must not access data directly without going through APIs managed by business rules/ validation/workflow. Data should be collected once and used many times.	Vital		
Sf.13	Central data storage	Data shall be stored at central data center. The Data acquisition server located at Central Data Centre will acquire the meter data at periodic interval as agreed between owner and bidder during implementation stage.	Vital		
Sf.14	Network environment	The application should be capable in running in a hybrid network connectivity environment i.e. Dialup, PSTN, Wireless, Leased Line, WAN environment etc. including MPLS/VPN based secured tunnel.	Vital		
Sf.15	Application scalability	The application portfolio and the IT infrastructure are to be vertically and horizontally scalable in size, on demand with virtualization capacity, and functionality to meet changing business and technical requirements, thereby enabling the utility to be adaptable to change.	Vital		



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Sf.16	Application manageability	Applications need to be designed for manageability using Enterprise Management System. This needs to encompass: scheduling, backup and recovery, application, database and network infrastructure monitoring, tuning and remote diagnostic management.	Essential		
Sf.17	Network option	The network will use standard, open, vendor neutral communication protocols. Considering the scale of implementation envisaged, the system will provide for various networking options between different entities. Such options would include Leased Lines, VSAT Links, Telephone Modems, through Internet , VPN etc.	Vital		
Sf.18	Central Administration	It will be possible to set various options and logic of the system (for example -Calculation Logic of payable amount by consumer) centrally. This will ease the system administration work.	Vital		
Sf.19	Data Ownership	Irrespective of the Operation/ Outsourcing option adopted for operation of the system, the ownership and physical possession of the data will always remain with the Discoms. The application should provide the flexibility of system disintegration/aggregation of information and application in case of outsourcing, acquisition, and merger of Discoms.	Vital		
Sf.20	Login wise rights, groups	The system will be able to grant specific access rights to each login or group of logins, as per the business requirement and policy of the DISCOMs with unique identify across the enterprise system. System shall also permit temporary transfer of access rights within his group to officers for employees reporting to him.	Essential		
Sf.21	Data Backup	System will be required to maintain daily backups of the database on reliable backup media like DAT drives, CDs, tape etc.	Vital		
Sf.22	Data Archiving	The System will maintain only five years of operations data online. Operations data more than five years old would be archived and the archives maintained at the various locations.	Essential		
Sf.23	Interface with other system	As per the requirement, system will exist in conjunction with several other systems. It would therefore be required to interface with other systems for seamless flow of	Vital		



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		business information in Web Services or W3C XML industry format/ OPC/ DDE /ODBC Interface.			
Sf.24	Embedded control	To make the operations more efficient, the system will have the facility of incorporating embedded controls, which would force the organization to carry required tasks in the time frame specified.	Essential		
Sf.25	Report Generation	The system will provide a report generating tool, which can be used to generate customized reports at any level. The reports generated should be stored in various user configurable "bins". The access to bins should be configurable by having security roles in the system.	Essential		
Sf.26	Mail interface	The system will have the capability to interface with the mailing system (e.g. Lotus Notes, Microsoft Exchange etc), if available, to deliver the Alerts and Service Orders. In the absence of such a system, the Alerts and Service Orders will be served on portal with user login. The system should also be capable of interfacing with other applications (ERPs, MS Office etc).	Essential		
Sf.27	Prioritizing workflow	The system will have in built priorities defined, which will be used to process the prioritized tasks first in case of system constraints (e.g. network unavailability, time constraints etc).	Desirable		
Sf.28	Performance monitoring of system	The system should have provision for network, application, and database monitoring for performance management, tuning, remote control configuration management features with facility for SLA report generation.	Essential		
Sf.29	MIS Reports	The system should allow for a graphical interface to view the summary data in MIS reports. This would include trend graphs, graphs indicating how much of the target has been met etc.	Essential		
Sf.30	Multiple OS support/ Inter-operability.	Client End: The solution should be able to support a variety of client end Operating Systems like Windows, Linux with X-Windows or MAC OS. Server End: The solution should be built on open standards and interoperable platform of WS* based open specification and shall be able to interoperate with multiple operating systems like Windows, Unix and Linux.	Essential		
Sf.31	Multiple database support	The solution should be able to interoperate with multiple industry standard RDBMS platforms like Oracle, MS SQL, MY SQL, DB2, Informix, Sybase or	essential		



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		any other RDBMS confirming to ANSI/ISO SQL-200n standards and should be built on WS* based open specifications.			
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1.0 Module : Meter data acquisition system

Objective :

The main objective is to acquire meter data from System and Select consumer meters automatically from remote avoiding any human intervention, Monitor important distribution parameters, use meter data for accurate billing purposes and generate exceptions and MIS reports for proper planning, monitoring, decisions and taking corrective actions on the business activities by the management.

The above objective under this specification is achieved by providing an Automatic Meter Reading (AMR) based Data Logging System using any of the available Communication Technologies available like GPRS, EDGE, covering all the Feeder Meter, DT Meters and All HT and LT consumers above 25 KW in the entire Utility area.

The module describes the broad functionalities and requirements of AMR based Data Logging System at Substations, Sub division and other offices in the entire utility area, as described in the following sections to acquire & store data of Energy Meters of various makes installed at 33/11 KV Feeders, Distribution Transformers, HT Consumer and select LT consumer ends.

The sub station data concentrator unit will acquire data from feeder meters and will transmit the same to central data centre server(s) through GPRS/EDGE. The meter data from all distribution transformers as well as HT/select LT consumers will be transmitted to the central data centre server(s) through GPRS/EDGE. A PC will be installed at each substation with a purpose for local viewing and monitoring of feeders by substation staff.

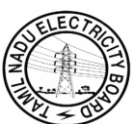
The sub station meters are fitted with RS 485 ports, whereas meters at DT & select consumer locations fitted with RS 232 ports. The supply and installation of the meters are excluded from the scope of this contract

The meters provided are modbus compliant. However, the solution provided shall be compatible with future meters also, which may be introduced in Indian market complying with DLMS/COSEM/IEC-62056/ANSI C-12 19/IEEE P 1377 Standards. For solving the interoperability issue of different make / model of Meters installed presently in different utilities, Utility is responsible for providing meter protocol and memory map of the meters installed in their area.

As most of the meters provided presently are Modbus compliant, Modbus/TCP shall be the preferred mode of communication.

The proposed Data Logging system is expected to provide continuous on line monitoring and logging of essentially, though not limited to, the following parameters in respect of all incoming and outgoing feeders, Distribution Transformers and consumers on real time basis : -

- i. Voltage, Phase to Phase and Phase to Neutral
- ii. Current on each phase
- iii. Power factor



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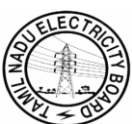
- iv. Frequency
- v. Power - Active / reactive / Apparent
- vi. Energy - Active, Reactive and Apparent

The proposed system is expected to provide continuous on line monitoring and logging of above mentioned parameters and capability to generate Spread Sheets and MIS report as below :

- i. System outage / downtime feeder wise.
- ii. Energy balancing at sub stations .
- iii. Daily peak loads feeder / transformer wise.
- iv. Peak Load of the Station.
- v. Bus bar profile.
- vi. Daily Log sheets & any other forms / reports as required by the Utility

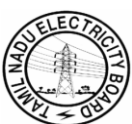
The detailed scope for each of the activities is detailed hereunder. The tentative quantities of Assets to be captured under the said scope of work is being mentioned in Annexure-A of Section: G6.

Requirement ID				
Das.1.0		System features :-		
Das1.1	Provision to collect and manage meter data	A system that collects and comprehensively manages meter data from system (utility network) meters and select customer meters using MODBUS/DLMS/COSEM/IEC/ANSI/EEE compliant protocol. As most of the meters provided presently are Modbus complaint, Modbus / TCP shall be the preferred mode of communication	Vital	C/ ER/F/ CR/ NC
Das1.2	Remote capturing of meter data from system & select consumer meters	A system that captures the meter data remotely from all the meters at 33 KV, 22 KV & 11 KV Feeders, Ring fencing meters, Distribution Transformers and HT/select LT Consumers for sending it automatically to the remote collection center i.e. Central data center. The system should have a provision of capturing data from captive generators, third party sales, wind energy generators etc if a provision of AMR is provided at these meters.	Vital	
Das1.3	Provision of communication media	The system provides for GPRS/ EDGE Communication technology between Meters located at Distribution transformer/HT/LT consumers substation DCUs ring fencing Meters and Central Data Center .	Vital	



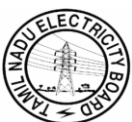
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Das1.4	Optimal utilization of meter data	A system that optimally utilizes meter data for distribution management and billing.	Essential		
Das1.5	Provision of a decision support system	A decision-support system for distribution operations, asset management and planning actions, e.g. Peak load monitoring shall help in finalizing the requirements for creation of additional electrical network element or up-gradation of existing electrical network element to meet the increased demand / load growth, Power factor monitoring shall help in capacitor placement requirement, voltage monitoring shall help in identifying low voltage areas for network up-gradation, data captured on imbalance between phases for DT, substation and 3 phase consumer meters can be used to increase reliability/plan load balancing jobs / advise customer to transfer loads between phases etc.	Essential		
Das1.6	Identification of poorly performing areas	A system that pinpoints poorly performing areas in the sub-transmission / distribution network, based upon the technical parameters, such as area wise distribution losses, theft, outages, overloaded circuits/equipment, voltage imbalance, reliability indices, power quality etc.	Vital		
Das1.7	Helping in network upgrade actions	A system that aids decision-making on network upgrade actions by leveraging of historical meter data to calculate area-wise load growth, equipment wise, downtime/outage statistics, seasonal effects and usage pattern for long term and short term planning.	Essential		
Das1.8	Enabling health and performance monitoring of assets	A system that enables 'health' and performance-monitoring and management of important system assets (feeders/ transformers).	Essential		
Das1.9	Detection of HV/DTR outages	A system that enables quicker, 'event-driven' detection of HV/DTR outages thereby improving reliability indices and customer satisfaction.	Essential		
Das1.10	Monitoring of customer performances	A system that enables monitoring of customer "performance", e.g. contract demand violation, peak load violation, tamper counts, average power factor etc. The system should also have provisions to cover usage patterns to solve high consumption complaints, facilitate	Essential		



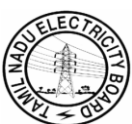
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		calculation of assessed readings for stopped meter cases, detect low consumption cases by comparing average historical consumption with actual consumption.			
Das1.11	Enabling dispatch of event notifications	A system that enables dispatching of event notifications to targeted recipients for faster field response and decision making.	Essential		
Das.2.0		Scope of deliverables :			
Das2.1	Supply /installation of Hardware	Supply and installation of Server, Work station with Printer and all other hardware system for data acquisition system at Central Data Centre	Vital		
Das2.2	Application software for capturing, validating and analyzing the Meter data	Web based Application software for capturing, validating and analyzing the Meter data for the given size of Utility network defined in Annexure-A of Section: G6. (Sub Station feeders, ring fencing meters DTs, HT Consumers and select LT Consumers)	Vital		
Das2.3	Application software at data center	Application software for acquiring incremental meter data from all metering points under the utility area for aggregation, analysis and generation of various MIS report through appending of the Metering module.	Vital		
Das2.4	Supply/ installation of data concentrator at sub stations	Supply and installation of data concentrator unit and connect all substation meters through Daisy chaining along with field wiring / cabling from feeder meters to Data concentrator unit	Vital		
Das2.5	Supply/ installation of Modems at sub stations	Supply and installation of suitable (GPRS/ EDGE) Modem at sub stations for communication between Data Concentrator Unit located at sub station and data acquisition server at Data Centre.	Vital		
Das2.6	Supply/ installation of Modems at DTs and HT/ Select LT consumers	Supply and installation of suitable Modem (/GPRS/ EDGE/) at meter ends for communication between Meters located at Distribution transformer, ring fencing meters and HT/select LT consumers and Data Acquisition Server at Central data Centre. Modem may be retrofitted on optical port of the meter.	Vital		
Das2.7	Supply/ installation of any other equipments or accessories	Any other equipments or accessories required for operation of the system.	Essential		



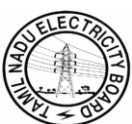
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Das.3.0		System Architecture : General Notes			
Das3.1	Provision of an integrated software system to meet the functionality of AMR	<p>An integrated software system should be provided to meet the following Functional requirements spanning Automated Meter Reading :-</p> <ul style="list-style-type: none"> ➤ Real Time data acquisition from Meters ➤ Historical data acquisition from Meters ➤ Supervisory function i.e. processing, monitoring, analysis and diagnostics ➤ Data exchange ➤ Storage of data ➤ Report generation and reporting ➤ Facility for user defined forms and reports e.g. calculation of Feeder/DT performance statistics ➤ Facility for time synchronizing ➤ Alarm list ➤ Event list ➤ Limit value violations 	Vital		
Das3.2	Flexible deployment / implementation of software system	The software system deployment/implementation should be flexible. The deployment should be web based and there should be no need for any installation / licensing at client end.	Vital		
Das3.3	Web based software system	The software shall be web based system for automatic data display and reporting capturing, etc.	Essential		
Das3.4	Provision for local / remote data collection	The software shall have option for data collection from meters connected locally or that are located in remote locations, through modem communication.	Vital		
Das3.5	Facility for Web based front end	Software shall have web based front end.	Essential		
Das3.6	Provision for data validation.	The software shall ensure data validation at Central Data Centre after reception to eliminate possibility of garbage data. The system at Central Data Centre should apply comprehensive data validation before accepting and using meter data.	Vital		
Das3.7	Provision for flexibility, user friendly and scalability	The software system shall be flexible in terms of System & Application software, user friendly and scalable upwards and downwards.	Essential		
Das3.8	Software system with robust architecture, high availability and reliability	The software should be based on a robust architecture model / framework that is highly scalable/available/reliable, gives good performance, and offers distributed computing.	Essential		



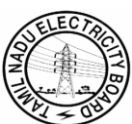
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Das3.9	N-tier design methodology	The software would be designed with multi-tier (N-tier) design methodology. It should have distinct tiers representing the data acquisition/ data processing/ time-series database/ rule based MDM/ web-interface/ reporting layers etc.	Vital		
Das3.10	Client tier	The client tier will be the interface of the software with the utility's operations/ dashboard user. The client tier will provide all the user interfaces for the operational and supervisory activities involved in meter data acquisition, processing and analysis.	Vital		
Das3.11	Business logic tier	The business logic tier would service the requests made by the client tier. These requests could be automated, based on user-defined schedules or on-demand from the user.	Vital		
Das3.12	Automatic workflow process from data acquisition to analysis	Normal workflow processes from meter data acquisition to analysis would be as automated as possible; for example user intervention would be sought only for data editing or verification decisions.	Essential		
Das3.13	Database tier	The database tier should comprise an RDBMS that should be designed to be able to maintain the relationships between meter and network assets, network topology, user privileges, service points, customer accounts and other entities.	Vital		
Das3.14	Maintenance of time stamped database	The database should also maintain a time-series repository that stores the data collected and processed from meters, including interval usage data, event logs and outage history, as well as derived data such as aggregations and asset performance indicators like load factor and load duration curves.	Vital		
Das3.15	Optimal designing of database	The database tier should be optimally designed to exploit both normalized as well as multidimensional data models.	Desirable		
Das3.16	Provision of OLTP and OLAP models	Both OLTP (Online Transaction Processing) and OLAP (Online Analytical Processing) models should be exploited for ensuring performance and scalability.	Essential		
Das.4.0		Features for Data logging system at Sub station:-			
Das4.1	Data collection on a common data structure	Software shall be capable of collecting data on a common data structure / format from Feeder meters of various manufacturers installed in the Sub station. The data logging software	Vital		



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		package should be able to integrate, extract and analyze data of different make of Meters.			
Das4.2					
Das4.3	Main areas of data collection	The software will in general collect the following data from the meter - <ul style="list-style-type: none"> ➤ Billing Data ➤ Load survey profiles ➤ Tamper data ➤ Date and time of collection of data ➤ Instantaneous parameters at the time of collection 	Vital		
Das4.4	Typical list of data acquisition from the Meters	A typical list of data acquisition from the Meters has been mentioned below : <ul style="list-style-type: none"> ➤ Acquire real time instantaneous data like voltage, current frequency, power factor, active power, reactive power etc. at the specified regular intervals (15 minutes as per meter specification) for online monitoring anywhere across Utility using web browser. ➤ Acquire stored historical values of data at regular interval with power consumptions, accumulated energy, accumulated power, maximum demand and other parameters. ➤ Acquire real values of specified parameters on demand. ➤ Synchronize date and time of all meters. 	Essential		
Das4.5	Provision of generating critical events	Software shall be able to provide details of critical events (e.g. No communication with Meter,, Power failure etc.) and necessary provision should exists to report the correct event to user.	Essential		
Das4.6	Provision of manual entry of data in case of meter change	Software shall have facility to enter manual readings & associated data for taking care of meter change on feeder, but only with appropriate user identification, security and audit trail.	Essential		
Das4.7	Seamless transfer of data even in case of meter change	Software shall show and transfer data seamlessly even in case of meter change. An indication of meter change shall be available.	Essential		
Das4.8	Storage of meter data at sub station	Sub-station data concentrator unit will acquire and store the Meter data in it's memory and push the data to the central data center at pre defined intervals..	Essential		
Das4.9	Mode of data	Normally the data transfer from	Essential		



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	transfer from sub station to Central Data Centre	Substation to data center will be over /GPRS/ EDGE/The data should be sent automatically on pre-defined interval (15 mins).			
Das4.10	Facility for back up and restoration of data	Facility for taking backup & restore of data collected at Data centre shall be provided in software.	Essential		
Das4.11	Administrator facility	The software at the data center shall provide administrator facility to decide the storage of data for at least three years.However, the data concentrator unit at the sub station shall have a storage capacity of Meter data of at least 24 hours	Essential		
Das.5.0		Features of Data Logging system for Central Data Centre:-			
Das5.1	Periodicity of data collection	System shall be capable of collecting data from all the HT consumers at least every One Hour and from all the Distribution Transformers at least once in 24Hour . The meter data from the substation data concentrator units shall also be captured at least once in 24 Hours . The data transfer from field to data center should be automatic without the need for any dialing or scheduling at the data center. The number of HT consumers and number of DTs have been furnished in the enclosed Annexure-A of Section: G6. However, the bidder may visit the area and collect the exact details about the number of HT consumers and number of DTs at site and design and supply the system as per actual availability at site. Further, the system shall be designed and shall have provisions for inclusion of new Consumers and Assets in future and shall provide additional spare capacity to cater 7.5% per annum growth over and above the actual requirement at site on account of the future provisions.	Vital		
Das5.2	Functionality of Data acquisition software	The Data acquisition software at central data centre must have the following functions : a) Data Collection : It shall receive data from the remote Data concentrator unit installed at the substations DTs and HT consumers through GPRS/EDGE Modems and store in the	Vital		



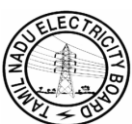
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		<p>database.</p> <p>b) Data Processing : It shall use data from the database to create reports, charts and spread sheets.</p> <p>c) Data transfer to data center : All the modems should be able to transmit the meter data to central data centre which shall reside in the Metering module for further aggregation, analysis and MIS generation as per request from various utility offices</p> <p>d) Messaging : Via GPRS/EDGE</p> <p>e) Program Generator: It shall have editors and configuration software.</p> <p>f) Facility to communicate with multiple clients simultaneously through multiple communication lines.</p>			
Das5.3	Availability of sufficient storage capacity	The system shall have sufficient memory capacity for storing every Analog, Digital and Accumulator data of all connected remote Data concentrator units as well as all Ring fencing meters, DTs and Consumer data for a period of at least three year at Central Data Center.	Vital		
Das5.4	Generation of DT wise, Feeder wise and Substation wise data base	The software shall provide DT wise, Feeder wise and Substation wise data for generating summary reports, statistical data, performance indices etc. in user defined forms.	Essential		
Das5.5	Ability of software to integrate, extract and analyze data of different make of Meters	Software shall be capable of collecting data on a common data structure / format from DT meters and HT/select LT consumers of various manufacturers. The data logging software package should be able to integrate, extract and analyze data of different make of Meters.	Vital		
Das5.6	Manual/ automatic mode of data transmission	The modems (remote devices) should automatically send the data at pre configured interval of time. There should be option for changing the frequency of data transfer from the central server.	Essential		
Das5.7	Viewing / exporting of collected data	The collected data can be viewed in the form of customized reports. User can take print outs of these reports, export the data into spreadsheets, or convert the data in the form of flat file.	Essential		
Das5.8	Mode of transfer of Meter data	The data will be transferred from various AMR devices/data concentrator unit to the data centre server in one of the following possible methods :-	Vital		



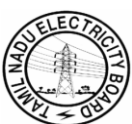
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a)	<u>Automatic Data Transfer</u>	<u>By default data shall be automatically sent in push mode by the AMR devices/data concentrator units to the Data Centre at preconfigured time interval.</u>	Vital		
b)	Manual Request for Data	<u>Under special circumstances there should also be a provision to get the data on manual request from AMR devices/data concentrator units</u>	Vital		
Das5.9	Facility for archiving, deletion, backup & restoration of the data	Facility for archiving, deletion and taking backup & restore of entire or part of the data collected at Central server office shall be provided in Software.	Essential		
Das.6.0		Meter Data Acquisition : software requirements			
Das6.1	Configurable data collection engine for meters of different make	The Data collection engine of the Data logging software shall be configurable for Meter of different make and shall have the ability to perform remote data acquisition from system and customer meters.	Vital		
Das6.2	Enabling of data acquisition from different AMR configuration	The software will enable data acquisition from different AMR configuration schemes (based on location and selection of system/consumer nodes)	Vital		
Das6.3	Enabling of data acquisition over any communication media	The software will enable data acquisition over any of the locally and reliably available communication media : GPRS, EDGE, etc.	Vital		
Das6.4	Provision to configure and manage technical parameters for communication media	The software will be able to configure and manage technical parameters for the communication media used in the project.	Vital		
Das6.5	Provision of remote reading & collection in both automated and manualmode.	Remote reading collection will be possible in data push from the field devices automated mode. as well as in the on-demand (real-time) mode.	Vital		
Das6.6	Features of data collection	Data from remote AMR devices will be acquired automatically. Software will allow reading cycle to be configured either for individual meters or groups of meters. Appropriate time windows for data collection from different meters at preconfigured interval of time to the Data collection server at the DC can be set. The	Vital		



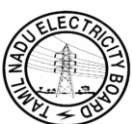
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		data collection could be at any one of the pre-defined monthly, daily, hourly or quarter-hourly frequencies or at any user-defined frequency greater than 15 minutes.			
Das6.7	Support for both inbound and outbound communication	The software will support both inbound and outbound communication, i.e. data transfer could be initiated by either the remote meter in general or the central software in case of special requirements.	Vital		
Das6.8	Type of Inbound communication	At minimum, inbound communication will include event notification calls for power outage and restoration events. The event driven polling of meters shall enable pinpointing of faults during outages, defective or stopped meter.	Essential		
Das6.9	Type of outbound communication	In outbound communication, the number of retries made by the software for failed meter readings will be configurable. If the meter cannot be read even after the specified number of retries, the system will raise an alarm and generate meter reading exceptions to enable tagging of cases for site verification.	Essential		
Das6.10	Ability to retrieve both instantaneous and logged data	The software will have the ability to retrieve both instantaneous and logged data from the meter.	Essential		
Das6.11	Support for import of meter data	The software will support import of meter data from external sources in industry-standard formats like ASCII, CSV or XML. It will also allow manual entry of meter data in exceptional cases only with appropriate user identification, security and audit trail. The input sources of meter data could be CMRIs (Common Meter Reading Instruments), substation log books etc.	Essential		
Das6.12	Synchronization of all meters to a common fixed reference	The software will be able to synchronize the date and time of all remote devices to a common fixed reference of the server clock. All the raw meter data entering the system via AMR or any external means is time-stamped and stored for audit and further analysis.	Essential		
Das.7.0		Network Topology Management			
Das7.1	Ability to capture and maintain the geographic /	The software will be able to capture and maintain the geographic / administrative / regional hierarchy of a utility's control area, i.e., the tree hierarchy of zones,	Essential		



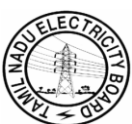
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	administrative / regional hierarchy	circles, divisions, subdivisions, sections and substations constituting a utility.			
Das7.2	Ability to capture and maintain the electrical network topology	The software will be able to capture and maintain the electrical network topology, i.e. ring fencing meters, substations, feeders, transformers and HT consumers and select LT consumers.	Essential		
Das7.3	Flexible and Indian context oriented regional hierarchy and topology	Both the regional hierarchy and topology would be specific to the Indian context and flexible enough to account for different voltage levels in Indian sub-transmission and distribution networks e.g. 66/33/22/11/ 0.4 KV.	Essential		
Das7.4	Provision to capture and maintain associations between various metering nodes	The software will be able to capture and maintain associations between various metering nodes (both system and consumer meters) and the regional hierarchy / network topology.	Essential		
Das7.5	Typical list of System metering nodes	System metering nodes could include AMR-enabled meters located at these network points, among others: (i) Outgoing feeders from grid substations (at 33kV/ 22kV / 11kV etc), (ii) Incomers (33kV etc) at the power/secondary substations, (iii) Outgoing feeders (22kV/11kV/ 6.6kV etc) from the power/secondary substations, (iv) inter-region power import / export tie-points on sub-transmission/ distribution feeders, (v) Distribution transformers (DTR) primary/secondary.	Vital		
Das7.6	Typical list of Consumer metering nodes	Consumer metering nodes could include AMR-enabled meters located at the service points of selected H.T./L.T. consumers (e.g. those with load above 25kW)	Vital		
Das7.7	Provision for modification in existing metering nodes	The software will allow modification of existing metering node parameters.	Essential		
Das7.8	Provision to add virtual metering nodes	The software will allow addition of virtual metering nodes and associate the same to the regional hierarchy / network topology.	Essential		
Das7.9	Provision to Navigate to any level of the regional hierarchy/ network	Navigation to any level of the regional hierarchy / network topology would be simple and intuitive via drill-down mechanism.	Essential		



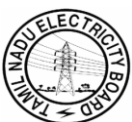
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	topology				
Das7.10	Provision to display SLD	Software will be able to display SLD schematics for important network areas.	Essential		
Das7.11	Provision to depict Single line diagram	Software shall have facility for creating data base and display of single line diagram of entire electrical network and embedding of acquired data (both analog & digital) of each feeder in real time.	Essential		
Das.8.0		Data Validation, Editing and Estimation (VEE)			
Das8.1	Supporting of automated rule-based validation	Software will support automated rule-based validation and estimation of raw metered data.	Essential		
Das8.2	Supporting of multiple data states	The software would support multiple data states for metered data through its transition from acquisition to analysis e.g. invalid, estimated, edited, verified, validated etc.	Essential		
Das8.3	Configuration of validation rules	The software will allow configurable validation rules that may be selectively applied to an individual metering node or groups of metering nodes or to channels common to different metering nodes.	Essential		
Das8.4	Logging of validation failures	Validation failures would be logged for audit purposes.	Essential		
Das8.5	Backing up of raw data	Raw data would be backed up for audit purposes.	Essential		
Das8.6	Provision of meter data estimation routine	The software will have a meter data estimation routine that will be triggered on occurrence of validation failures.	Essential		
Das8.7	Enabling of estimation routine	The estimation routine can be selectively enabled/disabled.	Essential		
Das8.8	Provision of manual editing	The software allows manual editing of metering data with audit trail.	Essential		
Das8.9	Provision for audit trail	All data state transitions would be logged for audit trail.	Essential		
Das.9.0		Data Analysis & Charting			
Das9.1	Processing of validated meter data	The software will enable processing of validated meter reading data for generation and storage of different time series channels. A channel would hold data pertaining to one particular parameter.	Essential		
Das9.2	Support for multiple channels for multi parameters	The software will support multiple channels for multi-parameter such as Voltage, Current, Frequency, Energy, Energy demand, performance indicator and event related data.	Essential		



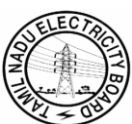
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Das9.3	Support for channels of different time series	The software will support channels of different time granularities, i.e. hourly, daily, monthly etc.	Essential		
Das9.4	Support for different channels for different type of data	The channels could hold direct measured data, derived (calculated) data, or data imported from external sources.	Essential		
Das9.5	Viewing of time series data in tabular / graphical form	User will be able to view time series data in tabular as well as graphical format.	Essential		
Das9.6	Ability to show status of time series data element	The software will be able to highlight the state of a particular time series data element, e.g. if it is absent, edited, estimated etc.	Essential		
Das9.7	Comparison of multiple time series data	The software will enable user to compare multiple time series together. The data series could pertain to the same channel or different channels.	Essential		
Das9.8	Facility for automated filling up of certain derived time series channels based on data in one or more other channels	Automated filling up of certain derived time series channels based on data in one or more other channels will be enabled; e.g. data for the power factor channel of a particular metering node can be calculated using the data in the active power and reactive power channels of the same node. The latter two may have been directly filled with measured data from the meter.	Essential		
Das9.9	Provision of setting/editing of the conversion formulae	The software will allow setting / editing of the conversion formulae for the derived channels. The conversion formulae can be based on simple arithmetic / trigonometric / aggregation functions.	Essential		
Das9.10	Provision of aggregation of time series data	The software should allow aggregation of time series data based on parameters like geography (regional hierarchy), network topology, time and customer category	Essential		
Das. 10.0.0		Executive Dashboard			
Das10.1	Provision of Executive dashboard at various utility offices	Various utility offices, such as Circle, Division, Sub division, sections, sub-stations etc., can interact with master Metering (AMR as well as non AMR enabled) / Billing database at data center to provide the below mentioned features.			
Das10.2	Provision of selective monitoring of	The software would support selective monitoring of important summarized data at user-defined intervals that would aid in	Essential		



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	summarized data	decision-making for distribution operations and planning actions.			
Das10.3	Highlighting of key performance indicators	Key performance indicators, like AT&C losses, SAIFI, SAIDI, CAIDI (but not limited to) will be highlighted for every level of the network hierarchy.	Essential		
Das10.4	Energy balance at different network levels	Energy balance at different network levels will be captured and displayed. This enables monitoring losses by region (section/subdivision/division /circle etc) and by network asset (transformer/feeder).	Essential		
Das10.5	Monitoring of losses at different voltage levels	Monitoring of losses at different voltage levels will be enabled.	Essential		
Das10.6	Display of load survey analysis	The software will enable capture and display of data from multi-parameter load survey analysis. Monitoring of usage/demand patterns would thus be enabled.	Essential		
Das10.7	Monitoring of peak load	Peak load at different network levels could be monitored.	Essential		
Das10.8	Monitoring of performance factors	Performance factors like load factor, power factor, utilization factor, load duration curves etc would be monitored.	Essential		
Das10.9	Provision of transformer load management	The dashboard will enable transformer load management. User will be able to monitor overloading/ under loading, phase imbalance, load factor, utilization factor, load duration curves of transformers.	Essential		
Das10.10	Provision of Feeder load management	The dashboard will enable feeder load management. User will be able to monitor overloading / under loading, phase imbalance, load factor, utilization factor, load duration curves of feeders etc.	Essential		
Das10.11	Personalization as per the user's preferences.	The software would support personalization of the dashboard displays as per the user's preferences.	Essential		
Das10.12	Navigation from one level of network hierarchy to another	Navigation from one level of network hierarchy to another will be intuitive and drilldown will be possible	Essential		
Das.11.0 1		Reports			
Das11.1	Generation of reports based on the results of	The software will be able to generate and display reports based on the results of data analysis. The reports module will be	Essential		



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	data analysis	used as a more data-heavy alternative to the Executive Dashboard.			
Das11.2	Reporting on energy flow, performance factor etc.	The software will be able to display reports on all energy, demand, performance factor and event related data available for different metering nodes.	Essential		
Das11.3	Generation of reports with date range	Each report will allow user to specify parameters like date range, end points for which reports need to be generated.	Essential		
Das11.4	Type of reporting	The reports could be either Windows or Web based.	Essential		
Das11.5	Exporting of reports to other applications	The software will enable the user to export reports into other application software like ERP, Microsoft Excel etc. for further processing.	Essential		
Das11.6		Reports for Sub stations :			
Das11.6.1	Finalization of reporting requirement as per utility	Few typical reporting requirements are mentioned below, exact formats & requirement may be finalized as per the requirement of the Utility.	Essential		
Das11.6.2	Facility to configure & view parameters in tabular/graphic form	Software at substation level shall provide facility to configure & view parameters captured in tabular & graphical format.	Essential		
Das11.6.3	Facility to query data based on date & parameter name	Software shall have facility to query data based on dates & parameter name. Software shall be able to show trend for single parameter & comparative trend for multiple parameters based on the selection.	Essential		
Das11.7		Reports for Sub division office			
Das11.7.1	Provision for comprehensive reporting and MIS facility	Software shall provide comprehensive reporting & MIS facility and it should provide fixed format as well as query based reports in tabular & graphic format as required by user.	Essential		
Das11.7.2	Option to view data selectively in numerical / Graphical form	The user should have option for viewing selective data like Instantaneous parameters, Cumulative Energy Readings, Tamper information's, Tariff-wise Billing Data for each reset backup, Load Survey data, Meter Programming records. Option should be provided to view the Load Survey data in both numerical as well as In Graphical format with selective or composite view of parameters and in different styles viz. bar, pie and line.	Essential		
Das11.7.3	Generation of summary report	The software should scan through each meter data and generate a summary	Essential		



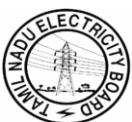
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	of meter data for any load violation and tamper counts	report of billing data, contract demand violation / peak load violation/ off days violation along with tamper counts for that particular meter.			
Das11.7.4	Provision of menu option for viewing each data report	Menu option shall be given for viewing each data reports. The options will be enabled based on the availability of the data for the meter selected for data viewing. Each report header should give the information regarding the Meter serial Number, RTC, Date and Time of data collection, Type of collection, CT/PT details and other important consumer details.	Essential		
Das11.7.5	Typical list of reports to be generated	Reports should provide detailed information on Billing data, Load Survey data, Profiles, Tamper information, Programming mode records and other system irregularities. Following is a representative list of reports for different levels of the network hierarchy and for different timeframes. <ul style="list-style-type: none"> • Energy balance report • Consumption trends report • Load factor report • Reliability analysis Report • Asset utilization report • Electrical network monitoring report 	Essential		
Das11.7.6	Availability of extensive search options	User should have extensive Search option for search using Meter number, Consumer Number, Consumer Name, Location, Date of Reading of meter. An explore option should also be given for listing out all the meter data available in the system. This menu option will provide the list of data files sorted in the order of serial numbers, consumer account number and location.	Essential		
Das11.7.7	List of a few typical reporting requirements	Few typical reporting, requirements are mentioned below, exact formats & requirement may be finalized as per the requirement of the Utility. <ul style="list-style-type: none"> ▪ Display of Electrical Parameters (Load current in Amp, power factor, frequency, voltage, active, reactive and apparent power etc.) in Tabular Formats and as Trends (Graphs) Over Periods (e.g. for a week or month) ▪ Comparative tabular & graphical reports for more than one meter & more than one parameters (comparison 	Essential		



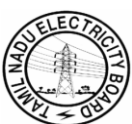
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		<p>of pure values as well as Min, Max, Sum, Average)</p> <ul style="list-style-type: none"> ▪ Min, Max, Sum, Average electrical parameters values, its time of occurrence and duration of maximum and minimum values ▪ Graphical Display of Maximum Power Demand Analysis ▪ Software shall have facility to query data based on dates & parameter name ▪ Software shall be able to show trend for single parameter & comparative trend for multiple parameters based on the selection. ▪ Support for sending report using Email or Alerts ▪ User Configurable Reports using MS Excel ▪ Detailed Error Reporting and diagnosis through Log Files and online display of Error Status ▪ Printing and Exporting of Reports to MS office. ▪ % availability factor of feeder (i.e. % of time for which power was available for feeders to know the reliability index of the feeder) 			
Das11.8		Reports for various Utility offices, such as Division, Circle, Head Quarter etc. :			
Das11.8.1	Reporting facility at various utility offices	Web based Reporting Software shall be available through web browser to Various utility offices, which can interact with Metering/ Billing database at Data center to provide extensive analysis & reporting facility. It shall also have extensive search options and should provide fixed format as well as query based reports in tabular & graphic format as per the requirement of the utility and described in detail at para Das.11.7 above (i.e. Reports at Sub division offices).	Essential		
Das11.8.2	Geographic/ administrative/ regional hierarchy wise reporting facility	The various offices of the utility e.g. zones, circles, divisions etc. can login to the system for generating and viewing various MIS reports, statistical data, performance indices etc. as per their requirement.	Essential		
Das.12.0		Event and Alarm Notification			
Das12.1	Monitoring of	The event list shall contain events, which	Essential		



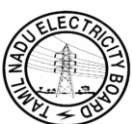
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	important events	are important for monitoring. The date and time has to be displayed for each event.			
Das12.2	Chronological registration of events	The events shall be registered in a chronological event list, in which the type of event and its time of occurrence are indicated. It shall be possible to store all events in the computer. The information shall be obtainable also from printed Event log.	Essential		
Das12.3	Listing of faults, errors and limit value violation in alarm list	Faults, errors and limit value violation of all values occurring shall be listed in an alarm list. Audible annunciation must be provided on receiving alarm. It shall contain unacknowledged alarms and persisting faults. Date and time of occurrence shall be indicated.	Essential		
Das12.4	Summary display of alarm situation	The alarm list shall consists of a summary display of the present alarm situation. Each alarm shall be reported on line that contains : <ul style="list-style-type: none"> ➤ Alarm date and time ➤ Name of the alarming object ➤ A descriptive text ➤ Acknowledgement state 	Essential		
Das12.5	Acknowledgement of alarms	The operator shall be able to acknowledge alarms. Acknowledged alarms shall be marked at the list.	Essential		
Das12.6	Typical list of items on which system can generate alarms	The system will analyze time-series / meter data and generate alarms/notifications. Following is the representative list of items on which system may generate alarms : <ul style="list-style-type: none"> ➤ Alarms based on consumption patterns ➤ Alarms based on loading conditions ➤ Alarms based on tamper detection ➤ Alarms based on outage detection ➤ Alarm based on violation of limit values ➤ Ability to configure criticality / priority of the events 	Essential		
Das12.7	Framework to configure thresholds for generating alarms at each end-point	The system will have framework that allows user to configure thresholds for generating alarms at each end-point. (e.g. one set of end points, user should be notified if daily consumption exceeds Y kWh and for some other end points alarms should be generated only if the daily consumption exceeds X kWh).	Essential		
Das12.8	Alarm on failure in communication,	The system will also generate alarms based on any failure in communication, missing/loss of data.	Essential		



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	loss of data etc.				
Das12.9	Supporting of alarm/ notification dispatch via comm. media	The system will support dispatching alarms/notification using various communication media like SMS, E-Mail, Desktop Application etc.	Essential		
Das12.10	Ability to deliver alarm/ notification to multiple recipients	The system will allow each alarm / notification to be delivered to multiple recipients. (e.g. alarms corresponding to outage at DTR level should be sent to a J.E. and an S.E.)	Essential		
Das12.11	Provision for turning certain alarm generation on/off as per user preferences	The system will allow turning on/off certain type of alarms generation (at system wide level or for particular end point) based on user preferences. (e.g. if one does not want any Communication Failure alarms, he/she can turn off the alarm generation for this criterion)	Essential		
Das12.12	Provision for turning certain alarm dispatch on/off as per user preferences	The system will allow turning on/off dispatching alarm notifications to required recipients. e.g. if Chief Engineer, does not want to receive any alarms for some reasons, system should be able to turn-off the same)	Essential		
Das12.13	Provision to acknowledge or ignore events / alarms	The system will allow user to acknowledge or ignore events/alarms. System will also allow user to log the actions taken, if any, for any particular event.	Essential		
Das12.14	Setting of different priority levels for different events /alarms	The system will support different priority levels for different types of events/ alarms.	Essential		
Das12.15	Provision of different dispatch schedules for different types of events/ alarms	The system will support different dispatch schedules for different types of events/ alarms. (e.g. Outage Alarms to be dispatched within 5 minutes of receipt and Contact Demand violation alarms should be dispatched before every billing cycle start)	Essential		
Das.13.0 1					

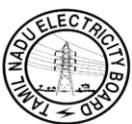


2.0 Module: Energy Audit

<p>Objective : Monitor important distribution parameters, capture hierarchical view of energy accounting, Network assets of power distribution utilities, intelligent analysis tools for plugging loop holes and identifying revenue leakage, adding into perform network planning and management activities, calculate / identify technical and commercial losses at any point in the network.</p>					
<p>Specification Energy Audit</p>					
Requirement ID	Functionality	Description	Criticality	Response	Comments
Ea.1	Collection of energy flow data from metering module	The system must collect energy flow data from the metering module. The manual entry of data should not be allowed except in the exceptional circumstances. The same can be allowed only by system administrator after approval of CEO or persons authorized for this purpose.	Vital	C/ ER/F/ CR/ NC	
Ea.2	Provision of graphical network diagram and network reconfiguration	The module should have a graphical network diagram indicating schematics of each substation, all connected transformers, outgoing feeders, DTs, all switches and connected meters. Based on the input from field, operator should be able to modify the switch position to represent reconfigured network. The time of carrying out such operation shall be informed by field staff. If the SCADA is in place the input for switch position should come from SCADA automatically. From the condition of switches, the system should be able to understand the power flow logic at any given point of time	Essential		
Ea.3	Calculation of Bus bar and transformation losses in the sub station	With the help of Integration with System Meter data acquisition module, the system should be able to check energy balance between HV side and LV side of any Sub station to ensure all the meters are working properly and can calculate bus bar losses and transformation losses in the substation.	Vital		

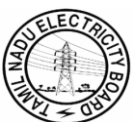
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Ea.4	Calculation of HT losses	The system should be able to balance 11 KV feeder flow against consumption of HT consumers and DTs in the feeder through integration with System Meter data acquisition module, thereby finding HT losses and DT losses.	Vital		
Ea.5	Calculation of DT losses	The system should be able to add consumptions of all the consumers connected to a particular DT and the consumptions of all the DTs in an 11 KV feeder. The necessary data for this regard will be available from the Customer indexing and asset coding database and billing data base.	Vital		
Ea.6	Provision of Network reconfiguration in case of change in power flow logic	In case of change in power flow logic due to network reconfiguration the system should be able to regroup the DTs / 11KV Feeders based on changed network configuration. The energy consumption data at the time of network reconfiguration should be recorded by system for energy accounting. In case meters are not recording on line data the consumption data of the meters recorded closest to the reconfiguration time should be taken for consideration.	Vital		
Ea.7	Calculation of technical losses in the system	With the help of Integration with Network Analysis module, the system should have be able to calculate the technical losses in the system from the power flow data and network data available in the system.	Essential		
Ea.8	Calculation of estimated technical and commercial losses in the system	The system should be able to calculate the estimated technical losses and segregate the commercial losses in every part of the network via integration with Network analysis module, GIS based indexing and asset mapping and computerized Billing System.	Vital		



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Ea.9	Generation of report of energy accounting and graphical analysis	It should store the energy audit data of each month for a period of 5 years. The system should be able to generate report of energy accounting indicating areas where high technical losses and high commercial losses are taking place. The system should be able to generate graphical analysis of losses over a period.	Essential		
Ea.10	Features of intelligent data analysis	The system should have intelligent data analysis feature to detect possible malpractices by comparing previous statistics of consumption.	Essential		



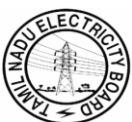
3.0 Module New Connection

Objective: The proposed system would aim at enhancing the convenience of the customer, when an application for new connection is received. It would enable the customer to collect and submit applications through a host of delivery channels, allow application status tracking etc. The system would help reduce the time taken for the new connection process. The system would enable updating customer data to be captured in the GIS based customer indexing database in a reliable way. The data entered at this stage would form the basis of the customer's record in the system. The system would ensure, through validation and checks, that the integrity of this data is maintained.

System Boundary From : Issue of Application To : New Connection confirmation, Temporary Connection, Load Extension/Reduction, Name Change and Meter Shifting etc.

Specification New Connection

Requirement ID	Functionality	Description	Criticality	Response	Comments
NC1.	Standardized formats and issue of form	The system should be able to generate and issue different application forms for New connection, Temporary connection, Load extension/reduction, Name change, meter shifting etc. for different categories of users, and the same forms should be available across all delivery channels (Section/ division/ circle/ corporate office/ customer service center, over the web	Vital	C/ ER/F/ CR/ NC	Standard
NC2.	Accepting application form	The system should be able to accept the form over the web and the system should trigger the CRM module to generate a bill inclusive of the registration fee and request the customer to make a payment at one of the Utility's collection centers before a specified date. The system should also be able to accept forms at customer care center and manual / automatic input (through scanner and OCR software) of customer data from application forms. System should check before accepting a form that all mandatory details as mentioned in the forms are filled.	Vital	C/ ER/F/ CR/ NC	Standard
NC3.	Accepting registration fee details	The system should be able to record the registration fee payment details and issue a receipt to the customer. The payments of registration fees may also be accepted through secure on line payment gateways over the web using latest version of SSL and in such cases receipt and application no will be displayed on the customer browser and the same will be emailed to customer.	Desirable	C/ ER/F/ CR/ NC	Standard



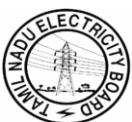
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NC4.	Generation of unique application no	The system should generate a unique application number for every application form received and registered.	Vital	C/ ER/F/ CR/ NC	Standard
NC5.	Reconciliation of collection	All registration fee details captured should be reconciled with the collections for the day via integration with MBC system.	Essential	C/ ER/F/ CR/ NC	Standard
NC6.	Accepting customer details	The system should be capable of capturing the details of the customer from the Application form.	Vital	C/ ER/F/ CR/ NC	Standard
NC7.	Checking customer details	The system should accept the customer details and then check the applicant's particulars against the set of existing customers, defaulted customers, disconnected and rejected applications. In case of a match in records, an exception should be raised. This exception should be flagged off to the relevant approving authority. After clearance from approving authority, the application will be processed further or the same will be rejected.	Essential		
NC8.	Handle special drives	The system should, based on a minimum set of data requirements and approvals specified by the utility, accept applications fulfilling the new connections or load enhancement need posed by special connection/ regularization drives.	Desirable		
NC9.	Checking system capability for issuing connection	The system should be able to assess the load for each applicant based on the predefined standards and validate the customer's self-assessment of load. The system should also have provision to accept installation test report of Licensed electrical contractor and to consider the load mentioned as the sanctioned load as per SERC regulations. During the verification process, the system shall also validate the current load on the relevant transformer, whether additional capacity is available. This information is maintained in a separate server (GIS based customer index and asset coding data base) The system should be able to provide a list of exceptions where the self-assessment	Vital		



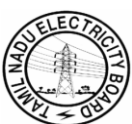
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NC10.	Inspection report generation	The system should provide the functionality of generating an intimation letter to the customer informing him of the customer premise inspection. The corresponding section office would also be informed of the premise inspection.	Desirable		
NC11.	Generate Standard	The system should be able to define area-wise standards based on the customer database for the area and a predefined logic. For instance, based on the applicant's locality, category and applicant details (premise floor area). The system should provide the flexibility of modifying the business logic that drives the standards.	Desirable		
NC12.	Waiver of inspection	The system should have the flexibility of bypassing the premise inspection requirements for customer below a particular connected load.	Essential		
NC13.	Accept inspection report and capture all details	The system should accept the customer load details, the category assigned etc. from the section officer, once the field test has been performed and add these to the customer database. It should also facilitate to capture the information regarding customer's planning to provide the service line himself etc, so that the development charges can be adjusted to reflect the same.	Essential		
NC14.	Estimate preparation	The system should be able to prepare an estimate for new connection, temporary connection, load extension/reduction, shifting of meter and / or service line with details as per utility defined criteria which may change from time to time. The system should be able to estimate the development cost after field inspection and the cost data provided by the utility. This database will be modified by the utility from time to time. In case of availability of on line stores and materials management module, system should be able to check materials availability and generate exceptions accordingly.	Desirable		
NC15.	Updating application status	The system should update the applicant log with his status (Accepted / Rejected / under process).	Essential		



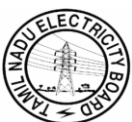
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NC16.	Generating rejection letter	In case the application is rejected, the system should generate a dues settlement statement, and print a cheque for dispatch to the applicant.	Desirable		
NC17.	Generation of bill for issuing new connection	When the Service Order for the' New Connection Approval, Temporary connection, Load extension/reduction, Name change, meter shifting etc. is generated, the system should trigger the billing module to generate a bill inclusive of the development charges and security deposit.	Vital		
NC18.	Generation of intimation letter	The system will generate an intimation letter informing him the bill amount etc. and last date of payment and will be sent to consumer by post, through email wherever available or any other information channels. E-mails should be sent automatically by the system and printed bills shall be dispatched by the Utility's staff.	Essential		
NC19.	Multiple contract formats	The system should also have the flexibility of storing multiple contract formats (between the utility and the customer) catering to the different customer categories.	Essential		
NC20.	Case by Case modifications to the contract	The system should have the facility for the user to specify a standard contract and make modifications to the same on a case to case basis.	Desirable		
NC21.	Accepting testing details	In response to the Service Order for new connection installation, the test report details should be entered into the system as a confirmation of the connection installation.	Desirable		
NC22.	Interfacing with stores for meters	The system should have the provision of accepting the number of meters available (of predefined types) through interface with online store management module (if implemented in future) and the business logic to allocate them. Based on this, the system can allocate meters to customers. In case of non availability, system should be able to generate exception.	Desirable		
NC23.	Route plan and monitoring of Meter installation	Based on the allocation and the service levels defined, the system should be able to provide meter installation route plan. System should also monitor installation report of the meters.	Desirable		



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NC24.	Generation of first bill	System should monitor generation of first bill of the consumer and raise exceptions after pre determined period.	Vital		
NC25.	Generation of unique service connection number	After approval of the application form for new connection / temporary connection, the system should generate a unique Service Connection Number ("SCN") for the customer. The logic for generating SCN shall be provided by the utility. The system may have to interface with GIS based consumer index database for generating SCN. This number would form the basis of all transactions by the customer under his account with the Utility. The service connection no. and the entire customer detail shall be first updated in GIS based indexing database before issue of service order for new connection / temporary connection. Similar updation of GIS database shall be done for other cases like load extension/reduction, name change etc.	vital		
NC26.	Integration with GIS and updation of database	This module shall be integrated with GIS database and GIS based network analysis module for allowing a new connection for the purpose of checking the network capability for adding additional load, the necessity for capacity augmentation and for generating work order with material requirement. At the time of adding a new customer the updation of GIS data base is mandatory. The system should have the provision for tagging connections to the property i.e. identifying all connections in the same building/ plot/premises, along with indication of their share of built up area. The tagging of connection with property should be superimposed on GIS maps to facilitate accurate dues transfer and facilitate site survey.	Vital		



4.0 Module : Disconnection & Dismantling

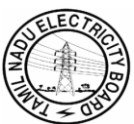
Objective: Recovery improvement and improvement in collection efficiency. The system should aim at improving recovery through a disciplined disconnection and dismantling mechanism that would serve as a deterrent for defaulters. This shall also provide updated information to CRM.

Specification : Disconnection, Dismantling & Details of Revenue related matters.

Requirement ID	Functionality	Description	Criticality	Response	Comments
Dis.1	Generation of defaulting consumer list	System should be capable of generating the list of defaulting consumers i.e. the consumers who do not make payment of their bills by the due date or the date on which list is generated, whichever is later. System should be capable to accept report of action taken on such consumers and remind further action required to be taken during specified period as decided by Utility.	Vital	C/ ER/F/ CR/ NC	
Dis.2	Generation of disconnection list	System should have the provision of generating automatically list of disconnection notices as per utility defined criteria in utility defined template. After expiry of due date of disconnection notice, it should print disconnection advise for disconnection by field staff. The utility defined criteria may : <ul style="list-style-type: none"> Exclude cases with open complaints in customer care module Classify live and disconnected cases in separate buckets Prioritize cases based on default amount, aging of debt, tariff category, category of consumer etc. On receiving the disconnection notice, if any customer approaches and requests for help like getting some more time for payment, then the system should have provision for payment extensions or accepting payment in installments.	Vital		
Dis.3	Process of dispatching	The system shall have provision of dispatching the disconnection notices to			

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	disconnection notices	the consumers by post, through email wherever available or any other information channels. E-mails should be sent automatically by the system and printed notices shall be dispatched by the utility's staff.			
Dis.4	Capturing of Non disconnection reasons	The system should capture the reason for non disconnection from amongst the reasons predefined by the Utility from time to time. System should also have provisions for maintaining (Adding/ Updating/Deleting) non-disconnection reasons to designated persons.	Essential		
Dis.5	Creation of exception report on disconnection	The system should recognize payment received on real time basis and shall be able to raise exceptions accordingly, so that the field staff can be informed on payments made after the disconnection list has been generated, to avoid unnecessary trips to the customer premises. System should also have provision for such cases, where the field staff receives the payment (Cash/ Cheque) from the customer while visiting customer premise for disconnection and update the disconnection status or call the designated person to update the same.	Desirable		
Dis.6	Updation of customer status	The system should be able to provide updates on the customer status - disconnected / dismantled / live.	Vital		
Dis.7	Updation of dismantlement status for deduction from SD on auto	The system should be able to update the dismantlement status, triggering an automatic deduction from the security deposit of the customer.	Vital		
Dis.8	Linkage with New Connection module	The dismantlement information should be available to the new connection approval process, so that dismantled customers are not provided new connections till the dues have been cleared.	Essential		
Dis.9	Tracking and escalation of disconnection failures	The system should be able to track reasons for failure of disconnection/dismantlement and escalate the case to a user-defined higher authority.	Vital		
Dis.10	Generation of optimal route	The system should be able to generate the optimal route and plan for dismantlement,	Desirable		



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	and plan	such that the people, transport asset (vehicles) and meters utilization are optimized. The system should be capable of accepting business logic to take care of such optimization.			
Dis.11	Termination of connection	In case a customer requests for termination of connection, the system should accept the terminating meter reading (which will be out of cycle in most cases) for generating the last bill.	Essential		
Dis.12	Integration with MM system	The system should be able to provide information to the materials management function, on the meters that have been rendered available because of dismantlement.	Desirable		
Dis.13	Integration with GIS database	This module shall be integrated with GIS database and updating of GIS database is mandatory in case of dismantling of existing customer.	Vital		
Dis.14	Exception reports on payment by disconnected consumers	The module shall generate exception, if the disconnected consumers not paying the dues after disconnection within a period specified by utility.	Essential		
Dis.15	Transfer of dues from one connection to other connection(s)	The system shall have provisions to transfer dues from one connection to other connection(s) including transfer of dues of disconnected connections to other live connections of same owner.	Desirable		
Dis.16	Notice through SMS	The disconnection notice would be sent to consumers in all the specified channels and must also be sent through SMS (text messaging) in case the mobile number of the consumer is registered.	Desirable		

5.0 Module: GIS based customer indexing and asset mapping

Requirement ID	Functionality	Description	Criticality	Response	Comments
G.1.0		INTRODUCTION			
G1.1	GIS Solution	<p>Geographic Information System solution consists of a system for capturing, storing, checking, integrating, manipulating, analyzing and displaying geo data related to positions on the Earth's surface and data related to attributes of the entities/Customers in an utility area. It pertains to both vector and raster GIS. The use of capabilities includes hardware, software and data, provided by a Geographic Information System specific to a set of user requirements.</p> <p>This is achieved through GIS mapping to pre-defined scale, generation of intelligence electrical network maps and super imposing them on the land base GIS maps and through customization and / or development of application software.</p> <p>The electrical network should include the entire network from SUBSTATIONS, HT line, Distribution transformers, LT line pillars and consumers wherever implied.</p>	Vital	C/ ER/F / CR/ NC	
G.2.0		System Software supply & Installation			
G.2.1	GIS Software	Supply and installation of all the software such as GIS software system, Internet mapping software, drawing software etc and necessary customization. The RDBMS procured for data centre may be used for GIS system.	Vital		
G.2.2	OGC Compliance Of GIS software	The GIS application package shall work in LAN/WAN/Internet/Intranet environment. Any standard software of GIS of international repute, registered with OGC (Open Geospatial Consortium) as compliant products shall be used.	Vital		
G.2.3	Versioning Capability of Software	Software must have capability of versioning.	Vital		
G.2.4	Relationship establishing capability	Software must have dynamic capability to establish relationship between the entities.	Essential		

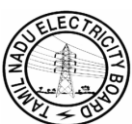
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G.2.5	Data Validation	Non-fatal errors or warnings : This would include incorrect phasing assigned by users, incorrect new line connectivity or incorrect conductor assignment. When new facilities are added, validation tables should exist to check the data entry against predefined parameters unique to the item being added, resulting in correct and consistent data entry. Additionally warnings should be generated when new facilities are placed in conflict with pre-established rules of connectivity as part of user customization.	Vital		
G.2.6	Error Listing	The application should capture errors with respect to connectivity and database integrity. Additionally the application should allow users to view a listing of the errors that have occurred.	Essential		
G.2.7	Integration Capability of GIS software with existing modules	It shall be the responsibility of the bidder for integration/interfacing with the existing applications. Also the single window interface for GIS software and the existing applications (requiring interface/ interaction / data exchange with the GIS software) shall be provided with proper security levels. The desired modifications in the underlying database of existing system software / GIS software should be possible through this single window interface. The bidder shall make necessary arrangements to provide such kind of interface.	Vital		
G.2.8	GIS Application Architecture-Features	Data model for data conversion : GIS Application Architecture should provide a framework and the necessary programming interfaces to enable complex GIS applications to be developed and integrated with applications that already exist within the utility. GIS Application Architecture should support the distribution of the functionality of GIS application across no. of components which interacts as separate process via process communication and control mechanism.	Vital		



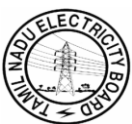
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G.2.9	GIS-Software- SLD creation feature	Create Single Line Diagram(SLDs) of electrical sub transmission network starting from 66 kV/33 KV bus of EHV sub station including 66 kV/33 KV feeders, 66/33/11 KV sub stations (with internals), 11 KV feeders up to 11/ 0.4 KV DT, LT feeders and LT poles. It should be possible to print/view the SLD of all or selected voltage level for desired distribution centers/ division/ circle. The electrical network should include Substations , HT line, Distribution transformers, LT line pillars and consumers.	Vital		
G.3.0		FEATURES AND CAPABILITIES OF SOFTWARE SYSTEM			
G.3.1		Generic Specifications			
G.3.1.1	GIS Software- Architecture Type	Open Architecture and COM Compliant : The application supports a fully extensible Component Object Model (COM) or Enterprise Entity Bean (EJB) or any other open standards architecture - compliant programming environment for customization and to have an open architecture system.	Vital		
G.3.1.2	GIS Engine- Capability to work in all industry standard cross- platforms	The GIS Spatial Data Engine should work on all industry standard Cross-Platform support such as Windows/Unix/Linux.	Vital		
G.3.1.3	Compliance of GIS Imaging Software	Proven Imaging Software System Platform : The GIS Imaging software package with latest version, and spatial data base engine with reputed developers such as Oracle/MS SQL/MY SQL/DB2/Informix/Sybase or any other RDBMS confirming to ANSI/ISO SQL-200n standards with latest version supplied shall have to be Open GIS consortium (OGC) registered compliant product time tested, widely deployed at multiple utilities worldwide	Vital		
G.3.1.4	Custom Functionality addition to application	The application supports an integrated customization environment to change the UI and to add custom functionality, programmatically.	Essential		
G.3.1.5	Software based functionality extensions to application	The system shall provide support in the form of a documented interface specification (API) to allow software based functionality extensions, or integration with other products to be achieved.	Vital		



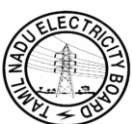
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G.3.2		Database Management			
G.3.2.1	Unique no. Allocation capability of Software	Customer Identification Number : The system shall be capable of allocating a unique identification number known as Customer Identification Number (CIN) to each Customer.	Essential		
G.3.2.2	Functionality to PAN display	The system should have functionality to PAN the display across the screen.	Desirable		
G.3.2.3	Provision for linking customer data to ledgers maintained prior to Customer Indexing	Provision for linking and maintaining records : Provision shall be made for linking and maintaining records (in Registers/ Ledgers) of the Utility Customer number as parameter, existing before implementation/adoption of the Customer indexing work under this specification. This shall be one of the relational data from archive of UTILITY record, to be listed by the system.	Vital		
G.3.2.4	Customer Database editing flexibility	Customer Database edit : The database shall be flexible for making changes in the Customer profile as required. The changes may be Customer name, location, connected load, category of connection, maximum demand, type of connection (HT/LT), and tariff related information.	Vital		
G.3.2.5	Sorting & viewing capability of any area	Sorting and viewing electrical area or feeder/administrative area wise Customer details should be possible on request.	Vital		
G.3.2.6	Database editing flexibility	Creating changes in the Customer and network entity attributes in relation to addition/ deletion of network entities, record of new Customer connections/ disconnections in response to other business process like billing and revenue system in geo database of GIS system.	Vital		
G.3.2.7	Color Graphic Display of System Network	Color graphic displays and Color Coding : The database shall generate color graphic displays of the system network which can be zoomed in / out. This shall represent each of the elements in the electrical system with suitable differing colors for the elements. The colour coding will be based on the rated voltage, Percentage of voltage at each bus, Percentage of loading of section, Symbols or any other chosen parameters by user.	Vital		



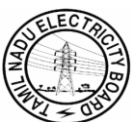
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G.3.2.8	Geographic Attributes Query in GIS software	Geographical attributes query : It shall be possible to query the geographical attributes of a specified location, preferably clicking on to the location or objects of interest and examining the contents of the database for the location of object.	Vital		
G.3.2.9	Dynamic Attribute query of any object in GIS software	Dynamic selection of attributes : User should be able to dynamically select one or more of the attributes of an object, to be displayed as label of the object. This can be for viewing, plotting and printing purposes.	Vital		
G.3.2.10	Representation of objects in different colors	Colors based attributes : System should support representation of the Entities/ Objects/Elements in different colors based on the attribute criterion.	Vital		
G.3.2.11	Dimensioning Capabilities	The system should have Dimensioning Capabilities	Vital		
G.3.2.12	Moving, copying capabilities	System should be able to perform move, copy, rotate, mirror and offset.	Essential		
G.3.2.13	Real length specifying capability	System should specify the real time measurement / length while drawing the lines.	Essential		
G.3.2.14	capability to save & restore views/layouts	Restoration of views / workspace / layouts : System should be able to save and restore views / workspace / layouts.	Essential		
G.3.2.15	capability to edit graphical & textual data	Entry / editing configuration on specific workstation : The graphical and textual data entry/editing shall be configured on specific workstation. The system shall allow facility to allow configuration of levels of security, whereby access and modification rights are appropriately assigned.	Essential		
G.3.2.16	capability to provide customer details DT wise	Details of Customers : It shall be possible to get a view of the details of the Customer or Customers connected to particular distribution transformer in a list form using a pointing device.	Essential		
G.3.2.17	capability to provide query regarding customers in relation to power supply network	Menu driven Customers query : It shall be possible to zoom in / out on a particular Customer to obtain the desired degree of information. Menus shall be provided for viewing various combination of information related to any group of Customers. For example, it shall be possible to view only the list of commercial Customers fed from a	Essential		



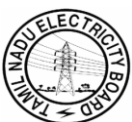
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		particular feeder. Similarly electrical equipment parameters shall also be possible to be viewed.			
G.3.2.18	Dynamic Configuration capability of system	Dynamic configuration : The graphic user interface shall have a modular structure with main menus and sub-menus that allow users to dynamically configure their own user interface to required level.	Essential		
G.3.2.19	Dynamic mode changeover capability of system	Dynamic switching over from one mode of view to the other : It shall be possible to view the system elements such as Customer location etc on, mapping and indexing work. It shall be dynamically possible to switch from one mode of view to the other by use of a pointing device. It shall be possible to view the physical system details in the background of the area maps created.	Essential		
G.3.2.20	Database security provisions in system	Application Administration : Database Security : The data management system incorporates mechanisms to ensure data integrity, security and distribution as well as to retain historical information. The databases shall have password protections with varying degree of access definable by the administrator. The security shall be adequate considering web-enabled usage.	Vital		
G.3.2.21	Provision of version management of Data	Version Management of the data - Changes / updates made to the base line drawing should be tracked as different versions.	Essential		
G.3.2.22	Provision of multi-tiered architecture	Managing conflicts : ➤ Be able to see the latest drawing on the system which should be union of all the changes made by all of the users/multiple users at same time on single work order and manage conflicts arising due to the merge / post of different versions. ➤ Have multi-Tiered Architecture.	Essential		
G.3.2.23	System capability of being operated through WAN	System to support the Enterprise wise central database and remote users over the WAN : System should be able to support the Enterprise wise/Circle wise central database and remote users over the WAN even for the creation and editing operations without degrading the performance over the net.	Vital		



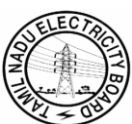
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G.3.2.24	System capability of supporting seamless data access	Support seamless data access between applications, which allow information in existing systems to be used without a need for migration or translation, ensuring a maximum return on existing investment.	Essential		
G.3.2.25	System capability of representing technical data of internals of any system entity	Facility of representing technical data of the internals of system entity : The proposed system should have facility of representing technical data of the internals of system entity. For example, with a click of mouse on the substation user should be able to see internals of the sub station and on taking the pointing device to a Power Transformer, a 'pull down' menu to show user options such as Tech. data, connectivity data or maintenance record data to be displayed on request. The internals visible on clicking on the substation should be dynamic in nature and not merely static snapshots.	Essential		
G.3.2.26	Electric Utility specific data model	The application should provide a data model specific for electric utilities. Bidder is requested to provide, along with documentation as part of their proposed system, a database schema that facilitates data access via queries and new applications. A utility data model is an advantage and would help realize the data warehouse concept.	Essential		
G.3.2.27	Electric Utility user specific data model	The data model should also be customizable to incorporate the user specific needs. UTILITY should also provide the final data model to other parties for the purpose of interface development or building new applications.	Essential		
G.3.2.28	Data import/Export capability of GIS software	Import / Export of data : The software should have the capability to import/export both data and graphical information in wide variety of formats (e.g. Access, Excel, DXF, DWG, MID, Geo-Tiff, Jpeg, MIF, TAB, E000, and DGN)	Essential		
G.3.2.29	Data export capability into XML format	The system must support export of data into XML format.	Essential		
G.3.2.30	Ability to support Customer Data	System should support Customer master data, Customer billing data, DGPS data to create network.	Vital		



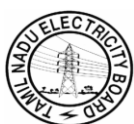
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G.3.2.31	Capability to import Satellite Imagery Data	Import of satellite imagery in different formats like Geo Tiff, JPEG etc.	Vital		
G.3.2.32	capability for importing & displaying color raster images	The software should have the ability to import and display both color and multiple gray scale raster images. Transparency of the image should be user controllable to allow for viewing items regardless of drawing priorities. The importable raster files formats should be of the same types listed in the previous requirement.	Vital		
G.3.2.33	Capability for opening / attaching standard format files without importing to mapping system	Opening / attachment of standard format files for schematic representation without importing into the mapping system : Should be able to open / attach all standard format files like Visio, Power Point, Excel, DWG etc. for Schematic representation without importing into the mapping system. All existing manual/cad drawings for all sub-stations to be attached as soft copy.	Vital		
G.3.2.34	Capability to provide query builder	Supporting multiple / complex SQL queries : System should provide query builder and support multiple / complex SQL queries.	Essential		
G.3.2.35	capability to support sorting /filtering of records	Should support Sorting, Filtering and display records in Tabular/ Browser formats.	Essential		
G.3.2.36	capability to save queries in text format	Should be able to save the queries as well as the output in text format.	Essential		
G.3.2.37	Highlighting capability of user specified attributes	On Query, the system should be able to highlight the objects based on the user specified boundary or attributes for visualization.	Essential		
G.3.2.38	capability to support web enablement	System should support the easy web enabling of the application.	Essential		
G.3.2.39	capability to store CAD & GIS data	Store and manage CAD and GIS data in a single repository.	Essential		
G.3.2.40	capability to support data validation	Support automated spatial and attribute data entry validation.	Essential		
G.3.2.41	Capability to translate geospatial data sets	Translate vector and raster geospatial data sets from a variety of standard and nonstandard projections and datums.	Essential		



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G.3.2.42	Updation of RDBMS attribute data on spatial changes	Automatically or manually update RDBMS attribute data when spatial changes are made.	Essential		
G.3.2.43	Capability to support distributed databases	Support for distributed databases within flexible, scalable, multi-tiered, partitionable architecture.	Essential		
G.3.2.44	Capability to modify asset data	The system shall be able to be configured to add additional asset types and to modify existing definitions of assets, such as the addition of additional attributes, without the need to involve the software vendor. Such configuration is to be achieved using Data Dictionary style tools and not require re-compilation of the software.	Essential		
G.3.2.45	System availability due to report run	Report runs and any other batch jobs should not affect system availability.	Essential		
G.3.3		Spatial database features			
G.3.3.1	capability to support all industry std. RDBMS	Database support : All Industry standard RDBMS should be supported viz. Oracle/MS SQL/MY SQL/DB2/Informix/Sybase or any other RDBMS confirming to ANSI/ISO SQL-200n standards.	Essential		
G.3.3.2	Database portability	Database portability : Each Table or layer should be independently exported to a file and restored into supplied database.	Essential		
G.3.3.3	Multipoint editing permissibility	Schema portability : In an enterprise-wide GIS, there may be different groups working on the same datasets at remote locations. To enable them to work on this dataset, one should be able to port the owner's schema to the remote database, let them edit the dataset and then bring back the changes after some time interval.	Essential		
G.3.3.4	capability to store additional data type	Additional data types : User should be able to store custom objects, dimensions.	Essential		
G.3.3.5	Published API's for interface to master database	Published APIs : Software must have published free java and C APIs and development tools for custom development and interface to master database.	Essential		
G.3.3.6	capability to support direct editing of	Support for direct editing of spatial data in the DBMS including multiple user editing with long transactions and advanced rule-based editing	Essential		



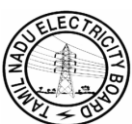
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	spatial data	with GIS Client.			
G.3.3.7	capability to serve database directly to internet mapping server & desktops	Serving the Database directly to the Internet Mapping Server and desktops should be possible without any conversion. Map server can upload a configurable amount of data to the users workstation based on different pre-defined situations / network load.	Essential		
G.3.3.8	Capability to support network topology	Should support network topology, versioning, long transactions. It should also handle version conflicts.	Essential		
G.3.3.9	Capability to support raster images & operations	Should support raster images and other raster operations (mosaic, catalog, editing) support for - Rasters, Native Cad entities, Annotations, Database & Versioning.	Essential		
G.3.3.10	Capability to enable map browsing in folders & DB	The ability to view and browse for maps in the contents of folders and databases is supported.	Essential		
G.3.3.11	Capability to preview map & table data	Map data and table data can be previewed.	Essential		
G.3.3.12	Capability to support OLE DB	Object Linking and Embedding database (OLE DB) providers is supported.	Essential		
G.3.3.13	Capability to manage data sources	The application provides the ability to manage data sources and database connections.	Essential		
G.3.3.14	Capability to manage coordinate systems	The application supports the ability to define and manage coordinate systems.	Essential		
G.3.3.15	Ability to create & maintain metadata	The application provides the ability to create and maintain metadata and store as XML data.	Essential		
G.3.3.16	Capability of DMS to provide spatial-indexing	The data management system provides spatial-indexing (i.e. a method of breaking down the master file by allocating each map an index in order to decrease the screen refresh and data access times.	Essential		
G.3.3.17	Capability of DMS to permit users to manage features	The data management system allows users to choose between managing features on an individual feature basis (user-specified features) or grouped by a logical selection.	Desirable		



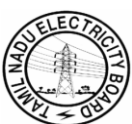
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G.3.3.18	Capability to support CASE tools	CASE tools are supported.	Desirable		
G.3.3.19	Ability to generate schemes for objects in UML using CASE	The application provides the ability to generate schemas for objects in UML using the CASE tools subsystem.	Desirable		
G.3.4		CORE GIS FUNCTIONALITIES			
G.3.4.1	Core GIS Engine specs.	Core GIS Engine : The Electric Utility GIS Desktop software should be built on top industry standard core GIS Engine having the following functionalities :	Vital		
G.3.4.2	Layer Creation capability of GIS software	Create layers from all supported data sources including coverage feature classes; shape files; computer-aided design, TIN, raster, and geo database feature classes; or tables containing x,y coordinates.	Vital		
G.3.4.3	Group Layer creation capability	Create group layers from multiple data sources including vector overlays on top of raster data/ images.	Vital		
G.3.4.4	Layer storage capability of GIS software	The application should allow users to define and save various user specified views, for example by storing collections of layers.	Vital		
G.3.4.5	Preset Layer configuration permissibility	The system should allow preset layer configurations for specific plotting applications.	Essential		
G.3.4.6	Intelligent layering capabilities	Intelligent layering capabilities. Ability to show only certain layers at a given scale and for a given condition (i.e. type of service call).	Essential		
G.3.4.7	Manual layering capabilities	Manual Layering capabilities. Ability for the operator to turn Layers on and off at will.	Essential		
G.3.4.8	Data previewing capability	Data Preview : Should provide facility to preview the data before Loading. Drag & Drop layer from the preview window to the map.	Essential		
G.3.4.9	Report Generation capability	Report Generation : The software should have inbuilt industry standard Reports Generation tool both at Server and Desktops. ➤ Facility to display Aerial, Projection and Surface distances. ➤ Feature Labeling : Should have the facility to label features based upon fields or expression of two or more fields. ➤ Registration, rectification & storage of Raster and Vector data in a single	Essential		



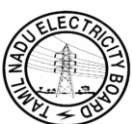
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		<p>database must be possible.</p> <ul style="list-style-type: none"> ➤ Must support Topological-editing capabilities. ➤ Defining rules for Topology like rules to make sure that no polygon overlaps another polygon in the same data, polygons should form a continuous surface with no voids or gaps, lines in a data should connect to one another, dangling and pseudo nodes removal 			
G.3.4.10	Bookmark creating capability	Create Bookmarks: Facility to Create, Edit and Move To Bookmarks. Bookmarks will be created to store the information of the display Extents of the map.	Essential		
G.3.4.11	Spatial querying engine facility	Spatial querying engine that can retrieve specific features based upon a user determined buffer zone around a point, line, or polygon.	Vital		
G.3.4.12	Configurability of screen data	The amount of data that initially appears on the screen should be configurable. This includes the geographic extent as well as the richness of the data.	Essential		
G.3.4.13	Transparency of data to user when queried	When user workstation requests additional data from the server, this should be transparent to the user.	Essential		
G.3.4.14	Availability of out of box tool for addressing queries.	Out of the box tool for geo-positioning based on software operator initialized address queries.	Essential		
G.3.4.15	Software ability to enable point & click access to data	Point and Click access to data (static objects as well as moving objects).	Essential		
G.3.4.16	capability to adopt to variety of clients	Clients : This can be proposed from a wide variety of clients from out-of-the-box browser-based clients to full-featured ArcGIS clients, or can be customized or built using HTML, DHTML, ASP, JSP, Java, Cold Fusion, or other standard web development tools.	Essential		
G.3.4.17	System ability to perform cluttering & decluttering of data details	Cluttering and decluttering - The application should have facility of cluttering and decluttering The process of showing more details as users zooms in is called cluttering and process of hiding details as user zooms out is called decluttering	Essential		



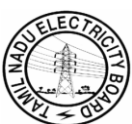
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G.3.4.18	Image Edge matching facility in GIS software	Edge matching - This system shall have the edge matching facility since edges may not match, whenever two images or two networks are joined together. For E.g.: If two maps of network are scanned and a line running is across two images, the ends of line cannot exactly match. Edge mapping is achieved by a snap of two ends or joining of two ends.	Essential		
G.3.4.19	capability to provide logical circuit connectivity to ensure compatibility	The software must : ➤ Support full connectivity of all electrical circuit elements and devices. ➤ Provide logical circuit connectivity techniques that insure proper hierarchy of line section and device connectivity. This should ensure that incompatible line types or devices cannot be directly connected in a circuit.	Essential		
G.3.4.20	Authorization to modify directional connectivity	Software should allow an authorized user to switch the position of a device, thus modifying the directional connectivity of the affected conductor.	Essential		
G.3.4.21	Software capability to create & store standard displays at system & user level	The electric utility geo database can contain 50 or more feature classes, each of which is represented as a layer. Users will have a number of standard views or displays, a display being a distinct combination of map layers and layer rendering properties. Individually changing properties of each of the 50 layers to configure a new display could be tedious and error-prone. Hence the software should store these standard displays in the RDBMS so that any user who logs in the system can choose the most suitable display. It should be possible to create and store these displays at system and user level.	Essential		
G.3.5		NETWORK MANAGEMENT			
G.3.5.1	Functionalities	This module shall have the following functionalities -	Vital		
	a)	Create a new network			
	b)	Open an existing network			
	c)	Merging of two networks			
	d)	Cut and paste part of the network			
	e)	Display a partial network of the area of the interest			
	f)	Delete a network			



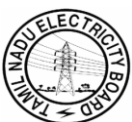
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G.3.5.2	Abilities of Network Mgmt.	The application provides the ability to create, maintain and save a geometric network using designated features or by adding features to an empty geometric network.	Vital		
G.3.5.3	Abilities of Network Mgmt.	The application can create and maintain flow direction in a geometric network based on the current configuration of sources and sinks.	Vital		
G.3.5.4	Abilities of Network Mgmt.	The application supports tracing operations to perform complex network analysis functions within a utility network.	Vital		
G.3.5.5	Abilities of Network Mgmt.	The application can create, maintain and save flags or starting points for trace operations.	Vital		
G.3.5.6	Abilities of Network Mgmt.	The application can create, maintain and save barriers for use in trace operations.	Vital		
G.3.5.7	Abilities of Network Mgmt.	The ability to disable features and layers to create a more permanent barrier for tracing at a particular location shall be supported.	Vital		
G.3.5.8	Abilities of Network Mgmt.	Customized trace results can be created, maintained, and saved.	Vital		
G.3.5.9	Network analysis functionality	The ability to perform network analysis along with the display of its result shall be supported.	Vital		
G.3.5.10	User capability to connect/ disconnect a network feature	The user should be able to disconnect and reconnect a network feature.	Essential		
G.3.5.11	Network impedance criterion	The system defines different network impedance criteria to support analysis at different times of the day.	Essential		
G.3.5.12	Tracing of network	The system allows for the tracing of networks to identify land parcels or customer information affected by network interruptions.	Essential		
G.3.5.13	Export of network analysis product	The system allows the export of network analysis product to third party modeling packages.	Essential		
G.3.5.14	Capability of network mgmt. module	Network topology processor : The module shall have the facility to identify the objects in a feeder and the feeders of a substation for purpose of color coding etc The module shall have capability of displaying hanging sections and loops in distribution networks.	Essential		
G.3.5.15	Capability of GIS to handle network problems	Handling network problems : GIS must be capable to handle network problems, such as road network analysis, which facilitate evaluation of the shortest path between two points.	Essential		



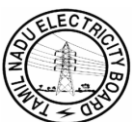
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G.3.5.16		Tracking Changes -			
G.3.5.16.1	System capability to track changes	Proper relationships shall be established in the database between the various entities. Further, hierarchical relationships should be established between various elements to link and group them at any voltage level. It should be possible to change the hierarchical parent of any element i.e. any element along with all its children in a hierarchical relationship can be made child of any other element. Such shifting should be possible only where voltage levels match. The time of making such changes shall be tracked. This arrangement should enable rearrange entity relationships with time stamping.	Essential		
G.3.5.16.2	System capability to provide information regarding manual or automatic switching	The energy accounting software supported by the Customer indexed database shall be able to recognize the transfer of any group of Customers fed by any particular line to any other neighborhood / alternate line by switching of isolators or modification of jumpers during the operation, for the purpose of improving the availability of supply. To facilitate the above, all switching devices in the system shall be properly identified in the database. Such changes may also be effected due to system modifications such as addition of a new distribution transformer or additional line or a new substation etc. The software system shall provide user-friendly screens for inputting the information for all manual switching operation carried out. The software shall also be capable of recognizing any automatic switching wherever provided at a later date.	Vital		
G.3.5.17	System ability to keep track of changes in customer attributes	The database shall keep track of all such changes in any of the Customer attributes such as change in name, connected load, tariff category, connection status, meter changes etc.	Vital		
G.3.5.18	System ability to provide information regarding outage affected customers/ areas	Affected Customers/ Areas : Software should have standard tools to find out affected customers in case of an outage. This must allow finding affected Customers/ areas in case of an outage or as a result of switching operation. The user shall get the affected Customers / areas by placing a flag at the point of outage. Outage data to be obtained from scada load centre wherever there is an existing provision for SCADA else else meter data acquisition system and other applications.	Vital		



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G.3.5.19	Software capability to support switching opns. & looped network	Switching & Looped Network: The software must support switching operations and recognize the status of the downstream network based on the switch position, on or off. The software must also support looped network in GIS.	Essential		
G.3.5.20	System ability to perform QA/QC on data created	QA/QC of GIS Data: The application should have tools to perform QA/QC on the data created. The software must be rule based. These rules should be configurable to suit UTILITY requirements.	Essential		
G.3.5.21		The QA/QC tool must perform QA/QC for all sub sections based on the following :			
a)	Attribute level QA/QC	Attribute level QA/QC as per the domains defined for the particular attribute: e.g. user cannot enter an incorrect voltage level and chooses from a drop down list of voltages	Essential		
b)	Connectivity rule-QA/QC	<u>Connectivity rules</u> e.g. a 3 phase tap cannot be taken from a single phase line.	Essential		
c)	Relationship rule-QA/QC	<u>Relationship rules</u> e.g. a PMT transformer can be placed on top of a pole only.	Essential		
d)	Contingent Validity Rule-QA/QC	<u>Contingent validity rules</u> : A set of valid values that depend on the value of another attribute.	Essential		
e)	Customer Validation Rule-QA/QC	<u>User's custom validation rules</u> The QA/QC functions shall have the feature to save the report/ result of the QA/QC and the tools should also provide with the error messages information to help user correct the errors.	Essential		
G.3.5.22	Availability of locator tool in GIS System	Locator Tool : The application must have a locator tool to find specific entities and automatically zoom to the same. It must also be able to find all specified entities within a certain radius by inputting the radius and the X, Y coordinates. It must also be able to locate tie devices in a specified feeder.	Essential		
G.3.5.23	Location Display facility in GIS	Location Display : Facility to display a given location when the location code or object code or latitude/longitude are specified.	Essential		
G.3.5.24	Location Tracking facility in GIS	Location Tracking : The system shall keep track of the location in the network from where a particular Customer is fed. This shall be achieved in conjunction with the network data created for the utility area.	Essential		



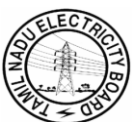
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G.3.5.25	System ability to permit composite object modeling	Allow modeling of composite objects : Placement of multiple objects at a single click is enabled by composite objects. An example of the same can be a switch box / LT panel containing internal bus bars, switches, fuses etc. Once the composite object is modeled with all its constituent entities, it can be placed on the map by a single click whenever required. This saves the effort of placing every entity all the time.	Essential		
G.3.5.26	System permissibility for templates	Allow defining Templates : These are models that define the behavior of the software to be controlled while editing the network. Say a template for LT service can be defined to in such a manner that it places a Tap on the main line and places a service line on the first click, places a fuse on the second click on the service line, a meter on the service line on the third click and ends the service line on the meter. This also helps save time and effort of the utility officials by eliminating the need of picking each entity and keying in the attributes of the same.	Essential		
G.3.5.27		Creation of Favorites & Mass attribute updates :			
G.3.5.27.1	System permissibility for creation of favorites	The system should allow creation of Favorites. These would be entities that are created from the complete generic library of models having predefined attributes.	Essential		
G.3.5.27.2	System ability to save Favorites & allow mass attributes update	The system must allow saving of Favorites organize and save attribute values of often-used features. The system must also allow mass attribute updates. This would help user in speeding up data creation.	Essential		
G.3.5.28	System permissibility of storing predefined layout display	Display : System must allow storing predefined display of layout and symbology. The symbology should be as per UTILITY standards. For the purpose of day to day work and display/query, it must be possible for users to change symbology of elements on the fly without changing the database. E.g. to display 50KVA transformers due for oil change in the next three months in a different colour/ symbol etc.	Essential		



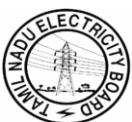
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G.3.6	Digitization of electrical symbols	DIGITIZATION OF ELECTRICAL AND LAND BASE SYMBOLS	Vital		
		The digitization module shall have the following functionalities :			
G.3.6.1	Desktop functionalities	Desktop functionalities	Vital		
a)		The application requires that information (metadata) be stored about a map.			
b)		The application supports a customizable graphical user interface.			
c)		The user will be able to create hyperlinks to any document or URL and store the hyperlinks with data in an attribute field.			
d)		The application can save a map in a thumbnail image.			
e)		The application can store data using different paths.			
f)		The application can create, store and maintain map templates.			
g)		The system can store true 3-D features (X, Y & Z coordinates).			
G.3.6.2	Display properties	Display Properties	Vital		
a)		The application requires the use of specified projections.			
b)		A variety of data sources can be displayed.			
c)		The application supports the ability to set background and symbols.			
d)		The application supports the manipulation of symbols.			
e)		The application supports the ability to label layers.			
f)		The application supports the display of TIN datasets.			
G.3.6.3	Interaction tools	Interaction Tools	Vital		
a)		Provide a list of map interaction tool supported by the application.			
b)		Describe the application's hot linking capabilities.			
c)		The application supports the ability to locate features.			
d)		The user should be able to create and save spatial bookmarks.			
e)		The application provides the ability to control map drawing.			
f)		The application should provide a magnifier			



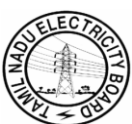
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		window that can be changed to any desired percentage and represent the magnified view as a snapshot.			
g)		The application can create an overview window which can be resized and moved such that it affects the active data frame.			
h)		The GIS software displays the results of attribute queries in graphic format. This may include graphics for a single record or an entire query result. Zoom to selected features.			
G.3.6.4	Vector data display	Vector Data	Vital		
a)		The application supports the ability to label definition and position			
b)		The application provides a display threshold for vector layers			
c)		Allows user to focus on an area of interest.			
d)		Tool tips can be created for toolbar buttons.			
e)		Selections can be customized.			
f)		The application provides the ability to manipulate map features.			
g)		A definition filter based on an SQL expression can be set up.			
G.3.6.5	Raster data display	Raster Data	Vital		
a)		The extent of raster image can be set.			
b)		Image brightness, contrast, and transparency can be changed.			
c)		The application provides for re-sampling for geometric transformations and for converting grids to other resolutions.			
G.3.6.6	Data query properties	Data Query	Vital		
a)		The application can query data using a number of different expressions.			
b)		The application allows query expressions to be saved and loaded.			
c)		The query language supports querying against a set of features, which are the result of executing a previous query.			
d)		The system allows features be selected for data editing in the following ways : Geographic window; Selection by mouse; Selection by SQL query.			
e)		The NOT qualifier can be applied to any spatial operator.			
f)		Query results are displayed or plotted in user-defined symbology.			
g)		Query results can be easily formatted in a			



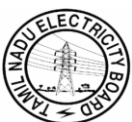
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		report. The report writer has a forms-driven user interface for the interactive definition and formatting of the report.			
G.3.6.7	Symbol related properties	Symbology	Vital		
a)		The user can assign values to attributes (scaling).			
b)		The application supports symbol classification.			
c)		The application supports color ramps for symbols.			
d)		The application supports label text.			
e)		The application supports the ability to perform statistics.			
f)		Interactive map symbol display capabilities are provided.			
g)		The application supports transparency function of attributes.			
h)		The application provides capabilities for symbol management.			
i)		The application supports symbol stretches.			
j)		The application provides ability to adjust brightness, contrast and transparency.			
k)		The user can predefine feature characteristics, such as line style, weight, color, symbol and angle, for features and text for the system to use as a default when displaying features.			
l)		Display attribute-based symbology.			
G.3.6.8	Symbol Editing & management prop	Symbol Editing and Management	Vital		
a)		The user can create templates and map series.			
b)		The application provides TrueType font support.			
c)		The application supports EMF and BMP formats.			
d)		The application provides symbol-editing support.			
e)		The application provides the ability to create and edit symbols.			
f)		The application supports gradient fills.			
g)		The map production system generates point symbols based on any attribute associated with a point. The software supports a variety of point symbols, including both system default and user-specified symbols.			
h)		The map production system generates line symbols based on any attribute associated with a line. The software supports a variety of line			



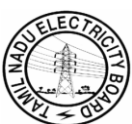
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		symbols, including more complex line symbols and the custom creation of user-defined line styles (including color, pattern and width).			
i)		The map production system generates polygon shade symbols based on any attribute associated with a polygon. The software supports a variety of shade characteristics for each polygon shade symbol, such as shade line colors, angles, patterns, line widths and separations.			
G.3.6.9	Labeling properties	Automatic Labeling	Vital		
a)		Conflict detection is provided.			
b)		The application supports labeling of multiple layers.			
c)		Interactive text can be placed on a map.			
d)		The application supports annotation stored with a map as a group or stored separately in a file or database.			
e)		The application supports feature linked annotation.			
f)		The application allows users to position and orient labels and graphics in a data frame or position map elements on the layout.			
g)		Supports transparency layers.			
h)		The application supports predefined label styles.			
i)		Support is provided for label display of a subset of features.			
j)		The application supports symbols as labels.			
k)		Labels can be stored in a graphic layer.			
l)		Manual placement of feature labels is supported.			
m)		The system shall allow for scaleable fonts that allow changes to font type, height, width, color, etc.			
n)		The system shall support multiple lines of text with full justification options available. Justification options include, top left, top center, top right, center left center, center right, bottom left, bottom center, and bottom right.			
G.3.6.10	Graphic properties	Graphics	Vital		
a)		The application supports text as graphics.			
b)		Different graphic shapes are supported.			
c)		Graphic editing is supported.			
d)		The application supports graphic placement and manipulation.			
e)		Moving, rotating, and ordering graphics is supported.			



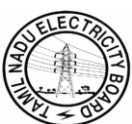
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G.3.6.11	Feature Editing properties	Feature Editing	Vital		
a)		The application supports feature editing.			
b)		New features can be created.			
c)		The creation of features at an x, y coordinate location is supported.			
d)		Features at a specified length or angle can be created.			
e)		The application supports the creation of segments using angles from existing segments.			
f)		True curves can be created.			
g)		The application supports copying a line at a specified interval.			
h)		The application supports creation of a buffer around a specific feature.			
i)		Mirror images can be created from existing features.			
j)		Merging features from the same layer into one feature are supported.			
k)		The application supports combining features from different layers into one feature.			
l)		The application supports the creation of a feature from features with common areas.			
m)		A new polygon with shared parts can be created.			
n)		The application supports the ability to modify existing shapes.			
o)		Splitting a line or polygon is supported.			
p)		The application supports trimming a line, line extensions, flipping a line.			
q)		The application supports the modification of existing features.			
r)		The application provides support of topological editing capabilities.			
s)		A comprehensive snapping environment is supported.			
t)		Copying and pasting attributes are supported.			
u)		Relationships between features and attributes can be created.			
v)		Validation rules are supported.			
w)		The application provides digitizer support.			
x)		Undo/Redo framework is supported.			
y)		The application supports a fully customizable editing environment.			
z)		When entering new data, the system displays a listing of features types to be selected, while automatically setting layer, attribution and symbology.			
aa)		The system allows attribute data to be interactively entered or edited using default field values (such as ownership) or user-defined			



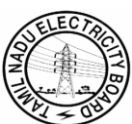
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		values at the time of entry (such as by equipment identification number).			
bb)		The system provides domains (pre-defined listings of valid values for a particular attribute) for graphic/ attribute integrity checking.			
cc)		The system can automatically update attribute values based upon changes to a feature's geometry, changes to other attributes, or the creation of a new feature, thus ensuring database integrity.			
dd)		The system supports the manipulation of sets of features, such as deleting, moving, querying and updating attributes.			
ee)		The system supports the interactive merging of two identified lines with and without an attribute comparison			
ff)		Checking for geometric connectivity : The system supports the interactive editing of topological edges and nodes, allowing vertices to be added, deleted, or moved on an edge (an edge, shared by two features, that is modified allows both features to share the modification).			
gg)		The system provides "heads-up" digitizing capabilities, including the ability to load raster and vector data as a background on the screen over which vector graphics can be traced using the cursor.			
hh)		The digitizing process includes interactive rubber sheeting, as well as the ability to snap to points during placement and editing.			
ii)		Digitizing allows for key-in by coordinate geometry			
jj)		The system allows the user to place construction points / lines when placing elements.			
kk)		The system supports "on-the-fly" digitizing techniques, such as line following and attribution during digitizing.			
ll)		The system allows for the automatic generation of points : <ul style="list-style-type: none"> - At the midpoint of a feature; - At the endpoint of a feature; - Projected (and vertex-inserted) onto a feature; - Perpendicular to and from a feature; - At a distance along a feature; - At a distance from a given point in a given direction; - At the centroid of an area feature 			
mm)		The system supports the development of specialized feature placement methods (e.g. pole			



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		bisecting a corner and street offset from a kerb line)			
G.3.6.12	Data formatting properties	Data Formats	Vital		
a)		Bidder should list the vector formats supported and editable by the proposed solution.			
b)		Bidder should list the raster formats supported by the proposed solution.			
c)		Bidder should list the formats in which the product can export data.			
d)		The proposed GIS allows data to be input from the following sources : Hardcopy maps; Digital coordinate ASCII files; Batch processing (to load attribute data).			
e)		The system allows ASCII data (both coordinate and attribute information) to be loaded as features, which are optionally linked to attribute records. An interface for ASCII format definition, modification and loading is provided.			
G.3.6.13	Table Management properties	Table Management	Vital		
a)		The application provides the ability to view data in a table.			
b)		The application supports table data selection and editing.			
c)		Aliases can be defined in tables.			
d)		Field values can be calculated.			
e)		The application provides the ability to find and replace functions in tables.			
f)		The application provides the ability to freeze columns during display.			
G.3.6.14	Chart properties	Charts	Vital		
a)		Bidder should list the different chart formats the application supports.			
b)		Graphics and charts should be editable			
G.3.6.15	Buffer Analysis Properties	Buffer Analysis	Essential		
a)		The application provides the ability to create buffers.			
b)		The ability to output buffers is supported.			
G.3.6.16	Spatial Analysis properties	Spatial Analysis	Vital		
a)		Data can be merged and joined.			



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G.3.6.17	Data mgmt. /compilation tool	Data Management/ Compilation tools	Vital		
a)		Data compilation tools for using data that is obtained in multiple formats			
b)		Projection Management Tools to standardize data from multiple projections.			
c)		Boundary creation tool. Need the ability to clump areas together from different layers (I.e. counties, zip codes) and create one area/polygon on a new layer with its own attributes. Also require manual boundary modification tools.			
d)		Geocoding Tool for objects based on street addresses.			
G.3.6.18	capability to support Page Template properties	Page Templates define and store standard map page elements to retrieve later. A page template defines the size, orientation, and map elements for a standard map. Similar to a template for a word processing document that defines the styles and format, a template saves time and repetition by storing elements used on every map. These then can be used for printing. The application should support creation of above-mentioned feature at system as well as user level.	Essential		
G.3.6.19	Utility tools for navigating large maps	The software should have utility tools to navigate large map documents quickly by finding, highlighting, and moving features. It should support tools like: a) Locator tool b) Copy c) Quick Attribute viewer d) Delete e) Highlight f) Pan Zoom to Etc	Essential		
G.3.6.20	Feeder Manager properties in software	Feeder Manager : The application must have a feeder manager to manage and trace specific feeders and must have the following capabilities : ➤ Help generate circuit map for a desired feeder ➤ Help locate all features or tie devices associated with a feeder ➤ Select features belonging to a particular feeder or group ➤ Show feeder information graphically in a map display (loops, islands, and double feeds or extra feeds)	Essential		



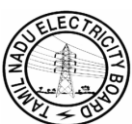
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		<ul style="list-style-type: none"> ➤ To assign energized phase information to each feature in a circuit indicating by name (R, Y, or B) the phases of electric power that can reach the feature from the power source(s) for the circuit. 			
G.3.6.21	Work Flow Manager properties	Work flow manager : to manage the work flow related to the complete design process / cycle (from design, approved, released for construction, construction complete to commissioned).	Essential		
G.3.6.22	capability for Schematic layout of compound objects	Schematic Lay out of compound objects -The module shall have capability to blow up compound objects like substation, DT, feeder pole, LT pole etc showing single line diagram of arrangement.	Essential		
G.3.6.23	Pole Code Generation facility	Pole Code Generation -This module shall have the capability to generate code for poles on a feeder as per user-defined format. The typical examples are 11 kV pole coding comprising substation code / substation name, feeder code, serial no of pole which can be continuous or varying on basis of laterals and sub laterals. - e.g. The 33kV cables are laid at 3 ft depth, 11 kV at 2 ft depth and LV cables are laid at 1 ft depth. It should be possible the no of cables at each depth and configuration of the trench etc.	Essential		
G.3.6.24	New symbol/ attribute	The user should be able to create any new symbol and also specify its attributes.	Essential		
G.3.6.25	Symbol/attribute limitation	There shall not be any limitation on the number of symbols or the number of attributes for a symbol. Attributes associated to each of the entity/object /element should be user definable like Data type, Lengths as per record of SEB, Access restriction, Pull down list and Mandatory / Optional.	Essential		
G.3.6.26	customized representation of entities/ objects/ elements	Customized representation of entities/objects/elements: System should allow the user to customize the representation for each of entities/objects/ elements.	Essential		
a)		Point			
b)		Line			
c)		Polygon			
d)		Text			
e)		Color			
f)		Hash pattern			
g)		Line style (Dashed, Dotted...)			



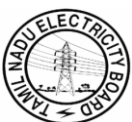
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h)		Font			
i)		Point shape (Round, square, user defined...)			
G.3.6.27	Type Of attributes	The attributes can be text; Number; reference of AutoCAD Drawing, Raster image, Photograph, etc.	Essential		
G.3.6.28	Software customization for electrical symbols & land based features	The software shall be customized to provide the electrical symbols given in <u>Annexure-D of Section: G6</u> and land based features given in <u>Annexure-E of Section: G6</u> . The attributes to be shown are also listed in the Annexure-E. As already stated, whenever user wants, he can add any number of attributes to a symbol and also create any number of new symbols. This capability should be demonstrated at the time of demo.	Essential		
G.3.6.29	Capture of all attributes while digitizing	Capability to capture all the attributes, while digitizing each symbol as specified by data dictionary, through a user friendly dialog box.	Essential		
G.3.6.30	Support of automatic scaling of graphics	The system should support automatic scaling of graphics. Based on defaults and parameters set by the user, the software should have the ability to manage inserted symbol size, so that it is displayed at a consistent size throughout any level of zoom scale.	Essential		
G.3.6.31	Creation of spatial database	As and when each symbol is digitized the attribute database, the spatial database should get created instantaneously.	Essential		
G.3.6.32	Layer specifying ability	Capability to specify layers, while digitizing.	Essential		
G.3.6.33	System readiness after digitization	On completion of digitization, the system should be ready for studies without any further interventions.	Essential		
G.3.6.34	Support raster images	Support raster Images / scanned photographs.	Essential		
G.3.6.35	Multi circuit Representation	Multi Circuit Representation On a pole or a tower, more than one OH line may be running. These lines may be different voltages or same voltages. The application program should provide for digitizing and display of these multi circuit lines. On clicking of multi circuit line, the configuration of Line shall be displayed.	Essential		
G.3.6.36	Multi-cable representation	Multi cable representation Number of cables running in the same duct or footpath is more common compared to OH lines. The application shall have the facility to display these cables and show also the configuration how these cable are laid.	Essential		



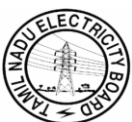
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		On clicking, cross section of trench shall be shown showing arrangements of cable.			
G.3.6.37	Land base representation	Land Base Representation : The land base shall be made intelligent. Various queries shall be made available for different entities in a land base area of UTILITY power network premises. Each entity will contain a minimum of five to six attributes to carry the basic information like Name, Address, Circle/Div/Sub-div/DC, Service Number, Telephone Number, etc. The software shall be able to build the topology on its own to ease this query process through the intelligence.	Essential		
G.3.6.38	Representation of Sub-station Electrical Components	Substation Representation : Substation is a building or out-door area location where various electrical accessories are connected together to serve the load centers. Following are the electrical equipment in a substation, which are normally installed and electrically connected :	Essential		
a)		High Voltage Cables/ Conductors			
b)		Circuit Breaker			
c)		Isolators			
d)		Transformers			
e)		Protective Relays			
f)		Feeder Energy meters			
g)		Fuse section pillars, LT Boards			
h)		LV Cable feeders			
i)		Bus couplers / Bus-Section			
j)		Aux. Systems (DG Set, Battery, Charger, UPS etc)			
G.3.6.39	Display of s/stn. Information on demand	The land base information shall be displayed on demand by just clicking on the substation diagram and the complete database of substation shall be displayed.	Essential		
G.3.6.40	Acceptance of new network symbols	There shall be user-friendly methods available in the software to define and integrate any new network symbols into symbol library.	Essential		
G.3.6.41	Sub-station Database	The substation's database should contain the details like equipment data (Make/Type /Model/rating plate information, History, Maintenance and Remark etc. These details shall also have to associate the electrical accessories details installed in the same premises.	Essential		
G.3.6.42	check of inter connectivity	The electrical connectivity shall be established at all times between substations	Essential		



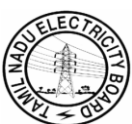
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	between substations	or from any nodes. It shall be linked so that the connectivity shall be checked at all times through the logical checks, which is being performed by the software internally.			
G.3.6.43	Text Editing Ability	It shall be possible to edit the associated text for its presentation. This shall be achieved for the users with the proper security rights.	Essential		
G.3.6.44	Placement of new equipment in geographic maps	During the placement of equipment, it shall be possible of being rotated, scaled and moved about its insertion point. The placement shall be assisted by a "rubber band" to assure a proper position.	Essential		
G.3.6.45	Identification of electrical entities in GIS	All of the electrical entities and accessories shall be identified by their name information of the substation in addition to their alphanumeric database information of interest, which is associated with each item.	Essential		
G.3.6.46	GUI availability to perform graphic operations	An interactive tool like icons in a toolbar, graphical user interface (GUI) shall be available to enable the users to perform their graphics handling operations such as zooming, panning, highlighting, selection, clicking an item for its alphanumeric details etc.	Essential		
G.3.6.47	System ability to provide information using GUI	The following information shall be queried using the user-friendly GUI by just selecting the category of the query. The results shall be made available in the graphics by highlighting them and/or in the non-graphical text report forms.	Essential		
a)		Connected load information, which is fed from the substation.			
b)		List of Customers based on the connected load			
c)		History information of load readings of the transformer and outgoing LV distributor cables etc.			
G.3.6.48	Query Type	The selection criteria and query of a substation / transformers / cables / pillars/ joints / ducts/ sleeves / manholes/ AD pillars/ Capacitors/ Switch Gear etc. may follow the patterns listed below :	Essential		
a)		Name of the substation. This will enable to highlight the selected elements			
b)		Name of the area of the substation			
c)		Display of service numbers of the Customer fed from the substation			
d)		The entities located in the downstream of the substation			



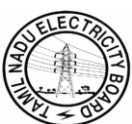
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e)		Through a polygon retrieval i.e. selecting a window area from the overview map, the software shall highlight and retrieve all the substation			
f)		The software shall highlight the respective substation by query i.e. substation located in a particular zone, substations located in a particular area.			
g)		The software shall be able to attach and retrieve any scanned image, video clips, sound files or any multi-media clippings to the substation.			
G.3.6.49	Report availability on non-graphic query	Following reports shall be made available after the non-graphics query :	Essential		
a)		List of substation connected on a particular Feeder			
b)		List of substation based on capacity of switchgears/ transformers			
c)		List of substation based on make of electrical entities			
d)		List of substation based on breakdowns			
e)		List of substation commissioned during the specified period.			
G.3.6.50	Cable technical information on GIS software	The software shall be able to compose the various types of cables with its technical information like type, material of the conductor, cross-section in the network cable symbol library. The list of cable type shall be available in the cable symbol library for selection in advance and for laying purpose in the field. The chosen cable type shall be displayed always in the geo-client's toolbar space until the selection is replaced.	Essential		
G.3.7		Cables and Other Electrical Components Representation :			
G.3.7.1	Cable location information	During the selection process, there shall be a provision to set the runtime environment settings i.e. the geometry of the cable e.g. Line, Arc, Tangential Arc, Tangential Line and also the type of connection like 'Begin' and 'End'. The distance information shall be made available to enter in case of different cable laying path.	Essential		
G.3.7.2	Availability of	All of the functions shall be available in terms	Essential		



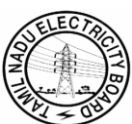
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	all functions on menu	of menu and/or toolbar icons.			
G.3.7.3	Accepting cable type as current one	There shall be a provision to click on the existing laid cable in the field by a mouse button and to accept that cable type as the current one. This enables wherever the existing cable may be extended or continued.	Essential		
G.3.7.4	Software capability to exhibit cable paths through obstructions	There shall be some facilities to consider the cable laying procedures through the rounding lines tangentially or by specifying a radius. Icons shall enable the same. This facility will be used wherever the cable-laying route has any obstructions or restricted area.	Essential		
G.3.7.5	Facility to exhibit LILO in exiting cables	The software shall have the mechanism to incorporate Loop-In-Loop-Out (LILO) facility in the existing cables. The network node symbol will be chosen earlier to use the same in LILO.	Essential		
G.3.7.6	GUI facility of exhibiting & editing multiple feeder cables	The software shall include the facility to compose different types of cable for laying the multiple feeders at a stretch. The GUI can be used to make the composition of the type for multiple feeder cables. The GUI shall contain the facility to add, delete the cable type selection for multiple feeders along with the parameter of line spacing distance and cable alignment. In addition to this, editing facility of the individual cable line type shall be made available.	Essential		
G.3.7.7	Multiple cable laying procedure on software	The software shall carry out the multiple feeder cable laying procedure through simple icon clicks. It shall also have the facility to continue existing multiple feeder cables to another location. Similarly connecting two different multiple lines with proper selection of individual cables in the multiple feeders through a rounding way or by an arc.	Essential		
G.3.7.8	Edition facility for cables/ Tr. lines in software	There must be very simple methods available to establish the edition of a transmission lines and / or distribution cables. The edition could be achieved as listed below :ll	Essential		
G.3.7.8.1		Drawing the two different end points of the feeder together by just clicking on to the end points of the feeder			
G.3.7.8.2		Connecting two different lines at an intersection point project from the same angle and direction			
G.3.7.8.3		Extending a single line by intersecting it with			



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		another line			
G.3.7.8.4		Unlinking the positions of the feeder from the cable			
G.3.7.8.5		Linking the positions of the feeder into the cable			
G.3.7.8.6		Moving the line points from a selected position to a new position through a dragging mechanism.			
G.3.7.8.7		Deleting the entire line/multiple line by just clicking on to the line / multiple line to be deleted.			
G.3.7.8.8		Deleting the portion of the line segment through the identification of the start and end positions.			
G.3.7.8.9		Replacing the line designation by selecting a new line designation. This is nothing but the "changing the line type" method.			
a)		Updating the cable's non-graphical data through an interactive GUI mask.			
b)		Displaying the cable's non-graphical data on to the graphical space			
G.3.7.9	Software capability to check electrical continuity for power flow	The software shall be able to check the electrical network line continuity for the power flow through graphical and non-graphical data as listed below :	Essential		
a)		The electrical line tracing till the end of the line by considering the switch positions on the line. The line will have to be highlighted after the tracing.			
b)		By ignoring the switch position conditions, the line shall be traced for its continuity and same shall be highlighted			
c)		By selecting the text attributes attached to a line, the tracing shall be possible.			
d)		Through a non-graphical data.			
G.3.7.10	Addition of electrical element in cable followed by updating of data	It shall be possible to insert an electrical element in to an existing cable. This will split the existing cable into two sections and each section's alpha data will be displayed in a mask for update. Accordingly the graphical and non-graphical data will be updated.	Essential		
G.3.7.11	Addition of electrical element in	It shall be possible to insert any of the chosen electrical devices on a multiple feeder cables. For instance, the electrical device will be	Essential		



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	cables followed by updating of data	connected with all of the lines in the multiple cables. Similarly, there shall be a provision to insert the electrical device net point on to individual cables in the multiple cable lines. The other functions shall be made available as listed below through a simple clicks by mouse button:			
a)		Deleting a electrical net point			
b)		Replacing a net point. The existing electrical net point will be replaced with the new electrical net point.			
c)		Switching a net point from open to close or vice versa positions			
d)		Moving and rotating the net point			
e)		Scaling up or down of the net point			
G.3.7.12	Updating of non-graphic master data	It shall be possible to update or change the non-graphic master data of the net point. Any of the endpoint can be selected by simple mouse clicks and the respective net point's master data should appear in the mask for the new values. Similarly, there shall be a provision to display the data based on the selection of the net points.	Essential		
G.3.7.13	Graphic alteration for addition of feeder points in bus bar	The bus bar shall be able to accommodate the increase in no. of feeder points. It shall be possible to redefine the no. of feeder entry/exit points in the bus bar to a higher number as per the requirement. The software shall internally replace the bus bar with more no. of feeder entry/exit points by retaining the technical information associated with the bus bar.	Essential		
G.3.7.14	Electrical item editing abilities	It shall be possible to perform the following tasks in the software.	Essential		
a)		Inserting a cable into a station/bus bar/distribution box			
b)		Laying a protective pipes on the cable route			
c)		Laying protective pipes with dimension defined			
d)		Creating a manhole			
e)		Creating a cross section for Trench, Man-hole, Protective Pipes			
f)		Defining the cable route			
g)		Labeling			
G.3.7.15	Electrical item editing abilities	It shall be possible to insert " cable beneath cable"	Essential		
G.3.7.16	Electrical item editing abilities	During the insertion of cable, if there is change between any segment, e.g. if there is change in type of cable between joint J2 and J3, the software shall allow the user to edit the same.	Essential		



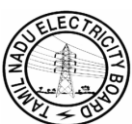
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G.3.7.17	Software capability to check electrical continuity for power flow after editing	After inserting the cable/joint, the software shall carry out on-line electrical connectivity establishment checks internally and all related databases tables shall be updated automatically.	Essential		
G.3.7.18	Error generation capability in software	The software shall have facility so that cable of same voltage levels can only be connected with each other, i.e. if by mistake, user connects LV cable / equipment with HV/EHV cable/equipment, the software shall generate error message.	Essential		
G.3.7.19	Software ability to display merging of cables	If parts of the cable are running across more than one sheet, the software shall be able to carry out merging of the two cables into one cable. The cable may be redesigned accordingly.	Essential		
G.3.7.20	Software ability to represent cables / switchgears	It shall be possible to represent cables/switchgears/HV-EHV cables under existing scenario.	Essential		
G.3.7.21	Calculation of length of upstream or downstream cable	It shall be possible to calculate the length of downstream or upstream from the selected element.	Essential		
G.3.7.22	Retrieval of electrical elements within polygon	It shall be possible to retrieve / query the elements like cable within the polygon.	Essential		
G.3.7.23	Splitting of existing cable	It shall be possible to split the existing cable/LC for the insertion of new Customer cable / LC.	Essential		
G.3.7.24	Tracing of customer's electrical connectivity	It shall be possible to trace electrical connectivity of a Customer. By default, the connectivity should be traced up to its feeding substation/Pole Mounted Transformer (PMT).	Essential		
G.3.7.25	Ability to attach scanned drawing	It shall be possible to attach scanned image of service SKETCH to a particular service number.	Essential		
G.3.7.26	Software capability to search & zoom in any drawing	It shall be possible to search and zoom into the user-defined distance around that service without any drawing sheet boundaries. The default distance shall be 100 meter around the service point.	Essential		
G.3.7.27	Project Administration features in	The software shall include the Project Administration features. The software shall enable the facility to address multi-project	Essential		



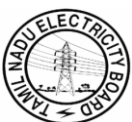
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	software	environment.			
G.3.7.28	Layer Mgmt. Features	The software shall include the Layer Management features. This function shall enable to assign descriptions to the layer. The composition of various objects shall be allocated in unique layers, depending on the user requirements.	Essential		
G.3.7.29	Task Management features	The software shall include the features of Task Management, by which the geographical data access will be controlled and monitored. This feature utilizes the security features administered by Data, Project and User administrators. It should also administer the interim backup storage, mechanism internally.	Essential		
G.3.7.30	Different accessing modes of area	Different accessing modes of area/ locality shall be possible in the software. Some of the modes are listed below :	Essential		
a)		Co-ordinate			
b)		User specific			
c)		Area			
d)		Map sheet number (Index for the map sheet shall be created).			
e)		Polygon or any shape of interest			
G.3.7.31	Creation of relationship between network components	Automatic creation of relationship between the network components while creating them. Besides that, the system is necessary to have facilities to generate, store, retrieve, edit, delete and display information on infrastructure assets, Customers through proposed system. The system should provide the facility to plot or print the base map or facility map to plotter or printer as well.	Essential		
G.3.7.32	Capability to create multiple features easily	The application should provide users with the capability to add multiple features with a single mouse click i.e. without picking each entity separately. This would help in speeding creation of network. For example adding a new service to a customer, the application should automatically know the set of facilities to be placed as per the category of the customer industrial, residential etc)	Essential		
G.3.7.33	Provision of stencil to create SLD	A stencil with relevant shapes for drawing a Single Line Diagram (SLD) will be provided which will enable the user to create a schematic representation of the basic electrical network.	Essential		



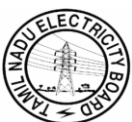
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G.3.7.34	Zooming facility in drawing	Zoom in/Zoom out : The user will have option to view an area with about 2000 objects (Customers, DTs, Cables, Poles, Junction Boxes, Etc.) represented on a Visio Interface and zoom in to sections of the drawing.	Essential		
G.3.7.35	Zoom sensitive layer control	The user should be able to define the number of objects displayed at any zoom scale (zoom-sensitive layer control).	Essential		
G.3.7.36	Connectivity to ODBC data sources	Connectivity to ODBC data sources : The objects shown on the interface would be connected to an ODBC Data source in the back end.	Essential		
G.3.7.37	System ability to draw automatically from database	Drawing schematic electrical network of a selected area automatically from the database. It will be possible for the user to plot the schematic electrical network of a selected area on a blank page in the interface based upon a selection query on the database.	Essential		
G.3.7.38	Software ability to exhibit data	Intelligent objects on the diagram showing data from back-end database on double click. The objects shown on the interface would be connected to an ODBC Data source in the back end. On double clicking an object in the interface a form would be shown with most relevant data, there would be options on the form to drill down and retrieve data in greater detail.	Essential		
G.3.7.39	Pictographic representation of assets	Pictographically representing assets in the distribution network.	Essential		
G.3.7.40	Stencil Features	The stencil provided in the Interface would have icons to represent constituents of the electrical network like feeders, Sub Stations, DTs, Junction Boxes, Cables, Poles and Customer Connections etc. These can further be colour coded to easily identify objects of similar rating. E.g. User would have an option to draw all 11 KV feeders in Blue objects on the Visio drawing can be text labeled.	Essential		
G.3.7.41	Equipment Status Display facility on GUI	Showing Equipment status : The interface would have options to show equipment status. e.g. Open and close status of circuit breakers would be shown in different colours. Switch position / status to be shown in different colours in real time based on manual input by user or through SCADA interface which shall be	Essential		



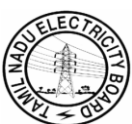
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		established by the owner at the later stage.			
G.3.7.42	GUI ability to accept query & provide result data on diagram	Query on the database and representation of result data on the schematic diagram. The interface would have a query through which the user would be able to select information from the database based upon specified parameters. The result set can then be either highlighted on the existing network or plotted on a separate page.	Essential		
G.3.7.43	Data entry provision after dragging objects to map	Data Entry by dragging objects onto the map for what-if analysis : The user would have options to drag objects from the stencil into the drawing area and enter data for the object in the form and save the data into the backend database.	Essential		
G.3.7.44	Printing capability of object data	Printing: Object property data shown in forms should be printed from Visio with the reporting tools.	Essential		
G.3.7.45	Ability to find element on drawing	Finding an element on the drawing: It should be possible to find and highlight elements on the drawing through query.	Essential		
G.3.7.46	Ability to draw a section of drawing	Drawing in parts: It should possible to draw a section of the complete network in a separate page from the seamless database and maintaining connectivity between pages.	Essential		
G.3.7.47	Software facility to represent internals	Representing Internals : The software shall have facility of representing the internals of objects like a sub-station.	Essential		
G.3.7.48	Report Creation Tools	The software should have industry standard report creation tools which would allow end users to create new reports with desired formatting functionalities such as sorting, filtering & display records in Tabular/ Browser format.	Essential		
G.3.7.49	Software ability to accept Utility defined symbols	User Friendly interface Network Symbol Library - The software should accept the user defined symbology applicable at the UTILITY. It should be possible to view the same network with different symbology in different views without changing the database, by storing the new display configuration. For example feeder view where different feeders of voltage level shown in different colors, outage view where live and energized line segments are displayed in different colors etc. all without changing the back end database.	Essential		



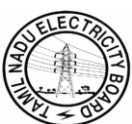
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		This would allow the users to view the network as desired by them.			
G.3.7.50	Provision of extensive library of symbols	The system should provide an extensive library of utility oriented symbols, allowing possibility of modification, if required. The system should also have the facility to create new symbols as per client requirements.	Essential		
G.3.8		Modes Of digitization: The digitization module shall have the following Capabilities :			
G.3.8.1	Ability to digitize SLD's	Capability to digitize either a single line diagram not to scale or geographical network to scale in user given coordinates or Global coordinates.	Essential		
G.3.8.2	Ability for on screen digitization	Capability for on screen Digitization i.e., to digitize freely using a mouse or a scanned image or satellite imagery.	Essential		
G.3.8.3	Multi-user digitization in single network	Capability for multiple users to digitize a single network	Essential		
G.3.9		Validations of Digitization			
G.3.9.1	Provision of Library of validations	The application shall provide library of validations and facility for user to choose the validations for any symbol existing or added to package. The validations shall be stored in database as stored procedures.	Essential		
G.3.9.2	Typical Validations	Typical validations are : Voltage of two objects / buses to be connected shall be the same; Voltage of any bus shall be one of standard voltages defined; the ratings of equipment shall confirm to standard ratings defined;	Essential		
G.3.9.3	List of validations	The bidder shall prepare a list of validations proposed for each symbol and take approval of utility.	Essential		
G.3.10		LINKAGES AND INTERFACES			
G.3.10.1	Integration Capability of GIS software to other modules in utility	Integration with other systems : For ensuring high level of interoperability of GIS software with the various business process software, open GIS standards and OGC Compliant/implemented software shall be adhered by the bidders. Software should have a ready provision / facility so that the proposed system can be easily integrated to the following systems :	Vital		



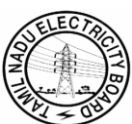
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a)		SCADA			
b)		Energy Management System			
c)		Customer Call Centre			
d)		Customer Information and Billing System (CIBS)			
e)		Project management			
G.3.10.2	Interface package for integration	IEC 61968-1, which is based on an integration bus approach focusing on integration of major utility applications relating to distribution management. The bidder is responsible to provide the interface software to Customer Billing package, SCADA package etc., if existing in the utility.	Vital		
G.3.10.3	Ability to interface with industry std. Analysis tools	Interface with Analysis Software : The application shall have the ability to easily integrate to industry standard analysis tools like SynerGEE, CYME etc. using XML.	Vital		
G.3.11		Specifications for the internet mapping server to enable the web enabling of the spatial data -			
G.3.11.1	Cross Platform support of internet mapping software	Cross-platform support : It Should work on all industry standard cross platforms with latest versions at the time of bidding, such Windows/ Unix/Linux.	Vital		
G.3.11.2	Web Server support of internet mapping software	Web server support : Several Web servers should be fully supported including Microsoft Internet Information Server, Netscape Enterprise Server, Java Server, Apache, SunOne - Sun Solaris, IBM HTTP Server, WebLogic, etc with support of all industry standard servlet engines : - ServletExec, Tomcat, Jrun, etc.	Vital		
G.3.11.3	Scalability & reliability of Internet Mapping software	Easier to install: - Scalable, reliable, more configurable (services across multiple machines (multi-tier) - in order to achieve faster response and load balancing),	Vital		
G.3.11.4	Advanced cartographic Capability	Advanced cartographic Capability	Vital		
G.3.11.5	Advanced Client side functionalities of Internet Mapping software	Advanced client side functionality : Should support streaming vector data to a client Web browser. More functions, such as map rendering, spatial selection, and querying, should be done in the client Web browser without sending requests back to the server.	Vital		



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G.3.11.6	Integration of local & internet data	Should integrate Local and Internet Data.	Vital		
G.3.11.7	Server architecture to be highly scaleable	Highly Scalable Server Architecture: IMS should publish GIS services from a single server or distributes services across multiple servers, which provides for a highly efficient and scalable environment.	Vital		
G.3.11.8	IMS capacity to function even if new servers are added or removed	The IMS should be specifically designed so that the site will continue to function while servers and services are added or removed. A site configuration should be able to save so that it will automatically restart the same configuration.	Essential		
G.3.12	Printing & Plotting	PRINTING & PLOTTING	Essential		
G.3.12.1	Printing Properties	Printing Properties : This module shall have the following printing facilities :	Essential		
G.3.12.1.1		Print network vector map alone, raster map alone and network superimposed over raster.			
G.3.12.1.2		The user should have the facility to print the features required by him.			
G.3.12.1.3		The user shall have the capability to print the complete network or a part of the network in a given size of paper.			
G.3.12.1.4		The user should be able to print complete or part of the network on given scale in multiple sheets of specified size.			
G.3.12.1.5		The application should support print preview feature as well as various drivers.			
G.3.12.1.6		The application supports PostScript.			
G.3.12.1.7		The user should have the option for labeling specific or all the devices or objects of the network.			
G.3.12.2	Plotting/Printing of graphical areas	Plotting and Printing of graphical areas : The system should support WYSIWYG Plotting and Printing of graphical areas.	Essential		
G.3.12.2.1		Legend, Texts styles in plotting template : Placement of Own Legend, various Texts styles in plotting template.			
G.3.12.2.2		List the supported Plotters and Printers			
G.3.12.2.3		The system must support : Map insets that allow the user to designate a portion of the			



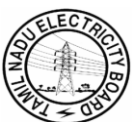
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		map in a source frame and show a zoomed version of the source in a destination frame to enable printing and plotting cluttered areas.			
G.3.12.2.4		The system should allow Generation of user defined Map grids, coordinate systems and preparation of Map-books automatically. System should also allow scheduling of plotting activity. A map grid is a set of map sheets that can be plotted.			
G.3.12.2.5		The application should provide users with the capability to store a map layout for consistent look and feel during map production.			
G.3.12.2.6		The system shall support Map Production tools that allow users to create map books and map sets. It shall be possible to schedule the plot / print of the map books.			
G.3.12.2.7		The map production system may automatically orient text (i.e. along the axis as opposed to horizontally).			
G.3.12.2.8		The map production system plots labels for point, line and polygon features using any attribute (alpha or numeric). Labels are plotted in a variety of text fonts, sizes, colors and angles.			
G.3.12.2.9		The system provides the functionality to automatically create titles, legends and other margin data and store them in templates that are transportable.			
G.3.12.2.10		The map production system needs to be able to create markers and line sizes that vary automatically by the scale of the map.			
G.3.12.2.11		The map production system allows the saving of layouts and or templates.			
G.3.12.2.12		The Map production system includes the optional application of standard drawing frames and editable title blocks.			
G.3.12.2.13		Storage of predefined templates for plotting			
G.3.12.2.14		The system shall support Inset Frame tool that allows user to display specific features within current view individually in separate windows. For example, user can depict each switching facility in the Switching Facility layer in its own inset frame. These are to be plottable.			
G. 3. 13	Report generation	REPORT GENERATION	Essential		
G.3.13.1		This module shall have the facility to print and display the following reports :			
G.3.13.2		Report of assets of complete network or a part of the network say Sub station, Feeder, Area etc.			



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G.3.13.3		Report showing number of objects for a particular symbol with different attribute data on the basis of selected attribute.			
G.3.13.4		The system should support ability to create reports and report templates.			
G.3.13.5		Bidder should list the report tools available with the proposed solution.			
G.3.13.6		The system is capable of generating reports from the results of batch query sets.			
G.3.13.7		The reports are user-format table and full-page when output to a printer.			
G.3.13.8		Graphic reports can be generated from within the GIS applications software.			
G.3.13.9		Wizard production of charts and reports in all user applications.			
G.3.14	System capability to provide sessions manager	Sessions Manager : The application must provide a Session Manager to establish and enforce a specific version structure and user roles. Session Manager should create an edit session in which an editor may make changes. After the changes are complete, the user forwards the session through an approval process. A session (and its associated version) may travel through the process several times before receiving approval and being posted to the geodatabase. Session Manager allows creating and editing sessions.	Essential		
G.3.15	Online help & online tutorials	ONLINE HELP & ONLINE TUTORIAL	Essential		
G.3.15.1		The system should have the facility for online help context based and also on line tutorials.			
G.3.15.2		A query builder to generate adhoc queries by user, who have no skills on SQL Commands, shall be provided.			
G.3.15.3		Context based and user-friendly help should be available.			
G.3.15.4		Help should be available at different levels : novice, expert etc.			

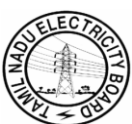


6.0 Module : GIS based integrated network analysis module

Requirement ID	Functionality	Description	Criticality	Response	Comments
Na.1.0		General features			
Na.1.1	Module capability	The module shall be able to perform several types of analyses on balanced or unbalanced three-phase, two-phase and single-phase systems that are operated in radial, looped, meshed or mixed configurations. The system shall be able to create "what-if" studies and performing simulations to evaluate the impact of modifications to existing network.	Vital	C/ ER/F/ CR/ NC	
Na.1.2	Module features	The system shall have functionality for editing, querying and viewing the electrical system on a GIS base. Background maps showing city, streets, land parcels or annotations can be used to give context to the electrical network. It shall also be possible to trace and query the electrical connectivity of the system.	Vital		
Na.1.3	Broad functionality	The module should have the capability to perform the following broad functions related to distribution system design, analysis and optimization : i) Creation and editing of network, ii) Load flow and voltage drop analysis, iii) Optimization studies like capacitor placement, network reconfiguration, conductor up-gradation, express feeder, load balancing and load allocation etc. iv) Creating extensive "what-if" studies. v) Fault analysis and protection coordination, vi) Network design reports, cost estimates, financial analysis, vii) Integration with New connection module for checking the network capability, augmentation requirement, if any	Vital		
Na.1.4	Comprehensive package and integration with GIS	It shall be possible to do any number of studies either sequentially or at random. The package should be comprehensive, cover all aspects of analysis, optimization & designing and should be integrated with GIS package via XML.	Vital		
Na.1.5	Sharing of GIS database	The package should share the database of the GIS and should not require a separate database.	Vital		

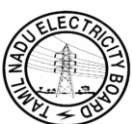
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Na.1.6	Actual Mode & Analysis Mode	There should be separate modes to maintain organization precious data - Actual Mode or Real Mode and Analysis mode for any study.	Vital		
Na.1.7	Actual Mode	Actual Mode or Real Mode must be the simulation of the network under subdivision. This type of study is useful for maintaining the real asset data and to view real network for planning purpose.	Vital		
Na.1.8	Network in Actual Mode	In “actual mode” the network must be connected with subdivision working and updated regularly with the associated module. Any changes made to the system are recorded and can be further traced. Since its information is precious to organization and must be updated through proper channel (i.e. subdivision or office working).	Vital		
Na.1.9	Editing in Actual Mode	In “actual mode” Cut, Paste, Save and Consumer shifting should be allowed but with proper check on user authenticity.	Vital		
Na.1.10	Analysis Mode	An analysis mode of network will be such that whatever ad-hoc changes made to the network for analysis will not affect the actual “network/subdivision data”, which represents actual network propriety of the organization.	Vital		
Na.1.11	Editing in Analysis mode	In “Analysis mode” Cut, Paste and all editing options shall be allowed so that user can analyze the network with different configurations and modifications.	Vital		
Na.1.12	System ability to analyze with part load on any feeder	A network / study can be opened (Loaded) either whole or in part i.e. user can specify the feeders or transformers to be loaded on network.	Essential		
Na.1.13	Graphical representation and Mosaicing features	The software should provide for online graphical creation and editing of network topology and data. Mosaicing features for large networks shall be provided.	Vital		
Na.1.14	Software ability to present tree view structure of network	The software should be capable of presenting a tree view structure of the network-representing root at Sub-division/GSS and successive feeders/transformers and LT circuits.	Essential		
Na.1.15	Backup copy for network	There should be provision to make different backup copy for the network.	Essential		
Na.1.16	Password protection for important editions	The software should provide a password protection on important issues like on deleting a study.	Vital		



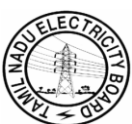
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Na.1.17	Merging of two studies	There should be facility to merge two studies in order to work in distributed environment.	Essential		
Na.1.18	Up gradation and expansion facility	There should be facility for up gradation and expansion without disrupting the earlier studies.	Essential		
Na.1.19	System ability to export full or in part network	User can export whole or part of a network to a new study via selecting transformers and feeders.	Essential		
Na.2.0		Modeling capabilities of Network equipments:			
Na.2.1	Software capability of modeling Electric Distribution Network	The software should be capable of representing (Modeling) an 'Electric Distribution Network', which comprises of various electric equipment, connected from each other to generate a distribution system.	Vital		
Na.2.2	Modular design with powerful tools and libraries	The software should be modular in design and should be combined with powerful tools, templates and libraries for easy input, updation and retrieval / sharing of data. The common database shall be available to all the users.	Vital		
Na.2.3	Network creation with different voltage levels and all entities	The software should provide tools for creation of 3/2/1 phase networks with different voltage levels with all its entities e.g., generator, bus, substation with different voltage grades, feeder, transformer, motor, capacitor, protective devices, lines with different size conductors and cables, loads, switches etc, with symbols and their technical data.	Vital		
Na.2.4	SLD of network	The information in the system should be available as single line diagram of the network, schematic diagram of the substations with facility to access any or all of the information about equipment or network with zoom and pan facility.	Vital		
Na.2.5	Indication of limitations	Any limitation regarding the number of nodes, buses, substations, feeders, number of balanced and unbalanced loads, branching on a circuit shall be clearly indicated.	Vital		
Na.2.6	Modeling of loads	It should be possible to model the loads as constant power loads, constant impedance loads and constant current loads.	Essential		
Na.2.7	Creation of user specific library of data	It should provide facility for expanding the standard library and also creating user specific library of symbols, design data, equipment data, operating limits and standards, cost data for equipment / material, cost data for power and energy losses and necessary data for carrying out economic analysis for the operating life time of the system.	Vital		



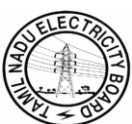
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Na.2.8	Network modeling of various electrical components	<ul style="list-style-type: none"> • The module should allow network modeling for all types of network elements or assets of TNEB distribution network eg.Transformers • Buses • Feeder as node • Section • Tap. • Circuit Breakers • Switches • Capacitors • Series Reactors • Boosters 	Essential		
Na.2.9	Network modeling with various electrical components & parameters	<p>It should allow modeling the system for</p> <ul style="list-style-type: none"> - Various Conductors (R, X & Amp. Capacity) - Various Distribution Transformer - Energy (kWh) - Various Loads (kW & KVAR) - Demand (kW & KVAR) 	Essential		
Na.2.10	Module validation capability	The module automatically checks and validates network topology and data for errors.	Essential		
Na.2.11	Modeling with Power & Distribution transformers	The module should provide for accurate modeling of Substation as well as Distribution transformers. The software provides a separate canvas for drawing GSS equipment.	Essential		
Na.2.12	Modeling with cables & overhead lines	Cable & lines can be modeled for Overhead lines, overhead, duct or underground cables, Cable joints etc.	Essential		
Na.2.13	Section representation in network	A section is represented in the network with a line from a possible parent node plus its physical structure.	Essential		
Na.2.14	Representation of various types of sections	<p>The software provides different shapes for different type of sections like -</p> <ul style="list-style-type: none"> • Cut-Point • Double-Pole structure • Composite line • Composite double circuit • Double Supply • Four Pole Structure • Six-pole structure <p>Shapes of each component of network will be furnished by TNEB during implementation.</p>	Essential		



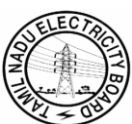
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Na.2.15	Checks while installing new sections on single/two phase lines	There should be proper checks provided for all types of phase connections while installing a section.	Essential		
Na.2.16	Module ability to analyze 'spot load' on pole	There should be a facility for utility to add and analyze "Spot load" on any network asset..	Essential		
Na.2.17	Module to display 'feeder node'	The point from where the feeder starts has a visible interface i.e. the 'Feeder node'.	Essential		
Na.2.18	Feeder installation restrictions	There should be restrictions that the feeder can be installed at either on a load bus of a grid substation or on the distribution transformer.	Essential		
Na.3.0		Analysis features -			
Na.3.1	Analytical Modules	The module should have following Analytical Capability- <ul style="list-style-type: none"> • Balanced/Unbalanced load flow and voltage drop Analysis • Fault Analysis (Symmetrical/ Unsymmetrical) • Optimization of losses • Capacitor Placement 	Essential		
Na.3.2	Analysis available through graphical interface	The following analysis results are to be available through graphical interface by "Point and Click" method. <ul style="list-style-type: none"> • T & D Losses Analysis • Balanced Analysis • By-phase Analysis • Fault Analysis 	Essential		
Na.4.0		Load Flow Analysis and voltage regulation -			
Na.4.1	Load Flow Analysis	The module must have balanced/Unbalanced voltage drops and load flow analysis.	Essential		
Na.4.2	Ability to perform technical actions on network & analyze	User can perform various technical actions on network to have the changed statistics of load flow.	Essential		
Na.4.3	Defining of LF, LLF	It should be possible to define / evaluate annual load factor and loss load factor from the load duration details obtained from data acquisition system	Essential		



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Na.4.4	Calculation of system and operating parameters	It should be possible to calculate the system and operating parameters from the data e.g., calculation of resistance, impedances, susceptances of the lines and cable at different temperatures and equivalent impedance of the transformers in case of parallel operation in a substation. It should be possible to define the spacing, configuration, temperature etc.	Essential		
Na.4.5	Provision of slack bus	The program should provide for at least one slack bus.	Essential		
Na.4.6	Modeling of bulk and UD loads	It should be possible to model bulk loads as well as uniformly distributed loads	Essential		
Na.4.7	Load flow capability on various type of networks	It should be possible to carry out load flow analysis of radial, meshed, looped or mixed configuration, 3/2/1 phase balanced and unbalanced networks. Provision shall be there for 3 phase 4 wire and 3 phase 5 wire system operating at user defined voltage and parallel operation with different sizes of conductors / cables	Vital		
Na.4.8	Deliverables in load flow	Load flow calculations should give power flows in MW & MVAR, current in each section, load at each node, voltage and % voltage regulation at each node	Vital		
Na.4.9	Peak power loss and energy loss in each section of Network	It should give the peak power loss and the energy loss in each line section and the transformation loss in each transformer. The iron losses and the copper losses (load losses) should be indicated separately. It should be possible to use the iron and copper loss values defined in user created library for the same	Essential		
Na.4.10	Voltage and component wise segregation of losses	It should also be possible to segregate and get a summary of the losses voltage level wise and component wise for the entire network under study	Essential		
Na.4.11	Load flow at varied tap & voltage levels	It should be possible to conduct load flow analysis for nominal voltages or user defined voltage. It should also be possible to conduct load flow analysis for different tap positions of the transformers	Vital		
Na.4.12	Indication of limit of violation	The load flow analysis should indicate violation of loading voltage and current limits	Vital		



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Na.4.13	Calculations according to various parameters	The calculation can be further filtered according to parameters like mentioned below and it should be possible for all distribution assets of TNEB- - a) Consumers category b) Diversity Factor of individual feeder. c) Inclusion of only 3 Phase load (exclusion of single phase load) d) Set load according to each LT Feeder, Peak loading, average loading e) Set Load according to the DTC full load, part load, average loading	Essential		
Na.4.14	Considering Seasonal Effects	The software must include seasonal effects like temperature, skin and corona effect.	Essential		
Na.4.15	Load calculations	The module should allow Allocation of Load by substation demand by - <ul style="list-style-type: none"> • Dividing load in proportion to connected kVA • Dividing load in proportion to KWH • Include spot loads 	Essential		
Na.4.16	Demand calculations	The module can calculate and allocate the Substation Demand among the feeders based on- <ul style="list-style-type: none"> • KVA and PF • KW and PF • KVAR and PF • KWH, Load Factor and PF • Amps, KVA and PF • KW and KVAR • Diversity factor 	Essential		
Na.4.17	Load Allocation	The module must provide facilities for Allocation of Load by Feeder Demand, DT demand, pf etc from the meter database. <ul style="list-style-type: none"> - Divide Load in proportion to KWH / connected KW - KWH parameter shall be updated regularly by subdivision working. - New load (consumer) added in the subdivision is automatically taken into account in load flow calculations. 	Essential		
Na.5.0		Optimization Studies -			
Na.5.1	Ability to support sub-station proposal	Software shall support Power / Distribution substation proposal	Vital		



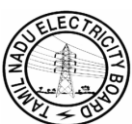
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Na.5.2	Design of support strength, clearances etc.	It should be possible to evaluate the design of distribution feeders to check adequacy of support strength and statutory clearances.	Vital		
Na.5.3	Earthing design	It should be possible to evaluate the design of earth mats and earth electrodes.	Vital		
Na.5.4	Computation of impedances	It should be possible to compute, positive sequence, negative sequence and zero sequence impedances with and without mutual impedances.	Vital		
Na.5.5	Ability to support power transformer proposal	It should be possible to determine the number, location and size of primary substations required to meet the growing demand at minimum total cost.	Vital		
Na.5.6	Ability to support Distribution transformer proposal	It shall be possible to generate optimum distribution transformer proposal, new or augmentation over a selected regions or nodes.	Vital		
Na.5.7	Solutions for line overloading etc	It should be possible to determine the optimum network configuration for formation of new links to nodes on a existing feeder, tie points for changing feed area from one substation to another to balance load among substations.	Vital		
Na.5.8	Creation of express feeder	It should propose an express feeder in order to overcome irregular overloading of a feeder, to remove or reduce the Low Voltage Area and to minimize line losses.	Essential		
Na.5.9	Economic and break-even loading limits	It should be possible to determine the economic and break-even loading limits of conductors and cables.	Vital		
Na.5.10	Solutions for conductor problems	The software can propose a new conductor over the over loaded regions on a feeder to remove/minimize the over loaded region by suggesting better conductor on the network.	Essential		
Na.5.11	User defining of Express feeder conductor	The conductor can be user-defined i.e. user can force suggest the conductor for express feeder proposal, feeder bifurcation, feeder re-conductoring etc.	Essential		
Na.5.12	Software alert for incorrect conductor selection	The software must warn if poor conductor is chosen which is poorer from the existing one in case of re-conductoring.	Essential		
Na.5.13	Capacitor proposal	The software must propose optimum reactive compensation along with sizing, location and switching time of capacitor to be installed for improvement of voltage profile, minimizing losses and maximizing the net economic benefits.	Essential		
Na.5.14	User ability to vary capacitor size	The unit of each individual capacitor bank installed can be adjusted.	Essential		



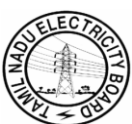
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Na.5.15	Load Balancing Analysis	The software should provide load-balancing analysis to minimize losses.	Essential		
Na.5.16	Phase change proposal for loads	The system suggests consumers re-phasing for minimum losses.	Essential		
Na.5.17	Proposal to reposition switch between two feeders	The software must suggest repositioning of a switch between two feeders to achieve the optimal feeder configuration, which will minimize losses, improve the voltage profile and balance the load between feeders. The module can determine the optimal location of the tie points by suggesting new location (addition of switching devices) or recommending new switching schemes to achieve the objective.	Essential		
Na.5.18	Technical and commercial feasibility due to any change	Software should provide the technical and commercial feasibility of any technical modification done by user. Such feasibility report shall include the following details. New proposal will be reflected with different line color and style.	Essential		
Na.5.19	Feasibility Report Contents	<ul style="list-style-type: none"> - The feeder statistics like length, power losses, max voltage drop, power factor, max current etc. as per the requirement before and after the proposal. - List, location, and details of equipment installed and actions performed. - List of equipment uninstalled due to replacement - Approximate cost of equipment installed and depreciated cost of equipment uninstalled. - Technical feasibility of the proposal. - Commercial feasibility of the proposal. - Pay back period of the proposal 	Essential		
Na.5.20	Network analysis based on certain practical constraints	Such summarized analysis can be made more practical further by putting following constraints - <ul style="list-style-type: none"> a) Fixing minimum limit for new transformer proposed. b) Available conductor. c) To select only those feeders where VR is above some specified limit. d) To select only those transformers, where overloading is above some specified limit. e) Limit can be fixed for minimum payback period of each unit of proposals 	Essential		
Na.5.21	Connection feasibility for new application	The consumer applications for new connections, load extension etc. shall be processed to generate connection feasibility report.	Essential		



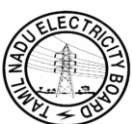
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Na.5.22	Contents of connection feasibility sheet	The Connection feasibility report shall include mainly the following details - a) The Feeder/Transformer statistics like max voltage drop, max current etc before and after the proposal. b) Suggested phase and technical details from tail end to source end of the feeder subjected . c) List of equipment to be installed/uninstalled and technical actions to be taken before release of new connection or load extension. d) Final suggestion for new connection like connection can be released or not.	Essential		
Na.5.23	Check for non bypass of processes of new connections	This application processing is bound to further processing. For example, if user tries to bypass the process then he can't generate the SCO or RCO etc.	Essential		
Na.5.24	Network updating on the basis of actual jobs done	The actual network updating can be bound to job order process in order to update the original changes to network.	Essential		
Na.5.25	Calculation of Technical losses in the network	The network analysis module shall be able to calculate the allowable as well as actual technical losses based upon the power flow data in any part of the network by linking with the meter data acquisition system and asset mapping database. The result of technical loss analysis shall be used by Energy Audit module to generate detail Energy accounting and Audit reports as described in detail in separate module of "Energy Audit".	Essential		
Na.5.26	Boundary Condition Conflict resolution through module	The package provides proper mechanism to solve boundary conditions conflicts of subdivisions and work area concept.	Essential		
Na.6.0		Fault Analysis -			
Na.6.1	Short circuit analysis feature	The software should provide following short circuit analysis. - LL - LLG - SLG - 3 phase	Essential		



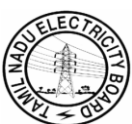
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Na.6.2	Short circuit module capability	The short circuit module shall provide values for fault currents for different types of fault and also gives the fault voltage and impedance analysis throughout the network taking into account pre-fault loading condition . A user shall specify any point in the system and the analysis will return fault values for all points downstream. This helps to determine fault values for entire feeders if required.	Essential		
Na.6.3	Short circuit analysis algorithm	The analysis algorithm shall take into account any closed loops in the distribution system and also for the fault infeeds from embedded generation and large motors throughout the system.	Essential		
Na.7.0		“What if “ studies -			
Na.7.1	‘What If’ scenario on certain parameters	The software should provide extensive “what if” scenario on all TNEB distribution assets parameters eg. -- <ul style="list-style-type: none"> - Connected load - Line Configuration - Distance - Conductor/Cable 	Essential		
Na.7.2	System study and analysis under different scenarios	The module should provide for system study and analysis of alternate network scenarios involving cost implications considering the following options : a) Capacitor placement and sizing b) Selective re-conductoring c) Selective reconfiguration d) Selective rerouting e) Substation sizing and location f) Network addition / augmentation by feeders / new transformers g) Selective and across the network load variation	Essential		
Na.7.3	Software facility for network analysis on “what if” changes in bulk	There must be a facility to implement “what if” changes in bulk with following criterion. <ul style="list-style-type: none"> - Changes Downward selected node : - This option will change the selected parameter, downward the selected node (i.e. the change will affect all the nodes supplied from this node.) - Downward on 11 kV sections only: - This will change the parameter for all 11KV section downward the selected node. - Upstream from selected section to section no: - This option enables user to change parameter for all nodes between two connected nodes. 	Essential		



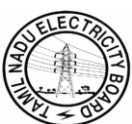
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Na.7.4	Making “what if” changes as permanent	These “what if” changes mentioned above can be made permanent, if required.	Essential		
Na.8.0		Protective device co-ordination -			
Na.8.1	Protection co-ordination	The software shall be able to verify the coordination of protective devices, the maximum permitted operating time and the maximum permitted continuous load current. Its coordination wizard shall be able to suggest protective device settings / adjustments and ratings.	Essential		
Na.8.2	Protective device database	The software shall be equipped with an extensive database of protective devices and device settings reports.	Essential		
Na.9.0		User level customization features			
Na.9.1	Line parameter customization	User can customize the line color, width, style for voltage levels according to his requirements.	Desirable		
Na.9.2	Equipment Color customization	User can customize the equipment color according to his requirements.	Desirable		
Na.9.3	Background Color customization	User can customize the background color, display of analysis results and input data information.	Desirable		
Na.9.4	Text customization	User-defined text and other labels can be changed for following properties :- <ul style="list-style-type: none"> - Font Name - Font Size - Font Color - Font Style 	Desirable		
Na.9.5	Color assigning for a circuit	One can assign a circuit/ feeder a distinguishable color permanently.	Essential		
Na.9.6	Color Editing of feeder	The standard color for a feeder can be attained again if required.	Essential		
Na.9.7	Overloaded equipment representation	User can see the overloaded equipment as blinking with overloaded color.	Essential		
Na.9.8	Complaint Affected node representation	The user must have a facility to view complaints affected nodes with different color.	Essential		
Na.9.9	Label Hiding	Labels loaded on the network can be made invisible if required.	Desirable		



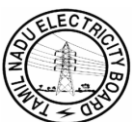
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Na.9.10	Change of parameters like tariff of energy	Important parameters like tariff of energy (in Rupees per unit) can be changed.	Essential		
Na.9.11	Unit system	The unit system for various parameters envisaged shall be in SI (Metric) units and cost in Indian Rupees.	Essential		
Na.9.12	Fixing voltage limits	User can fix the limit of Over Volt and Under Volt conditions (Voltage Regulation) according to the organization regulations.	Essential		
Na.9.13	Storage of Load Flow Statistics	User can store load flow statistics with different name and reload them when required further.	Essential		
Na.9.14	Unit Allocation for capacitance value	User can fix the unit of capacitance with which the system gives the capacitor proposal.	Essential		
Na.9.15	Section Unit allocation	User can fix the unit of section installed by the system according to different voltage levels and pole type like cut point, double circuit etc.	Essential		
Na.10.0		Help/Search/Display Features			
Na.10.1	'Help' features in software	The software should contain varied range of tool tip help, with important parameters/ attributes can be seen with balloon help.	Vital		
Na.10.2	Attributes on balloon help	Specifically it should provide following attributes on balloon help on proper node : <ul style="list-style-type: none"> - No of Consumers on a node - Distance of this node from source. - Load at the pole of different phases R, B, Y. - Current :- Individual and all 3 phases - Voltage regulation : Individual and all 3 phases current 	Essential		
Na.10.3	Balloon help to be node specific	The balloon help must be specific to the type of node.	Essential		
Na.10.4	Source trace ability through node	A source can be traced from the node selected showing it with a different line color.	Essential		
Na.10.5	View/Print Option wrt nodes	It should provide following views and prints. <ul style="list-style-type: none"> - Remove all nodes upwards. - Remove all nodes downwards. - Show All Nodes downward - Show All Nodes 	Essential		
Na.10.6	Node inclusion in 'View Changes'	These "view changes" must not exclude the nodes from calculations.	Essential		



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Na.10.7	Easy Interface for network traversing	The network traversing is provided with easy interface like “dragging the canvas”.	Essential		
Na.10.8	Network Traversing by Keyboard	The network can also be traversed by keyboard from the selected node in upward and downward directions.	Essential		
Na.10.9	Provision for Toolbar removal when not required	The toolbars can be removed from screen when not required.	Essential		
Na.10.10	Filtered search for node tracing	The node searching should be provided with systematically filtered search.	Essential		
Na.10.11	Node Search Support Logic	The node search support global as well as Feeder ID/Feeder Name/Transformer ID/Transformer Name/ Absolute ID oriented search.	Essential		
Na.10.12	Node search on basis of customer information	A node can be searched for a consumer if consumer information is provided like Service No. / Account No. etc	Essential		
Na.10.13	System ability to show particular type of nodes only	A particular or whole network can be set to show only junction and terminal nodes while excluding carry nodes.	Essential		
Na.10.14	Drawing formats in system	Supports shp, dwg etc. drawing formats.	Essential		
Na.10.15	Insertion of GIS layers in network	Number of GIS Layers can be inserted in the network with electrical layer superimposing rest all the layer.	Essential		
Na.10.16	Representation of different voltage levels in different layers	The application shall facilitate a network to be entered in several different layers. User can have different view of Layers like 33KV, 11KV, LT layers etc.	Essential		
Na.10.17	Area identification on map	Identification of area on the map based on the results of data analysis shall be done on various functions such as commercial functions, billing demand, defaulter concentrations, no of new connections, load & energy balance etc.	Essential		



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Na.10.18	System permissibility for customization of graphical representation for each entities	System allows the user to customize and insert the graphical elements in the network to represent for each of entities/objects/elements. <ul style="list-style-type: none"> • Point • Line • Polygon • Text • Color • Hash pattern • Line style • Font • Point shape (Round, square, user defined..) 	Essential		
Na.10.19	User ability to dynamically select object attributes	User can dynamically select one or more of the attributes of an object, to be displayed as label or Tool Tip of the object. This can be for viewing, plotting and printing purposes. <ul style="list-style-type: none"> - System supports representation of the structure/object/elements in different colors based on the certain attribute criterion - User can display the different layers with different scales. - The software should have dimensioning capabilities. - The system gives the real time measurement / length, while drawing the sections. 	Essential		
Na.10.20	System improvement proposals generated by system	The system improvement proposals generated by the application are not only on cost effective aspects but also involves GIS enabled logic like shortest route technically feasible.	Essential		
Na.10.21	Feature to tag as existing, new or proposed	The program should provide for feature to tag/identify/code the equipment / network component as existing, new , proposed etc.	Essential		
Na.10.22	Pan/zoom features	Shall control the display of the data on the screen and allow the user to refresh, pan, zoom in, zoom out, zoom to preset scales etc.	Essential		
Na.11.0		Editing Features			
Na.11.1	Controlled Editing of network	It should provide restrictions on all edits modifications on the network including adding/editing equipment on the network.	Vital		
Na.11.2	Locking facility for system studies	It must provide a facility for a super user to lock some particular studies or backup safe from others via password protection.	Essential		
Na.11.3	Moving/Shifting of complete circuit	Users can move/shift a complete circuit downward by moving source equipment with proper validations.	Essential		
Na.11.4	Entry of probable/ default value	For ease of data entry, every probable or default value should be entered implicitly.	Essential		



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Na.11.5	User permission to change supply	User can change the supply shifting/change in the network.	Essential		
Na.11.6	Validation of Supply Change	The supply change is supported with proper validation like mismatch in voltages, ring generation, logical constraints, shunt equipment ,alternate sources of supply and their load indicationsetc.	Essential		
Na.11.7	Mapping composite nodes	It can properly map composite nodes as one node same time treating them with different lines equipment as well as maintaining the inventory.	Essential		
Na.11.8	Software facility for geographic & equipment attribute labels	The software has facility to put geographical labels as well as equipment attribute labels on study.	Essential		
Na.11.9	Label Dedication	These labels can be dedicated to a feeder alone.	Essential		
Na.11.10	Multiple Node Selection	The software shall allow multiple nodes selection. and alternate sources of supply and their load to be indicated.	Essential		
Na.11.11	Node insertion permissibility by software	A node can be inserted between two already existing nodes irrespective of their order.	Essential		
Na.11.12	Equipment rotation permissibility in drawing	The software shall provide facility to rotate asymmetric equipment like series equipment like transformer,	Essential		
Na.11.13	Recording of significant actions	Any significant action performed by user like Supply change, Switch On/OFF, move, rotate etc. should be recorded.	Essential		
Na.11.14	Retrieval of records	These actions can be retrieved with repeat history (Undo).	Essential		
Na.11.15	Saving of Record History	The record history (undo record) should persist even after closing a session.	Essential		
Na.11.16	Circuit Rotation ability of software	A circuit can be rotated from its source with any degree of rotation.	Essential		
Na.11.17	Closure of new nodes on closing of network	The new nodes, which are added by software at the time of new proposals/ augmentation should automatically vanish on closing of the network.	Essential		
Na.11.18	Mapping of new nodes with different lines/ colors	The nodes added at the time of proposals or estimate should be mapped with dash or different line color/node-id to distinguish them from persistent nodes.	Essential		
Na.11.19	Provision to remove temporary equipment	There must be provisions to remove such temporary equipment automatically as well as forced.	Essential		

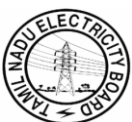


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Na.11.20	Provision to supply source bus with another source	To expand any study on further high level there are provisions to supply the source bus with some other source.	Essential		
Na.11.21	Selecting/ Deselecting of node	Any node selected can be deselected deliberately.	Essential		
Na.12.0	Querying & Reporting facility	Querying and Reporting facility : Other than analyses, software should provide following querying and reporting facility.			
Na.12.1	Querying & Reporting on 'Sections'	Section - a) Section parameters individual. b) Section consumer detailed/Individual.	Essential		
Na.12.2	Querying & Reporting on 'Feeders'	Feeder - a) Feeder parameters individual. b) Feeder parameter detailed. c) Feeder parameter summary d) Circuit parameters Graph. - Distance V/s Pole - Current V/s Load - Power losses e) Consumers reports f) Consumer service lines losses detailed	Essential		
Na.12.3	Querying & Reporting on 'Transformers'	Transformer - a) Transformer parameters individual Static. b) Transformer parameters individual (dynamic) c) Consumers reports (User filtered/customized)	Essential		
Na.12.4	Querying & Reporting on 'Sub-stations'	Substation - a) Substation design print schematic b) Substation inventory summary c) Subdivision level consumers report (User filtered/customized)	Essential		
Na.13.0		Printing and Plotting			
Na.13.1	Network Printout from tree view	It should provide facility to view and print Network directly from tree view of the network without actually loading the study as :- a) LT Maps only b) LT Maps with 11 KV c) 11 KV Map with LT d) 11 KV Map e) Whole study Map	Essential		

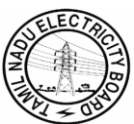
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Na.13.2	Generation of various summary / individual reports	There should be facility for generation of various summary / individual reports for example feeder wise, transformer wise, voltage level wise, zone/area wise, consumer category wise etc.	Essential		
Na.13.3	Abnormal condition reports	Abnormal condition reports for sections with voltage violations and / or over loads.	Vital		
Na.13.4	Identification of equipment through colors code on SLD in abnormal condition.	There should be facility for identification of network element / equipment through colors code on a single line diagram in case of abnormal operating condition.	Vital		
Na.13.5	Saving of reports	The user can save reports, information (Tabular/Graphical /non-graphical) to file/printer/terminal.	Essential		
Na.13.6	User Text printing along with selected network	The comments/user text can be printed along with the selected graphs and network diagrams.	Essential		
Na.13.7	Saving in different formats	There should be facility for importing Single line diagrams and reports to industry standard packages like Microsoft Word, Microsoft Excel etc.	Essential		
Na.14.0		Cost Estimating -			
Na.14.1	Preparation of cost estimates as per cost data	The module should be capable of preparing cost estimates of lines, substations etc. based on the cost data.	Vital		
Na.14.2	Provisions to input special and customized cost data	There should be provision for users to input customized costs for special structures like river crossings, railway crossings. There should also be provision to input the cost data of storing the material and associated equipment, erection charges, other standard and non-standard estimate components.	Essential		
Na.14.3	Estimated for several lines and sub stations	The module should be capable of preparing project estimates consisting of several lines and substations.	Essential		
Na.14.4	Storage of cost data of several areas and multiple versions	There should be facility to store the cost data of several areas and more than one version of the project report.	Vital		



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Na.14.5	Automatic capturing of works proposed and creation of cost estimates	The module should be capable of capturing the works proposed under various studies and creating the estimates of the studies performed by transferring the initial works proposed in the studies without again entering those details.	Vital		
Na.14.6	Automatic creation of cost estimates	When the user picks up the study, the cost estimate should get created automatically interactively by selecting the complete details of the lines and equipment proposed.	Vital		
Na.15.0		Financial Analysis			
Na.15.1	Module for cost benefit analysis	For providing the commercial feasibility of any technical modification proposed, the software should have module for cost benefit analysis of any network under various proposed alternatives.	Vital		
Na.15.2	Provision for cost depreciation	The proposal shall also include the depreciation of "Item recovered"	Essential		
Na.15.3	Cost calculations for various options	The module should provide for evaluation of project and cost calculations for various system improvement options proposed.	Essential		
Na.15.4	Calculation of various financial parameters	It should be able to calculate the financial parameters such as internal rate of return, pay back period, sensitivity analysis etc. so as to optimize the investment for an electrical distribution system.	Vital		
Na.15.5	Provision of optimal solution	Module should also give the optimal solution for any given network and shall have provisions for minimization of losses so as to maximize the net benefit i.e., the present worth of loss reduction is more than the annual cost of capital investment.	Vital		



7.0 Module: Customer Care Services

Objective: The system should improve the customer service by processing and resolving customer requests/queries/complaints in minimum possible time by taking up it at appropriate place and level.

Module domain

From :	Receipt of customer requests / queries/ complaints
To :	Closure of complaints and intimation of the same to the customer

Specification Customer Services

The CRS will provide customer care using all subdivision's latest consumer and network data using latest technologies. The prime data input for the CRS will be as follows -

a	Consumer related all sub-division information	Via	Each sub-division's daily working
b	Latest Network information	Via	Each sub-division latest Network data
C	Feeder Shutdown, Breakdown, Faults, Alerts	Via	CRS operator or SCADA
D	Complaint/Grievances registering, logging and assigning	Via	CRS operator
E	Attending the complaint	Via	Line party/Gang
F	Attending of Grievances	Via	Concerned subdivision officials/modules
G	Feedback or receiving the solved information	Via	CRS operator

Type of Complaints that shall be received include -

S. No.	Type of Complaint / Grievances	Nature of Complaint	
1.	Voltage related	Voltage High	
		Voltage Low	
		Dim Supply	
		Voltage Fluctuation	
2.	Supply Failure related	Supply failed - Individual	
		Supply failed - Total Area	
		Supply failed - One Phase	
3.	Transformer related	Transformer - Cable / Lugs burnt	
		Transformer - Oil Leakage	
		Transformer - Sparking at Pole	
		Transformer - Smoke /Flames	

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4.	Line related	Line Snapped	
		Line - Tree branches touching	
		Line - Bunched / Twisted	
5.	Pole related	Pole - Rusted / Damaged	
		Pole - Fell Down	
		Pole - Leaning	
		Pole - Current leakage in pole	
6.	Services connection related	Service connection-Wire Damaged	
		Services Connection - Wire Broken	
		Services Connection - Wire Loose Connection	
7	Billing related	Excess billing, wrong meter reading etc.	
8	Meter related	Defective or damaged meter	
9	New connection	Getting new service connection,	
10	Disconnection / not in use	Disconnection of supply / not in use for long period	
11	Attribute change	Attribute changes i.e. location, name, floor, load etc.	

The various other services in addition to technical complaints as mentioned above that shall be extended by the customer care center to the customer of DISCOM are mentioned below. The list is just indicative.

1) Customer Information -

Providing information to customer queries relating to metering and billing data. Information about how to avail various customer services offered by DISCOM, etc.

2) New Services Connection -

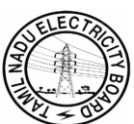
Provide status and information for new service connection.

3) Handle Metering & Billing related and other Complaints -

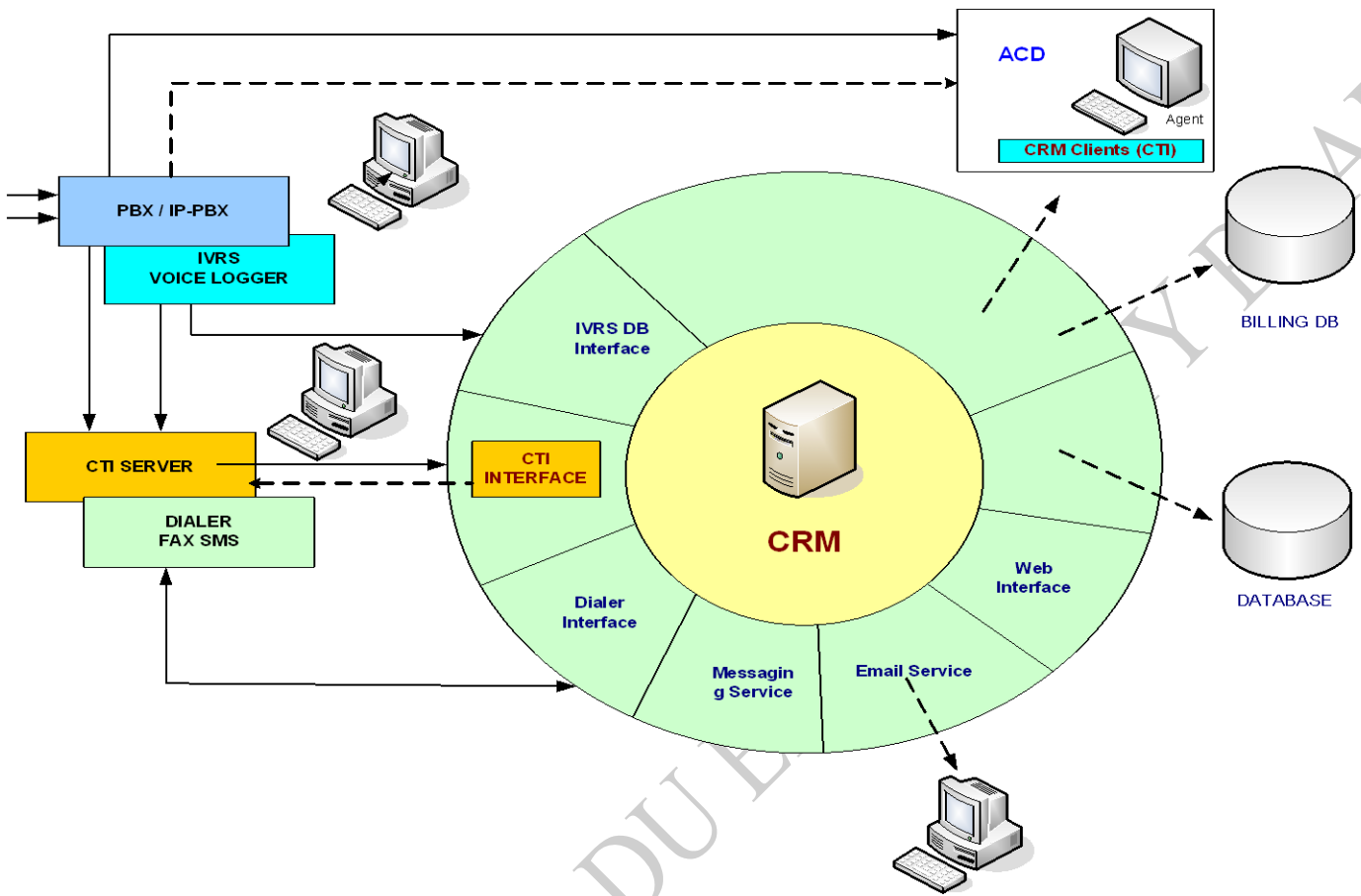
Receive and register all complaints relating to metering, billing, disconnection, dismantlement etc., forward the registered complaints to the respective office of DISCOM for timely redressal. Follow up until the complaint is successfully resolved.

4) Handle Service Request -

Accept and register various service request relating to status of title transfer, change of consumer data, change of contracted load, energy theft enumeration, line shifting, etc. Forward the registered complaints to the respective offices of DISCOM for timely redressal. Follow up until the complaint is successfully resolved.



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“ System Logical Block Diagram showing different components and Interfaces of the Centralized Customer Care Center “

Module: Centralized Customer Care Services

Requirement ID	Functionality	Description	Criticality	Response	Comments
CC1.0		General Features -			
CC1.1	Establishment of single window computerized customer care center	The specification is for establishment of an centralized and computerized customer care center with single window operation equipped with latest technology & multi skilled customer service representatives. The one point contact service relieves the customer from the inconvenience of visiting or contacting different utility offices. In addition to Complaints received online through Telephone, email, fax, letters and IVR system, many customers may choose a personal visit and therefore the Customer care Centre set up to address their grievances, must be equipped with basic amenities, clean environment and manned by trained personnel, who should be sensitive to customer needs.	Vital	C/ ER/F/ CR/ NC	
CC1.2	Main features	<ul style="list-style-type: none"> Easy to remember and easy to access Telephone number like 1912 with multiple lines Available 24-hours a day, 365 days a year. Multi-lingual if required (Hindi, English, any regional language) Multi-Skilled Customer Service Representatives Single touch-point for no supply, billing complaints, fire & shock complaints, all other queries and assistance etc. 	Vital		
CC1.3	Link of CC Centre to maintenance staff	The Customer care centre should be linked through mobile SMS in a “closed user group” to breakdown staff / mobile maintenance vans. Immediately upon receipt of a no-supply complaint, an SMS will be sent by CC centre to the breakdown staff/van for fault restoration. After restoration of the fault, the breakdown staff will close the complaint at the CC centre.	Vital		
CC1.4	Seating capacity	Initially the centralized CC centre may be established with 30 seats, but should be further expandable as per the requirement of utility.	Desirable		

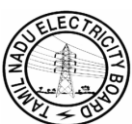
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CC1.5	Availability of required functionalities like billing, consumer indexing etc. on agent desktop	<p>The CRM infrastructure shall make use of the existing applications in such a way that the required functionalities are available on the agent desktop in the following fashion :-</p> <ol style="list-style-type: none"> 1. The existing screens, features & functionalities of the Billing, Consumer Indexing and Asset Mapping & Customer Care Solution shall be popped up appropriately. The system shall have the scalability so that any change, if required can be done free of charge in 48 hrs time. 2. For the data, which is generated & maintained in the CC Centre itself such as call center performance, voice recording etc., the local database will be accessed. All other information like billing, collection, other customer service functions will reside over central server. 	Vital		
CC1.6	Provision of read access to CC centre staff for various database tables	The utility shall provide read access to various database tables related with Computerized Billing, Consumer indexing and Asset mapping (if any). The agency shall be responsible for designing, procuring and installing necessary software and hardware for accessing the same.	Essential		
CC1.7	Design of CRM application by bidder to suit utility's requirement	The bidder shall design different CRM application for meeting the requirements of its agents in consultation with utility. This application should be fast, flexible and efficient enough to meet all the requirements of customers' queries. Typically such an application shall display customer's personal profile, product / facility profile, billing and payment profile besides the answers for their queries. The bidder shall further add new features to be installed at CRM application, if so desired by utility free of charge within 7 days of the request.	Essential		
CC1.8	Use of incoming as well as outgoing calls	The CC centre will provide facility not only for receiving calls, but also outbound calls. The Agents would be asked to make outbound calls for informing customers about the various power supply positions, payment reminders etc.	Essential		
CC2.0		Infrastructure			
CC2.1	Workstation dimensions	The workstation for each agent should meet minimum requirement of 36"x24" table size with partition. The agent seats should be placed at sufficient distance so that conversations are not overheard. Each agent should be provided with a standard and convenient seating arrangement / chair.	Desirable		
CC2.2	PC & communication facilities	Each workstation should be provided with Work station PC along with Telephone Instrument with good quality handsets of reputed brands with options like voice	Essential		



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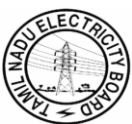
	at workstation	switch, background noise cancellation etc. Option of using headsets should also be available.			
CC2.3	Public conveniences & ambience	The CC centre environment should be pleasant and refreshing. The lighting should be soothing and air-conditioning up to human comfort level. Call center should have its own pantry and clean and tidy toilet.	Essential		
CC2.4	Sound proofing	The work atmosphere should be noise proof to avoid disturbances from external sources.	Essential		
CC2.5	Fire fighting equipment	The infrastructure should be provided with fire fighting equipments to avoid any disasters.	Essential		
CC2.6	Inter-connectivity of workstations	The workstations will be connected to each other through a LAN (Local Area Network) connection.	Essential		
CC2.7	Space to accommodate Technology Equipments	There should be separate and adequate space to host technology equipments, which must be safe, secure and accessible to administrative use only.	Essential		
CC3.0		Technology -			
CC3.1	Voice logger & CTI server	It should be Voice logger driven, CTI Server based Customer care Center with real time data update. It will act as an interface between the customer and the Utility operations in the entire supply related complaint handling processes. It should use a wide variety of latest technologies to allow them to manage the large volumes of work that need to be managed by the customer care centre. These technologies will ensure that agents are kept as productive as possible, and that calls are queued and processed as quickly as possible according to the desired levels of service.	Essential		
CC3.2	High-Tech facilities	The centralized Customer Care Center consists of the following components. The components shown are logical blocks, these components can reside on single server or span across multiple servers. 1. Call Switching Equipment (Private Branch Exchange) - Soft PBX / switch based PBX 2. IVRS (Interactive Voice Response System) / Fax on Demand 3. CTI (Computer telephony Integration) - Screen pop-up 4. Automatic Call Distributor 5. Dialer 6. Voice Logger 7. Reporting 8. Call Monitoring and recording 9. CTI Remote monitoring capabilities and remote logging facility 10. Customer Relationship Module (CRM)	Vital		
CC4.0		Call switching Equipment / PBX :			
CC4.1	PBX features	The PBX system on the incoming trunk side should	Vital		



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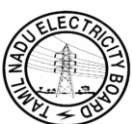
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		<p>support both Analog and Digital lines (ISDN PRI). The capacity on the trunks and extensions shall be as per the size of the call center. The PBX should have all features of an advanced PABX System and should be CTI and IP enabled. The PBX should have the following features :-</p> <p>Call Transfer, Conference, Call Pickup, Call Monitoring, Call Recording, Call Hunt Groups, Direct Inward System Access (DID), Extension Dialing, Voice Messaging, and ACD (Automatic Call Distribution).</p> <p>The ISDN-PRI interface must support the following features -</p> <ul style="list-style-type: none"> • Call-by-Call Service Selection • Channel Negotiation • Calling party number (ANI) • Called party number(DNIS) • Billing Number (BN) • Non-Facility Associated Signaling (NFAS) • D-Channel Backup • Administration Connections with Automatic Restoration Temporary Signaling Connections 			
CC4.2	Ability to support DNIS, ANI & CLI features	Call Switching System should also support standard features like DNIS, ANI and CLI.	Essential		
CC4.3	Server or switch based PBX system	The PBX system can be either switch based or server based system.	Essential		
CC5.0		Automatic Call Distributor (ACD) :			
CC5.1	ACD features	Automatic Call Distributor (ACD) distributes incoming calls to a specific group of terminals used by agents. ACD is a feature used to route calls in a call center environment to the appropriate agents, based on factors such as time available, skill sets and priority levels.	Essential		
CC5.2	ACD feature	Handling incoming calls is the task of the ACD system that consists of hardware for the terminals, switches, Telephone lines and software for the routing strategy. The routing strategy is a rule based set of instructions that tells the ACD how calls are handled inside the system. Most of the time this will be a set that determines the best available agent for a certain incoming call. To help make this match, extra variables are taken into account, most often to find out the reason why the customer is calling. Sometimes the caller's caller ID or ANI is used, more often a simple IVR is used to just ask for the reason.	Essential		



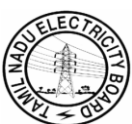
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CC5.3	System capacity to generate Call Detail Records	<p>Call Detail Recording. The system must be able to generate Call Detail Records (CDRs). CDRs must be generated for both incoming and outgoing calls on trunk facilities, The Bidder must describe :</p> <ul style="list-style-type: none"> • The information provided in a CDR. • The methods for outputting CDR data. Buffering must be provided in the event that the external call accounting system, or storage device, is unable to accept the CDRs for any period of time. How many CDRs can be buffered ? • If the system has the capability to provide a printed listing of CDRs as they are output. • The Bidder must provide samples of Call Detail Records. 	Essential		
CC5.4	Password protection of system	<p>System Management Security. Access to the system for management purposes must be logging password-protected. The system should have the ability to restrict the capabilities of the users based on the login IDs.</p> <p>The system must support the setting of an attempts threshold (number of attempts within a specific time period) for access to system management ports. If this threshold is exceeded, the system must automatically disable the login. The Bidder must describe his proposed system's ability to meet this requirement.</p>	Vital		
CC5.5	Call Delivery to CSR's by ACD	<p>Call Handling. Calls must be delivered to CSRs in First In / First Out order (order of arrival queuing). Calls must be distributed to the "most-idle" CSR. The Bidder must describe the algorithm for selecting the "most idle" CSR.</p>	Essential		
CC5.6	Priority Queuing facility in ACD	<p>Priority Queuing. It is desirable that calls to certain trunk groups or to certain dialed numbers be assigned a higher priority than other calls and that calls which overflow from another split be queued ahead of other calls. The Bidder must describe this process.</p>	Essential		
CC5.7	Call Queuing facility in ACD	<p>ACD systems place calls into a queue, where they are typically handled in the order received.</p>	Essential		
CC5.8	Handling of calls by ACD	<p>ACD systems may handle routing of inbound or outbound calls, or in some cases a combination of the two.</p>	Essential		
CC5.9	ACD ability to support priority handling etc.	<p>ACD system should support skill base routing, multiple group support, priority handling and Queue status indicator.</p>	Essential		
CC5.10	Monitoring in ACD	<p>It should provide supervisor assistance and monitoring</p>	Essential		
CC5.11	Real time MIS of ACD status	<p>Real time remote monitoring of ACD queue, agent status, and no call answered, abandoned etc. by Supervisor.</p>	Essential		
CC5.12	ACD system's ability to	<p>Queue Specific Delay Announcement / Music. For basic ACD applications, the customers must be</p>	Essential		



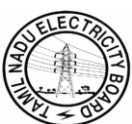
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	announce average wait time & music to customer during hold up	provided a queue specific (different for each queue) delay announcement if a CSR is not immediately available to answer a call. If a CSR is not available to handle a call, the call must queue for the next available CSR. The system must be able to announce the average wait time to the caller. The system must offer the caller the option of opting out to automated information (i.e. IVR) or call back facility The system must be able to provide music and announcements on hold until the call is answered. The Bidder must describe how the proposed system meets these basic announcement requirements.			
CC5.13	Monitoring of CSR's availability/ non availability	Tracking CSR Activities by Reason Codes / Automatic Availability / Wrap Up Work. In order to give call center managers detailed information about how CSRs spend their time and to develop precise staffing forecasting models, CSRs must enter a numeric code that describes their reason for entering non-available work modes or for logging out of the system. At least 9 codes must be supported. CSR sets must have the ability to be automatically available to take the next call upon disconnecting from the current call. CSR sets must have the ability automatically to go into a wrap-up, unavailable work state at the completion of a call. CSRs must also be able to temporarily remove themselves from the call queue to perform call related tasks. Time spent in this work state (e.g., wrap up, lunch, restroom, etc.) must be included in the individual CSR and group statistics. In addition, the supervisor must be provided with a visual real time indication of CSRs spending time in this state.	Essential		
CC5.14	System ability to permit CSR to activate alarm in case of emergency	Emergency Notification. The system must allow CSR positions to activate an alarm notifying a supervisor of an emergency condition. The system must also have the ability to automatically record the trunk number and/or calling number if provided, the CSR position involved in the emergency, and to activate a recording of the conversation with recording equipment provided.	Essential		
CC5.15	System capability to permit CSR to take help from supervisor to deal with an active call	CSR Request for Assistance. The CSR set will have the ability to directly signal the supervisor when the CSR requires assistance handling an active call. Answering of CSR requests for supervisor assistance must be provided on the supervisor's set with special audible and visual notification; so that the supervisor may readily identify that a CSR requires support. The LCD or alphanumeric display must provide identification of the calling CSR to the supervisor without referring to the supervisor terminal.	Essential		
CC5.16	Supervisors as CSR's during busy	Supervisors As CSRs. Supervisors must have the capability to receive ACD calls during busy periods.	Essential		



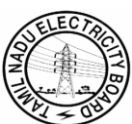
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	periods				
CC5.17	Supervisor ability to logout CSR's from its terminal	Logout of CSRs by Supervisor. Supervisors must be able to logout CSRs from their own "soft phone" or supervisor terminal without having to go to the CSR's desk. They must also be able to log a CSR out from a remote location.	Essential		
CC5.18	System ability to enable monitoring a CSR's conversation	Monitoring CSR Conversations The supervisor must be able to monitor a CSR's conversation for training or administrative purposes from the supervisor set, without plugging in to the CSR's "soft phone" set. The proposed system must also meet the following requirements : <ul style="list-style-type: none"> • Both silent monitoring and tone indication to the CSR during monitoring must be available. • The system must offer a "soft phone" or supervisor terminal capability for monitoring directly at the CSR's "soft phone" or supervisor terminal for "ride along" CSR training. • The "soft phone" or supervisor terminal must be equipped with two jacks in order to permit a supervisor to plug into the "soft phone" set for training purposes. 	Essential		
CC5.19	CSR set ability to view call center MIS regarding ACD statistics on real time basis	Access to Real Time ACD Statistics. Each CSR set must have the ability to view a customizable list of Call Center MIS information on the digital display of the CSR "soft phone". This information shall be individually configured or selected from a pre-defined list of MIS templates such as current split/skill performance, application performance, and individual performance status. CSRs and supervisors must be notified via the "soft phone" or supervisor terminal indicators when thresholds are reached for individuals and groups. The capability must also exist to notify via email. CSRs must be able to receive continual real-time display updates of ACD statistics via their display including such information as a comparison of individual performance to group averages or objectives. The display of ACD statistics on the "soft phone" or supervisor terminal must include, but is not limited to, the following items: <ul style="list-style-type: none"> • ACD calls • calls abandoned • calls waiting • oldest call waiting • average speed of answer • average time to abandon • percent in service level • CSRs staffed • CSRs available • CSRs on ACD calls • CSRs on extension calls • calls handled by CSR 	Essential		



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		<ul style="list-style-type: none"> calls completed by CSR 			
CC5.20	System ability to provide real time monitoring of CSR's to supervisor	<p>Real Time Monitoring Reports. The system must support real time monitoring of CSRs, split/skill groups, trunk groups, and applications. Reports must be available in both text based and full color, graphical formats.</p> <p>The supervisor must be able to see at a minimum (in plain language and color graphical formats) information including but not limited to each of the following items:</p> <ul style="list-style-type: none"> the active CSRs and the current individual CSR status (whether on an active ACD call, in after-call work, waiting for an ACD call, or in an inactive or idle state). the number of CSRs currently in various work states such as available, on ACD calls, in unavailable modes. drill down capability to see individual performance data for a given CSR. the current queue status including calls waiting, oldest call waiting, number of calls handled, number of calls abandoned, service level, etc. a display of how CSR time is spent based upon assigned reason codes for unavailable non call associated work modes. For example: how much time CSRs spent on breaks, in group meetings, training, etc. At least nine different reason codes are required for reporting time spent unavailable. These must be reported individually on each individual CSR report. a call handling time profile which displays the number of calls answered and abandoned according to increasing service intervals. For example, how many calls were answered and abandoned from 0-5 seconds, 5-30 seconds, 30-60 seconds, 60-90 seconds, etc. the number of times during the current interval that a CSR reported a call event. This will assist Utility in keeping count of specific customer requests or types of calls. At least nine different call events must be tracked. 	Essential		
CC5.21	System ability to support call overflow rerouting	<p>Call overflow : The system should support call overflow routing e.g. if there is a queue in particular ACD group and another group is sitting idle, system should be able to transfer the calls to another group based on the settings defined by the administrator.</p>	Essential		
CC5.22	System ability to rate CSR's on various parameters	<p>Skill Assignment and Preference Levels. The proposed system must be able to assign individual skills to each CSR (i.e. bilingual, training or experience level, product knowledge, customer knowledge, etc.). Individually assigned skills must be able to be ranked and rated in terms of priority, proficiency or</p>	Essential		



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		<p>preference -</p> <ul style="list-style-type: none"> • the maximum number of simultaneous skills queries and routing requests that can be executed at a time • how call processing is affected with a server or link failure • backup and recovery options 			
CC5.23	System ability to route calls depending on skills of CSR	<p>Skills-based Routing - The proposed system must be able to match the requirements of the caller to a CSR with the skills to handle the call. The Bidder must explain how this is accomplished. The system must assure that the CSR will receive a waiting call for his/her primary assignments even if a secondary skill assignment call has been waiting longer. Alternatively, on a CSR by CSR basis, the system must provide that a CSR always receives the highest priority, oldest call waiting for any of the CSR's skill competencies on a "greatest need" basis.</p>	Essential		
CC5.24	System ability to modify CSR skills dynamically	<p>Changing CSR Skill Assignments-The ability must be provided to add or remove CSR skills dynamically while CSRs are on calls. The system must provide the capability for CSRs to be logged into one or more splits/skills when being moved between CSR groups.</p>	Essential		
CC5.25	CSR ability to login on any soft phone	<p>Virtual Seating or Free Seating - The proposed system must support the concept of virtual seating. CSRs can log-on from any "soft phone" instrument within the system. CSRs on the proposed system will be logically defined, rather than requiring a "soft phone" extension and termination. Each CSR and supervisor on the system must have an individually assigned log-on identification number which permits individual statistics to be collected by the ACD management information system. Multiple log-on events by the same individual during a work period at different terminals must be tracked individually as one "shift".</p>	Essential		
CC5.26	System to have integrated auto-attendant routing	<p>Integrated Auto-Attendant - The system must provide integrated auto-attendant routing functionality such as "If you know the extension of the party you wish to speak with, you may dial it now". The system must have the capability to prompt customers for the type of service they desire, i.e. "Press 1..., Press 2..." The proposed system should support these capabilities internally within the proposed Switching/ACD system even without requiring an external IVR.</p>	Essential		
CC5.27	System ability to provide announcement to customers in queue	<p>Announcement Hardware / Capacities - The system must provide customers in queue with a variety of announcements. This capability must be inherent within the ACD architecture avoiding the need for external announcement devices and/or IVR servers.</p>	Essential		
CC5.28	Flexible	<p>General Announcement Features - The system must</p>	Essent		



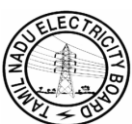
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	announcement features in system	be able to force customers to listen to an entire announcement before being connected to a CSR. Alternatively, the system must be able to immediately connect a call to the CSR if a CSR becomes available before an announcement is completed. The supervisor must have the capability to control which method is being used.	ial		
CC5.29	Call Identification Tag facility	Unique Call Identification Tag - A unique tag must be associated with each call when it originates and remain with the call throughout a multi-site network to facilitate cradle to grave call tracking.	Essential		
CC5.30	Call Routing capacity of ACD	Call Routing Commands/ Capacity. The system must promote an autopilot approach to call routing by providing routing tables of selectable commands and conditions and using Standard English commands.	Essential		
CC5.31	Database maintenance for call routing	Integrated Routing Database Tables - A database must be maintained in the system for specialized routing purposes (e.g., a table of priority customers which would receive priority routing and possibly queue to a dedicated CSR).	Essential		
CC5.32	Call Routing Comparator facility in ACD	Call Routing Comparators - Comparison operators such as "less than", "greater than", etc., must be available for constructing vector routing commands.	Essential		
CC5.33	Wildcard Digit matching capability in Call Router	Wildcard Digit Matching for Call Routing - The system must be able to match ANI or other digits in routing tables using wild card sequences that would identify and route specific calls to a specified destination. Bidder must describe type of wild card digit.	Essential		
CC6.0		CSR AND SUPERVISOR TERMINALS			
CC6.1	General functionality of CSR & supervisor functionalities	General Functionality - The CSR and supervisor terminals must use open architecture state-of the art technology and be widely used, generally available and standard equipment. Bidder will provide the desktop PCs/ workstations and headsets to interface with the proposed solution. The Bidder must offer ACD "soft phone" and supervisor terminal functionality that is controlled by a PC-based CSR interface.	Vital		
CC6.2	CSR station technology	CSR Station - Bidders must propose "soft phone" technology for the CSR station. The proposed solution must integrate with PCs provided by Bidder. PC specifications are specified in hardware section.As an option, the Bidder must describe available touch screen operation for CSRs.	Vital		
CC6.3	CSR 'soft phone' support abilities	CSR Headset / Handset Operation - The CSR "soft phone" set must be able to support both a CSR headset and a CSR handset. There must be volume controls for each. The Bidder has to provide soft phone with amplifier and head set.	Vital		



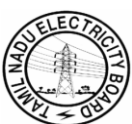
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CC6.4	Incoming call announcement capability of system	Incoming Call Announcement - The system must provide audible and visual whisper indication prior to the automatic connection of an ACD call to the CSR. For CSRs that handle calls for multiple applications, a whisper must indicate what type of call is arriving so that the CSR can greet the caller appropriately. The "soft phone" must also display this information to the CSR before delivery of the call.	Vital		
CC6.5	Call Hold, Transfer & Conference features of CSR & Supervisor soft phone	Hold, Transfer & Conference Features - A dedicated, fixed feature button, for each function, must be provided on the CSR and supervisor "soft phone" set. The system must have the capability for CSRs and supervisors to set up conference calls for a minimum of 4 parties (including the CSR supervisor) without requiring attendant assistance.	Vital		
CC6.6	Personalized Greeting recording capability of CSR soft phone	CSR Personalized Greeting - The system must offer the capability for CSRs to record personalized greetings that can be played to the caller prior to connection to the CSR.	Essential		
CC6.7	CSR phone system ability to have & accept event codes	Entering Event Codes (Wrap Up) - CSRs must be able to enter codes to identify events that occurred during a call and to enter wrap up codes before becoming available for another call.	Essential		
CC6.8	CSR phone system ability to have & accept call identification codes	Entering Call Identification Codes - CSRs must be able to associate other types of identifying information, such as consumer code, to particular calls. The system must support up to sixteen digits per code.	Essential		
CC6.9	Audio fault reporting & tracing ability	Audio Difficulty Trace - When a CSR experiences static or a noisy trunk, the audio difficulty must be easily reported and traced.	Essential		
CC6.10	System ability to route calls based on DNIS	Routing Based on DNIS - The system must be able to route calls based on Dialed Number Identification Service (DNIS).	Essential		
CC6.11	System ability to route calls based on ANI	Routing Based on ANI - The system must be able to route calls based on Automatic Number Identification (ANI).	Essential		
CC6.12	System support for network	Support for Network Provided CINFO Digits (Caller Information Forwarding) - The system must have the ability to collect caller entered digits (CED) and	Essential		



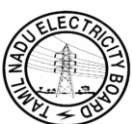
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	provided customer information digits	customer database provided digits (CDPD) supplied by the network in an incoming call's ISDN PRI setup message and provide routing based upon these digits.			
CC6.13	System ability to divert calls to IVRS based on conditions	Overflow Destinations - Calls must have the capability to be automatically overflowed to a voice response system based upon conditions in the call center including call volume and time of day.	Essential		
CC6.14	Ability of ACD system to request & collect customer information & route call	Route by Caller Prompted Information - The ACD system must be able to request and collect information, such as a consumer no, and then route the call based upon that information. The system must have the ability to prompt a caller for up to 12 fields containing up to 16 alpha/numeric characters of information.	Essential		
CC7.0		MANAGEMENT INFORMATION SYSTEM			
CC7.1	System ability to provide real time & historical reports	Basic Internal Reporting - The system must provide basic low-cost, integrated reporting that does not require administration, external processors or external storage. Both real time reports and historical reports are required. Historical reports must be available for hourly or half hourly intervals. The proposed system must be capable of displaying reports on a video display terminal in real time or emailing them.	Vital		
CC7.2	System ability for creation of custom reports	Custom Reporting - Fast, easy creation of custom reports from scratch is required as is modification of existing reports to customize them for reporting purposes. Report customization must include the ability to create custom data items and define custom calculations.	Essential		
CC7.3	ODBC compliance of database	Open Data Base Connectivity - The database must be ODBC compliant.	Essential		
CC7.4	System ability to transfer call center data for other applications	Exporting Data - It is desirable that call center data be exported to file or directly to other applications (e.g., other database systems, web servers).	Essential		
CC7.5	System ability to provide access to MIS from remote	Remote Access - Supervisors must be able to access the management information system and monitor and administer the call center from a PC at remote locations.	Vital		
CC7.6	'Cradle to Grave' reporting by	Cradle to Grave Reporting - The system must support "cradle to grave" reporting which would reveal exactly what happened to a caller from the time they entered the system until the time they hung up, and	Essential		



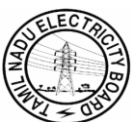
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	system	everything in between.			
CC7.7	System ability to support call record queries via web browser	Web Browser Interface - The system must support customized queries of detailed call records via an industry-standard Web browser or graphical user interface.	Essential		
CC7.8	Long term record storage	Long Term Storage of Detailed Call Records - The system must provide for long-term storage of detailed call history records.	Essential		
CC7.9	Comprehensive Historical Reporting	Comprehensive Historical Reporting - Historical reports must be available for CSRs, split/skills, trunk groups, and applications in interval, daily, weekly, and monthly formats. Both graphical and text based formats are required. It is required that reports be printed on demand and on a scheduled basis. Historical data must be stored. Real Time reports must update automatically approximately every 3 seconds or less.	Essential		
CC7.10	Graphical PC based reporting	Basic Graphical PC based Reporting - The system must provide real-time graphical reporting (bar-chart, pie-chart, time trace, wallboard, or text report display formats) to multiple supervisors, such as : <ul style="list-style-type: none"> • support of multiple external PC-based wallboards for display of real-time data to various ACD groups • text messages created by supervisors displayed on PC-based wallboards • set thresholds on data items that alert supervisors both visually and audibly when thresholds are reached and be able to send beeper/text messaging device • Supervisor ability to customize views for real time monitoring of items and resources of interest in the call center. 	Essential		
CC7.11	LAN connectivity of CSR PC's for remote MIS access	Local Area Network Connectivity - Supervisors must have access to the management information system via a PC connected to a local area network using TCP/IP protocol.	Essential		
CC7.12	Exceptions & threshold reporting by system	Exceptions and Thresholds - The following reports capabilities are required : <ul style="list-style-type: none"> • Real time reports displaying color threshold indications for items that are exceeding desired levels such as number of calls in queue or oldest call waiting time. • Definable exception categories and thresholds. Bidder must fully explain if thresholds can vary between different splits and applications or are they set for the entire system. 	Essential		



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		<ul style="list-style-type: none"> Supervisors receive notification of all defined exceptions. Recent exceptions be displayed on demand. 			
CC7.13	Backup process performance	Backup Process - Backups must be performed scheduled or on demand.	Essential		
CC7.14	Online Help	Online Help - The system must provide Browser/GUI-based online Help.	Essential		
CC7.15	Alarm in event of problem or error	Alarms and Error Conditions -The system must generate an alarm and notify service personnel in the event of system problems or errors.	Essential		
CC7.16	Integrated Forecasting Capabilities of MIS	INTEGRATED FORECASTING CAPABILITIES - The Management Information System must offer integrated Forecasting capabilities based on AHT (average Handle time) and no of CSR etc. It is desirable the proposed solution has a call center simulator or the ability to provide "what if" forecasting scenarios considering the factor such as holidays, special campaigns, season trends, billing cycles, and other date of month influences are taken into consideration. Assignment of work shifts to employees. Generate an optimal schedule for CSRs for each hour that meets the forecasted call volume taking into consideration CSR availability, calendar management, and our desired service objectives.	Essential		
CC8.0		Interactive voice response system (IVRS) :			
CC8.1	IVRS with ASP features with text to speech & text to fax capabilities	<p>Interactive voice response system, or IVRS, is a computerized system that should allow a telephone caller, to select an option from a voice menu. The system should play a pre-recorded voice prompts to which the person presses a number on a telephone keypad to select the option chosen, or speaks simple answers such as "yes", "no", or numbers in answer to the voice prompts.</p> <p>Advanced Speech Processing (ASP). The multiple advanced speech processing technologies (large vocabulary recognition, natural language understanding, speaker verification, speech-to-text) may be required as features. The ASP technology should be provided with software that runs on an open, industry standard subsystem platform, under Unix or Windows. The platform must permit qualified third party developers to integrate additional ASP technology and functions.</p> <p>ASP shall support English and local language. The latest system of natural language speech recognition shall be used to interpret the questions that the person wants answered. Latest innovations of</p>	Vital		



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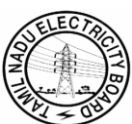
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		its ability to speak complex and dynamic information such as an e-mail or any other information using Text-To-Speech (TTS) , which is computer generated synthesized speech, shall be used. Real voices are used to create the speech in tiny fragments that are glued together before being played to the caller. Text to FAX capabilities. The IVR Bidder must support this functionality consistent with the languages supported by the Text to Speech, ASP. IVR will provide multiple options to callers for self- retrieval of information by fax.			
CC8.2	IVRS system features	IVR systems shall generally be used at the front end of call centers to identify what service the caller wants and to extract numeric information such as electricity payment dues, bill payment status as well as provide answers to simple questions such as completion of fuse off calls or allow pre-recorded information to be heard. The IVR Systems should be properly designed so as to connect callers to their desired service promptly and with a minimum of fuss.	Essential		
CC8.3	Scalability of IVRS	The IVR System should be scalable as per the locations of consumer base. All the calls received at the call center shall first land on the IVRS, the system shall welcome the user and present a voice menu to select the service he requires and also key in and retrieve information from the system. The IVRS shall be CTI supported so that all the information entered by the caller on the IVRS is to be passed to the customer service representative screen as popup.	Vital		
CC8.4	IVRS capability to handle variable call volume	The average call duration is 2 minutes; The IVR system must be able to accommodate fluctuations in call volume.	Essential		
CC8.5	Response Time of IVRS	Response Time / Performance / Availability - The response time must be no more than 2.0 seconds. The worst-case IVR response time (not the average) must be measured with all phone ports simultaneously speaking different messages (different or the same). The response time must be measured using the following two scenarios: <ul style="list-style-type: none"> • The time the user completes input until the start of voice output is heard; and • From the time a host message is received until the start of voice output is heard. • The requirement is for the IVR system to be available in a 24 X 7 X 365 for general narrative information and customer billing information. 	Vital		
CC8.6	General	General Architectural Requirements - Although the	Vital		



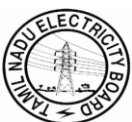
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	Architectural Requirements of IVRS	<p>Bidder will propose the general architecture of the system, there are certain overall aspects of the system that the Utility considers important to include. These are :</p> <ul style="list-style-type: none"> • For effective use of memory capacity, the system must permit multiple applications to use common speech files to handle items unique to an application along with common items. • The IVR system must be built employing open industry standards and widely-used and generally available components and software. • The system must be a client-server architecture that is scaleable. • The proposed IVR system must interface with the Customer care systems and database. 			
CC8.7	Redundancy of connections for tele-communication & LAN network	<p>Redundancy / Alternate Call Routing - The IVR system must have redundant connections to both the telecommunications network and the Local Area Network (LAN) interfaces. These connections must have failover capability to support both voice and data traffic. These failover connections are to ensure redundancy in the event of failure within the network servicing the IVR, and for the LAN providing the data from the back-end systems. Each of the links must be capable of supporting the emulation of multiple terminals. Recovery from power interruptions and system problems must occur automatically. The system must include provisions to monitor all centers 24 hours per day, 7 days per week and the capability to conduct online, on-demand and routine diagnostics to determine general status of the IVR and its applications without interfering with service. The telephone connections required for this purpose has to be arranged by the bidder and cost of the same shall be reimbursed by the utility in actual.</p>	Vital		
CC8.8	Processor & system standards for IVRS system	<p>To ensure that the proposed IVR platform can support growing and changing needs, the bidder shall provide a platform based on an industry standard processor and operating system utilizing a Unix or Windows platform.</p> <ul style="list-style-type: none"> • The kernel of the operating system must not be modified or use proprietary drivers. • The system must be a modular design to support expansion and enhancement to major components of the IVR system. 	Vital		
CC8.9	Menu tree complexity of IVRS system	<p>IVR Menu Tree Complexity - Based on the business process requirement the bidder has to design menu tree structure. The menu structure should not be more than 4 levels with 4 to 5 options per level. Each of the IVR system's menu options will need to be reviewed with the utility prior to IVR development to ensure</p>	Essential		



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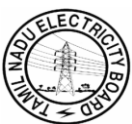
		that all business functions are implemented as needed. The Bidder must make recommendations on the best way to implement the required functionality of the menu trees.			
CC8.10	Integration of IVRS with Call centre networks	IVR Data Base Interfaces - The required method of connectivity is to integrate the proposed IVR to networks located at CC centre with the master database of the utility This connectivity should be through a single point, with redundancy provided through 2 connections at the single point.	Vital		
CC8.11	General Functionality of IVRS system	General Functionality -The IVR must be designed with the following parameters to manage / limit the following call transaction and duration characteristics : <ul style="list-style-type: none"> • total transaction (call length) • individual message input (response to a prompt) The parameters must be configurable by the Bidder and Utility with no interruption of production applications running on the system.	Essential		
CC8.12	IVRS functionality	INTELLIGENT CALL ROUTING REQUIREMENTS - If it becomes necessary to shut down an IVR application, the system must be capable of providing an announcement to the caller. Utility must be able to take all lines out of service after the completion of the call in progress on each line. This must be initiated by console command or host command. The IVR system must be able to automatically restart following a power failure. When the host systems are unavailable, the IVR must be capable of responding to incoming calls in various different ways. First, it must offer the capability to answer incoming calls and announce either "Information not available at this time" or "System unavailable" (as examples). Secondly, the system must have the ability to make all ports appear busy. It is desirable to have the system's response to this condition be controlled by the application software, rather than defined at the system level. The following additional functionality is required when a host or IVR application is unavailable to the caller: <ul style="list-style-type: none"> • Ability to directly route all incoming calls to the CSRs for complaints handling • Ability to route incoming calls to a CSR when the Customer has difficulty in accurately inputting their customer no. • Ability to route incoming calls to CSR when the data server or an IVR application is down during business hours and the Customer can not access specific information during an Information Inquiry. 	Vital		
CC8.13	Graphical	Monitoring, Statistics and Reporting - Each system	Essent		



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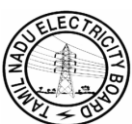
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	<p>tool for monitoring & Reporting on real time / on demand basis</p>	<p>must provide a graphical tool for supervisors, managers and system administrators for real-time monitoring of the system. Utility requires ad hoc reporting, upon demand.</p> <p>The system must include an administration or management tool for local and remote monitoring and management of every component of the IVR system. The monitoring tool must allow for immediate or progressive shutdowns and for shut down of single or multiple telephone lines, host connections, processors, applications of the entire system. The management tool must be secure from unauthorized users and available to one or more administrators concurrently. The management tool must be accessible via remote access. At minimum, reporting features must capture all of the following criteria and be available on-line, in real time:</p> <ul style="list-style-type: none"> • Ability to generate traffic and performance reports online on a daily, weekly, monthly and quarterly basis. • Application statistics must be provided on an event basis and accumulated by specific applications in the IVR and by Customer ID. • Application statistics must be provided showing the number of times a Customer is transferred to a CSR during a Information Inquiry transaction. • Report information to include downtime, system usage by event script application, calls aborted, average length of call, busy hours, average call hold time by script application accessed. • Cumulative data to the previous hour must be available at the half-hour. • System capability to permit automatic scheduling of certain routine tasks at specific intervals. This would include report generation, data collection, and transfer or scripts for administration. A log file provided to review activities. • The reporting system must track historical and real-time information. The reporting system must be capable of creating, saving and printing both standard and customized reports. The real time monitoring and reporting must be accomplished in a windowing environment. Monitoring and reporting must include security features to ensure access only by authorized personnel. • Common monitoring statistics across all systems include call volumes, IVR uptime, utilization, billing, max/min call usage, average length of call, average queue depth, average hold time and logging (for legal traceability). 	<p>ial</p>		
<p>CC8.14</p>	<p>IVRS</p>	<p>The bidder shall keep provision for making changes in</p>	<p>Essent</p>		



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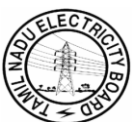
	announcement changes	the IVRS announcement as per the request of utility within two days.	Essential		
CC8.15	IVRS ability to respond to each call	IVR will be responsible to answer each and every call and multilingual / multilevel option to be provided to the caller based on the dialed number (DNIS).	Essential		
CC8.16	IVRS ability to provide user defined rule based information	IVR should provide user defined rule based routing e.g. IVR can automatically play payment balance, energy used etc. in the current month based on the data captured (CLI) or entered by the subscriber.	Essential		
CC8.17	IVRS ability to route call to requisite ACD group	IVR will route the call to the appropriate ACD group e.g. billing enquiry, fuse off complaints, new payment schemes, technical support etc.	Essential		
CC8.18	IVRS ability to present customer dialing details to ACD	IVR should also capture customer's dialing details and presenting them to ACD or CTI directly to make routing of calls easier by identifying the calls i.e. by identifying the customers from DNIS, CLI, ANI or internal calls etc.	Essential		
CC8.19	Integration of other voice related technologies	Other voice related technologies shall also be integrated to IVR system.	Desirable		
CC8.20	IVRS (all applications) performance testing by bidder	<p>a) Performance Testing. Because the Bidder will be delivering hardware and software across all applications, the Bidder must provide performance testing for each application before full acceptance of a system by Purchaser.</p> <p>b) Testing, Diagnostics, and Monitoring. The Bidder must develop, implement and install the new IVR systems. The hardware, software and developed application must be tested prior to full production implementation. The Bidder's must complete the installation and provide pre-installation site preparation to ensure proper environments and adequate space is available for the IVR. The Bidder must ensure that the system is fully integrated with existing database server and equipment.</p> <p>The Bidder is required to perform extensive testing, based upon the requirements for each application, including but not limited to Bidder testing, and acceptance testing. These tests will include load testing, and verification that the application works at each location. Testing must include hardware, software and application full integration and systems testing, stress testing, post implementation testing and parallel testing, where appropriate. The Bidder is responsible to establish the testing environment. The Bidder must coordinate with Purchaser for transition from the existing systems if any to the new systems</p>	Vital		



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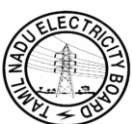
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		without interference with production systems. Adequate reporting must be available to allow both the Bidder and Purchaser to measure the system's performance accurately under defined test conditions and in defined environments. The Bidder must develop and submit a Test Plan, including resource requirements and schedules, for complete testing of each of the applications, with test criteria to support all hardware and software performance requirements, IVR system features, interfaces, and architectural, communications and security requirements. The Bidder must include a disaster recovery procedure to insure that the systems are always available. The Test Plan must include the intended plan and justification for the chosen testing environment(s) throughout the entire testing lifecycle. Contingency plans must be defined in the event the Test Plan cannot be carried out, as initially planned. Purchaser must approve each segment of the Test Plan before testing begins			
CC8.21	Documentation & Training to Customer	<p>TRAINING AND DOCUMENTATION -</p> <p>a) Common Initial Training Requirements. The Bidder must provide SOCC site training for Purchaser staff at the time of installation. Initial training must include training on the overall functionality and monitoring capabilities of the Call Center, statistical monitoring and generation of ad hoc reporting capabilities. The Bidder must provide train-the-trainer training and documentation to the CSRs and supervisors. They must also provide training for any administrator or programmer. Purchaser requires the Bidder to develop a training document (pamphlet, binder, or manual) for each IVR application, outlining the Customer interfaces of each application for distribution among Customers who will use the applications. The Bidder must provide PURCHASER with copies of all documentation regarding the IVR applications and Call Center application, including a User Manual. The Bidder must provide basic maintenance training and support training to Purchaser's staff.</p> <p>b) Unique Training and Documentation Requirements. The Bidder will provide Purchaser's staff with training, documentation and tools to allow the PURCHASER staff to make ACD and IVR system script or vocabulary changes</p>	Vital		
CC9.0		Voice Messaging :			
CC9.1	Voice Mail facility	It is used for recording, storing, playing and distributing phone messages to agents and / or group. The voice messages could be attached as e-mail messages and routed to agents.	Vital		



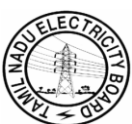
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		Voice Mail provides the customers the choice to leave their requests e.g. call back requests in times of long time queuing etc.			
CC9.2	Retrieving of voicemail	Voice mail requests can be retrieved and played back at any time from agent's voice mailboxes or via their desktops.	Essential		
CC9.3	System ability to keep log of all messages	The system should keep a log of all voice messages, senders, receivers date & time etc. for reporting purpose.	Essential		
CC9.4	No. of IVR ports	The no. of IVR ports should be equivalent to the incoming voice channels to provide non-blocking facility.	Essential		
CC10.0 0		Computer telephony integration (CTI)			
CC10.1	CTI system	<p>CTI (Computer telephony integration) is the technology that allows interactions on a telephone and a computer to be integrated or co-ordinated. The following functions are implemented using CTI -</p> <ul style="list-style-type: none"> ▪ Calling Line Information Display (Caller's Number, Number Called, IVR Options) ▪ Screen Population on answer, with or without using calling line data ▪ On Screen Dialling (Fast dial, preview and predictive dial) ▪ On Screen Phone Control (Ringing, Answer, Hang-up, Hold, Conference etc.) 	Vital		
CC10.2	CTI forms	<p>Forms of CTI - Generally there are two forms of CTI -</p> <p>a) First-party Call control - Here, only the computer associated with the phone can control all the functions of the phone at the computer user's directions.</p> <p>b) Third-party Call control - It requires a dedicated telephony Server to interface between the Telephone network and Computer network. Any computer in the Network has the potential to control any Telephone in the telephone system. The phone does not need to be built into the computer and may only need to have a microphone and Headset in the circuit.</p> <p>For the proposed Call centre, the agency should provide CTI with Third party call control.</p>	Vital		
CC10.3	CTI ability to transfer information from PBX & IVR to CSR's CRM screen	The CTI (Computer Telephony Integration) component shall be required for passing all the information from the PBX and IVR, such as the caller identification, Dialed number information, Language option service opted by the caller etc., to the CSR's CRM screens.	Essential		



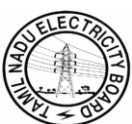
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CC10.4	Integration of agent application to CRM application	The system should provide an agent application integrated with CRM application. It should pop-up along with the caller information, when the call comes to the agent. The CLI should have the capability to popup all the vital customer data on screen.	Vital		
CC10.5	CTI system ability to enable control of telephony features from GUI application	The Agent should be able to control the telephony features from this GUI application like login, logout, away, pick-up, hold, hang-up, conference, and transfer to another agent along with the screen (voice and data). Screen pop-ups should be multi-colored. CRM components, queries or call priorities should be recognizable by the color of the pop-up.	Essential		
CC10.6	CTI system support for login from any workstation	The system should support virtual login e.g. an agent can sit anywhere and login by putting his login id and that becomes his workstation.	Essential		
CC10.7	Report generation capability of CTI system	Entire login, logout, away, total call handled, data of the agent should be captured and produced as reports.	Essential		
CC10.8	Online display of ACD queue	The Agent application should also have the online monitoring display of the ACD queue(s).	Essential		
CC10.9	Integration of CTI application to billing & consumer indexing database	The CTI application should also record a ticket on each call for reporting purpose. The docket shall be opened by the CC centre and should be closed only after the customer is satisfied. The system shall have the capability to integrate with the utility's billing and consumer indexing database.	Vital		
CC11.0 0		DIALER :			
CC11.1	Automatic Dialing System	The dialer system should be capable of interfacing with the CRM for automatically dialing out to the consumers to deliver information like power supply position, payment reminders, payment acknowledgement and other information. The dialer should also be capable of working in both predictive and progressive modes depending on the requirement.	Essential		
CC12.0 0		Remote monitoring capabilities			
CC12.1	Remote monitoring ability of ACD status, no. of agents etc.	The system should support remote monitoring of real time ACD statistics, queue, and number of agents, abandoned, answered calls from their office using the application provided by the system. The application software shall have the facility for fault escalation to various administrative levels of utility depending upon the delay in clearance.	Essential		



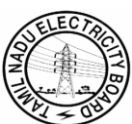
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CC13.0		Database Integration: -			
CC13.1	System integration with billing module & Consumer indexing & asset mapping module	The System should support retrieval of data from Utility's computerized billing, Consumer indexing and asset mapping systems residing at different server e.g. if a caller wants to check his billing status, the IVR should retrieve the data in real time from the database residing at these servers.	Essential		
CC13.2	System integration with billing & consumer indexing modules	Certain database access, like Billing and consumer indexing, should be integrated with CTI for screen pop-up, CRM and priority handling etc.	Essential		
CC14.0 0	CRM features	CRM: - Some of the main features of the CRM are :	Essential		
CC14.1	Multiple host connectivity	Application should support multiple host connectivity- local as well as remote.	Essential		
CC14.2	Single Interface for customer interactions	Single interface for consistent customer interactions through multiple touch points.	Essential		
CC14.3	Customer Feedback	Consolidated view of the customer to ensure that each agent has complete knowledge of every interaction regardless of the channel of communication.	Desirable		
CC14.4	Agent ability	The Agent should be able to rapidly create, assign, track, and resolve a complete range of service requests, cases, and trouble calls. They should also be able to generate confidence by successfully resolving inquiries. Brief description of all queries should be recorded.	Essential		
CC14.5	Standard features	Should support standard features for e.g. subscribers call history, booking of complaints etc.	Essential		
CC14.6	System ability to permit agents to extract information from system	The system should allow agents to capture and display contact information, problem descriptions, problem categorization, severity classification, prioritisation, and complete status tracking with open and closed dates and times.	Essential		
CC14.7	System ability to provide CSR with defect	Should provide Customer service professionals with comprehensive defect tracking capabilities, enabling to categorize, prioritise, and assign product defects for resolution based on input from incoming customer	Essential		



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	management data	service requests to proactively correct product quality issues.			
CC14.8	Billing details for six months	Should provide option to view billing details of the customer (last six months records) on CTI pop up along with vital information of customer.	Essential		
CC14.9	Option to send billing details by e-mail/ fax	Should provide option to send the billing record (last six months) of the customer through e-mail / fax.	Essential		
CC14.10	Ability to view customer details	Should be able to view details of the customer with an authentic ID e.g. Consumer number, Name, Telephone number, Address and with an option to change the required parameters.	Essential		
CC14.11	Ability to build FAQ database	Should build a FAQ database for commonly asked query. In case of any changes in tariff, the FAQ should be updated within 1 day.	Essential		
CC14.12	Search option for most similar answer to FAQ	Search option to find the most similar answer to the queries in the FAQ section with an option to e-mail the same to the customer also.	Desirable		
CC14.13	Report Generation module	Report generation module e.g. billing reports, customer details report etc. - CRM application will record the language preference of a customer and his next call will be routed according to his preference.	Essential		
CC15.0		COMPLAINTS ESCALATION SYSTEM			
CC15.1	Escalation policy	In case the issues are not resolved within the defined service levels, it shall be possible to escalate to pre-specified higher authorities. The escalation hierarchy would consist of three or more levels for escalation of complaints to expedite the complaint resolution process. The choice of escalation authorities would be made based on the criticality of the situation, which could include the AE/EE or even the SE of the Circle.	Vital		
CC15.2	Escalation policy	The call centre software shall have a facility for Automatic diversion of message from the Call Centre Supervisor's desk to the utility hierarchy as given above, if the complaints are not closed within 2 Hours. However, it shall be possible to escalate all the critical complaints like death / accident immediately to the respective Circle CEO as well as Town in-charge of the utility.	Vital		



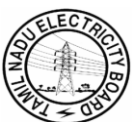
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CC16.0		OTHER SERVICES			
CC16.1	Complaint status enquiry	Status Enquiry - Consumers should be able to know the status of their complaint anytime by calling the CC center and providing the unique registration number / token number to CSR.	Vital		
CC16.2	Payment reminders	Payment Reminders - It shall be possible for the CSRs in the CC center to follow-up with the consumers regarding payments. The appropriate details of such overdue consumers would be provided by the Utility to the call center Supervisor. Billing software shall generate weekly reports of such consumers, who have outstanding payments and should be forwarded to call center every week through automatic messaging services for further follow up with consumers. Concerned utility may also decide a cutoff point for consumers with such overdue payments, for whom call center will refuse to lodge any complaint till all the previous dues are cleared.	Essential		
CC16.3	New connection and other facilities	New Connection and other activities - As this Call Centre will be a Single window option type, consumer will be approaching for providing new connection. Call center will provide the Application form to consumers for New Connection and will also collect, scrutinize and forward the same to utility official concerned. The back end operation will be done by the utility staff, but will keep the status updated in the system. Similarly, there are other activities for which the required application along with the required document if any will be collected by the call center and forwarded to utility official for sanctioning, changing the tariff category etc, such as - <ul style="list-style-type: none"> - Extension / Reduction of Load - Change/Transfer of Name - Address correction - Change of Category - Disconnection and re-connection of power - Any adhoc scheme etc. <p>All the status should be available with the Call center at any point of time from the point consumer submits his application till the job is completed and the consumer shall get complete status of his application at any point of time from call center itself through Phone or in person.</p>	Essential		
CC16.4	Lead generation and marketing of services	Lead generation and marketing of services - The above shall be possible through the CSR personnel e.g. new payment modalities like direct debit facilities, ATP Machines, Bill payment through Credit Card, Cheque Drop boxes etc. could be explained to the	Desirable		



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		consumers. The CSR should inform the consumers regarding tariff or any new service provided by the utility.			
CC16.5	Group messaging system	<p>Group Messaging System - The CC software should have facility to sent group messages to those consumers having Mobile phones as per the call centre database, such as -</p> <ul style="list-style-type: none"> • Common message transmittal/warning in case of group faults (DT/Feeder failure etc) or any other information common for all consumers on power situation • Advance intimation to consumers regarding load shedding or planned shutdown or preventive maintenance schedule • Date of bills generated and due date of payments 	Essential		
CC16.6	Closing of complaints	<p>Closing of issues/requests - Once the issue is resolved or the fault has been attended, the concerned Electrical maintenance staff in the field will inform the status to the CSR through his CUG Mobile phone. The CSR personnel will update the status of the complaint as closed and will also intimate the customer of the same and take a feedback regarding service provided by his personnel.</p>	Essential		



8.0 Module: Management Information System (MIS)

Requirement ID	Functionality	Description	Criticality	Response	Comments
Mis.1	Generation and maintenance of various MIS reports	<p>The specification covers maintenance and generation of various management information reports required for top management, middle level management and respective unit offices. These are generally based on the data generated under different other packages covered in this section.</p> <p>The MIS Module should include</p> <ul style="list-style-type: none"> ▪ Information capturing ▪ Information processing ▪ Information management ▪ Information based decision-making & reporting. 	Vital	C/ ER/F/ CR/ NC	
Mis.2	Study of existing business process to finalize MIS formats	Before finalization of MIS requirement and formats, a through study of the existing business process shall be carried out along with the utility. Based on the organization structure and requirement of decision support system at organization level, a comprehensive MIS requirement document shall be prepared. The actual MIS requirement shall be finalized at implementation Stage.	Vital		
Mis.3	Provision to generate MIS on regular basis	The system should able to generate reports on regular basis. Utility will finalize the periodicity and the format of report.	Essential		
Mis.4	Creation of different formats for different level	The format for same report prepared for different levels will be different, e.g. Monthly collection report for SDO, SE & CEO will be different.	Essential		
Mis.5	Elimination of human intervention in data acquisition	Data acquisition for MIS should preferably be without human intervention as far as possible. The data should be collected only at the lowest level and from the same source and in the standard formats.	Essential		

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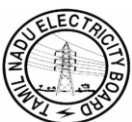
Mis.6	Provision to generate MIS reports for external agencies	MIS reports are also to be generated for external agencies such as regulatory Commission. The Formats for such reports are different based on the specific requirement of SERC. The formats and the periodicity of the same will be finalized with the utility.	Essential																		
Mis.7	Type and periodicity of reports	<p>Type of report and periodicity of such reports given below are indicative only and final requirement will be spelt out by utility as per requirement :</p> <table border="1"> <thead> <tr> <th>Type :</th> <th>Lower level</th> <th>Middle level</th> <th>Top level</th> </tr> </thead> <tbody> <tr> <td>Financial</td> <td>Daily</td> <td>Daily / weekly / monthl y</td> <td>Monthly / quarterly / yearly</td> </tr> <tr> <td>Operational Efficiency</td> <td>Daily / weekl y</td> <td>Daily / weekly / monthl y</td> <td>Monthly / quarterly / yearly</td> </tr> <tr> <td>Customer Satisfaction</td> <td>weekl y</td> <td>Weekly / monthl y</td> <td>Monthly / quarterly / yearly</td> </tr> </tbody> </table>	Type :	Lower level	Middle level	Top level	Financial	Daily	Daily / weekly / monthl y	Monthly / quarterly / yearly	Operational Efficiency	Daily / weekl y	Daily / weekly / monthl y	Monthly / quarterly / yearly	Customer Satisfaction	weekl y	Weekly / monthl y	Monthly / quarterly / yearly	Essential		
Type :	Lower level	Middle level	Top level																		
Financial	Daily	Daily / weekly / monthl y	Monthly / quarterly / yearly																		
Operational Efficiency	Daily / weekl y	Daily / weekly / monthl y	Monthly / quarterly / yearly																		
Customer Satisfaction	weekl y	Weekly / monthl y	Monthly / quarterly / yearly																		
Mis.8	Provision of monitoring system	<p>This module should also provide monitoring system for -</p> <ul style="list-style-type: none"> • Revenue monitoring and Reconciliation monitoring (based on billing backup data & bank reconciliation and cash collection data) • Grievances & Public representation • Legal Cases • Vigilance, Theft & embezzlement cases • Reconciliation of consumer wise opening & closing balances QTR & Year wise will also be required 	Essential																		



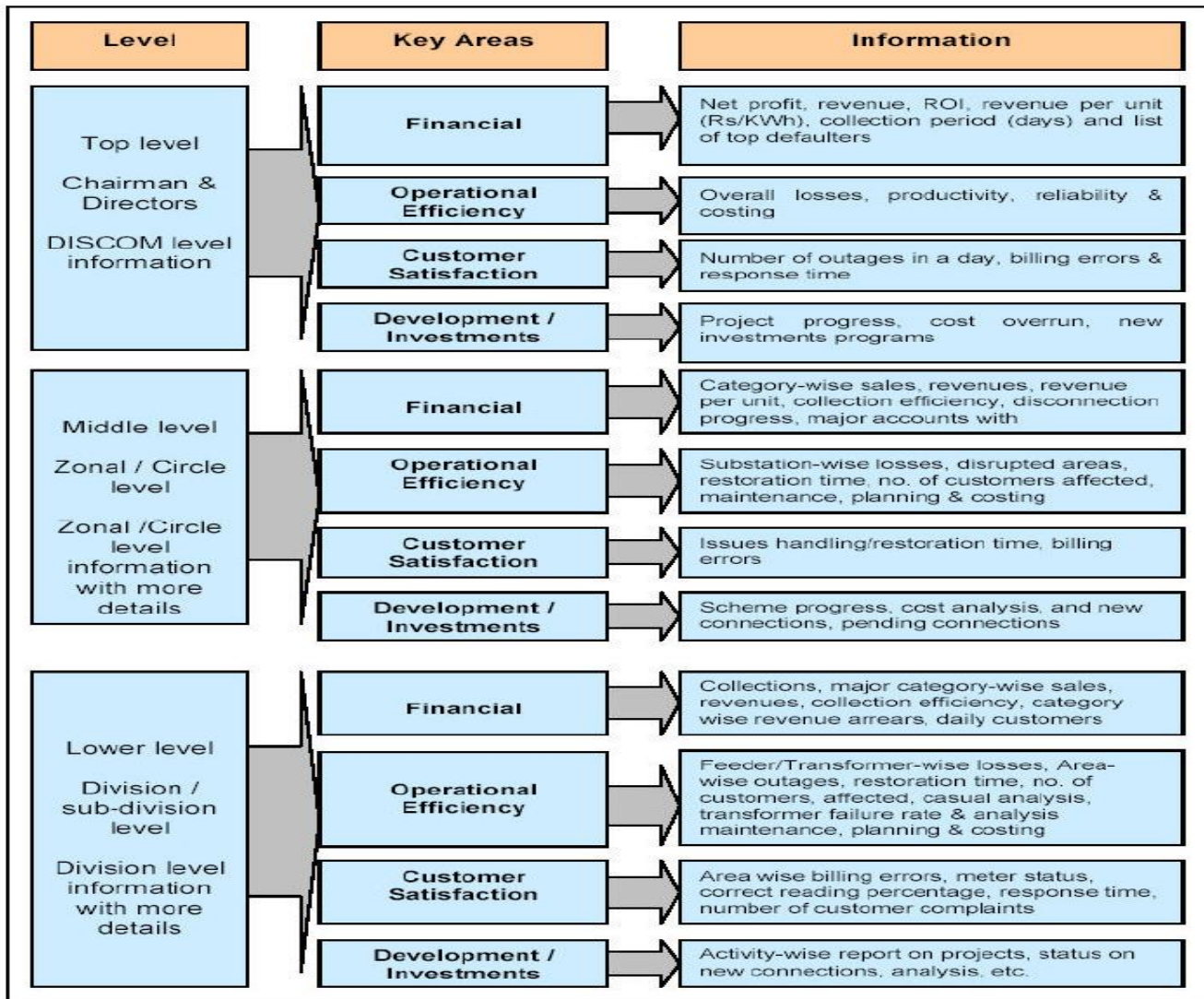
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Mis.9	Provision of Business Intelligence Tools	This module should provide Business Intelligence Tools for data mining, analysis, trending, simulation, manage reporting, OLAP analysis, Ad-Hoc querying, dashboarding, score carding, business activity monitoring, Office Integration.	Essential		
Mis.10	Provision to generate reports for all modules in user defined formats	The system shall generate reports for all the modules in user-defined formats. The system will have a graphical user interface with a capability for generating customized reports, apart from the regular ones mentioned above, as per the requirement of management and operations staff. Display of statistical data shall be presented additionally in graphical formats such as bar-graph/pie diagram etc. for convenience of analysis.	Essential		
Mis.11	Single Platform	All BI solutions mentioned above need to be provided from a single BI platform.	Vital		
Mis.12	Web Client	The application should be web based and there should be no requirement to install any component on client machine.	Vital		
Mis.13	Access of Services	Common service oriented architecture and data access services should be used by all BI features.	Vital		
Mis.14	Security	All BI solutions should have Common Security model & Support cube level, table level, row and column level as well as cell level security	Essential		

An indicative chart for MIS requirement is given below.



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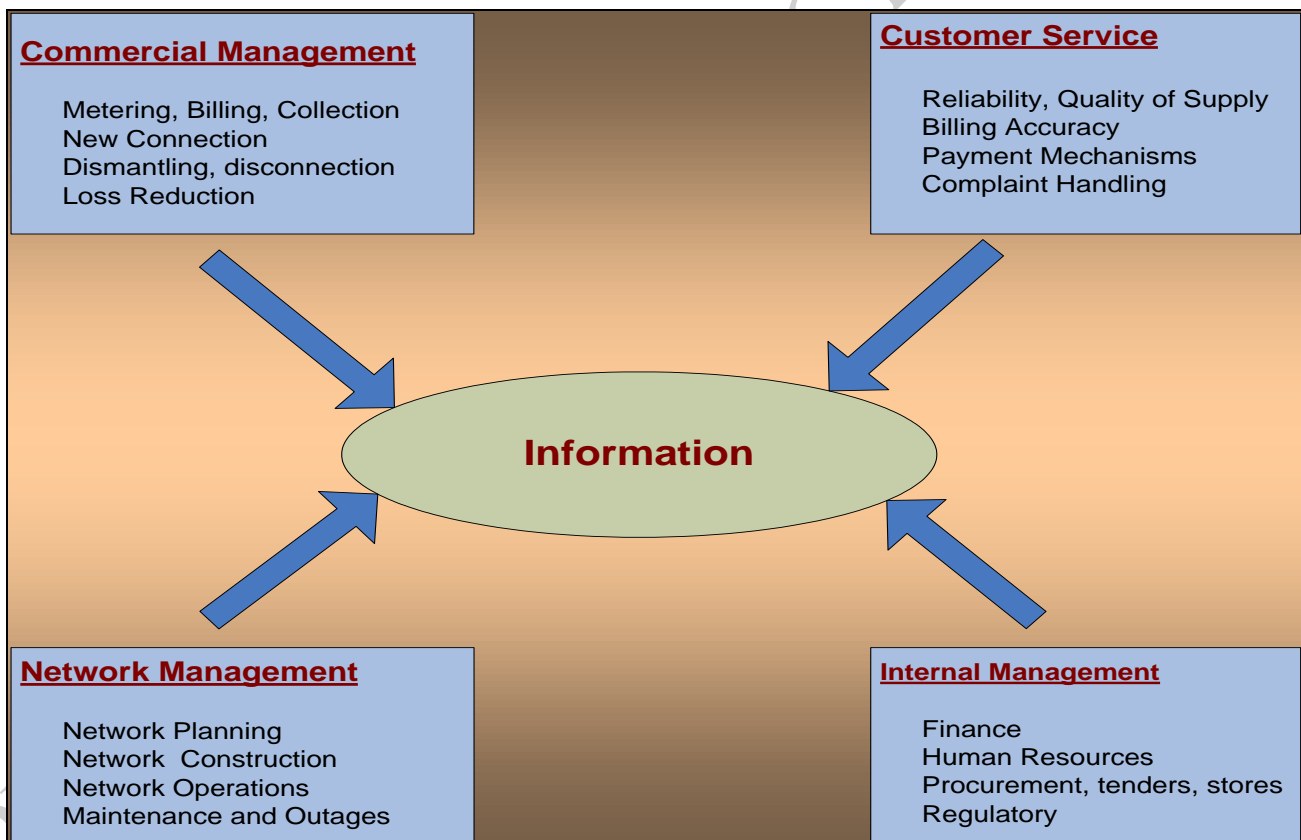


Document Management Solution:

Document management solution is a computer system used to track and store electronic documents and/or images of paper documents; provide storage, versioning, metadata, security, as well as indexing and retrieval capabilities. It's also termed as document management software or document management tool.

Operating efficiency in utility companies is necessary to decrease liability, maximize capacity, minimize operating costs, and boost productivity. Companies require integration across suppliers, partners and customer. The information in the form of documents is required to be shared across the stakeholders for smooth functioning and maintaining high service levels.

Utilities providers must find ways to: optimize their document workflow, manage multiple technology assets and, maintain full process integrity and security for invoices and statements. In addition they also need to implement strategies for customer-centric initiatives and unify disparate systems to offer value-added services.

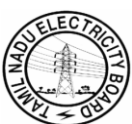


Requirement of Document management solution -

- **Storage :** Every user should have approx 1 GB of storage space so that user can add documents as per their requirement.
- **Easy Additions:** Adding a new Document should be easy and trouble free so that user can upload the document file at ease.
- **Managed Filing:** Document filing system can be maintained hierarchy like normal disk based file systems and also associate multiple taxonomies with the same document or set of documents.
- **Fast Retrieval:** User should be able to search for any document that has been uploaded by name with Full Text Search of inside any kind of document. Automated Retrieval should also available by popular XML formats like RSS for every Tag.
- **Security:** Each document must be protected by a granular security system, All Documents must be protected against theft, loss and tampering. Also should support for archival storage of tier storage, HSM, WORM etc. devices.
- **Distribution:** The documents must be available in utility's internal and external portal depending upon utility's policy to any user who has access right to it. It should also be possible easily click-to-distribute documents to select users, user group or even the whole Web Space.
- **Archival:** Automatic Revision control system must be in place that maintains versions automatically, every time a document is updated. All prior revisions should also be always available.
- **Retention:** The facility of purging prior revisions and permanently deleting stored documents should also be available to user to protect security of sensitive documents.
- **File Collaboration:** It should be possible to collaborate on any kind of document that is stored within using Ad-Hoc Workflows of Collaboration.

Benefits of document Management:

- Scanning customer documents and other back office files (including meter books, ledgers etc) to save office space and retrieval time.
- Enabling auto storage of documents submitted through website.
- Enabling information sharing between different offices, departments and customers
- Automating document filing
- Scanning of tender documents and automating tendering process.
- Automating paper or form based business processes
- Implementation of enterprise wide Electronic Data Management (EDM) solutions
- Enabling Document security from manipulation, compliance & regulatory norms.
- Reuse of content without adding any cost to the organization



- Enabling the delivery of content through multiple channel like web, email even mobile devices.
- Ensure single & consistent view of documents for various applications
- Enabling Information Life Cycle Management of document from generation to archival.
- Easy search & access of content using index & full text search based retrieval

Data warehousing and Business Intelligence:

BI applications should include the activities of decision support systems, query and reporting, online analytical processing (OLAP), statistical analysis, forecasting, and data mining.

Essentially, a BI solution is normally implemented with following components

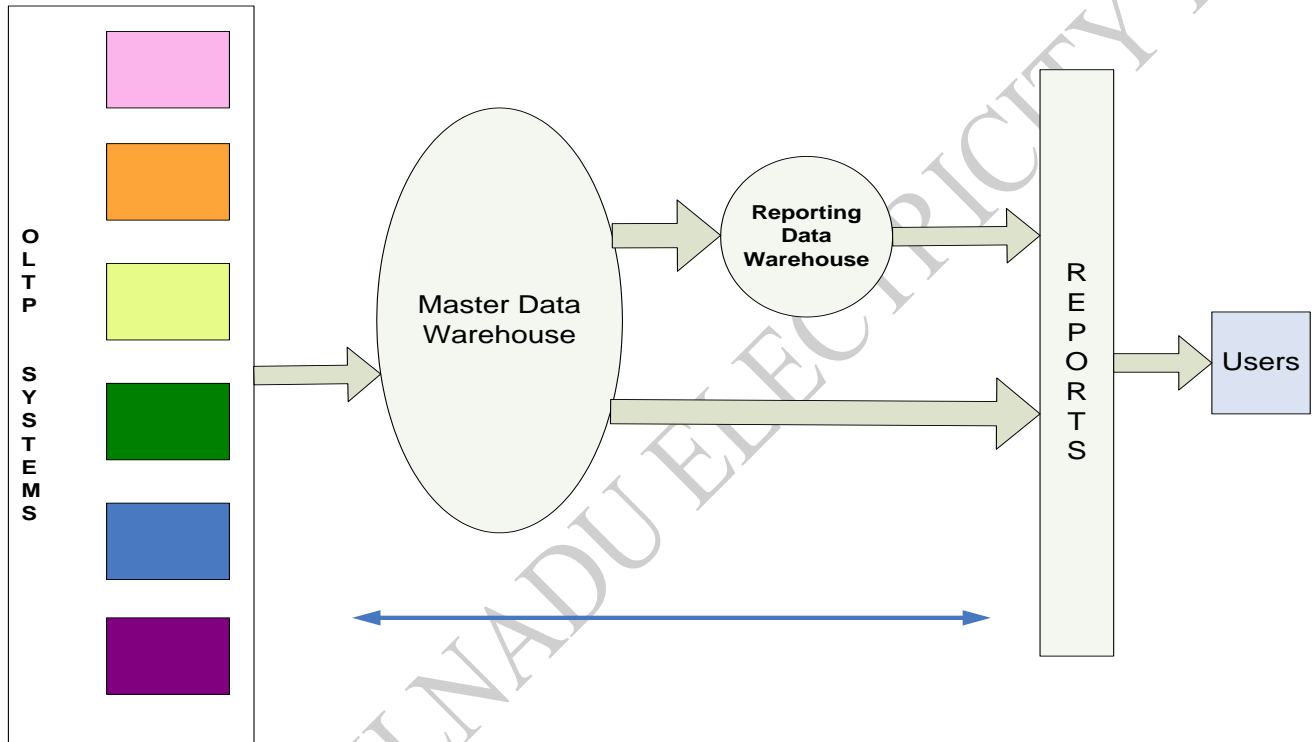
- An Extraction, transformation and loading (ETL) component which extracts data from OLTP systems, transforms it and load it to the data warehouse
- A data warehouse component which will host the data.
- A reporting component which will allow on-the-fly reporting on the data from data warehouse.

The MIS should utilise the BI solution and data ware house for management information, data analysis, reporting and estimating what if scenario

Specific areas which BI should include:

- Customer credit analysis.
- Daily, weekly and monthly report generation to access the performance of sub divisions/division and circles.
- Load forecasting
- Customer segmentation and analysis for SLAs
- Customer complaint analysis
- Network planning
- Capacity expansion planning
- Accurate manpower planning
- Material Planning

Suggested Technical Architecture of BI -



The above figure depicts the data flow vis-à-vis the system. As depicted, there are various sources of data (OLTP systems) from where the data flows to the Master Data Warehouse.

Before loading to master data warehouse, the data goes through cleansing and transformation to maintain data integrity. Loading process also does simple data aggregation. Once data is loaded to master DW, then it is again aggregated and loaded to reporting DW. The reports requiring only aggregate data refers only to report DW but the reports requiring data at most granular level will fetch data from master DW.

Suggested Logical Architecture Diagram

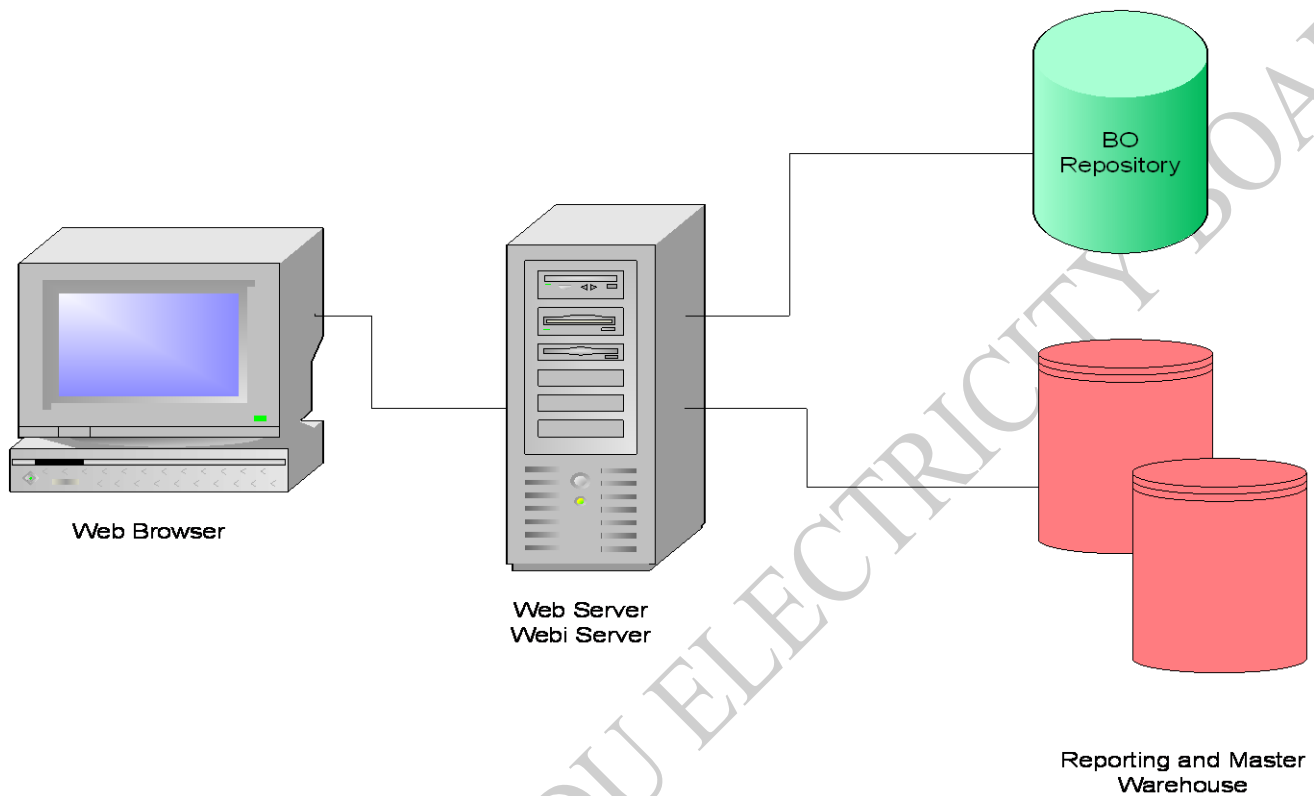


Fig : Logical Architecture Diagram

The logical architecture Diagram can be represented as shown above in figure. It is a graphical representation of how Webi reports are generated as and when requested by an end user using a Web Browser.

9.0 Module: Web Self Service

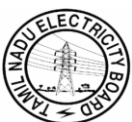
Objective :

The goal is to provide a high quality experience for the customers and business associates that will provide them a user friendly portal that will make it easy for them to communicate with the utility through the web instead of direct phone calls or visits. This portal will also act as a source of information for the customers regarding policies and procedures. This in turn will improve customer satisfaction and reduce work load on the employees.

Requirement ID	Functionality	Description	Criticality	Response	Comments
wss.1	Home	This page provides a brief description about the site, the various functionalities it provides and promotional features or any kind of advertisement for special programs can be placed in this page. Login Component is provided and registered users may login using their username and password. New Users can also register by clicking on the First Time Users Register link. The Forgot Password link helps the user to retrieve their password.	Vital	C/ ER/F/ CR/ NC	
wss.2	Log In	The Log In page asks the registered users for their username and password while the new members can also register through this page.	Vital		
wss.3	Registration	The user is asked for personal, security and account information in this page before registering.	Vital		
wss.4	Forgot Password	The user is asked for his first name, last name, zip code, birthday and his primary email address before being provided with the security question.	Vital		
wss.5	Security Question Answer	The new password is sent to the user by email (his primary email address as in his profile) on answering the question correctly.	Vital		
wss.6	Change Password	Once the user has logged in, he can change his credentials i.e. Username and Password by clicking on the Change Credentials link	Vital		
wss.7	My Accounts	This is the landing page for the users with multiple accounts. The screen contains a brief summary of all the accounts such as the account name, address, balance, due date and the account status.	Vital		
wss.8	Single Account	This is the landing page for the customers. The screen contains a description of the account. Any status messages pertaining to the account involving immediate user action is also presented here.	Vital		

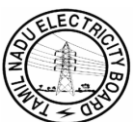
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wss.9	Consumption History	The page provides an account of the usage for the last 12 months graphically. A more detailed analysis is provided in a tabular format listing the meter reading date, the reading, consumption, number of days, charges etc.	Vital		
wss.10	Consumption Calculator	The consumption calculator popup is provided to help the user calculate the usage between any two given dates.	Vital		
wss.11	Bill Summary	The Bill Summary page gives a record of the Billing amounts and Payments made by the customer over the last few months.	Vital		
wss.12	Online Billing Registration	The user is provided with the options of registering in Online Billing and also continues with paper bills.	Vital		
wss.13	View and Pay Bill	The View and Pay Bill page presents a short summary of the bill. The user can also view the bill in PDF format by clicking on the link 'View Bill as PDF'.	Vital		
wss.14	Pay Bill	The user is provided with 2 modes of payment namely Credit Card and Debit card On providing the valid credentials payment can be made directly from the site. The online payment shall be processed through secured payment gateways	Vital		
wss.15	Multiple Pay Bill	Payments for all the accounts can be directly made from this page. For each of the account the user is provided with 2 modes of payment namely Credit Card and Debit card. On providing the valid credentials payment can be made from the site directly.	Vital		
wss.16	Manage Accounts	The page lists all the accounts for the user and the preferences for the accounts.	Essential		
wss.17	Service Requests	This page allows customer to lodge request for services such as new connection, disconnection, load change, name change, category change, meter shifting etc. Depending on the regulatory/utility requirements user is required to submit the documents.	Vital		



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wss.18	Service Request Status	This is a read only screen which the user can view. Status of various pending requests for the customer such as load change, name change, category change, meter shifting etc are listed here.	Vital		
wss.19	Complain	Under this page user can log his complaint using a drop down menu and also enter some text.	Vital		
wss.20	Complaint Status	This is a read only screen in which user can view the complaint status.	Vital		
wss.21	Report Power Failure	This screen contains static data related to the power failure. The contact number is mentioned in case any power failure occurs. The user calls up the number and reports the power failure and necessary action is taken to restore the power connection.	Vital		
wss.22	Report Street Light Outage	This screen allows the user to report any street light outage incident. The user has to fill up the specific information provided in the screen in order to locate the street light and then report it.	Vital		
wss.23	Update Profile	This screen enables the user to update his/her profile information. The user can edit the personal information and click on Update Changes button to save those changes.	Vital		
wss.24	Commercial Information	This screen displays the applicable policies, acts and rules prescribed by the utility, regulator and the law, which are helpful for customers.	Essential		
wss.25	Associated Sites	This screen provides the link to all the associated sites such as SERC. CERC, Ministry of Power etc.	Essential		
wss.26	Contact Us	This screen displays the information of the contact persons, who should be contacted for any information or for providing any feedback.	Vital		
wss.27	Privacy Policy	This screen shows the different privacy policies to which the web site adheres. This screen displays only static content. The user can navigate to other pages by clicking on the bread crumb or the left navigation.	Vital		

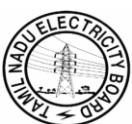


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wss.28	Business Associate	This screen enables business associates (contractors) to register online, view tenders, purchase tenders, submit tenders, etc.	Essential		
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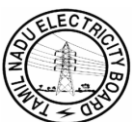
12.0 Module: Identity and Access Management System

Requirement ID	Feature	Functionality	Criticality	Response	Comments
Idm.1		Adapter/ connector Support			
Idm.1.1	Solution Compatible	The proposed solution should be compatible on all the operating systems offered by the bidder in the proposed solution including client machines which are most likely window based system.	Vital	C/ ER/F/ CR/ NC	
Idm.1.2	Out of box workflow	Identity management for user provisioning should have out of the box workflow for automating approvals for user access management, self registration and self-care functionality for reducing the administrative load and manual intervention.	Vital		
Idm.1.3	IDE to design Work - Flow	The solution should provide an IDE to design the workflows.	Desirable		
Idm.1.4	Standard for Workflow implementation	The proposed solution should support "Workflow Management Consortium (WfMC) TC-1003 Workflow Reference Model standard for workflow implementation".	Desirable		
Idm.1.5	Connector availability for target systems	Identity Management Solution should have Connector availability for all target systems that need to be managed.	Essential		
Idm.1.6	Connector development tool	The proposed solution Should provide resource kit or an SDK to add new Resource adapters.	Essential		
Idm.1.7	Agent-less Architecture	Identity Management solution should be Agent-less Architecture and use gateways where agent is required.	Essential		
Idm.1.8	Certification	The Proposed solution should be certified as "Liberty Interoperable?" And Should be interoperable with other products / solution based on SAML 2.0 specification. A few typical profiles given below:	Desirable		



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		<p>Identity Provider Identity Provider Extended Service Provider Service Provider Complete Service Provider Extended ECP Attribute Authority Requester Attribute Authority Responder Authorization Decision Authority Requester Authorization Decision Authority Responder Authentication Authority Requester Authentication Authority Responder POST Binding GSA Profile</p>			
Idm.1.9	Indexing	The solution should leverage an intelligent indexing system to manage user identities and access privileges, leaving account information with the information owner and thus avoiding the time-consuming effort of building and maintaining another user repository.	Essential		
Idm.1.10	Discovery and Correlation of user Account	The Proposed solution should provide an automated way to discover and correlate all accounts associated with an individual to speed the account mapping process.	Essential		
Idm.1.11	User Repository	The solution should use separate repository for user data and audit log information.	Essential		
Idm.1.12	Open Provisioning Standard	The solution should support open provisioning standard like SPML.	Desirable		
Idm.1.13	Authentication/authorization framework	The solution should allow enterprise applications and platforms to integrate into the centralized authentication/ authorization framework seamlessly. The solution should support both thick client as well as web based applications.	Vital		
Idm.1.14	Access Management	The Access Management solution should be capable of running on web servers as well as application servers.	Essential		
Idm.1.15	Pluggable authentication module	The proposed solution should provide the ability for pluggable authentication module, and new auth modules should be able to be added via an SDK.	Essential		
Idm.2		Access Rights Capabilities and Access Control			
Idm.2.1	Data protection	Sensitive customers' data must be protected in accordance with guidelines that will be agreed with the Purchaser.	Vital		



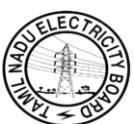
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Idm.2.2	Entry screens	<p>On completion of successful logon, the following information shall be displayed :</p> <p>a) Date and time of previous successful logon.</p> <p>b) Details of any unsuccessful logon attempts since the previous successful logon.</p> <p>Reminder of the onus of the user to bring to notice any aberration observed.</p>	desirable		
Idm.2.3	Unsuccessful logon attempts	After predefined number of consecutive unsuccessful attempts to logon to a user Id, that user id shall be disabled against further use until the same is enabled by System Administrator.	Essential		
Idm.2.4	Application time out	Terminal / User Id time-out shall occur if a terminal / user ID remains logged onto a system/ application but remains inactive for a predefined time. If the terminal is dedicated to one application then timeout shall occur after predefined time inactivity. The screen shall be cleared of any information when time out occurs.	Vital		
Idm.2.5	Limited application software on key systems	Software which can be used to modify existing programs on systems / applications, e.g. editors and compilers, shall have access restricted to authorized staff only. Any such software which is not needed for operational reasons shall be removed after the modifications have been made.	desirable		
Idm.2.6	Segregation of duties	<p>Clear segregation of duties between user groups is necessary to minimize the risk of negligent or deliberate system misuse. In particular segregation must be implemented between :</p> <ol style="list-style-type: none"> 1. Business use. 2. Computer operations. 3. Network management. 4. System administration. 5. System development & maintenance. 6. Change management. 7. Security administration. 8. Security audit. <p>Where it is operationally not possible to adhere to this policy advice shall be sought from the Purchaser on security. As a minimum, the above segregation shall be enforced at the User Id level i.e. the above functions shall not be allowed from the same User Id.</p>	Essential		
Idm.2.7	Communicating usage restrictions	A prescribed warning screen shall be displayed immediately after a user successfully completes the logon sequence to any multi user system, server or database. This does not apply when	desirable		



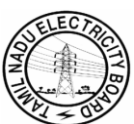
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		logging onto a PC, which cannot be accessed via any other means, or when logging onto a network where no information is available without further logon (note: the screen should be presented after this further logon). This screen will emphasize the requirement to comply with requirements on usage of computer as laid down by the Purchaser. The screen will require confirmation that the user has understood these requirements prior to proceeding.			
Idm.2.8	Controlling User's access	The system shall provide a mechanism to authorize users to access the system, revoke users from accessing the system, and modify the security information associated with users. The system shall also be able to automatically suspend or roll back a reconfigured account that violates policy.	Vital		
Idm.2.9	Restricted access to resources	The system / resources shall provide a mechanism to allow or deny specified user IDs to access the system during specified ranges of time based on time-of-day, day-of-week, and calendar date.	Essential		
Idm.2.10	Console operations for privileged users	The system shall provide a mechanism to allow or deny specified user IDs to access the system based on means of access or port of entry.	Essential		
Idm.2.11	Resource, access control list	For each resource, the system shall provide a mechanism to specify a list of user IDs or groups with their specific access rights to that resource (i.e. an access control list). Solution Shall provide for grouping of users and assigning ACL to the group.	Essential		
Idm.2.12	Group ACL vs individual ACL	Group ACL should be aggregated to individual user's ACL and in case of conflict, user's ACL shall govern.	Desirable		
Idm.2.13	Grant and deny access	System shall provide both Grant and Deny to a resource.	Essential		
Idm.2.14	Individual access rights to users	The system shall have ability to assign users individual access rights and to define access rights available to users in a role upon their request and approval.	Vital		
Idm.2.15	Job based access to	The system shall have ability for different personnel to view different levels of information	Vital		



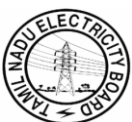
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	information	based on their job duties.			
Idm.2.16	Modifications to the access list	The system shall provide a mechanism to modify the contents of a resource's access control list.	Essential		
Idm.2.17	Change in Access rights	The System shall have ability to associate access-rights definition with a role within the organization and dynamically and automatically change access rights based on changes in user roles. The system shall also have ability to set designated times for changes in access rights or policies.	Vital		
Idm.2.18	Rules for routing approvals	System should also use defined rules/ information specific to utility to determine routing of approvals.	Vital		
Idm.2.19	Access rights change notification	The system shall be able to compare local administrator changes against a system-of-record of account states to determine if changes comply with approved authorities and policies and shall be able to notify designated personnel of access-rights changes made outside the provisioning solution, if any.	Vital		
Idm.2.20	Audits on user accounts	The solution should provide the capability to do half yearly audits on the lines of ISO 17799/BS7799 for user accounts.	Vital		
Idm.2.21	Resource ownership	The system shall provide a mechanism to identify all resources in the system that are owned by a specified user ID, the resources to which that user ID is allowed access and the specific access rights for each resource.	Essential		
Idm.2.22	User's authority changes	System shall also be able to detect, evaluate and respond to user authority changes made directly to a resource.	Essential		
Idm.2.23	Restrictive access	Each resource delivered with the system shall have the most restrictive access rights possible to permit the intended use of that resource.	Essential		
Idm.2.24	Restricted access to access control information	The system shall protect all information used for resource access control decisions (e.g., access control lists, groups lists, system date and time)	Essential		
Idm.2.25	Policy simulation	The system shall provide policy simulation and 'what-if' modeling of changes, i.e. simulation of effects of policy changes before they are enacted, reporting errors, or potential problems, and ability to resolve before live operations.	Desirable		



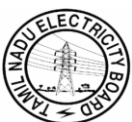
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Idm.2.26	Monitoring of access controls	The system shall monitor the followings :- <ul style="list-style-type: none"> • Successful logins and login attempts e.g. Wrong user ID / Password, and login patterns • Rejected access attempts because of insufficient authority • All usage by privilege users e.g. Powerful access to system utilities or applications • Use of sensitive resources e.g. Access to highly sensitive data • Change to access rights of resources • Changes to the system security configuration • Modification of the package software • Changes to user privileges. 	Essential		
Idm.2.27	Reporting on user roles and rights	The system shall have ability to report on roles, rights associated with roles and users associated with roles.	Desirable		
Idm.2.28	Flexible connection to multiple data stores	The system shall have flexible mechanisms to connect to multiple data stores containing accurate information on valid users.	Essential		
Idm.2.29	Identity store information in real time	The system shall have ability to load identity store information on a scheduled bulk basis and to detect and respond to identity store changes in near real time.	Essential		
Idm.2.30	Retrieval of account information	The system shall have ability to retrieve account information from target managed resources on a scheduled basis, both in bulk or in filtered subsets to preserve network bandwidth.	Essential		
Idm.2.31	Real-time local administrator account maintenance	The system shall have ability to detect and report in near real-time local administrator account maintenance (creation, deletion, changes) made directly on local resources natively.	Essential		
Idm.2.32	Support for prerequisite services	The system shall define services that must be granted prior to creation of the access rights. For example, Microsoft ® Windows NT ® rights must be granted prior to granting rights to Exchange Support for entitlement defaults and constraints (each characteristic of an entitlement may be set to a default value, or its range can be constrained, depending on the capabilities of the entitlement to be granted)	Essential		
Idm.3		User Administration			
Idm.3.1	Creation of standard User Profile	A mechanism must exist to allow a range of User Ids to be built with a standard user profiles of multiple categories, e.g. Data entry user, data modify user at the section office, division office etc	Vital		
Idm.3.2	Dormant User	Where a user Id remains unused for a pre-specified number of consecutive days, it shall be	Essential		



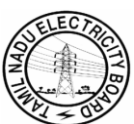
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		disabled. If no authorized request for reinstatement is received within a further predefined time period, the user Id shall be deleted. The user would be informed before this happens.			
Idm.3.3	Segregating user access to system	All user Ids shall be set up with privileges that limit the use of the user Id to designated areas only and to ensure that other functions cannot be performed by the user ID for which they are not authorized. Some user IDs have powerful privileges associated with them and these shall only be provided and maintained by the system administrator. To prevent the provision of user IDs with privileges associated to them, when these are not required by the user, any templates used to set up user IDs shall have no default privileges associated with them.	Vital		
Idm.3.4	Unique User ID	System shall be able to create unique user IDs using a set of consistent algorithms and defined policies of the owner and not in current use or previous use by the organization and not shared with others. The system shall provide a mechanism to associate specified information (e.g., user name and affiliation) with each user ID.	Vital		
Idm.3.5	ID conventions	Procedures for user account management should define the naming convention for user IDs and the operations practices for provisioning and removing these user Ids.	Essential		
Idm.3.6	Differentiating normal and privileged users	User Ids shall not consist of less than a predefined number of characters. The number of characters would be different for normal users and privileged users;	Vital		
Idm.3.7	Single account with multiple authorities	The system shall have ability to create a single account with multiple authorities governed by different policies.	Essential		
Idm.3.8	Temporarily Disabling	The system shall provide a mechanism to administratively disable user IDs and a mechanism for re-enabling or deleting a disabled user ID after a specified period of time. The use of this mechanism shall be privileged.	Desirable		
Idm.3.9	Active Users	The system shall internally maintain the identity of all active users.	Essential		
Idm.3.10	Tracking User IDs	The system shall provide a mechanism to obtain the status of any user ID.	Desirable		
Idm.3.11	Grouping User IDs	The system shall provide a mechanism that allows a collection of user IDs to be referenced together as a group.	Essential		
Idm.3.12	Limiting multiple log on	For those systems that have the architecture to support multiple logons per user ID, the system shall provide a mechanism that limits the number of multiple logon sessions for the same user ID.	Desirable		



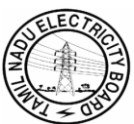
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		The mechanism shall allow limits for user IDs and groups to be specified. The system default shall limit each user ID to one simultaneous logon session. As per business process requirement, particular machine ID's to permit login by selected users only.			
Idm.3.13	Associating IDs to processes	The system shall provide a mechanism by which the user ID associated with a process can change to a user ID that would provide any additional privileges.	Desirable		
Idm.3.14	Assignment of one or more roles to users	The system shall be able to assign users to one or more roles and can implicitly define subsets of access to be unavailable to a role.	Essential		
Idm.4		Self Regulation User Administration capabilities			
Idm.4.1	Adherence to open standards	The system shall adhere to open standards.	Vital		
Idm.4.2	Secure environment	The system shall have secure environment for transmitting access changes across the Internet.	Vital		
Idm.4.3	Protection of private user information	Protection of private user information through secure facilities and sound processes.	Vital		
Idm.4.4	Reporting of user rights	Reports of user rights into external systems, sponsors of users and audit trails of access rights changes.	Desirable		
Idm.5		Authentication			
Idm.5.1	Authentication mechanism	The system shall provide a mechanism to authenticate the claimed identity of a user.	Vital		
Idm.5.2	Single authentication procedure	The system shall perform the entire user authentication procedure even if the user ID that was entered was not valid. Error feedback shall contain no information regarding which part of the authentication information is incorrect	Essential		
Idm.5.3	Modification Ability to authentication information	The system shall provide a mechanism to support the initial entry or modification of authentication information.	Essential		
Idm.5.4	Privileged access to authentication data	The system shall require a privilege to access any internal storage of authentication data	Vital		
Idm.5.5	2-Factor Authentication	System should support two factor authentication (Biometrics, tokens etc.)			
Idm.6		Password Management			
Idm.6.1	Password confidentiality	System shall be able to securely deliver User Ids and passwords to new users electronically.	Vital		



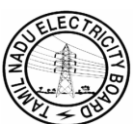
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	y	User Ids and passwords, when conveyed electronically shall only be visible to the person for whom they are intended e.g. after the user has logged on to the appropriate electronic system.			
Idm.6.2	Password protection	<p>All electronic information systems and applications shall have a password management system which meets the following requirements :</p> <ul style="list-style-type: none"> a) Enforces change of initial password at first logon. b) Allows users to select and change their own passwords at any time subsequently. c) Have ability to implement password formation rules to enforce password strength across the organization, e.g. minimum character length of password, password as a combination of numeric, alphabets & special characters d) Have validation routines built in which, as far as possible, check that the password selected is a quality password as defined in a Policy Document to be handed over to the Purchaser at the time of implementation. e) have a confirmation process on changing passwords to cater for typing errors, f) have ability to deliver password-change success/ failure status to requestor electronically g) have the ability to enforce password change after every n days. if the password is not changed in the pre specified number of logins then the ID should be disabled requiring re-enabling by System Administrator. h) prevents reuse of passwords within a specified period. i) does not echo passwords to screen or paper. j) Stores passwords in a one-way encrypted form away from the system/ application data files in a protected password file that is access controlled such that no users can read or copy the encrypted contents. k) Prohibit use of null passwords l) Have ability to synchronize passwords for multiple systems to the same value to reduce the number of different passwords to be remembered by the user 	Essential		



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		m) Have a challenge-response system to authenticate a user with a forgotten password by using shared secrets			
Idm.6.3	Unique passwords	The system shall provide no mechanism whereby multiple user IDs explicitly shares a single stored password entry. The system shall provide no means to facilitate the sharing of passwords by multiple users.	Vital		
Idm.6.4	Clearing passwords	The system shall allow a user to choose a password that is already associated with another user ID. The system shall provide no indication that a password is already associated with another user ID.	Essential		
Idm.7		Directory Services Requirement for Enterprise			
Idm.7.1	LDAP and Open Standards	<ul style="list-style-type: none"> ➤ The Directory Server should be LDAP v3 Compliant. ➤ LDAP server should be able to replicate data between servers and support cascading replication. ➤ Should have support for open standards (LDAP v.3, XML) 	Essential		
Idm.7.2	Group Policies Management	<ul style="list-style-type: none"> ➤ The directory service should provide support for Group policies and software restriction policies. ➤ The group policies should have settings to configure various desktop or user related settings via centralized control. These settings will include items like Browser setting, desktop restrictions, program restrictions, admin controls, software deployment etc. It should allow for almost all manual functions to be automated using group policies. 	Vital		
Idm.7.3	Integration	<ul style="list-style-type: none"> ➤ Should have support for integrated authentication mechanism across operating system, messaging services. ➤ The Directory server should have out of the box integration with the e-mail server. ➤ Should provide enhanced authentication like Kerberos which support authentication across multiple Operating system like Windows and Unix/ Linux. ➤ Should be able to integrate with other standards based Directory system for synchronizing user accounts and passwords. 	Essential		
Idm.7.4	Management	<ul style="list-style-type: none"> ➤ SNMP support for flexible network monitoring and management. ➤ Should support directory services integrated DNS zones for ease of management and administration/ replication. ➤ The directory service should support features 	Desirable		



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		<p>for health monitoring and verifying replication.</p> <ul style="list-style-type: none"> ➤ The directory service shall provide support for modifiable and extensible schema. 			
Idm.7.5	Access Control	<ul style="list-style-type: none"> ➤ Support for Access Control Lists (ACLs). ➤ Support for controlling access to the directory, a subtree, entries, attributes by setting permissions for users, groups, roles and location information like IP addresses. ➤ Should provide facility to provide Rights Management Service for documents like Word, Excel etc on the built on standards like XRML. 	Essential		
Idm.7.6	Multi Factor Authentication	<ul style="list-style-type: none"> ➤ Support for user authentication through user ID/ password, X.509v3 public-key certificates, or Anonymous authentication ➤ Should support security features such as support for Kerberos, smart cards, public key infrastructure (PKI), and x.509 certificates 	Vital		
Idm.7.7	High Availability	<ul style="list-style-type: none"> ➤ Should support participating into multiple LDAP Repository architectures for scalability ➤ Should support LDAP servers in multi master configuration ➤ Ability to keep Replicas in Synch and to enforce Replication updates. 	Essential		
Idm.7.8	Administration	<ul style="list-style-type: none"> ➤ The solution should provide a comprehensive single window Admin tool locally or over internet to administer the directory services. ➤ The Directory Services should have APIs to programmatically manage each component of Directory Service. ➤ The directory service shall provide support for modifiable and extensible schema both manually and programmatically 	Essential		
Idm.8		Audit Trails & Reports			
Idm.8.1	Time-stamped records	<p>The system must maintain-</p> <ul style="list-style-type: none"> • Time-stamped records of every access change request, approval/denial, justification and change to a managed resource • Time-stamped record of every administrative and policy-driven change to access rights 	Vital		
Idm.8.2	Audit Trail reporting	The system must provide reports on audit trails for users, systems, administrators and time periods, including workflow approvals, rejections, request statistics, policy compliance and Audit reports, User account reports, Access reports and Service reports and also any customized reports based on specific need.	Essential		
Idm.8.3	Maintaining audit trails	Audit trail records shall be retained in a tamper proof environment in accordance with the Purchaser's policy for a reasonable amount of time to allow for accountability and evidential	Vital		



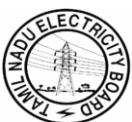
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		purposes. Backup copies shall also be maintained to protect against any accidental or deliberate erasure of data.			
Idm.9		Distributed Administration			
Idm.9.1	Defining of organizational structures	Ability to define organizational structures based on the access-granting authority	Desirable		
Idm.9.2	Delegation of administrative tasks	Ability to delegate each administrative task with fine-grained control at Organizational Unit Level so that the team or Dept Admins can completely perform the Administrative tasks for their Organization Unit.	Essential		
Idm.9.3	Access to delegated capabilities over web	Ability to access all delegated capabilities over the Web via Web Browser with a zero-footprint client.	Essential		
Idm.9.4	Web access control with single sign-on environment	Ability to incorporate Web access control with single sign-on environment and to distribute provisioning components securely over WAN and Internet environments, including crossing firewalls.	Vital		
Idm.9.5	Enterprise Single Sign On products	Ability to incorporate Enterprise Single Sign On products to include the provisioning solution within the Thick client single sign-on environment.	Vital		
Idm.9.6	Custom user authentication approach	Ability to incorporate custom user authentication approaches commensurate with internal security policies and to create private, filtered views of information about users and available resources.	Essential		
Idm.9.7	Ability to import and export configurations	Ability to import and export configurations to enable migrations between Development, Staging and Production environment without delays.	Desirable		
Idm.10		System Operations			
Idm.10.1	interaction with target resources	Ability to interact with target resources without interfering with their performance.	Essential		
Idm.10.2	Operation for temp inaccessible system	Ability to continue to operate without degradation when the managed system is temporarily inaccessible.	Essential		
Idm.10.3	Function if provisioning solution unavailable	Ability for the managed resources to remain fully functional if the provisioning solution is unavailable	Essential		
Idm.10.4	Users interaction with	Responsiveness to users interacting with the provisioning solution features for searches, reporting, approvals, self-service and auditing.	Desirable		



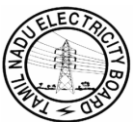
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	provisioning solution				
Idm.10.5	synchronization with user information	Ability to load and maintain synchronization with user information from existing human resources and other identity systems, both statically and dynamically.	Desirable		
Idm.10.6	account and authorization information from existing systems	Ability to load account and authorization information from existing operational systems without data entry	Essential		
Idm.10.7	Reconcile accounts created by other adm. systems	Ability to detect and reconcile accounts created by, and/or changed by, other administrative systems (e.g., the local administration console provided with the managed resource)	Essential		
Idm.10.8	Support for configuration and scalability requirements	Support for configuration and scalability requirements for large environments and high-availability operations utilizing shared communication capacity on corporate WANs.	Essential		
Idm.10.9	End-to-end security	End-to-end security over account changes.	Vital		
Idm.10.10	Web-based functionality	Entirely Web-based functionality to allow easy distributed administration on an unlimited scale.	Essential		
Idm.10.11	Integrated functionality w/o duplicate data entry	Integrated functionality that does not require duplicate data entry or manual synchronization of information shared for multiple functions.	Essential		
Idm.10.12	Server configuration for high availability opn.	Ability for servers to be inexpensively configured for high-availability operation, including disaster recovery.	Vital		
Idm.10.13	Utilized data store configuration for high availability opn.	Ability for utilized data stores to be configured for high-availability operation.	Vital		
Idm.10.14	Accuracy in provisioning solution	Ability for provisioning solution to maintain accuracy when local administrators maintain privileges to make changes to target resources.	Vital		
Idm.10.15	Resilient communications design	Resilient communications design between distributed components to withstand network or target resource outages.	Desirable		
Idm.10.16	Multi-layered security architecture	Multilayered security architecture for operation in a "demilitarized zone" (DMZ) and for management of users and systems in untrusted environments.	Vital		



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Idm.10.17	interaction with external systems	XML-based extensibility and interaction with external systems	Desirable		
Idm.10.18	common and de facto standards	Use of common and de facto standards for interfaces that are internal and external to the provisioning solution.	Desirable		
Idm.10.19	Integration of LDAP directory services	Integration of LDAP directory services as identity stores, access control system authorization stores and internal user account and policy stores.	Essential		
Idm.10.20	audit trails and system recovery	Inclusion of a persistent data store or repository for audit trails and system recovery.	Vital		
Idm.10.21	Quick response to user interactions	Ability to respond quickly to user interactions including report requests, access change requests, policy changes and password self-service.	Essential		

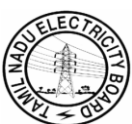


11.0 Module: System Security Requirement

Requirement ID	Functionality	Description	Criticality	Response	Comments
Ss.1		<u>Audit Trails and Reports</u>			
Ss.1.1	Tracking key system accesses	The system must be capable of generating log trails, which contain details about any read / write access to sensitive data. Details must relate activity to an identifiable person. They must be configurable, so that filters and switches can be used to lower performance overheads and focus on areas of concern. It is important that the audit trail that is generated contain enough information to support after-the-fact investigation of loss or impropriety.	Essential	C/ER/F/CR/ NC	
Ss.1.2	Time-stamp based auditing method	Where equipment uses a real-time clock to timestamp audit and other time related events, the clock should be regularly checked for synchronization with both connected systems and reference clock outside of the system, in this case the Indian Standard time. For daily reporting, this would ensure that the reports generated have some sanity given continuous data input	Essential		
Ss.1.3	Exception reporting	Where the security audit trail becomes unavailable for any reason, the system shall continue to operate but will trigger an alarm. Action shall be taken as soon as possible to rectify the situation	Vital		
Ss.1.4	Detailed system access tracking	System and application use and attempted use will be monitored to ensure that the integrity and security of the client and customer data is maintained. The documented process shall include details of: who will monitor what event and how, the frequency of monitoring, what to do when suspicious activity is noted, when to escalate and the escalation path. All events logged in the audit data shall be taken into account when deciding what to audit and the appropriate actions to take. The log must record the user or process responsible for the event, terminal ID where available, and the date and time of the event The following shall be monitored :- <ul style="list-style-type: none"> • Enabling and disabling of the audit process • Any changes to the type of events logged 	Essential		

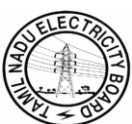
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		<p>by the audit trail</p> <ul style="list-style-type: none"> • Any changes to the audit trail itself • Start up parameters and any changes to them • System or application start-up and shut-down • Use of selected transactions • Changes to any of the data base or records 			
Ss.1.5	Maintaining audit trails	Audit records and journals shall be retained in a tamper proof environment in accordance with the Purchaser's policy for a reasonable amount of time to allow for accountability and evidential purposes. Backup copies shall also be maintained to protect against any accidental or deliberate erasure of data.	Vital		
Ss.1.6	Disaster recovery	A recovery options analysis shall be carried out to produce the practical options for those systems and networks, which are deemed to require recovery in the event of a disaster. The most effective option shall be chosen, taking into account the cost of recovery and the cost to the business of unavailability of the application.	Vital		
Ss.2		<u>System Integrity</u>			
Ss.2.1	User process protection	The system should be able to protect the user process and local data from other user.	Essential		
Ss.2.2	Version consistency checks	Mechanisms should be in place to ensure that the currently installed software has remained consistent with the delivered product.	Essential		
Ss.2.3	Versioning	Software used on systems/ applications shall be subject to version and change control to ensure that only the current authorized software is used at all user location.	Essential		
Ss.2.4	Modification of the system	Modification or replacement of the software provided with the system would require special privileges	Desirable		
Ss.2.5	System maintenance	Execution of system maintenance and repair software would require special privileges	Essential		



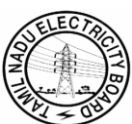
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Ss.2.6	Basic checks on data input	Data input to an application shall be validated by the application to ensure that the data is correct and appropriate. As a minimum, an application shall check input data is complete, within the required ranges, and contains no invalid characters. Procedures shall be established to deal with any input data violations.	Vital		
Ss.2.7	Time stamping modifications	The system should be able to track the date and time at which a resource was last modified.	Essential		
Ss.2.8	Integrity of data passed over a communication channel	The system should have in-built mechanisms e.g. checksums to verify the integrity of data passed over a communication channel.	Vital		
Ss.2.9	Data transfer lock	Where an encryption process used for data transfer fails and cannot be automatically corrected, then the transfer should not be completed.	Essential		
Ss.3		<u>Confidentiality</u>			
Ss.3.1	Use of encryption	The system should have the flexibility of encrypting the data stored online.	Essential		
Ss.3.2	Approval for cryptographic techniques	Any cryptographic techniques or encryption systems used to safeguard information shall have been approved by relevant authority on data security prior to their use.	Essential		
Ss.3.3	Approval for security components	Only security components which have been approved by the Purchaser shall be used to protect the Purchaser's sensitive information and processes.	Essential		
Ss.3.4	Documentation of encryption procedures	The procedures used to maintain confidentiality should be documented and access to them restricted.	Essential		
Ss.4		<u>Networking and Data Transfer</u>			
Ss.4.1	Authorized data transfer	All data transfers must be documented and authorized by the owner of the donor system. They must only be authorized where the receiving system has the capability to protect the data, i.e. it has an acceptable security rating.	Vital		
Ss.4.2	Inter system data Transfers	Data which is to be passed between systems shall be labeled to indicate the type and sensitivity of that data. The security policy for a system will state what data may be sent to, or received from, another system and will state the translation, if any, between the labeling of	Essential		



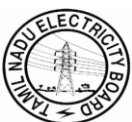
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		<p>the two systems.</p> <p>Interfaces that have been built - i.e. the data migration systems should have defined access rights.</p> <p>The interfaces should have a fixed enabling procedure - including the frequency with which the migration happens to and from the system, the data flow that would happen and the data items that would be frozen during such a migration.</p>			
Ss.5		<u>Customer needs</u>			
Ss.5.1	Documentation of risks and its mitigation strategy	System developers responsible for customization should consider and document the risks and associated mitigation in the design.	Essential		
Ss.5.2	Installation and configuration	Developers will document instructions on how the system is to be delivered, installed and configured in a secure manner.	Essential		
Ss.5.3	Startup documentation	Developers will document instructions for the secure start-up, re-start and operation of the system.	Vital		
Ss.5.4	Interface designing	Interface designs must include the capability to selectively deny access to certain types of data.	Essential		
Ss.5.5	Scope control	Vendor supplied software packages must not be modified outside of the scope recommended by the Purchaser.	Essential		
Ss.5.6	Software change control	<p>A mechanism for controlling software changes during development shall be implemented. This mechanism shall as a minimum ensure that :</p> <ol style="list-style-type: none"> a) The change is reviewed by appropriate groups prior to authorization, b) Changes are properly authorized prior to implementation, c) All change requests are logged. d) All associated documentation is altered along with the software change. e) Version control records are maintained. 	Essential		
Ss.5.7	Internal data	All applications shall be designed to minimize the risk of corruption by processing errors by building in validation checks, reconciliation checks etc. , where necessary.	Essential		



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Ss.5.8	Module and product testing	<p>All new and modified software to be used on system/application shall first be tested by expert personnel to ensure that the software have been subjected to the rigor of test and thereby -</p> <ul style="list-style-type: none"> a) Does not introduce added security risks b) Functions according to design specifications c) Does not adversely affect the operation of the system d) Introduces no unauthorized system changes. 	Essential		
Ss.6		Security of web services			
Ss. 6.1	XML based Web security schemas	<p>As web services have certain limitations with SSL type of security scheme, the web service technology shall be used with different XML-based security schemes. Some of the XML-based securities include the following: -</p> <ul style="list-style-type: none"> ➤ WS-Security ➤ XML digital signature ➤ XKMS (XML key Management Specifications) ➤ SAML (Secure Assertion Markup Language) ➤ ebXML Message Service <p>The bidder shall ensure content security, message level security and secure message delivery, meter data security policy, trust management and secure public key infrastructure while implementing web services using appropriate web security mechanism, which must be W3C/ OASIS compliant.</p>			



SECTION – G2 : PART-B

**APPLICATION PACKAGES FOR COMMERCIAL
OPERATION, viz. M, B, C**

12.0 Module: Development of Commercial Database of Consumers

The Commercial Database of Consumer is to be developed based on the Consumers Billing Database available with the Utility and the GIS based consumer and asset data base developed/being developed. The system to be developed and installed under this specification shall be capable of accepting the data as will be made available and capable of appending any necessary attribute etc. and performing the entire intended task. After the first installation, the database shall be updated online and taken into the system for routine functioning.

- a) The commercial data base development shall cover the following activities-
- Development of Master File of consumer comprising of consumer's details including Energy meter history as per Annexure-G of Section-G6 of this specification ,
 - meter reading,
 - energy consumption,
 - assessment,
 - payments and
 - other relevant data from the initial record and other relevant records to be provided by Utility.
 - Data model should support complex billing operations such as single bill for a customer having more than 1 connection and other such operations which require customer information at various layers.
 - In case of consumers on computerized billing system, data shall be provided in the form of soft copy as far as possible.
 - In case of consumers billed manually or new connection, data will be provided in the form of manuscript as per standard card code system.
- b) Development of well-designed layout / formats for Master Information Data in soft copy for easy reference and access, to be approved by Utility. The layout / formats will be properly defined and documented for reference to facilitate Data Management and print out as and when required.
- c) Updating of consumers' master file on the basis of the transaction advice from respective source from time to time in respect of energy consumption, payment made and any other changes to affect required modification in the Master Data.
- d) Undertaking consumers' master file listing in the prescribed format, compilation of corrected master file at the initial exercise of master file creation as detailed against 'a', 'b' and 'c' above, incorporating such corrections to consumers' master file on subsequent repetitive processing as detailed against item 'c' above, so that at any time master file of consumers and listing of such corrections / additions represents the correct status of consumers file record for reference.

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- e) Utility shall be providing the existing customer related information as available on records for starting the billing activity. In the Commercial Database available with Utility each consumer is allotted a Service Connection Number and Book Number. While developing database care is to be taken that each consumer is allotted unique identity number (generated during consumer indexing) so that with the help of that identity number it should be possible to identify the Consumer, Feeder, Distribution Transformer and the Substation feeding the consumer. Application should have the provision of bifurcation of one section into many and vice versa while maintaining the relationship between the old and the new consumer details.
- f) All data related to a consumer must be captured in database v.i.z. Consumer S.C Number, premise number, e-mail ID, Name, Meter number and make, CT/PT ratio, date of installation, date of testing, name of personnel employed for checking and sealing, billing address, supply address, phone number, customers tariff category, contracted load, special consumer status (like hospital, water works, govt. offices etc.) etc.
- g) GIS based index database has structured customer information on GIS based map with electrical system on the fore ground and all the Consumers are being coded and segregated 11 kV feeder wise and Distribution Transformer wise. In the Commercial Database to be developed, care has to be taken that Consumers are segregated Distribution Transformer wise, 11kV Feeder wise and 33/11 kV Substation wise so that there is no problem in Energy Accounting. More over any change taken place in customer information related to electrical network equipment due to addition/ modification of network in the base GIS system, the commercial database shall be automatically updated.
- h) The agency developing the system software shall provide with easy and convenient platform to integrate his software system with indexed Geographical and Electrical Database. The two systems (i.e. Customer indexing cum asset mapping system and billing system software) have to work in total unison such that any revision of data in one of the system should automatically update into related information in the other without any conflict. Wherever there is limitation on account of any cross system interaction, it has to be resolved and debugged by the supplier to the complete satisfaction of Utility.
- i) System must be able to support operations for variety of consumer like residential, industrial, commercial government, agriculture etc. History of consumption and payment for every consumer must be maintained even after account is closed or interrupted for a period of 10 years or as may be mutually decided with UTILITY.
- j) Complete data of the entire system for the past 2 years must be available on server. Data of prior period must be available on external media, which can be loaded on server as and when needed.
- k) The Commercial Database to be developed should be capable to interface with the Geographical and Electrical Database with the S.C. No. of the consumer being the link key between the two databases. Provision should be there that interfacing of the database should be possible with any other system that may be developed at a later stage.

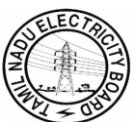
13.0 Module: Metering

Objective: An Effective meter reading system would enhance the effectiveness of the measurement process. This would include accurate metering for all customers and tapping revenue loss through the identification and handing of exceptions.

System Boundary: From: Consumption detail capturing To: Providing final reading

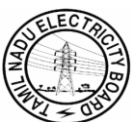
Specification Metering

Requirement ID	Functionality	Explanation	Criticality	Response	Comments
M1	Collecting meter readings in the metering database from remote meters	All the input points to the circle and feeders & related distribution transformers are having electronic meters. The data of all such meters will normally be downloaded on a central server located at data centre. The system should also be capable of interfacing with Spot billing devices and MRI data for uploading such meter readings including consumer meter readings. The detail specification of system meter data acquisition is in separate chapter as 'data logger'	Vital	C/ ER/F/ CR/ NC	
M2	Data Validation	System should provide data validation checks to minimize data entry errors. It should incorporate user supplied logics to check variations in consumption and generate exceptions. After data entry, the system should generate an Exception Report for non reading of meters due to any reason. A typical list of such exceptions has been listed at Annexure-F of Section G-6. It shall also highlight possible inconsistencies in the metering data. After handling of exceptions by the respective officials, the system should be updated with the result of exception handling. While validating if the meter reading found low / unacceptable based on earlier readings/trends the system should issue a work order for checking and replacement of meter. If the work orders are not closed with valid reason system should escalate the issue till the same is resolved	Vital	-do-	-do-
M3	Data Review	The system should provide the facility for the designated officials to review the metering	Essential	-do-	-do-



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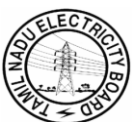
		data as per utility defined criteria. In case any discrepancy is found, the system will allow the data to be edited, with proper access rights and audit trails.			
M4	AMR Compatibility	The system should be able to interface with Automatic online Meter Reading devices. System should be capable to schedule and collect automatically readings from online connected consumer meters / Distribution Transformers meters through automatic meter reading system. The system should generate exception in case meter reading found unacceptable after validation check	Essential		
M5	Capturing Meter reading Data	The system should be capable of capturing meter reading data from a Meter Reading Book, handheld computers/CMRI used for spot metering & billing for uploading and downloading the data. System should be capable to upload and download the data for a given set or group of consumers to CMRI/HHC automatically. System should also keep log of CMRI Device/HHC assigned to meter reader. The system should have provision for storing check readings which can be used for assessment and analysis purposes, however this would not be utilized for the billing/utilized case to case basis.	Vital		
M6	Validations for the spot metering and billing data updated	The system should be able to transfer or update the meter reading validation logic to the MRI and spot billing machines. The system should have the flexibility of validating the data uploaded from the meter reading instruments. The validation would include restricting the customer data uploads to those that were indicated in the meter reader's schedule.	Essential		
M7	Prohibiting the wrong entry	The system shall also have provision for prompting the Meter Reader at the time of entering wrong meter reading values in the spot billing machine.	Essential		



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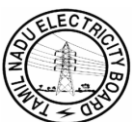
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M8	Meter reading plan generation	<p>System should generate meter-reading plan for day / week / fortnight by meter readers and provide it to the respective authorities. For generating meter reading plan system should take care of no of meter readers available with the customer and their productivity for coverage of all meters before due date. The business logic shall be provided by owner and owner should have a flexibility to modify the same. After generation of plan the same shall be sent to respective offices by e-mail/other mode, so that the meter reader can download the site/premise addresses of the meters to be read on that day.</p> <p>The system should be capable of-</p> <ul style="list-style-type: none"> i) Assigning individual MRIs to individual Readers to track their performance. ii) Generation of optimum route plan using the capabilities of the GIS and based on reading jobs (including re-reads if any) to be read in a given cycle in a given area/route to maximize the productivity of meter readers. iii) Optimization of meter plans whenever a new connection is "inserted" in a route, or an existing connection is disconnected and "deleted" from the route. iv) Reading plan should include disconnected connections also based on logic, and should exclude the same based on instruction from authorized user; reader should not be able to know from MRI whether a particular connection on his reading plan is supposed to be live or disconnected, for the purpose of tracing the connections wrongly marked disconnected where meter may still be at site. 	Essential		
M9	Monitoring meter reading plan	<p>The system should make it necessary for the meter readers to upload all the meter readings according to the itinerary generated within the timeframe stipulated by the utility. Otherwise exceptions should be generated and further meter reading can be entered only after clearance from specified authority. The system should track and generate the exception reports, for each meter reader to establish performance measures and determine deviations if any. It may include No. of meters planned, no. of meters actually read per day, no. of wrong readings, unread meters by reason etc.</p>	Essential		



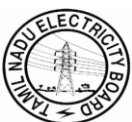
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M10	Monitoring Customer exception	The system should be able to track customer behavior in terms of exceptions. For example: The number of times a customer figures in the list of exceptions.	Essential		
M11	Supporting meter reading on trust	The system should also have the facility if desired by utility to enter the meter reading as specified by the customer by telephone/ fax/ web portal and record that the same is customer-specified. All customers who provide a reading on trust, should be inspected after a Utility specified time period. This would mean that a customer providing a reading on trust would be inspected once every 6/12 months for instance.	Essential		
M12	Overdue alert	In case a meter reading becomes overdue (Utility specified criteria), the system would generate the necessary exceptions and alerts.	Vital		
M13	Accepting change in metering cycle	The system should be in a position to cater to changes in the metering cycle. Metering in certain cases maybe TOD, hourly, daily, fortnightly etc.	Essential		
M14	Capability to store data for a specified period	The system should keep past metering data online for a period specified by the Utility & SERC guidelines from time to time.	Vital		
M15	Interfacing with spot billing and MRI instruments	The system will support data downloading to and uploading from handheld devices used for Spot metering & billing and MRI. The devices would provide information about the meter number, customer code, meter reader's employee no, meter reading with date and time stamping, billing amount, collection mode and collection amount in case the collection is made at the consumer premise itself.	Vital		
M16	Meter reading for temporary connections	The System should be capable of accepting opening, closing and intermediate meter readings for temporary connections for generation of bills for such connection.	Essential		
M17			Essenti		



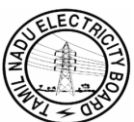
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	Final meter reading for closure of connection	For all kinds of disconnections (whether a customer requests for termination of connection or utility disconnects due to non payment), the system should accept the terminating meter reading (which will be out of cycle in most cases) for generating the last bill.	al		
M18	Lifecycle monitoring and testing plan for meters	System must be capable of capturing complete meter history throughout meter's lifecycle, starting from arrival in stores to type, Make, Model, Batch, Catalogue Number of meter, its place of installation, cycle and record of calibration/testing till it is being scrapped or destroyed. System must be capable of capturing data like ordinary meter, electronic meter etc. System must be able to identify the meters, which are due for mass replacement or scheduled testing/calibrations and generate a work order for action by field staff. It is desirable that system should be able to interact with meter testing devices for obtaining test report	Essenti al		
M19	MIS generation	System should be capable to monitor and track the following : Meter reader's performance, Comparison of input versus expected consumption, variance in consumption for consumers etc.	Vital		
M20	Tracking meter location	Current location of meter must be tracked i.e. in stores, under testing, at consumer premise, under overhauling etc. Data must be captured at appropriate locations and point of time to track the meter.	Essenti al		
M21	Tracking meter status	The system will track the current status of the meter. Various options would include Correct Meter, Stuck-Up Meter, Sluggish Meter, Door Lock etc.	Vital		
M22	Tracking meter/meter boxes Seals	Tracking & reconciliation of meter seals i.e. date, type no. of seals, sealed by condition of meter etc. including meter boxes.	Essenti al		
M23	Vigilance Report	The system shall be capable to prepare the vigilance report at site. Format will be finalized during implementation.	Vital		



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M24	Tracking the consumer	The system shall be capable to track the consumer who has been found to frequently indulge in theft and malpractices.	Essential		
M25	Tag the consumer on GIS map	The system shall be capable to tag the consumers / non-consumers / location / site on GIS map who was found to commit the theft.	Vital		



14.0 Module: Billing

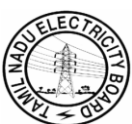
Objective: A comprehensive billing system will ensure that the utility efficiently bill their customers for the services rendered. It should support the continuous billing to reduce the outstanding. Ensure the timely and accurate billing. The system will support the complaints handling functionally by providing short turnaround times for billing related customer queries.

System Boundary: From: Accepting Consumption data To: Providing reminder letters

System Functionality: This system should broadly cover functions relating to generation, printing and issue of bills to the consumers. Specifications for various billing types, tracking of reasons for deviations from normal billing, billing logic flexibility etc. are some of the features that the system should address.

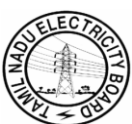
Specification Billing

Requirement ID	Functionality	Description	Criticality	Response	Comments
B1.	Unique Bill No	All bills generated by the system should be given a unique number	Vital	C/ ER/F/ CR/ NC	
B2.	Format of bill number	The logic for defining the bill number would be flexible and provided by the client. For example the system should be capable of generating bill numbers that are reflective of the Section Office, Subdivision, Division etc that the customer falls under. It should also capture the customer category and the billing month.	Vital	C/ ER/F/ CR/ NC	
B3.	Bill Calculation -Billing Logic flexibility	The Utility would provide the billing logic for generation of bills. This calculation logic will be flexible and the utility should be able to revise the billing logic from time to time depending upon the modifications in regulations, tariffs, etc. It should be possible to make these changes from a central location. It should be possible to manually modify the billing logic on a case to case basis, with alerts and within specified limits. The system should follow the same for computing the final bill amount and should generate bill in soft and hard forms for the all type of requisite customers with certain pre-defined periodicity. The periodicity may also vary from generating continuous bills for spot billing to bills once a year for particular type of customers like agricultural customers. The system should have the flexibility of defining the periodicity in bill processing. The system should have the capability to generate the bills either in batches or individually. System should also accept billing logic for	Vital	C/ ER/F/ CR/ NC	



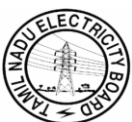
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		consumer purchased meters. Suitable rebate as per rule be provided for consumer purchased meters. System should have provision of - i) Auto-credit of penalty specified by SERC for Utility in case of deficiency of service to the consumer ii) Putting a certain bill amount under deferral due to stay order from court till the matter is decided.			
B4.	Transfer in billing logic	System should also support prepaid metering and billing system, if implemented by utility later on and should permit seamless transfer of existing customers from - i) post-paid to prepaid regime and back ii) Unmetered to metered regime iii) kWh based billing to kWh & kVAh based billing regime and back	Essential	C/ ER/F/ CR/ NC	
B5.	Meter data validation	The system shall be capable of identifying meter tampering data as per utility defined criteria and generate flags for operator intimation and further investigation. The billing system shall be capable of identifying faulty meters and preparation of bills considering a defined algorithm for estimation of consumption during such periods of meter faults. The bills shall indicate the estimated consumption separately. System shall also incorporate multiple meter changes in a single billing cycle, properly accounting old meter final consumption based on final reading (or assessment if functional reading is not available)	Vital		
B6.	Bar code generation	System should be capable of automatic generation of bar code and printing on the consumer's bill Using Code-39 or any other Universal standard; capable of generating Alphanumeric and all the special characters available on 'Microsoft-Word', Additional Capability to generate output in 'local language' script will be preferred.	Vital		
B7.	Billing logic download	System should be capable to download the billing logic to CMRI/HHC to facilitate spot billing at consumer premises using HHC/CMRI as and when required.	Vital		



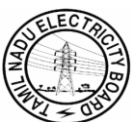
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B8.	Bill printing based on dispatch sequence	System must be able to automatically select and print those bills together in a desirable sequence for ease of distribution, which are under same reading cycle/group, convenient for walking order of meter readers/bill distributors.	Essential		
B9.	Group billing	System should allow for generation of common bill for a set of consumers with same or different due dates. The system should also have provision for generation of bill of multiple premises on a single bill for a single customer, if the customer has opted for the same. In case of advance payments the system should have a logic for adjusting such payments with the bill amounts of the same set of consumers with same or different due dates.	Essential		
B10.	Bill printing flexibility	System must support bill processing and printing either at workstation location or at the base billing center.	Essential		
B11.	Use of pre printed stationary	System must be able to print the bills either on pre-printed stationary or plain paper in Hindi/English/Local language as per directions of Utility.	Vital		
B12.	Interfacing with manual billing	The system should have the flexibility of capturing inputs manually to update the customer database on bills that have been manually generated, with a reason for the same. Such updates should be limited to specific logins.	Vital		
B13.	Bill on demand	The system should be capable of generating bills on demand by the customers. The system should have the provision of generating duplicate bills on demand from the customer - and have the provision for accepting payment details for the same. The system shall have provision to print duplicate bill of any past bill up to last 3 years (applicable after the software is rolled out)	Essential		
B14.	Bill correction/ amendment provisions	The system should have provision for Bill correction/amendment manually to update/ modify the customer billing database, with a reason for the same. Such bill amendments should be limited to specific logins. The system shall employ separate accounting process for bill amendments, which results in reversal of sales (Unit and Rs) booked (bill raised) in past financial years, i.e. prior to	Essential		



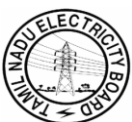
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		start of current year.			
B15.	Change of billing cycle	The system will have the capability to change billing cycle of a consumer. The changes would include - shifting to another cycle and increasing or decreasing the frequency of billing.	Essential		
B16.	Interfacing with special drives	If there is some special scheme for payments (e.g. Installments), then the system will generate the bills taking into account the special scheme provisions. Also, there would be codes for all the Schemes, so that the system can track their usage. There would be codes for all the Schemes so that the system can track their usage. The system will keep a record, as to who authorized the scheme (e.g. installment) and capture the details of the scheme.	Essential		
B17.	options for level payments	System should have options for level payments where in the customer can pay a fixed amount per month. In such a scheme, system should also provide for balancing the charges at the end of the year for any variations between the calculated amount (Fixed amount) Vs the actual charges the customer has incurred.	Desirable		
B18.	Penal Billing for unauthorized use of electricity	System should have provision to compute penal billing for unauthorized use of electricity, as per Electricity Act, and based on parameters defined by SERC a) Assessment based on sanctioned load / connected load / MDI b) Assessment based on error in meter accuracy due to tampering c) Penal tariff for theft / misuse.	Vital		
B19.	Linking consumer to appropriate tariff	The system should link the customer to the rate applicable to his category. The rate applicable is calculated on the basis of fixed charges, consumed energy, capacity (power consumption limit), taxes applicable, subsidy or support from the government, etc. System shall also have provision to account for retrospective changes in tariff / discount / subsidy announced by Govt. with effect from back date. In case of subsidized customer the system should calculate amount of subsidy payable against each bill and if utility want the subsidy amount can be printed on the bill for information of	Vital		



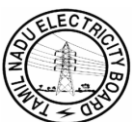
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		customer.			
B20.	Inclusion of past dues and surcharge	The system should calculate other dues for the customer (e.g. late payment charge, electricity duty surcharge, assessed amount, etc) and add them to the regular bill amount. If there are past dues, the system should calculate both the past dues and the fines on past dues as applicable. The system should allow flexibility to define and modify the logic for fine/ penalty calculation for different types of arrears as per the prevailing norms of the utility. If past dues are there the generated bill should include past dues. In case of any post facto extension of due date, system to have provisions to automatically waive late payment surcharge.	Vital		
B21.	Management of Security Deposit (SD):	The system should have provision of Managing Security Deposit (SD) like : i.) Refund of SD by adjustment in final Bill ii.) Interest payout on SD through auto-debit in bills or lump sum payout separately iii.) Adjustment of SD in prepaid charges for any consumer shifting from post-paid to prepaid regime iv.) Caution money deposits in case of New Connections should be treated as a Security Deposit.	Essential		
B22.	Billing with pre payment credit	If there is any credit on account of prepayment, adjustment etc., the system should be able to adjust the credit against the amount payable for the month and generate a zero or a negative bill.	Vital		
B23.	Estimate billing	As and when the metering data is validated in the system, it should be capable to generate bill under the normal billing cycle. In case of meter data is not available the system should generate an estimate bill based on the past consumption pattern of the customer. It shall also be possible to generate Estimate Bill for theft/enforcement cases. The system should also provide for change in the estimation logic that may happen from time to time. The system should incorporate the estimate for consumption from the metering module.	Vital		
B24.	Reasons for	The system will have a list of all standard	Vital		



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	estimate billing	reasons for estimate billing. The list will be compiled based upon the utility and SERC guidelines, which may change from time to time. The system should be capable of generating bills for all instances of exceptional readings. The scenarios under which exceptional readings are taken are temporary connections, voluntary termination, forced termination etc. The system will allow the bill amount to be modified by the designate authorities through their login ids only. All such changes along with the corresponding login ids will be tracked by the system.			
B25.	Electronic dispatch of bill/ availability of bills on internet portal of utility	The system should be capable to dispatch the generated bill electronically to customer/ payment portals to which customer is registered if desired by customer. The bill in actual format must also be available on utility's internet portal for customers. System must be able to inform customer regarding new bill along with due date & amount via SMS automatically. The system should allow generation of reminder letters at predefined intervals before the due date - over the web/ mobile phones/ paper formats.	Vital		
B26.	Discontinuing billing after dismantling	The system should have the provision of stopping the generation of bills and taking the arrears as bad debts, after a Purchaser specified period of time, say 6-12 months after dismantlement.	Desirable		
B27.	Billing for temporary connections.	The system should have the provision of preparation of Temporary Connection Energy Bill, with DISCOM defined Category and Charges. Provision for - <ul style="list-style-type: none"> ➤ Final Bill Proportion ➤ Fixed amount calculation (In case of first bill) ➤ Amount Shifted to next bill (if next bill is prepared in same month) ➤ Debit/Credit Adjustment (Unit or Amount) The system should have provision for automatic job creation for disconnection and final billing of temporary connections one day prior to the expiry of the duration for which the temporary connection was granted. The system should also have option to extend such temporary connections based	Vital		



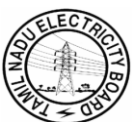
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		on utility defined authorization.			
B28.	Creation of monthly ledger	The system should provide the monthly ledger of the assessment and realization.	Vital		
B29.	Ledger adjustment	The system should have the provision for Debit/Credit Adjustment in ledger.	Essential		
B30.	Final reconciliation	The system should have the provision for Final Bill Reconciliation, in case of permanent disconnection and provision for final amount adjustment.	Essential		
B31.	Monthly report generation	Module can close Ledger monthly and generate assessment and realization report.	Vital		
B32.	Last bill generation	In case a customer requests for termination of connection, the system should accept the terminating meter reading (which will be out of cycle in most cases) for generating the last bill.	Vital		
B33.	Provision for holding bill printing till checked	System should have the provision of not allowing to print any bill of a cycle unless cleared by bill quality check group. System shall have post billing filters to outsort abnormal bills based on logic, so that such bills are not printed/sent to consumer by any mode.	Vital		
B34.	Bill distribution route plan generation	The system should have provision to generate optimal bill distributor route plan based on bill distribution jobs in a given area in a given cycle.	Desirable		
B35.	Enforcement and Legal Module : Logging of leads	System shall have provision to log leads of theft / misuse by : <ul style="list-style-type: none"> - Creating automatic leads based on consumption analysis and tamper analysis - Accepting lead through mail, website, phone calls, call centre or any other mode - Capturing the details of the lead contributor person, whether employee/outsider 	Desirable		
B36.	Enforcement and Legal Module : Lead processing	The system shall have provision of lead processing - workflow and life cycle tracking for : <ul style="list-style-type: none"> - Assessment billing - Public Hearing and bill revision - Payment and Settlement - Escalation & Legal proceedings 	Desirable		



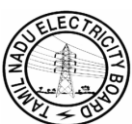
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		<ul style="list-style-type: none"> - Recovery of installments - Case closure 			
B37.	Detect doubtful consumer	The system should be able to detect the doubtful consumer by comparing consumption data of similar consumers category / consumption / amount / trend / previous consumption etc	Essential		
B38.	Analyze consumer consumption	System should be able to analyze consumer consumptions for a particular period and present the same graphically.	Essential		
B39.	Generate Disconnection Notice	System should be able to generate disconnection notice to the consumer, when theft or any other malpractice is detected.	Essential		
B40.	Notice to consumer	System should generate the notice to consumer / non- consumer and also be mailed or SMS	Essential		
B41.	Penalty realization	System should be able to track penalty realization	Essential		
B42.	Log court cases	System should be able to log court cases and proceedings	Essential		
B43.		Spot Billing System -			
B46.1	Downloading of data in spot billing system	The Spot Billing system shall enable meter reading activities by transferring relevant consumer information data base from Billing system, like service numbers, address, area code, meter number, phase, load, MF, old meter reading, old status, category, arrears if any etc.	Vital		
B46.2	Uploading of data in spot billing system	At the end of data collection and billing operation in the field, the information recorded in the spot billing machine should be uploaded into the Base Billing system for updating master database in the system. The information would contain the service number, present meter reading, present status of the meter, billed date and time, units consumed, average units, billed amount, due date, disconnection date, collections mode, collection amount in case the collection is done at the consumer	Vital		



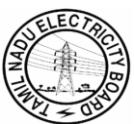
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		promise itself, etc.			
B46.3	Billing logic in spot billing system	The Spot Billing software to be resident in the HHE shall be based on the existing billing logic and algorithms of the utility.	Vital		
B46.4	Tariff revision cases	The HHE should be able to calculate the tariff rates accordingly with the previous and present rates during the assessment period, so as to issue the on date calculated demand to consumers under tariff revision period including number of days, slab rates etc.	Vital		
B46.5	Skipping of meter reading entry	The HHE should prompt for entry of present meter reading. If meter reading is skipped, average/units consumed for previous month from the master shall be calculated/retrieved and units for billing shall be displayed.	Vital		
B46.6	Entry of meter status	The HHE should prompt for entry of meter status and display of calculated units/Avg. Units (Avg. units is to be retrieved from the master data) depending upon the meter status.	Essential		
B46.7	Billing with charges / adjustments	The HHE shall prompt for any other adjustments/charges depending on the category of the consumer. Net bill is to be calculated after adjustment of above charges and should be displayed and prompt for printout shall be given.	Essential		
B46.8	Error checking	Extensive error checking shall be provided to assure data integrity during communications between the HHE and the PC.	Vital		
B46.9	Validation of meter reading data	Field validation for meter reading shall be ensured if the readings are beyond a predefined range and software will have provisions to enter remarks in such cases of abnormality.	Vital		
B46.10	Printing of summary report	Spot Billing system would print the summary report with HHC serial number, which contains the consumer file downloaded to the unit, total number of services, services billed / unbilled, total amount, collection etc.	Desirable		
B46.11	Password protection	HHE shall have two levels of Password Protection - Supervisory level for functions of upload, download, time setting and other supervisory functions and Meter Reader	Essential		



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		level for starting and closing the meter reading.			
B46.12	Event logging	All events should be recorded in the event file in HHE. The event details should be downloadable for analysis.	Essential		
B46.13	Menu driven modular format	The spot billing software shall be user friendly, menu driven, structured and modular format for flexibility (Easy changes / Up gradation etc.)	Vital		
B46.14	Time stamping of logged data	Data Logging in the spot billing machine shall be date and time stamped.	Vital		
B46.15	Provision for enhancing the functionality	There should be a provision for enhancing the functionality of the software by adding additional features.	Essential		
B46.16	Time setting of HHE	The HHE shall have the facility to get its time set from Billing system only with proper security and password authentication.	Essential		



15.0 Module: Collections

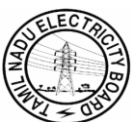
Objective : The system should provide different payment and information channels to customers and own staff to improve customer convenience for payments and enable collections for the energy billed, and a shorter metering-bill billing-collections (MBC) trade cycle
 System Boundary: From: Capturing payment details To: Generation of disconnection and dismantlement lists

Specification: Collection

Requirement ID	Functionality	Description	Criticality	Response	Comments
C1	Decentralized payment processing & centralized reconciliation	System must be capable of handling centralized or decentralized payment processing. And System must be capable of centralized reconciliation of the collection.	Vital	C/ ER/F/ CR/ NC	
C2	Linking payment logging id to	The system should capture all the customer and payment details as specified by the Utility time to time. All payments should be associated with the login-id of the personal receiving them and the collection center codes at which they were received. All collections should be made against specific bills/ forms to enable reconciliation at a later stage.	Vital		
C3	Mandatory reason code	In all Instances of collections without bill/ form the system should make it mandatory for the user to specify a reason from the predefined reason codes embedded in the system, and defined by the Utility time to time.	Essential		
C4	Code based Classification of collection	All collections will be classified against standard codes of payments that would be specified by the Utility from time to time.	Vital		
C5	Receipt generation	The system should generate a receipt whenever money is collected. Each receipt should have a unique receipt number. The system will allow payments to be collected under the payment categories indicated by Utility.	Vital		
C6	Adaptability to different mode of collection	System shall be capable to receive payments made by the consumer in either of the following modes: - Cash/ Cheque/ Bank Draft/ Credit Cards/ Debit Cards/ Internet Payment Gateway/spot collection or Payment made by direct debit from bank accounts on authorization by the consumer (ECS). Any other mode as may be specified by Utility from time to time. In certain cases (e.g. Advance Payments) collections can be accepted without the bill as well. System should have support of accepting payment through a single cheque against multiple bills and keep proper track against respective bills. Further, the system shall also allow the consumer	Vital		

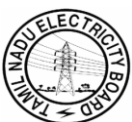
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		to pay one single bill through multiple modes i.e. through multiple cheques of different banks, by cash & cheque etc. The payments made by the consumers are to be acknowledged and accounted for in the respective databases. For payment made by the consumers at Collection Counter through Cheque/ Bank Draft computerized acknowledgement shall be issued to the consumers. System must be able to generate & send SMS automatically to customer for every payment received.			
C7	Handling of cheque payments	The system should have following functionalities : a) Holding recovery proceedings based on cheque submission, but recognition of payment on cheque clearance only. b) In case of cheque dishonour - i) Reversal of any payment recognized by the system ii) Levy of handling charges iii) Generation of Notice under Negotiable Instruments Act iv) Blocking of further payment by cheque till a defined timeframe/logic with appropriate message on bill for same.	Essential		
C8	Daily reconciliation of cash and bank	The system should generate a daily total for the receipts issued for the day. This would enable the daily reconciliation of the cash collected with the amount entered in the system as 'payment received'. The system should also capture all bank remittance details. At the end of a period, the system should reconcile them with the bank statements.	Vital		
C9	Acceptance of part/ advance payment	The system should have the flexibility to accept full, partial or advance payments. The system should also have the facility to centrally change these settings from time to time (e.g. - not accepting partial payments during the last few months of a financial year).	Essential		
C10	Interfacing with special drives	In certain cases (eg during special collection drives, collection by spot billing agent etc) collections are made in the field and receipts issued there. The system will have the provision for accepting the collections and receipt details for such field collections.	Vital		
C11	Generation of reminders/ disconnection	The system should allow generation of reminders by SMS/ letters at specified dates - before the payment due date, and notices for disconnection,	Essential		



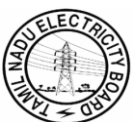
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	notice	dismantlement.			
C12	System ability to keep track of cancelled receipt	System shall be capable to cancel receipt at cash counters due to wrong punching etc. The details of cancelled receipt to be kept in the system and the same may be printed on the new receipt also. System should also provide to reverse the payment applied to a particular account in case errors are detected at a later stage, e.g. payment getting applied to a wrong customer.	Essential		
C13	Finance & Accounting	The system should have provision for - i) Automatic creation of books of accounts based on : - Balance Sheet and Profit & Loss Statement as per GAAP and Indian Companies Act 1956 - Annual Revenue Requirement, based on Electricity Act 2003 read in conjunction with SERC regulations ii) Meter to be treated as asset in ARR (may be treated as consumable material in other books of accounts) iii) Different payment settlement logic for various components of payment received from the consumer: - Energy Revenue (a) Revenue as per tariff : i. Subsidy/Discount outside normal tariff structure ii. Penal tariff in case of theft / misuse (b) Electricity Tax - Non-energy revenue (a) Charges for various services : Service Tax (b) Late Payment Surcharge (c) Penalty payout to consumer in case of deficiency of service (d) Interest payout to consumer on: i. Security Deposit ii. Advance Payment - FIFO/LIFO settlement logic specific to Utility's requirements, on the following buckets : (a) Arrears : i. Prior to certain period, inherited by Discom from	Essential		



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		<p>SEB as legacy</p> <p>ii. After the certain timeline, as accumulated by Discom (b) Current Demand</p> <p>iv) Payment settlement logic should take care of the following scenarios:</p> <ul style="list-style-type: none">- Part payment- Late payment- Surplus payment- Advance payment- Bill amendment after payment of bill			
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16.0 Module: Asset Management

Requirement ID	Functionality	Description	Criticality	Response	Comments
AM.1	Identification of business entity	The system shall have the ability to identify a business entity/district to which the equipment/assets belongs and also should be able to reorganize divisions, office codes, etc. in the case of organizational changes. The system shall have the ability to track from fixed assets to movable assets, line assets (cables, conduits) to underground assets, which run across business entities.	Vital	C/ ER/F/ CR/ NC	
AM.2	Creation of multiple asset grouping	The system should be able to create and define multiple asset grouping for each type of asset e.g. poles in a group of LT pole, 11 KV pole etc and again PCC Pole, Rail pole etc. The user should be able to classify the asset as per the defined asset groups.	Vital		
AM.3	Electronic certification of physical inventory	The system shall allow electronic certification of physical inventory for locations including, but not limited to: <ul style="list-style-type: none"> • Circles • Division • Sub division 	Vital		
AM.4	Creation of asset master records	The system shall have the ability to initiate the creation of asset master records from the process of creating and processing store issue documents. The system shall have the ability to identify potential fixed assets through Store transaction details.	Vital		
AM.5	Recording of purchase and all other historical information about asset	The system shall be able to record information such as the supplier, purchase dates, serial number against each individual piece of equipment. <ul style="list-style-type: none"> • Equipment / Asset identification number, Description • Serial number - Manufacturer - Model number • Year of manufacturing • Maintenance history for the equipment • Cost centre • Bill of Materials • Status (e.g. installed, repaired, in store) • Supplier, • Warrant period • Location etc 	Vital		

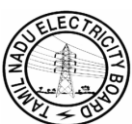
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AM.6	Analytical features	<p>The system shall be capable to record condition assessment calculation (condition analysis) as well as root cause analysis of failures (FMEA studies). Along with the risk factor (probability of failure), the consequence factor (criticality of the failure) should also be captured for each asset.</p> <p>The system shall also be able to analyze the stress levels on the assets (accelerated ageing) from the data of AMR/SCADA/ DMS.</p>	Vital		
AM.7	Tracking of insurance values	The system shall have the ability to track insurance values (e.g., replacement value).	Vital		
AM.8	Capability to update/ regroup individual asset record	The system shall have the ability for the user to make subsequent updates to grouped or component assets. (e.g., the user may acquire, retire or transfer one component of a group of assets). The system shall provide the capability to update the individual asset record and to re-group into an existing group or component structure.	Essential		
AM.9	Review and approval of assets assigned to his unit on transfer of BUH	The system shall allow the incoming and (or) outgoing Business Unit head to review and approve assets assigned to his Business Unit whenever transfer of personnel takes place. The system shall support this function with reports of assets under BUH's control.	Vital		
AM.10	Maintaining the list of spares with their part no.	<p>The system should be able to maintain the list of spares along with their part no for each equipment. The system should also be able to group equipments of same make and rating for the purpose of assessment of spares requirement.</p> <p>To avoid stock out situations and ensure minimum inventory carrying costs, the system should be able to prompt for replenishing of spares, optimal re-order levels for major assets and also for re-ordering of daily consumables.</p>	Essential		
AM.11	Capability to scan bar code tags and upload the inventory	The system shall provide the capability to scan their own bar code tags and automatically upload the physical inventory for review, reconciliation, and approval.	Essential		
AM.12	Furnishing of condition of the asset on the date of physical inventory	<p>The system shall allow utilities to provide a 'condition of the asset' at the date of physical inventory. Examples include:</p> <ul style="list-style-type: none"> • New • Good • Poor • Broken 	Vital		
AM.13	Recording of a	The system shall allow utilities to record a 'date	Essen		



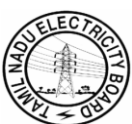
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	date of physical inventory	of physical inventory' when inventory counts of physical assets take place.	tial		
AM.14	Provision for mass updates to a physical inventory date field	The system shall allow utilities to provide mass updates to a physical inventory date field. This would be required for agencies that complete their inventory at one time and wish to update all of their assets with one transaction.	Essential		
AM.15	Capability to identify missed or non updated assets	The system shall allow utilities to provide the capability to identify all assets that have been missed and not updated by the physical inventory process, or to identify all assets in the following categories : <ul style="list-style-type: none"> • Missing or lost • Stolen • Destroyed • Under disposal review 	Essential		
AM.16	Capability to identify vehicles and other assets	The system shall provide the capability to identify vehicles and other assets that have been purchased or leased via various methods.	Essential		
AM.17	Provision of workflow to identify and route lease renewals	The system shall provide workflow to identify and route possible lease renewals to the appropriate user.	Essential		
AM.18	Insurance claims related asset tracking	The system shall allow asset tracking and reporting related to insurance claims and insurance recoveries.	Essential		
AM.19	Provision for asset transfer transaction	The system shall provide an asset transfer transaction for collaborative data entry. This shall include the capability to enter and save partially completed asset transfers. This could include allowing the transferring agency to complete their portion of a transfer and to allow the document to be saved. At a later date, the receiving agency could access the transaction for completion and posting of the final transfer.	Essential		
AM.20	Generation of reports on cost of new assets	The system shall generate reports detailing the cost of new assets acquired to replace an asset lost, missing, stolen, or destroyed.	Vital		
AM.21	Provision to deactivate an asset	The system shall provide the ability to deactivate an asset when removed for maintenance and allow reactivation based on proper authorization.	Vital		
AM.22	Allowing and tracking of adjustments to historical cost	The system shall allow and track adjustments to historical cost (e.g., An isolator which was captured as part of the original cost of the substation is transferred, requiring the original cost of the Sub station to reflect the adjusted cost base).	Essential		



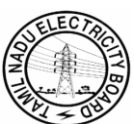
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AM.23	Online viewing and search of fixed asset policy and procedures	The system shall have the ability to allow agency asset managers to view and search official fixed asset policy and procedures online or via web browser.	Essential		
AM.24	Creation of population table for identifying ownership and maintenance responsibility	The system shall contain a population table for the purpose of identifying ownership and maintenance responsibility for equipments.	Vital		
AM.25	Provision for different depreciation schedules and methods	The system shall allow different depreciation schedules and methods for different assets within an asset group.	Vital		
AM.26	Classification of assets	The system shall allow for major asset class (e.g., personal property (including vehicles), buildings (new, improvements, renovations), land, land improvements, infrastructure, leasehold improvements, and construction in progress) dependent features for tracking and reporting data elements. The system shall also be able to identify and classify the assets as per its criticality in improving the system reliability indices (SAIDI, SAIFI etc). For reliability based asset management, the system should also be able to perform reliability analysis (N-1 criteria) or other applicable criteria.	Vital		
AM.27	Tracking of an alternate replacement date	The system shall be capable of tracking an alternate replacement date besides useful life expiration date.	Essential		
AM.28	Ability to link asset master records to other asset master records	The system shall have the ability to link asset master records to other asset master records for grouping (Custodian) Assignment. The system shall have the ability to flexibly track assets (parent to child relationships), to effectively have asset structures record component and 'complex' assets, essentially allowing a 'roll up' feature (e.g., the individual asset values for routers will roll up to the asset value for the network rack, which is the asset master record).	Desirable		
AM.29	Creation and maintenance of coding table	The system shall have the capability to create and maintain both central and agency dependent coding tables for all tracking fields (e.g., location, sub divisions, etc.).	Essential		



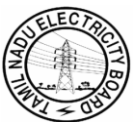
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AM.30	Uniform naming conventions	The system shall have uniform naming conventions for coding employees, integrated with the HR employee number, name, or other unique identifier when assigning an asset to an employee or custodian.	Essential		
AM.31	Provision of mass adjustment facility	The system shall allow mass adjustment functionality (e.g., useful life for building changes from 25 to 30 years) to update all assets in that category.	Essential		
AM.32	Provision to track multiple location codes	The system shall have the ability to track multiple location codes. These codes would provide Utilities with the ability to identify where the assets are located, including but not limited to : <ul style="list-style-type: none"> • Sub station • Feeder • Buildings 	Essential		
AM.33	Provision of multiple responsibility codes.	The system shall provide agencies with multiple responsibility codes. These codes would provide agencies with the ability to identify who is responsible for the asset, including but not limited to : <ul style="list-style-type: none"> • Department assignment • Organization assignment • Group assignment • Individual assigned responsibility • Program responsible • District responsible • Supervisor responsible 	Essential		
AM.34	Identification of maintenance or capital cost	The system shall allow for the identification of maintenance or capital costs performed.	Essential		
AM.35	Generation of an asset record status	Shall have the ability to establish an asset record status based on a 'level of completeness' and update that status and master record.	Essential		
AM.36	Integration with web-based GIS information	The system shall allow integration of web-based GIS (geographic information system) information, such as X, Y coordinates.	Vital		
AM.37	Provision of flexible selection criteria.	The system shall provide flexible selection criteria in asset management reporting (e.g., site locations and vehicles).	Essential		
AM.38	Tracking and reporting of statistical information	The system shall have the ability to track and report statistical information.	Vital		
AM.39	Provision of insurance reporting	The system shall have insurance reporting for risk management.	Essential		



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AM.40	Life cycle cost analysis and calculation of replacement costs of asset	The system shall calculate replacement costs by tracking current or forecasted values. The system shall also be capable of performing life cycle cost analysis to maintain a balance between system reliability and cost incurred over the assets life cycle and to facilitate decision to continue with maintenance of the asset or replace the same.	Essential		
AM.41	Generation of capital asset activity report	The system shall have the ability to produce capital asset activity reports by agency, asset class and fund source.	Essential		



17.0 Module: Maintenance Management

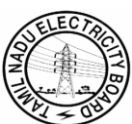
Objective : For better planning and co-ordination of various maintenance activities, reduce breakdowns by inculcating the culture of preventive and predictive maintenance, to maintain maintenance history, to review and control maintenance costs and providing a feedback to management for timely decision making.

Specification: Maintenance Management System

Requirement ID	Functionality	Description	Criticality	Response	Comments
MM.1.0		General Features and Scope of Work: -			
MM.1.1	Co-ordination between various Maintenance works	Ability to provide a means to co-ordinate various maintenance work being planned (e.g. corrective, preventive, breakdown and predictive maintenance related work).	Vital	C/ER/F/CR/ NC	
MM.1.2	Printing of shutdown notices	Ability to print shutdown notices for potentially affected customers and integrate with Customer Care System, which can send SMS to such customers automatically. System shall also have ability to print excavation permits for underground works for the purpose of attending cable faults and related maintenance activities.	Vital		
MM.1.3	Review of planned maintenance works	Ability to review any outages/ overhaul / shutdowns being planned, and the maintenance work planned to be performed during that period.	Desirable		
MM.1.4	Support for predictive maintenance	Ability to support Predictive Maintenance, where specific equipment data (e.g. noise level, meter reading, abnormal temperature at line joints etc.) can be recorded and monitored for automatic creation of maintenance work order, in case certain event occur (e.g. meter reading is at danger level).	Vital		
MM.1.5	Forecasting of future corrective works	Ability to support the forecasting of future corrective work for next 12 months (user-definable period). An analysis of historical work will be used to forecast future corrective work. Such an exercise would likely include an analysis of the incidence of certain classes of failures, analysis of causes of failure etc.	Essential		
MM.1.6	Automatic creation of work orders	Ability to automatically trigger the creation of Work Orders for single equipment or group of equipments based on equipment condition monitoring results, maintenance strategies and associated criteria. These Work Orders should in	Vital		

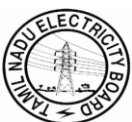
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		turn be based on a Standard Job capable of storing all job requirement information.			
MM.1.7	Flagging of statutory works	Ability to flag work units created for statutory or regulatory reasons.	Essential		
MM.1.8	Automatic generation of WO after expiry of warranty	Ability to generate work orders automatically when a particular asset's warranty is soon to expire. This would be used to trigger maintenance checks / inspections prior to the warranty expiring.	Vital		
MM.1.9	Forecasting of planned maintenance jobs	Forecast Maintenance Activities - Ability to forecast planned / preventive maintenance for next 12 months (user-definable period) based on maintenance strategies / triggers. The forecast should apply both time and operational / conditional triggers to predict, 'when' maintenance activities will be required.	Vital		
MM.1.10	Automatic creation of WO as per maintenance schedule	Ability to schedule maintenance plan for automatic creation of work order, based on : <ul style="list-style-type: none"> - Time (calendar date or fixed time interval) - Activity (counter based) - Time and activity based on which ever is earlier basis. 	Vital		
MM.1.11	Time based creation of WO	Ability to maintain time based criteria for the creation of work units. This refers to maintenance strategies based on time (e.g. Perform statutory inspection every twelve months).	Vital		
MM.1.12	Usage based creation of WO	Ability to Maintain Usage Based Criteria for the creation of work units. This refers to maintenance strategies based on equipment usage (e.g. Perform circuit breaker maintenance every 500 operations).	Vital		
MM.1.13	User defined creation of WO	Ability to maintain user defined maintenance criteria for the creation of work units. Any special maintenance strategies defined by users.	Vital		
MM.1.14	Automatic generation of schedule, priority etc.	Ability to automatically generate a recommended schedule / shift pattern based on work order due dates, work order priorities / criticality, resource availability, Feeder / location / geography. Also, ability to automatically schedule down to work crew level triggered preventive maintenance work orders and priority jobs.	Vital		
MM.1.15	Identification of opportunity maintenance jobs	Ability to identify opportunity maintenance. Opportunities arise through: <ul style="list-style-type: none"> - Review of outstanding work orders on specific items of equipment - Examination of the work 'mode' that identifies the outage requirements for the work and consequently the down-stream activities that can be performed. - Review of condition monitoring data for the equipment and 'related' equipment. - Review of future preventive maintenance 	Vital		



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		<p>tasks.</p> <ul style="list-style-type: none"> - Review of location of work and identification of work, which may be performed within a geographical area. 			
MM.1.16	Creation of short/medium term planning	The short to medium term maintenance planning horizon is on a monthly basis and should be approximately at least 12 months long. Ability to support the update of the plan on a regular basis.	Vital		
MM.1.17	Resource planning and review	Ability to review resources available compared with resources required to undertake the work. Resources may be either individual skills or work groups (e.g. teams / crews) or special tools & tackle. Also, ability to identify resource shortfalls in suggested schedule.	Vital		
MM.1.18	Search inquiry on Work request and WO	Ability to inquire on Work Request and Work Order through inbuilt system searches.	Vital		
MM.1.19	Location of WO on customer reference	Ability to use a customer reference to locate a Work Request or Work Order and ascertain progress.	Vital		
MM.1.20	Graphical depiction of online schedule	<p>Ability to graphically depict and manipulate online schedules in the form of GANTT charts by multiple variables including:</p> <ul style="list-style-type: none"> - Period - Date (Between two dates) - Time (Days/Hours/Weeks/Months/Years) - Work Group/Branch - individual - Work Order Type (preventive, corrective, fault type) - Work Order Relationship (Parent, Child, Peer to Peer) - Skill or Resource - Location - Tools - Equipment/Plant 	Essential		
MM.1.21	Creation of snap shot of schedule	Ability to take a 'snap-shot' of the schedule for the purpose of forwarding the schedule to the appropriate person (supervisor) to review and approve via workflow.	Essential		
MM.1.22	Creation of customer appointment schedule	Ability to schedule work for customer appointments (generally for new connections) allowing for several appointments per day by either an individual or crew. Such calls will initially be recorded in the Utility's Call Centre.	Essential		
MM.1.23	Rescheduling of planned works	It should also be possible to change the planned execution date for the maintenance work while providing a means to co-ordinate all related works at a particular location and time.	Vital		
MM.1.24	Creation of bulk schedule	Ability to bulk schedule and bulk approve.	Essential		
MM.1.25	Creation of bulk schedule and slip	Ability to bulk reschedule and slip schedule (i.e. Remove work from the schedule and move to open periods), e.g. cater for storms and other high	Essential		



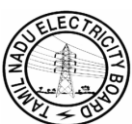
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	schedule	priority events. This should be able to be performed graphically by dragging and dropping GANTT chart objects. Scheduling should be allowed across districts, and/or divisions, sub divisions, work groups, types or grouping of assets.			
MM.1.26	Creation of Inspection work parcels	Inspection work will be sub-divided into manageable parcels using the asset relationships held within the GIS system (either by polygon or network). Work parcels will be prepared by nominating the inspection activities to be applied to the asset. Inspection tasks will be required to be held as standard jobs in the maintenance management system.	Vital		
MM.1.27	Downloading of inspection work parcels	Ability to download inspection work parcels into a format readable by work crew, who perform the inspections.	Vital		
MM.1.28	Generation of work parcels based on network activity	Ability to generate work parcels by nominating a network activity to be applied to the asset. The subsequent work will be required to be held as standard jobs in the maintenance management system.	Essential		
MM.1.29	Forecasting and planning for labour requirements	Ability to forecast labor requirements and support labour planning in terms of both quantities and skills based on work forecasts. Labour planning would include structure and size of work crews, individual skills and involve analysis of worker leave patterns.	Vital		
MM.1.30	Forecasting and planning for contractor requirements	Ability to forecast contractor requirements and support contractor planning based on work forecasts.	Vital		
MM.1.31	Forecasting and planning for T&P requirements	Ability to forecast maintenance plant / tool requirements and support maintenance plant / tool planning based on work forecasts.	Vital		
MM.1.32	Forecasting and planning for material requirements	Ability to forecast materials requirements and support materials planning based on work forecasts.	Vital		
MM.1.33	Work plan as a series of work parcels	Ability to hold the work plan as a series of work parcels tied to specific time period - i.e. Months, Weeks etc.	Essential		
MM.1.34	Updation of long term plans	Ability to update the long-term plan for a business division or department.	Essential		
MM.1.35	Tracing of movement and usage	Ability to trace movement and usage. History of the movement of traced components will be performed largely automatically. The allowing details will be maintained / available: - Acquisition details (order no, date and price); - Issue details (requisition no and date); - Installation details	Desirable		



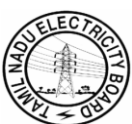
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		(equipment identifier, date installed and removed); - Repair details (technical description, costs, dates, operating statistic e.g. hours); - Operational and condition statistics of installed equipment (e.g. failure rates, outputs, vibration results, oil samples etc)			
MM.1.36	Integration with Materials, HR and Finance	Ability to integrate with the Materials, HR and Finance management system in future.	Vital		
MM.2.0		Work Requests			
MM.2.1	Creation, review and deletion of work requests	Ability to create, maintain and review work requests and delete them if they are not required.	Vital		
MM.2.2	Creation of Work requests	Ability to raise maintenance Work Requests after receiving notification from operations about a breakdown. The Work Request should then be capable of actioning / triggering electronic notification to the maintenance supervisor.	Vital		
MM.2.3	Capturing of all job requests	Ability to capture maintenance job requests from a variety of groups and systems in addition to Operations, Maintenance personnel of the utility, which includes external customers via the Internet, Fax, letter Telephone or Modem through the utility's interfacing Systems/Call centres.	Essential		
MM.2.4	Search capability for all work requests	Ability to easily review / search for equipment related Work Request and/or any other Work Request problem e.g. graphical, Colloquial searches for equipment IDs, drop down menus for selectable fields and sizeable descriptive fields for recording job/fault information.	Essential		
MM.2.5	Classification of work requests	Ability to classify Work Request/Work Order by user defined variables. For example safety, modification, new work, rework, breakdown, preventive etc.. It should be possible to report by each of these classifications.	Essential		
MM.2.6	Prioritization of work requests	Ability to assign a priority to a Work Request.	Vital		
MM.2.7	Ability to view any work request	Ability to view details of any outstanding Work Requests on a specific job or related piece of equipment in order to avoid duplicating work requests. Also, ability to link / reference a Work Request against a customer reference or location.	Vital		
MM.2.8	Status of a work request	Ability to record the status of a Work Request via user defined variables eg. Awaiting approval etc.	Vital		
MM.2.9	Feedback to requestor	Ability to inform requestor via e-mail or otherwise upon approval / rejection of Work Request.	Vital		
MM.2.10	Automatic	Ability to automatically and manually create / link	Vital		



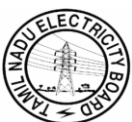
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	creation/ linking of WO to a work request	Work Orders to a Work request.			
MM.2.11	Transfer of information from work request to WO	Ability to transfer (manually or automatically) information captured within a Work Request directly into a Work Order fields e.g. Job Type. Once entered in the Work Order, it should be possible to alter this information e.g. fault description.	Vital		
MM.2.12	Establishment of Service level targets	Ability to establish Service Level targets against a Work Request. These targets could be time, financial and/or quality based. The ability to report on these targets should also exist.	Desirable		
MM.2.13	Defining of work	Ability to clearly define work, in terms of attributes (nature, type, driver etc), by populating fields and allowing user to enter a suitable long/short text description.	Desirable		
MM.2.14	Defining of critical dates	Ability to define critical dates against a Work Request. e.g. Required By date.	Vital		
MM.2.15	Approval to closure of request online	Ability to approve, maintain, complete and close Work Request online.	Vital		
MM.3.0		Work Orders			
MM.3.1	Creation, review and deletion of WO	Ability to create, maintain and delete Work Orders.	Vital		
MM.3.2	Creation of Work orders	Ability to create a work order for all types of work by estimating the job duration, resource requirements, material requirements, contractor requirements and allocate a work priority and mode to the request. The mode refers to the requirement for and type of 'outage'. The work order shall also identify the labor type and/or crew (s) allocated to the work, description of the work and the duration of the work. It is likely that for Emergency work, the Work Order details could be provided in via an electronic interface.	Vital		
MM.3.3	Generation of WO number	The Work Order reference number should accommodate existing numbering and naming conventions used by the utility.	Essential		
MM.3.4	Linkage of WO with account code	Ability to link a Work Order to a financial account code.	Essential		
MM.3.5	Defining of critical dates for a WO	Ability to define critical dates against a Work Order e.g. Required By date, planned start date, planned end date, job duration etc.	Essential		
MM.3.6	Format of a	The Work Order details should include but not be	Essential		



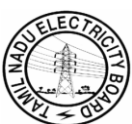
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	WO	<p>limited to:</p> <ul style="list-style-type: none"> ➤ Work Order type (e.g. corrective, preventive, breakdown etc.) ➤ Sub categories within a Work Order type ➤ Detailed description ➤ Work Order tasks ➤ Planned start/end date and duration for work ➤ Asset object requiring attention (e.g. equipment, function, location) ➤ Work instructions/tasks ➤ Any safety procedures ➤ Material (spare parts, stock and non stock items) required ➤ Estimation of manpower (internal and external labor) requirement ➤ Labor skill level ➤ Work permit ➤ Planned cost ➤ Cost centre/project code etc. 			
MM.3.7	Linking of WO	Ability to link/reference a Work Order against a piece or group of equipment, customer reference or location.	Essential		
MM.3.8	Creation of multi WO tasks	Ability to create multiple Work Order tasks against a Work Order.	Essential		
MM.3.9	Defining of work requirements	Ability to define work requirements (plan/ labour/ equipment/ other) against the Work Order.	Essential		
MM.3.10	Review of WO priorities	Ability to assign and review Work Order priorities.	Essential		
MM.3.11	Postponement of WO	Ability to postpone Work Orders to a certain date or to a specific shutdown period.	Vital		
MM.3.12	Ability to change a WO	Ability to make changes to a Work Order (e.g. change maintenance steps, change material requirements, change labour requirements).	Essential		
MM.3.13	Ability to view details of a WO	Ability to view details of any outstanding Work Orders on specific or related pieces of equipment.	Essential		
MM.3.14	Recording the status of a WO	Ability to record the status of a Work Order via user defined variables e.g. on stand-by awaiting materials, partially closed, closed etc.	Essential		
MM.3.15	Generation of WO based on maintenance triggers	<p>Ability to generate Work Orders based on maintenance triggers. Work Orders for Preventative Maintenance tasks may be generated in the following ways :</p> <ul style="list-style-type: none"> ➤ Automatically ➤ Automatically requiring approval / authorization ➤ Manually 	Essential		



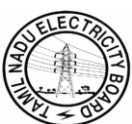
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MM.3.16	Automatic waiver of a WO	Ability to automatically identify and waive a Work Order, if a previous activity has already taken place that satisfied the work requirement.	Essential		
MM.3.17	Online approval of WO	The ability to approve work orders on-line via workflow is required. This could be performed by different incumbents within the organization, depending on work order size/cost, priority, mode and Delegated Financial Authority levels etc. If a work order is not approved within a specified time it should be forwarded to the next appropriate person.	Essential		
MM.3.18	Closure of WO online	Ability to maintain, complete and close Work Orders online.	Essential		
MM.3.19	Adjustment in WO	Ability to adjust all elements of the Work Order including : <ul style="list-style-type: none"> ➤ Materials ➤ Resources ➤ Tools ➤ Timings 	Essential		
MM.3.20	Creation of an emergency WO	Ability to create and issue an emergency Work Order that does not require approval. An audit trail will record the user who authorized the Work Order.	Vital		
MM.3.21	Review of maintenance history	Ability to review maintenance history for a specific item of equipment and/or on a particular manufacturer based on Work Order history.	Desirable		
MM.3.22	Attachment of documents to a WO	Ability to attach documents to a Work Order including detailed work instructions, safety requirements and checklists, drawings etc. Upon issue of a Work Order, it should be optional as to whether attachments are printed automatically or at the discretion of the user.	Desirable		
MM.3.23	Review and printing of tech information	Ability to review and print any technical information associated with the work parcel.	Desirable		
MM.3.24	Status on warranty	Ability to check whether there are any current warranties on the equipment, or 'related' equipment. This will require a link to the equipment database where all warranty information will be kept.	Desirable		
MM.3.25	Bulk creation of WO	Ability to create Work Orders in bulk using a pre-selected set of fields.	Essential		
MM.3.26	Bulk updation of WO	Ability to bulk update information for a number of Work Orders.	Essential		
MM.3.27	Search criteria on group of WO	Ability to specifically target a group of Work Orders during a search - based on Work Order fields populated by the user.	Desirable		
MM.3.28	Viewing of bulk WO information	Ability to view bulk Work Order information and manipulate this information based on user requirements. These modifications should include filed/code updates and/or generic description/information input into the Work Orders description	Essential		



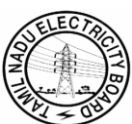
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		/ extended description.			
MM.3.29	Issue of warning / alarm in case of non completion	Ability to notify relevant personnel or issue a warning/alarm, if a Work Order has not been completed after certain period of time.	Essential		
MM.3.30	Generation of work permit requisition	Ability to generate a requisition of permit in order to isolate equipments for maintenance.	Vital		
MM.3.31	Status of permits	Ability to identify all permits issued/outstanding in relation to a particular piece of equipment or groups of equipment.	Vital		
MM.3.32	Automatic creation of resource requisition	Once work has been scheduled requisitions are automatically raised for materials and contractors. These requisitions should not require additional approval i.e. Once the work order is approved all related business objects that require approval should be approved.	Essential		
MM.3.33	Automatic dispatch of work to crews	Ability to dispatch work to crews automatically (Manually function should be able to overwrite the automatic function.) based on user defined criteria.	Vital		
MM.3.34	Integration with mobile messaging and CC system	Ability to integrate with Mobile messaging and/or Internet systems for electronic dispatch of work to work groups or crews via Utility's Customer care system.	Vital		
MM.3.35	Modification in work crew / teams	Ability to create, review and modify the structure and make-up of the work teams / crews including skills and competency requirements.	Desirable		
MM.4.0		Standard Jobs			
MM.4.1	Creation of standard jobs	Ability to create, retain and use standard jobs including specification of tasks, materials requirements, labour, hours and skills and contractor hours and skills, in-house and outsourced tools / plant requirements, outage requirements, priorities, accounting information etc.	Essential		
MM.4.2	Creation of standard jobs for specific equipments	Ability to create standard maintenance jobs for activities involving specific equipment, specific 'classes' or 'groups' of equipment or some 'general' jobs.	Essential		
MM.4.3	Creation of standard jobs for specific conditions	Ability to use standard jobs to create Work Orders resulting from condition results.	Essential		
MM.4.4	Creation of standard jobs for scheduled tasks	Ability to use standard jobs to create Work Orders for work originated from Maintenance Scheduled Tasks.	Essential		



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MM.4.5	Classification of standard jobs	Ability to classify standard job. Due to the anticipated number of standard jobs, an easy-to-use classification system for standard jobs/Work Orders is required. For example this system may be dependent on the equipment hierarchy, equipment class, location etc.	Essential		
MM.4.6	Isolation requirement for a standard job	Ability to link a standard job to any isolation procedures required (e.g. need to shutdown certain part of a plant).	Essential		
MM.4.7	Linkage of documents to a standard job	Ability to link to a standard job(s) any required documents including technical information, safety instructions, method sheets, checklists etc.	Essential		
MM.4.8	Tasks during a standard job	Ability to specify the type of tasks that will be performed during a standard job.	Essential		
MM.4.9	Linkage of safety documents to a standard job	Ability to link to a standard job any required safety instructions. Linkage is also required to be maintained to Safety procedures within externally maintained documentation.	Essential		
MM.4.10	Linkage of inspection checklists to a standard job	Ability to link a standard job to any inspection checklists.	Essential		
MM.5.0		Backlogs			
MM.5.1	Viewing of backlogs	Ability to view all work, review the backlog, and availability of resources to see which of the jobs can be absorbed into the current or next schedulable period(s). All work, including backlog, should be able to be reviewed by user-defined codes e.g. Fault type.	Essential		
MM.5.2	Graphical representation of backlogs	Ability to graphically indicate all backlog work.	Desirable		
MM.5.3	Actioning on backlog work	Ability to bulk re-schedule, cancel, close or postpone backlog work.	Desirable		
MM.6.0		Work Flow Functionality			
MM.6.1	Workflow tracking function	Ability to perform work flow and job tracking functionalities.	Essential		
MM.6.2	Structuring of workflow as per utility BP	The Work flow functionality should be able to be structured according to utility's business processes.	Essential		
MM.6.3	Graphical representation of a process	Ability to provide a graphical representation of a process in terms of : <ul style="list-style-type: none"> - Roles - Tasks - Tools - Processes 	Desirable		
MM.6.4	Definition of process rules with help	The work flow functionality should be able to define process rules with help options from drop down lists.	Essential		



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	options				
MM.6.5	Creation of work units & linking with equipment	Based on certain process options and actions, the work flow function should be able to create work units and link them to appropriate equipment information.	Desirable		
MM.6.6	Creation of work flow related jobs	Ability to utilize standard jobs and job estimates in the creation of Work Flow related jobs/work parcels.	Essential		
MM.6.7	Automatic alert options in a work flow	The work flow should be able to automatically alert or notify on : <ul style="list-style-type: none"> - Tasks completion - Approval - Exceed Service Levels 	Desirable		
MM.6.8	Prioritization	Ability to priorities work - automatically and manually.	Desirable		
MM.6.9	Conductance of statistical analysis	Ability to conduct statistical analysis such as: average time to complete, average workload (by individual and work groups) etc.	Vital		
MM.6.10	Providing support in work steps and control elements	Ability to support work steps and control elements such as: <ul style="list-style-type: none"> - Sending & editing messages - Scheduling - Creating text documents & notes - Setting & monitoring deadlines - Escalation of overdue activities etc. 	Desirable		
MM.6.11	Interface with fax-on-demand	Ability to interface with fax-on-demand systems.	Desirable		
MM.6.12	Ability to support electronic signature	Ability to support electronic signature for document approval	Vital		
MM.7.0		Work Sign Off			
MM.7.1	Mandatory recording of maintenance history data	Ability to record the maintenance history data against a component/equipment that has had a work order raised against it. It should be possible to make this field mandatory i.e. A job cannot be closed unless this field has been entered.	Vital		
MM.7.2	Capturing of all information for a completed work	Ability to capture all information relating to completed maintenance work against a work order as part of the maintenance history database. Retain the information as part of the maintenance history unless it is physically removed from the system (e.g. through archiving exercise).	Essential		
MM.7.3	Recording the return of unused materials	Ability to record the return of materials that were issued against the work order, but they were then not used.	Desirable		
MM.7.4	Recording the	Ability to record the fact that the work has been	Essential		



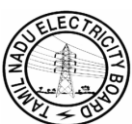
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	delayed completion on a/c of materials	delayed due to the materials not being available in time. This will be used to evaluate the material planning procedures.			
MM.7.5	Recording the delayed completion on a/c of labour	Ability to record the fact that the work has been delayed due to insufficient labor resources. This will be used to evaluate the scheduling procedures.	Essential		
MM.7.6	Recording the delayed completion on a/c of permit to work	Ability to record the fact that the work has been delayed due to Lack of permit issue or any other user definable fields.	Essential		
MM.7.7	Bulk closure of WO	Ability to bulk close Work Orders meeting a user defined time, cost, resource, status or other criteria.	Essential		
MM.7.8	Automatic closure of WO	Ability to close Work Orders automatically once the last Work Order Task has been completed.	Essential		
MM.7.9	Authorization to enter comments against WO	Ability to allow authorized employees to enter text in a free format against the Work Order. These comments should be able to be forwarded to maintainer's supervisor.	Essential		
MM.7.10	Flagging WO for cost escalation	Ability to flag/warning work orders where the work order cost exceeds the work estimate / budget for the month/year or user defined approval limit.	Essential		
MM.7.11	Automatic flagging of outstanding orders	Ability to automatically flag outstanding orders/costs when attempting to close a Work Order.	Essential		
MM.7.12	Attachment of user defined codes	Ability to attach user defined codes to work orders upon closure e.g. fault type.	Essential		
MM.7.13	Complete closure of WO	Ability to completely close off work order. System should inform user that all outstanding commitments and invoices have been met. After this step, no more costs can be charged to the order.	Essential		
MM.7.14	Archiving of WO	Ability to archive Work Orders after a defined period of time. It should be possible to easily retrieve archived Work Orders within few hours.	Desirable		
MM.7.15	Resetting of any time based or usage based triggers	Any associated time based or usage-based triggers should be reset, if the related work has been completed. "Completion" should be user defined e.g. Partially closed Work Order. The system will then begin to schedule the next predictive or preventative maintenance Work Order.	Desirable		
MM.8.0		Maintain Bill of Materials			
MM.8.1	Maintaining	Ability to maintain the parts list contained in the	Essential		



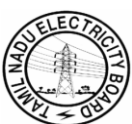
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	parts list	equipment. The list should also include the quantities of parts involved. Ideally a graphical parts book Referenced to the catalogue would support this.			
MM.8.2	Maintaining history of changes in parts list	Ability to maintain history of changes to Part List. From time to time equipment is reconfigured with alternative parts. History of such changes is required to be kept.	Essential		
MM.8.3	Maintaining reference to catalogue	Ability to maintain reference to catalogue. For each part in the equipment parts list, there is a requirement to include a cross-reference to the catalogue, to enable material identification and reservations.	Essential		
MM.8.4	Maintaining document identification and contents	Ability to maintain the document identification and document contents in the document register. Ability to maintain any links between documents and any Equipment/ Component items.	Essential		
MM.8.5	Maintaining drawing identification and contents	Ability to maintain the drawing identification and drawing contents in the drawing register. Ability to maintain any links between drawings and any Equipment/ Component items. It also desirable to have the ability to mark up/red line drawings on the users screen and email the changes to an officer responsible for updating the document.	Essential		
MM.8.6	Creation of asset	When an equipment item / component is created, it is required to reference the item / component to an asset in the fixed assets register. Where a relevant asset hasn't been set up, it is expected that the system would require the creation of an appropriate asset.	Essential		
MM.9.0		Maintain Vendor Supplied Information			
MM.9.1	Recording of vendor recommendation skill requirement	Ability to record the vendor recommended skills required to maintain the equipment/ component.	Essential		
MM.9.2	Recording of vendor recommendation performance	Ability to record against the equipment/component vendor recommendations for how it will perform.	Essential		
MM.9.3	Recording of vendor recommendation operating conditions	Ability to record against the equipment/component vendor recommendations for the conditions under which it should be operated.	Essential		
MM.9.4	Maintaining history of changes to above recommendations	Ability to hold history of changes to recommended performance / operational specifications.	Essential		
MM.9.5	Maintaining the warranty details	Ability to record the warranty duration, the warranty period end date, the warranty number and any warranty notes. If a WO is raised on an	Essential		



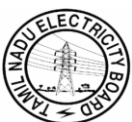
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		asset under warranty, the system should flag that the vendor is responsible for repairs and that maintenance is required to be performed in accordance with warranty supply and contract conditions.			
MM.9.6	Recording of vendor recommendation maint. freq, type, procedure etc.	Ability to record the maintenance frequency, type and procedure recommended by the vendor.	Essential		
MM.9.7	Maintaining history of changes to above recommendations	Ability to hold history of changes to the recommended maintenance frequency, type and procedure.	Desirable		
MM.9.8	Recording of environmental issues	Ability to record any environmental issues or regulations required in the operation of the equipment / asset.	Desirable		
MM.9.9	Maintaining the useful life details	For the purpose of repair / replacement decisions, it is required that the individual items useful life be maintained.	Essential		
MM.10.0		Analyze and Report			
MM.10.1	Reporting of total cost and quantity	Ability to report the total costs and quantities for a particular job. Ability to drill down into the Work Order for a more detailed breakdown including an analysis of internal and external labour, materials and other costs.	Essential		
MM.10.2	Performance of standard job against estimate	Ability to analyze the performance of standard jobs against the estimates contained within it. The job costs and quantities should be able to be broken down by work crew.	Essential		
MM.10.3	Analysis of time taken to complete against estimated duration	Ability to list the amount of time taken to complete a Work Order for making comparison against the planned / estimated duration. This time analysis should be able to be classified by work type or Work Order classification and be broken down by work crew.	Essential		
MM.10.4	Listing of total cost due to issue of materials	Ability to list the total costs incurred due to issue of material to Work Orders. The material could either be store issue or direct purchase issue. This report could be against a specific equipment or against a cost centre.	Essential		
MM.10.5	Listing of total cost due to contractor cost	Ability to list the total costs incurred due to contractor work charged to Work Orders. This would include any contractor overheads. This report could be against an item of equipment, a cost center, a contractor, an equipment ID etc.	Essential		
MM.10.6	Graphical display of resource and utilization factor	Ability to measure and report on resource and utilization factors. This should include graphical displays and/or tabulated data.	Desirable		



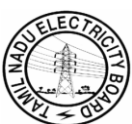
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MM.10.7	Ability to review backlog WO	One component of the planning performance is to keep the backlog of jobs to a minimum, therefore the ability to review backlog Work Orders is crucial.	Vital		
MM.10.8	Listing of outstanding & incomplete WO	Ability to list the outstanding Work Orders that have not been completed by their estimated due date.	Essential		
MM.10.9	Reporting on status of Preventive works	Ability to report on all Preventive maintenance work that has been missed rescheduled or postponed.	Essential		
MM.10.10	Listing of WO completed during a shut down period	Ability to list all Work Orders completed by a work group during the shutdown period. It should be able to compare this summary with the total number of Work Orders scheduled for completion during this period.	Essential		
MM.10.11	Listing of delayed WO	Ability to report on Work Orders that have been delayed due to: <ul style="list-style-type: none"> - Materials not being available in time for the maintenance work; - Insufficient internal / external labour resources; - Lack of permit being issued; - Other user defined fields. 	Essential		
MM.10.12	Comparison between planned and unplanned works	Ability to compare the amount of planned work (Preventative) to the amount of unplanned work (breakdown or corrective) over a set time period.	Essential		
MM.10.13	Comparison of cost between preventive and other work	Ability to compare the costs of preventative work to corrective and modification work incurred over a set time period.	Essential		
MM.10.14	Analysis of historical work	Ability to support the analysis of historical work to assist in the estimation of future work and resource requirements.	Essential		
MM.10.15	Ability to record status of a WO	Ability to record status of a Work Order such as approved, not-approved, wait on materials, wait on contractors, wait on labour, held etc.	Essential		
MM.10.16	Capturing of Work progress of a WO	Ability to capture work progress including : <ul style="list-style-type: none"> - Internal labour hours performed on each task and resultant charges - Hourly hire contractor hours performed on each task and resultant charges - Material charges based on issue - Contractor charges from invoice entry - Plant charges - Completion of tasks and closure of Work Orders - Manually derived % complete for each task or Work Order 	Essential		



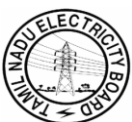
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MM.10.17	Reporting on asset maintenance history	Ability to report on an asset's maintenance history based on Work Orders raised against it.	Essential		
MM.11.0		Analyze and Report asset performance			
MM.11.1	Viewing of maintenance cost	Ability to display the maintenance costs for a range of equipment/ components. This will enable the user to review all costs incurred during the life of an asset including labor, materials, contractors costs etc.	Essential		
MM.11.2	Reporting of common failures & repair times	Ability to report common equipment failures and repair times based on fault codes.	Essential		
MM.11.3	Review of any notes on equipment	Ability to review any notes about the particular equipment/ component, which have been entered by maintenance experts. The notes should be accessed from the particular equipment/ component record.	Essential		
MM.11.4	Analysis and report on MTBF	Ability to analyze and report the mean time between failure (MTBF) or an item of equipment. It should be able to be summarized for any particular equipment or a group of equipment. In addition, the 'time between failure' should be able to be replaced by usage statistics between failure.	Essential		
MM.11.5	Analysis and report on MTTR	Ability to analyze and report the mean time to repair (MTTR) for an item of equipment. This involves calculating the average of the work order duration's for an item of equipment. Alternatively, it could be an average of the recorded downtimes.	Essential		
MM.11.6	Reporting on frequency of failure.	Ability to report how many times an item of equipment has failed within nominated time periods (Frequency of Failure).	Essential		
MM.11.7	Assessment of failure probability.	Ability to determine from the historical data the probability of failure over a set time period.	Essential		
MM.11.8	Assessment on affect of failure	Ability to display what affects the failure of an equipment/ component. This will then help to determine how critical it is that this equipment/ component does not fail.	Essential		
MM.11.9	Statistics on cause of failure and its effects	Ability to produce statistics linking the cause of failure and the effects of the failure.	Essential		
MM.11.10	Graphical mapping of rate of failure	Ability to map (graphically) how the rate of failure changes with different work load, by equipment/group of equipment. It would be used to assist in determining the optimal workload.	Desirable		
MM.11.11	Graphical analysis of fault	Ability to report equipment / group of equipment downtimes over a particular period of time including analysis of fault (Graphically).	Desirable		



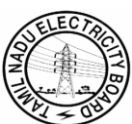
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MM.11.12	Review of age, maintenance history & working life of equipment	Ability to assist in the reviewing equipment/component age, maintenance history, and recommended working life to determine if it will be able to meet the requirements of the operations/ maintenance departments.	Essential		
MM.11.13	Assisting in making replacement decision	Ability to assist in the decision to retain an item in its current state, replace the item, or modify it based on future usage, estimated maintenance costs, average downtime etc.	Essential		
MM.11.14	Review of maintenance work and highlighting any defects of recurring nature	Ability to review maintenance work performed on equipment and highlight regularly occurring defects in specific types/designs of equipment. The report should be able to be run based on user defined parameters such as equipment ID, make / model, defect code etc.	Vital		
MM.11.15	Simulation of life cycle maintenance costs	Ability to simulate the life cycle maintenance costs for an item of equipment, when different operational conditions and maintenance strategies are entered as parameters.	Vital		
MM.12.0		Reporting and On-line Inquiry			
MM.12.1	Defining criteria for data extraction	Able to define criteria for extraction of data.	Essential		
MM.12.2	Defining security rules for data extraction	Able to define security rules for data extraction.	Essential		
MM.12.3	Comparison of historical and actual data	Able to compare historical data to actual data based on user defined period (e.g. monthly, quarterly, yearly).	Essential		
MM.12.4	Comparison of target and actual data	Able to compare actual data to Target / budget data based on user defined period (e.g. monthly, quarterly, yearly).	Essential		
MM.12.5	Defining formula for data formatting	Able to define formula for formatting data i.e. metric conversion, quantity count, percentage calculation and arithmetic calculation.	Essential		
MM.12.6	Tracing of summarized information	Able to provide drill down functionality to trace summarized information to source data/transaction.	Essential		
MM.12.7	Performing of scenario analysis	Able to perform "what if" or scenario analysis on report data.	Essential		
MM.12.8	Selection of level and volume of data	Able to select the level of details and volume of data for reporting	Essential		
MM.12.9	Defining	Able to define criteria for filtering data subject to	Essential		



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	criteria for filtering data	security rules.			
MM.12.10	Generation of reports-1	Able to generate reports : <ul style="list-style-type: none"> - One at a time, - Multiple reports at a time - Ad hoc and regular reports together 	Essential		
MM.12.11	Generation of reports-2	Able to generate reports at : <ul style="list-style-type: none"> - Real time / on line basis. - In background (when evaluation is time-consuming). - Via overnight batch - Specific date - Regular time interval 	Essential		
MM.12.12	Creation of user defined reports	Allow creation of user-defined reports without the need for technical skills.	Essential		
MM.12.13	Defining report layout and graphical representation	Able to provide flexible reporting tools for defining report layout and type of graphical representation.	Essential		
MM.12.14	defining personalized report menu.	Able to define personalized report menu.	Essential		
MM.12.15	Restriction in report selection	Able to restrict report selection based on security of database, organization structure, group.	Essential		
MM.12.16	Provision of flexible report writer	Provide flexible Report Writer with the following minimum features : <ul style="list-style-type: none"> ➤ Specify the format and layout of reports; ➤ Summaries and total the information to be reported; ➤ Select records to be included in the report; ➤ Select details from each record to be included; ➤ Sort the information to be reported as one level within another; ➤ Perform arithmetic calculation on the information selected or totals thereof; ➤ Ability to add narrative comments to reports ➤ Store the report format for later use; and ➤ Produce reports in graphical form for presentation purposes. 	Essential		
MM.12.17	Downloading of reports	Able to allow downloading of reports to standard PC applications (e.g. MS Excel spreadsheet, MS Project, MS Word, MSWorks etc)	Vital		
MM.12.18	Outputting of reports	Able to output reports in various media: - screen - printer - electronic media	Vital		



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MM.12.19	Prioritization of reports	Able to prioritize reports for processing.	Essential		
MM.12.20	Defining distribution list	Able to define distribution list for each report.	Essential		
MM.12.21	Electronic distribution of reports	Able to distribute reports electronically to other users : <ul style="list-style-type: none"> - Automatically upon completion - At preset time 	Essential		
MM.13.0		Cost Control			
MM.13.1	Costing of internal maintenance work hours	Ability to cost internal maintenance work hours to the work parcel. The value should be a multiple of the hours and a predefined standard charge rate.	Essential		
MM.13.2	Costing of contractor work hours	Ability to cost contractor hours to the work parcel. The charge rate should be contained in an established agreement with the contractor. It shall also have ability to record other contractor charges, such as overheads, costs of using contractor owned equipment, or costs of using contractor materials etc.	Essential		
MM.13.3	Reconciliation of Work hours	Upon receipt of contractors invoice it should be possible to reconcile hours against those appearing on the W/O.	Essential		
MM.13.4	Recording of all costs towards materials/spares	Ability to record all costs towards materials/spares etc. against a work Order	Essential		
MM.13.5	Costing of T&P based on work hours	Ability to cost equipment, plant and tools to Work Orders based on hourly rates.	Essential		
MM.13.6	Recording of actual work hours on an on-line time sheet	Ability to allow the recording of actual worked hours on an on-line timesheet. It should be possible to enter the timesheet data by individual employee, work group, work crew or by Work Order.	Essential		
MM.13.7	Interfacing with Financial system	Ability to interface with financial system via the referencing/linking of the Work Order to an account code. There should be an option to link all transactions booked to the Work Order to a transaction file for examinations of costs and dates of incurrence.	Vital		
MM.13.8	Validation of timesheet data	Ability to validate entered timesheet data including : <ul style="list-style-type: none"> ➤ Employees (validate against crews and individuals scheduled to the work); ➤ Work Order no (validate against Work Order no and status e.g. closed for actual) 	Essential		



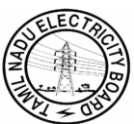
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MM.13.9	Forwarding of input timesheet via workflow	Ability to forward, through Work Flow, the input timesheet to the appropriate approving officer for certification.	Essential		
MM.13.10	Ability to manually key in WO expenses	Ability to allow for manual keying in of Work Order expenses.	Essential		
MM.13.11	Allocation of cost to different WO	Ability to allocate (manually and/or automatic; individually and/or in bulk) cost to different Work Orders and asset types (e.g. contractor fees).	Essential		
MM.13.12	Costing of individual transaction in a Work order	Ability to drill down from Work Order or job to individual cost transactions.	Desirable		
MM.13.13	Comparison of WO actual cost vs budget cost	Ability to show Work Order actual costs versus budget and forecast.	Desirable		
MM.13.14	Generation of alarm on cost escalation	Ability to generate an alarm when Work Order expenses reach a user defined limit.	Vital		
MM.13.15	Online viewing of cost	Ability to view (on-line) cost information for the purpose of checking and monitoring progress.	Essential		
MM.13.16	Checks on cost transfer	Capable of performing checks to ensure that cost can only be transferred based on approved criteria (e.g. that the job to which the cost is to be transferred to is a valid job).	Essential		
MM.13.17	Prevention of cost transfer against closed jobs	Ability to prevent cost transfers against closed jobs.	Essential		
MM.13.18	Security Checks on cost transfer	Ability to establish security measures to control the transfer of costs.	Essential		
MM.14.0		Data Capturing and Extraction			
MM.14.1	Capturing of statistical data	Able to capture statistical data from <ul style="list-style-type: none"> ➤ Manual entry ➤ External electronic media ➤ Interfacing with external databases 	Essential		
MM.14.2		Integration with Other Systems			
MM.14.2.1	Integration with GIS	Integrated to GIS System to identify the nearest substation and to perform load analysis.	Vital		
MM.14.2.2	Integration with Customer care system	Integrated to Customer Care System to use CCS functionalities and information	Vital		
MM.14.2.3	Integration with DMS-SCADA system	Integrated to DMS-SCADA System to use SCADA functionalities, if available.	Vital		



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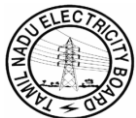
MM.14.2.4	Integration with Asset database	Integrated to Asset Database to use Asset Database functionalities and information.	Vital		
MM.14.2.5	Database Support	The system should support multiple databases.	Essential		



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SRS document is generic in nature, vendor neutral and technology independent. Whenever any material or article is specified or described by the name of any particular brand, manufacturer or trade mark, the specific item shall be understood as establishing type, function and quality desired. Products of other manufacturers may also be considered, provided sufficient information is furnished so as to enable the owner to determine that the products are equivalent to those named.

HARDWARE SPECIFICATIONS:

1) INTRODUCTION

The scope of the vendor is to supply, install and commission all necessary hardware associated software, all switches, backup servers, tape drives, local area network at data center, Disaster Recovery Center and at identified utility offices.

The vendor has to design a suitable data center to cater the need of the utility. The purpose of this section is not to specify size and capacity of equipment but to lay down the design philosophy of the data center. The vendor has to select the suitable hardware so that it meets the performance criteria specified in the contract. In case the offered hardware does not satisfy performance criteria as specified in clause-9, Section G1 and other sections the vendor has to provide additional equipments or upgrade the equipments without any additional cost to owner.

The vendor should provide the detailed specifications of equipment, design calculation, server sizing to satisfy the owner. As the designing of the data center and meeting the performance criteria is the responsibility of bidder the approval of drawing and design calculations does not absolve the vendor from it's responsibility of meeting the performance standard. In case offered design of data center is different than the design philosophy laid down in the document the vendor should clearly brought out the deviations and demonstrate the offered solution is superior to the prescribed guideline and all necessary literature documentation shall be provided by vendor to support his claim.

Briefly the various activities involve the supply, installation and successful commissioning of -

- Servers, Work station PCs at Data center, Customer care centers, Sub division, Sub Station, division, Circle, Head Quarter and any other office of the utility as per their requirement
- Operating Systems at Server/ Desktops,
- Data Base - Oracle/MS SQL/MY SQL/DB2/Informix/Sybase or any other RDBMS confirming to ANSI/ISO SQL-200n standards
- Applications
- DC LAN switches, Antivirus, NMS, IDS, Firewall / Backup Solution etc.



- Creation of LAN at datacenter, Customer care centers, Sub division, division, Circle, Head Quarter and any other office of the utility as per their requirement
- Creation of VPN/ MPLS WAN
- WAN equipments and bandwidth for connectivity
- IP Telephony along with IP phones
- Overall operation and maintenance support for DC LAN and WAN.
- Dedicated manpower for administration, troubleshooting and managing the whole set-up.
- Call Center and all associated hardware and software
- Enterprise License of all hardware software provided under this contract
- Integration of the entire infrastructure

The datacenter shall be connected to different utility offices through a router which is connected to VPN/MPLS cloud of the service provider. Normally the clients at the utility offices are trusted client however the core switches offered shall have provision of integrated firewall, intrusion detection system and network analysis module.

The data center shall also be connected to web portal of utility which is connected to public access internet service for providing web based support to their customer. All necessary hardware, software including router and firewall for the web portal and its development is in the scope of the bidder. For the purpose of calculating the maximum loading on web server, the bidder may consider 0.1% of total consumer base of the utility may access this facility at any point of time with a rise of 7.5% per year for next 5 years.

The Data Centre architecture & design should be driven by the principle of energy consumption optimization. Given the fact that data centers are becoming more and more power hungry, it is important for utilities to be an example for its consumers. The data centre architecture and design should consider various factors including server and storage consolidation / virtualization for a cost effective and energy efficient solution. The computing equipments and systems in the data center should comply to SpecPower_ssj2008, TPC or equivalent standards. The Data Centre will be connected to the Customer Care Center (proposed to be near the Data Centre) with Gigabit Lan which should terminate in the Core Router at the Data Center. Entire data center design including all relevant components, layouts etc would be supplied by vendor.

2) LOCAL AREA NETWORK

The scope of work involves supply, installation, testing and commissioning of Local Area Network including Switches and other related equipments for Data Center, Customer care center, Sub division, division, Circle, Head Quarter and any other office of the utility as per their requirement. The LAN shall be used to connect all servers, networking equipment & Users at the relevant location.

In respect of all offices other than data centre and customer care centre, the network equipments should be installed in the suitable wall mount rack.

[LAN design should be based on following requirement:](#)



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It is planned to provide network non-blocking, congestion less and with high bandwidth availability to handle priority traffic, network reliability of 99.99%. The network equipments shall be scalable in terms CPU, Memory, additional Bandwidth throughput, etc as specified in the technical specifications below -

LAN Network setup should be planned for high-speed connectivity to the servers, with non-blocking design, can handle congestion of traffic and manage the bandwidth available during peak load.

The network equipment shall be highly reliable providing 99.99% uptime and ensuring availability of the network of 99.99%. The reliability should be provided at the levels including cabling infrastructure, active components, on link level, redundant cabling. The bidder shall identify the point of failures in active component; define multiple logical paths, load balancing and QoS implementation.

Reference Standards for Ethernet Switches/Routers/Firewall/IDS (IPS/NIDS/UTM) as applicable shall comply with following IEEE, RFC's and standards accordingly for features specified against each of them in these specifications.

IEEE 802.3 10BaseT specification	IEEE 802.3u 100BaseTX specification
IEEE 802.3x full duplex on 10BaseT, 100BaseTX, and 1000BaseT ports	IEEE 802.3z 1000BaseX specification - 1000 Base SX, - 1000 Base LX
IEEE 802.1Q VLAN	IEEE 802.1D Spanning-Tree Protocol
IEEE 802.1p class-of-service (CoS) prioritization	IEEE 802.1p to DiffServ Mapping
IEEE 802.3ad or equivalent	RMON
IETF DiffServ based QoS (RFC 2474, 2475)	All 64 DSCP (DiffServ Code Points)
SNMP support including support for SNMPv3	RFC 1213 (MIB-II)
RFC 1493 (Bridge MIB)	RFC 2863 (Interfaces Group MIB)
RFC 2665 (Ethernet MIB)	RFC 2737 (Entity MIBv2)
RFC 1757 (RMON)	RFC 1157 (SNMP)
RFC 2748 (COPS)	RFC 2940 (COPS Clients)
RFC 3084 (COPS Provisioning)	RFC 2570 to RFC 2576 (SNMPv3)



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RFC 2338 (VRRP)	RFC 1058 (RIP v1)
RFC 1723 (RIP v2)	RFC 2178 (OSPFv2)
BootP / DHCP Relay	BGP4

References and standards for Structured Cabling system -

- Commercial Building Telecommunications Wiring Standards ANSI/TIA 568-B.1, General requirements, May 2001
- Commercial Building Telecommunications Wiring Standards ANSI/TIA 568-B.2, Balanced Twisted Pair Cabling Components, May 2001
- Commercial Building Telecommunications Wiring Standards ANSI/TIA 568-B.3, Optical Fiber Cabling Components standards, April 2000
- TIA/EIA -569 - Commercial Building Standard for Telecommunications Pathways and Spaces.
- TIA/EIA - 606 - Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
- International Standards Organization/International Electromechanical Commission (ISO/IEC) DIS 11801, January 6, 1994.
- Underwriters Laboratories (UL®) Cable Certification and Follow Up Program.
- National Electrical Manufacturers Association (NEMA).
- American Society for Testing Materials (ASTM).
- National Electric Code (NEC®).
- Institute of Electrical and Electronic Engineers (IEEE).
- UL Testing Bulletin.
- American National Standards Institute (ANSI) X3T9.5 Requirements for UTP at 100 Mbps.

3) VPN/ MPLS WIDE AREA NETWORK

The bidder is required to design, procure and implement the WAN Backbone, capable of carrying data and voice and shall provide connectivity to WAN backbone through secure VPN tunnel via MPLS/VPN cloud..

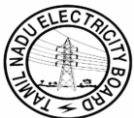
The bidder shall procure and supply all Network components (Active as well as passive), security system and software etc. as per requirements of the technical specification. The detail specification of the VPN solution shall be as follows:-



3.1 General Guidelines -

The overall solution of WAN proposed by the bidder shall comply with the general guidelines, as well as those specified by Gol from time to time to ensure seamless inter operability and interconnectivity. Any WAN Network of Central or State Government may also be used for this project, subject to availability of spare capacity, technical feasibility and permission from requisite authority. These guidelines require WAN to adhere to the following:

- a) WAN shall be a TCP/IP based network on a high-performance packet forwarding technology that integrates the performance and traffic management capabilities of data link layer (Layer 2) switching with the scalability, flexibility, and performance of network-layer (Layer 3) routing.
- b) The WAN will be built to incorporate any open standards available as per Open Systems Interconnection (OSI) model. The network should support seamless transformation and integration of protocols.
- c) The WAN has to upgrade the network infrastructure/software to support new protocols adopted by Internet community as a continuous process. For example, migration from IPv4 to IPv6 as and when the transition is required.
- d) WAN must use the hardware devices, such as Internet routers, terminal servers, Internet systems that interface to Ethernets, or datagram-based database servers, which support open standards and have open Network Management System (NMS) support for monitoring, configuring and measurement of the network resources.
- e) WAN network equipment should have Ipv4 and IPv6 features.
- f) WAN shall have the capability to run IP routing protocols like OSPF (Open Shortest Path Find) version 2, OSPF v3, RIP v2, RIPng, OSPF over demand circuit, IS-IS, BGP4.
- g) WAN may run any routing protocol (like OSPF, BGP) depending on the individual design criteria of the WAN. It is mandatory that the network should allow interaction between multiple routing protocols for keeping a unified network reach ability table across the country.
- h) While two routing protocols are interacting to exchange routing updates, there should be the capability to selectively filter certain routes for security reasons.
- i) The WAN should be capable to provision IP multicast based services. The same would require the capability of running industry standard IP multicast protocols like Protocol Independent Multicast (PIM) Sparse Mode and Dense Mode, Multicast OSPF (MOSPF), multicast BGP (MBGP) and DVMRP or equivalent.
- j) WAN should have the multicast group management capability through Industry standard protocols like Internet Group Management Protocol (IGMP) version 1, 2 and 3.
- k) The voice networking of WAN should be based on IP and should be designed in such a way that a central call processing system is able to service phones at remote locations. WAN should have the voice conferencing solution deployed based on industry standard protocols.
- l) All communications happening over the various links within the WAN should be encrypted using standard protocols like IPsec, 3DES & AES to ensure highly secure communication.
- m) WAN should have adequate device for performing intelligent packet filtering, URL filtering, context based access control, blocking of malicious contents to maximize security.
- n) All equipments proposed shall ensure optimum throughput to take care of the connectivity requirements of the network including minimum bandwidth requirement and scalability in bandwidth.
- o) All networking equipments proposed shall support SNMP.



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- p) The routers at Data centre shall have the provision for connecting to DR site in case the same is established at a later date.
- q) The capacity of the links at various tier of WAN will be up gradable subject to actual usage and utilization for the particular channel. The Bidder shall be responsible for regular monitoring of bandwidth utilization and generating reports at regular interval.

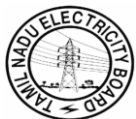
3.2 WAN at Data Centre, NOC and Utility HQ

The Data Centre is the base and starting point of the network , hence a primary component of the WAN backbone. As the NOC at data Centre shall hold the core interconnecting routers and critical servers of WAN, the availability of this Network operating centre is highly critical. Failure of any components in this centre would bring down the entire network. So, the design of the Data Centre along with the NOC should meet the high availability requirement. Usage of MPLS-VPN has been envisaged in the SRS as primary communication media for WAN(connectivity between all branch offices and Data Center). The MPLS-VPN connectivity at data center end would have redundant path from the ISP and the total aggregated Bandwidth will be assessed based on total requirement. The redundant link should be in active-active cluster fail over & load balancing mode..

- Utility HQ offices (proposed to be near the Data Centre) would be connected to the Data Centre through a existing Gigabit fiber optic network and terminated at Gigabit interface of WAN Core Router
- Data Centre will be connected to Internet through a minimum 10 Mbps Internet gateway from two different ISP on active active cluster failover and load balancing mode. The Internet link should be terminated in a separate Internet router.
- Data Center will be connected to the MPLS-VPN core cloud with minimum of 20Mbps of MPLS-VPN link primary, 20 Mbps of MPLS-VPN link as secondary with load balancing and fail over mode. Out of which 10 Mbps of each will be dedicated connectivity between Data Center and Disaster Recovery Center for data replication. The connectivity shall work bandwidth allocation based on demand.
- The Data Centre shall have facilities for connecting to Utility HQ, all the remote utility offices in Circles, divisions, Sub divisions etc. as per the requirement of utility and all the Customer care centres.
- It is required to have proper segregation between the WAN network, Internet servers, WAN Intranet servers, Internet and local area LAN. All the different sections of the network would be segregated through a Firewall system.
- DNS server shall be configured for serving the Intranet users and name registration of Intranet Equipments. All components in the Intranet shall have a DNS entry.
- Firewall, NIDS, & Antivirus Gateway shall be implemented in such manner that Network shall have greater level of security from inside/outside traffic.
- VPN Gateway shall be implemented to cater the requirement of VPN access from different department or offices. VPN access shall be given on the basis of access rule defined for this.

3.3 WAN for all other offices including Circle, Division, Sub-Division, Section offices etc.-

- There will not be any connectivity in office hierarchy. All connectivity of distant locations will be directly to the Data centre. The proposed network has to be on a minimum 512Kbps MPLS-VPN connectivity. The various offices like circles, divisions, sub-division, section and various other offices as per the requirement of the utility will be connected to Data Centre via MPLS-VPN cloud of the Service Provider. The uplink WAN connection will terminate in a networking device, which will be connected to the switch via security equipment, which will ensure the fully secure enterprise VPN. There will no back-up connectivity requirement for these offices.



3.4 Authentication:

- RADIUS, including Challenge/Response
- LDAP
- Native local user database
- Active Card (RADIUS)

3.5 Encryption:

- IPsec (AES)

3.6 Granular Auditing and logging

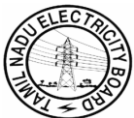
- User sign-in and sign-out
- Session timeouts, including idle and maximum length session timeouts
- User file requests, uploads, downloads, etc.
- User connects and disconnects via clientless telnet/SSH function
- Web requests, every HTML request. Java Applet socket commands, etc.
- Bytes transferred for client/server application requests
- The SSL VPN box should log for : User/admin authentication success /failure, access
- Number of simultaneous users at each one hour interval (logged on the hour), gateway address, session ID, session time, and cause of termination, Any changes to the system, Session timeouts, including idle and maximum length session timeouts

3.7 End point security: (This facility would be deployed as and when required)

- Native Host check before permitting access to the resources including without having any preloaded agent on the end point PC.
- Pre-Specified checks such as Antivirus update, Spyware, Ports check, process check, File check, Registry check, Software version check like antivirus version and custom checks based on user flexibility.
- Authentication parameter including username password, digital certificates, RSA token.

3.8 Access Privilege Management

- The SSL VPN should permit access to a user based on :
Dynamic Authentication: Source IP, Network Interface (internal/external), Digital certificate, Endpoint Security - Host Checker/Cache Cleaner, User Agent (Browser), Sign-in URL SSL version and cipher strength (global)



3.9 Role Definition: The following can be used to determine the identity of the user:

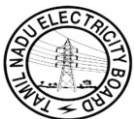
- User name
- User attribute(s)
- Certificate attribute(s)
- Groups (static, dynamic)
- Role Mapping based on Simple expressions (AND Based) combining identity plus restrictions:
 - Source IP
 - Digital certificate
 - Endpoint Security - Host Checker/Cache Cleaner
 - User Agent (browser)
 - Time of Day
 - Login Time Authentication Type (e.g. dual factor)
 - Network Interface (external/internal)
- Role mapping rules can be dynamically or periodically evaluated upon administrator's configuration changes and upon demand

3.10 Performance, High Availability and Scalability -

- The SSL VPN solution should support hardware-based SSL acceleration for RC4, 3DES and AES encryption.
- The SSL VPN solution should support software based compression for all traffic (HTTPS, HTTP, ftp, file, client/server application) enabling rapid response times even at very high concurrent user loads.
- Support for High Availability of SSL VPN appliance.
- The SSL VPN units that are part of a cluster communicate session and database information among them for stateful failover. Stateful synchronization should be done for configuration, policy, profile, and session.

3.11 Single Sign-on

- Standards-based interface for extensive integration with password policies in directory stores (LDAP, Active Directory, NT, etc.)
- Ability to pass user name, credential and other customer defined attributes to the authentication forms of other products (HTTP POST).
- Ability to pass user name, credential and other customer defined attributes as header variables
- Cookie Based, Basic Auth (W3C)
- Support for multiple host names from the same appliance, as well as support for multiple customisable sign-in pages.
- Modes of operation
 - Clientless -Browser based
 - Client : For client server access
- Full Network access should also be supported with end point security.



4) IMPLEMENTATION PLAN

For redundancy configurations in the cabling setup, it should be noted that each server will have two network connections connected using standard patch cords to the same rack which would have either a patch panel, / I/O outlet, or a switch. From that particular switch / patch panel/ I/o outlet, there should be 2 connections going to at least two different network switches that are located in each row. This will mean that there are dual cable paths from the server, to the network switches in each row, and from the network switches to the core backbone also. This would ensure a high level of cable redundancy in the setup.

The UTP cabling for Gigabit and normal 100 MB Ethernet should be Cat6 cabling to connect the servers & other access points with Core switches.

- All network drops will be a dual drop of Category 6 rated cable. This configuration will support current application and present an additional growth capability.
- The network drops will be terminated in compliance with Category 6 or higher specifications to two RJ45 jacks and labeled with IDF No., Panel No. (where applicable) and jack ID numbers.
- All cable that runs back to cable telecom closets will be terminated on a Category 6 rated patch panel, clearly labeled for each jack.
- The cabling contractor should provide cable certification reports and warranty statements to verify each Category 6 drop.
- Copper/UTP Category 6 cable runs exceeding 295 feet will be deemed unacceptable, as they would be out of specification with regard to the EIA/TIA 568x specification.
- The maximum permitted horizontal distance is 90 meters (295') with 10 meters (33') allowed as the total cumulative length for patch cables, jumpers cords, etc. (Total maximum length not to exceed 100 meters).
- Horizontal cables are Category 6 or (XL-7) or higher rated 4-Pair /100 Ohm UTP cables.
- Copper cabling must have all four pairs terminated and pairs must not be split between jacks.

Required Installation Practices To Be exercised By The Contractors -

General

- Cable and cable bundles will not be attached to any electrical wiring or light fixtures, nor will its vertical deflection allow it to come in contact with ceiling grids, HVAC mechanical controls, fluorescent light fixtures, or drainage line piping.
- All cables terminating at the distribution frame will be vertically straight with no cables crossing each other from twelve inches the ceiling area to the termination block.



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- All MDF/IDF tie and station cable bundles will be combed and bundled to accommodate individual termination block rows. Each cable or cable bundle will be secured to both the distribution frame and the structure to which the frame anchor points placed a maximum of nine inches apart starting at the center of the top of the termination block.
- For any given MDF/IDF, a horizontal and vertical alignment for all mounting hardware will be maintained, providing a symmetrical and uniform appearance to the distribution frame.
- Contractor will firmly secure any surface mount device, including station cable termination plates/jacks.
- MDF/IDF, station cables, and tie a cable refers to distribution frames and cabling located inside the building as defined in any scope of work. All station cables in offices or work areas will be installed behind the wall or inside provided floor or duct channels.
- Station cables will terminate on jacks as per the system requirements or specified by owner. All terminations will be made to Category 6 standards. It is the responsibility of the Contractor to understand and comply with these requirements.
- IDF/MDF termination racks and panels will be mounted vertically or horizontally (if any required) with a uniform spacing between each row of panels and jacks. Cable management will be mounted on the top, sides, and front as required to provide a symmetrical, aesthetic, and professional appearance of the frame

All Node Desk Top Station Cables shall meet the following criteria :

- Category 6 Plenum cables will be installed for all interior environments.
- All patch and station will be terminated on Category 6 rated RJ45 jacks.
- All patch and station cables will be kept to a minimum length in order to keep the channel distance within the 100meter specification, as set by the EIA/TIA.
- All data cable installations shall meet Category 6 Standards from the originating IDF to the furthest remote cable termination point.

Supplemental Equipment

Supplemental equipment refers to the different types of hardware, brackets racks and attachments required installing the cabling in the Data center complex distribution system per these specifications.

- All IDF/MDF wall mount racks shall include at minimum:
 - Vertical front and back cable management along watch side of rack
 - Horizontal cable management at top of rack and every 48-72 jacks, or 72 port panel, thereafter.
 - Horizontal rack-mount surge protector including 12ft. cord for standard household 220V/15A power, On/Off switch, circuit breaker, and minimum 6 standard Multipurpose AC outlets. (To be installed in racks housing electronic equipment.)
- All IDF/MDF floor mount racks will include at minimum :
 - Secure attachment to building floor at bottom
 - Secure attachment to wall via ladder attachment to rack
 - Vertical front and back cable management along each side of rack



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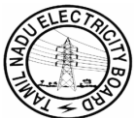
- Horizontal cable management at top of rack and every 48-72 jacks, or 72 port panel, thereafter.
- Horizontal rack-mount surge protector including 12ft. cord for standard household 220V/15A power, On/Off switch, circuit breaker, and minimum 6 standard Multipurpose AC outlets. (To be installed in racks housing electronic equipment.)
- All IDF/MDF floor mount racks will include at minimum:
 - Access for mobility and service needs.
 - Leveling feet/pads for stability when not being serviced
 - Vertical front and back cable management inside each rack
 - Adequate ventilation mechanism, including top-mount exhaust fans
 - Horizontal cable management inside of and at top rack and every 48-72 jacks, or 72 port panel, thereafter.
 - Horizontal rack-mount surge protector including 12ft. cord for standard household 220V/15A power, On/Off switch, circuit breaker, and minimum 6 standard Multipurpose AC outlets. (To be installed in racks housing electronic equipment.)

Miscellaneous

- The Contractor will provide a complete and final location table and spreadsheet indicating all wall jack locations including the following information: jack numbers, room number, wall orientation per jack number North, South, East, or West, or Power Pole if applicable), landmark orientation and distance. Cable Installation through the floor will be released to meet applicable codes.
- The cabling system is not considered Category 6 complaint unless all cabling components satisfy the requirements for Category 6 UTP installation practices and certified.
- All UTP shall be installed according to the TIA/EIA standard regarding color codes, labeling and documentation.
- The amount of untwisting when terminating Cat 6 jacks or panels is according to EIA/TIA parameters for Category 6 installations.
- The bend radii should not be less than the specification set by the EIA/TIA for Category 6 installations
- Conduit or duct may be required for some projects. Any wire molding required shall be of the non-adhesive-backed type using metal fasteners for attachment. Wall molding must be installed for all exposed cabling in marked areas.

Upon completion, the Contractor will provide the following documentation:

1. A document indicating the MDF and IDF cable count assignments.
 - Test results of all cable plans and distances between MDF, IDF, and MDF/IDF to Station Termination locations.
2. An updated cabling location table indicating:
 - Cable drop label/Identifier
 - Location of each drop by room number/location point.
 - Location of each drop by north, south, east, or west wall, or power pole where applicable
 - Location of each drop by orientation/permanent landmark in the room
 - A corresponding cross-reference for each drop identifying the source IDF/MDF identifier
 - A corresponding cross-reference for each drop identifying the source IDF/MDF building(s)



- A corresponding cross-reference for each drop identifying the source IDF/MDF floor
 - A corresponding cross-reference for each drop identifying the source IDF/MDF room number
 - All information contained in the cabling location table will be delivered to owner via both hard-copy/paper and electronic format.
 - One hard copy of each updated cabling location table will be pasted in the location-wiring closet (IDF/MDF), attached to or inside the rack or enclosure.
 - All documentation becomes the property of owner.
 - All document costs must be itemized and included in the quoted price for each project.
3. An updated floor-plan providing visual identification of the drops or IDFs added for the installation (s) at the site :
- Owner will provide, where/when a available, a floor-plan for the purpose of updating owner drawings.
 - **If a floor-plan does not exist for a site, contractor should create a reasonably accurate hand-drawn floor–plan of the building and floors to be affected by the installation, attaching accurate dimension and orientation markings.**

Fiber Optic Installation Requirements

The fiber cabling pathway should be provided by a dedicated duct system/ Fiber Protection System so as to provide safe and protective method for routing & storing fiber patch cords, pig tails, & riser cables, fiber distribution frame panels, termination equipments, etc.

- Fiber optic cable shall be tight-buffered construction, all dielectric, with no metallic components of any kind. Outer cable sheath construction will be of NEC 8300 Rated OFNP (PLENUM) Jacket- Flame retardant material.
- Each buffer tube within a cable must be color coded with none of the same colors appearing in one cable. Each fiber within a buffer tube must be color coded with none of the same colors appearing in the same buffer tube.
- Jumpers will be premium performance two-fiber dual sub-unit cable, OFNR or OFNP classified round type for routing inside cabinet spaces.

Terminations/ Connections / Splicing

- Entire cable runs will be installed in one continuous length from bulkhead connector to bulkhead connector, including coiled loops, without splices or repairs.
- Individual mated connector pair loss will be less than or equal to 0.20 dB.
- All fiber distribution panels will have plastic dust caps on each unused fiber termination.
- Multimode fiber patch cables will be terminated with ‘ST’ connectors and in accordance with industry standards.
- Bulkhead distribution cabinets must have phenolic labels showing cable numbers and far end location for each cable terminated in the cabinet.
- Aerial installation of fiber optic cable shall be avoided
- Cable installation shall meet all manufacturer specifications for tensile loading, bend radius, and vertical rise. All pulls involving a winch must be monitored for tension and cannot exceed the maximum tensile rating.



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- Lubricants may be used to facilitate pulling of cables but the lubricant must not be harmful to the cable, the raceway or humans.
- A swivel-pulling head must be used on all pulls to prevent twisting of the cable as it is pulled into place.
- Fiber-optic cable and inter-ducts installed in a cable but the lubricant must not be harmful to the cable tray should be fastened to the tray with UV resistant tie wraps at 10 ft intervals.
- Each time a cable enters a cabinet or junction box it must be securely tied down with cable ties.
- No individual exposed fibers will be permitted.
- Cable entrances into equipment or cabinets must be protected with insulated bushings or grommets.
- A minimum of ten feet of extra cable should be coiled as a service loop at the end of each run.
- Two, one-meter lengths of cable, cut from each reel of cable supplied, will be provided to owner as permanent retention samples. These samples are to be neatly tagged with the manufacturer's cable numbers, serial number, and reel number.



5) Cabling System and Component Specifications

Category 6 (XL-7) UTP , 4 Pair (High Performance) cables shall extend as per the layout requirement of the Data Center & Disaster recovery Center shall consist of 4 pair, 24 gauge, UTP and shall terminate on 8 Pin modular jacks provided at each outlet.

Cable jacket shall comply with Article 800 NEC for use as a Plenum or Non Plenum cable. The 4 Pair UTP cable shall be UL and C Listed Type of CMP Plenum or CM non-plenum cable. The high performance category6 UTP Cable shall be of traditional round design with Mylar Separator tape between pairs 2/3 and 1/4. The Cable Shall support voice, Analog Base band video/Audio/Fax, Mbps 10/100/1000BaseT Ethernet, Digital Audio, 270 Mbps Digital video, and emerging high-bandwidth applications, including 1 Gbps Ethernet. All Category 6 high performance cables shall meet or exceed the following;

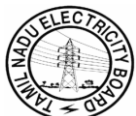
Mutual capacitance	47.5 nF/m
Characteristic Impedance	100Ohms(+/-3%) at 1-550Mhz
DC Resistance	9.83 Ohms/100m
Attenuation	<33db at 250Mhz
Return Loss	<17db at 250 MHz

UTP Cabling System

Type	Unshielded twisted pair cabling system, TIA / EIA 568-B.1 addendum Category 6 Cabling system
Networks Supported	10 / 100 Ethernet, 155 Mbps ATM, 1000 Mbps IEEE 802.3ab Ethernet, and proposed Cat 6 Gigabit Ethernet
Approvals	
TIA / EIA 568-B.1	ETL Verified
IEEE 802.3ab	Zero-bit Error, ETL verified
Warranty	25-year systems warranty; Warranty to cover Bandwidth of the specified and installed cabling system, and the installation costs
Performance characteristics to be provided along with bid	Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR for 4-connector channel

UTP Cable

Type	Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2
Material:	



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Conductors	24 AWG solid bare copper
Insulation	Polyethylene
Separator	Should be a cross filler. Any other filler type, like bi-directional strip would not be acceptable.
Jacket	Flame Retardant PVC
Approvals	UL Listed
	ETL verified to TIA / EIA Cat 6
Operating temperature	-20 Deg. C to +60 Deg. C
Frequency tested up to	600 MHz
Packing	Box of 305 meters
Delay Skew	25ns / 100m MAX.
Impedance	100 Ohms + / - 15 ohms
Performance characteristics to be provided along with bid	Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR

The Bidder shall provide & configure Distribution Frame consisting of Cat-6 Patch Panel adhering to International design & quality standards above mentioned standards. Configuration shall be so structured so as to provide desired number of user ports (as specified in Bill of Quantities). Cat-6 Patch Cords for patching active connections through Patch Panel shall be offered by the bidder. Distribution Frame (Jack/Patch Panel) shall be 19" Rack mountable. Bidder shall include 19" Wall Box Rack of suitable size (min.12U height) with key lockable doors (for security reasons)for housing the panel and hub stack.

UTP Jacks

Type	PCB based, Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2
Durability	
Modular Jack	750 mating cycles
Wire terminal	200 termination cycles
Accessories	Strain relief and bend-limiting boot for cable Integrated hinged dust cover
Materials	
Housing	Poly-phenylene oxide, 94V-0 rated
Wiring blocks	Polycarbonate, 94V-0 rated
Jack contacts	Phosphorous bronze, plated with 1.27micro-meter thick gold
Approvals	UL listed
Performance Characteristics to be	Attenuation, NEXT, PS NEXT, FEXT and Return Loss



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provided with bid	
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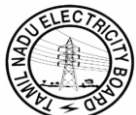
UTP Jack Panels

Type	24-port, Modular, PCB based, Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2
Ports	24, upgradeable to intelligent jack panel
Port arrangement	Modules of 6-ports each
Category	Category 6
Circuit Identification Scheme	Icons on each of 24-ports
Port Identification	9mm or 12mm Labels on each of 24-ports (to be included in supply)
Height	1 U (1.75 inches)
Durability	
Modular Jack	750 mating cycles
Wire terminal (110 block)	200 termination cycles
Accessories	Strain relief and bend limiting boot for cable
Materials	
Housing	Polyphenylene oxide, 94V-0 rated
Wiring blocks	Polycarbonate, 94V-0 rated
Jack contacts	Phosphorous bronze, plated with 1.27micro-meter thick gold
Panel	Black, powder coated steel
Approvals	UL listed
Termination Pattern	TIA / EIA 568 A and B;
Performance Characteristics to be provided along with bid	Attenuation, NEXT, PS NEXT, FEXT and Return Loss

Faceplates

Surface Mount Face Plate & Box with CAT6 Work Area Data I/O Outlet (RJ45) adhering to EIA/TIA-568-B2.1, ISO/IEC 11801(2002) and CENELEC EN50173-1 (2002) specifications. The outlets may preferably have a spring loaded dust covers.

Type	1-port, White surface box
Material	ABS / UL 94 V-0



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No. of ports	One
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Workstation / Equipment Cords

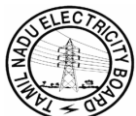
Type	Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2
Conductor	24 AWG 7 / 32, stranded copper
Length	7-feet for workstation and 3feet for Jack panel/equipment
Plug Protection	Matching colored snag-less, elastomer polyolefin boot
Warranty	25-year component warranty
Category	Category 6
Plug	
Housing	Clear polycarbonate
Terminals	Phosphor Bronze, 50 micron gold plating over selected area and gold flash over remainder, over 100 micron nickel under plate
Load bar	PBT polyester
Jacket	PVC
Insulation	Flame Retardant Polyethylene

Specifications for Fiber Optic Cabling Systems

Fiber optic Cable

Cable Type	24-core, Single Mode, Armored, Loose-tube, Gel filled
Fiber Type	Single Mode, 9 / 125, 250 micron primary coated buffers
No. of cores	24
Armor	Corrugated Steel Tape Armor
Cable Construction Type	BELLCORE GR 20 / IEC 794-1
Attenuation	
@ 1310nm	0.45 db/KM
@1500nm	0.4 dB/KM
Tensile rating	1200N
Maximum Crush resistance	3000N
Operating Temperature	-40 Degree C to +60 Degree C

Cable Type	24-core, Multimode, OM3, Armored, loose-tube, Gel Filled
Fiber type- Laser Grade	50 / 125, OM3, 250 micron primary coated buffers



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No. of cores	24 corrugated Steel Tape Armor
Cable Construction	BELLCORE GR 20 / IEC 794-1
Attenuation	
@850nm	3.5 dB / KM
@1300nm	1.5 dB / KM
Bandwidth	
@850nm	1500 MHz-KM
@1300nm	500 MHz-KM or higher
Network Support	
10 / 100 Ethernet	2000m
155 Mbps ATM	2000m
1000 Base SX	900m
1000 Base Lx	550m
10G SR	300m
10G X4	300m
Tensile rating	1200N
Maximum Crush resistance	3000N
Operating Temperature	-40 Degree C to +60 Degree C
Armor	Corrugated Steel tape Armor

Note: For Composite fiber optic cables, the above specifications for SM and MM fibers apply.

Fiber Optic Connectors

Connector Type	SC-Style, Simplex
Operating temperature	-40 Degree C to +85 Degree C
Durability & color	
MM connectors	500 cycles, Beige
SM connectors	220 cycles, Blue
Ferrules	Pre-radiused Ceramic Ferrules
Attenuation	Not more than 0.75 dB per mated pair

SC - SC/ST Multimode patch chord	
Cable type	2 Core Multimode
Fiber type	Multimode 50/125 250 micron primary coated buffers



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No of cores	2 Cable construction Type PVC outer jacket
Attenuation	@1310nm Return loss > 20 dB, Insertion loss < 0.3 dB, Factory test report to be included with supply
Tensile rating	1200N
Maximum crush resistance	3000N
Operating Temperature	-40 Degree to + 60 Degree

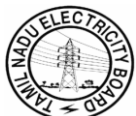
SC - SC	single mode patch chord
Cable type	2 Core single mode
Fiber type	Single mode 9/125 250 micron primary coated buffers
No of cores	2 Cable construction Type PVC outer jacket
Attenuation	@ 1310nm 0.5dB max insertion loss and 55dB Min Return Loss, Factory test report to be included with supply
Tensile rating	1200N
Maximum crush resistance	3000N
Operating Temperature	-40 Degree to + 60 Degree

Fiber Optic Patch panels

Horizontal cabling located/layed under the access flooring in the well defined pathways using brackets/tray/cable tray of the slab floor. Cable hall be armored designed (i.e. optical fiber cable is wrapped in flexible aluminum armor swirls “. Horizontal cables shall be pre-terminated using MTP/MPO connectors providing pulling grip over the connector.

Fiber optic patch panel	19-inch, Rack mounted Fiber optic patch panel, upgradeable to intelligent patch panel
Height	2 U, 3.5 inches
# of fibers	24
# of OSP Cables for termination	Minimum 2
Grounding	2 Nos. of earthing lugs, pre-loaded
Cable Management rings	Front and rear cable management rings, pre-loaded
# of 6-port / 12-port adapter plates	4 / 4 Max.

Fiber optic patch panel	Wall mounted Fiber optic patch panel
Dimension	12cmX10cmX38cm (HXDXW)
# of fibers	24



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# of OSP Cables for termination	Minimum 2
# of 6-port / 12-port adapter plates	4 / 4 Max.

Fiber Optic Adapter plates

Fiber Optic adapter plate	6-port, SC-Style, SM & MM
Attenuation	Max of 0.75 dB per mated pair

Fiber Optic Patch cord

Fiber Optic Patch cord	SC-SC, SM & MM
Insertion Loss	Less than 0.5db
Return Loss	More than 50 db

6) Switches/Routers

All the Routers shall be of the same Make/manufacturer and all the switches shall be of the same make/manufacturers and shall be covered under same back-up guarantee from the same OEM, to ensure full compatibility, inter-working and inter-operability.

The minimum no of switches offered shall be as follows

- 1) Core switch - 2 No
- 2) Access Switch - 2 No
- 3) Distribution Switch - 2 No (For local area network for internal uses)
- 4) Layer II switch - As per requirement in utility offices

6.1 Common to Core switch, Access Switch and Distribution switch

All switch chassis shall be modular & rack mountable. The chassis configuration shall provide to 3 free slots for future expansion after full port module configuration and with redundant switch fabrics, control modules, CPU cards and its operating Software /Supervisors. The chassis shall provide shared memory architecture and hot swappable modules. The chassis should support interfaces for 100BASE-FX, 10/100 BASE-TX, 10/100/1000BASE-T, 1000BASE-SX,-LX, and long haul (-LX/LH, -ZX) full duplex.

All the ports on the Switch shall be offered with requisite connecting cables and Trans-receivers, if any for termination on Jack/Patch Panel.



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Layer III Switching for IP:

The switch should be a multi-protocol switch with support for IP, IPX, IP - Multicast routing, For IP Routing the switch should have support for Static, RIP v1, RIP v2, OSPF, BGP4 routing, Provide Equal Cost Multipath routing for load sharing across multiple links, provide IP Multicast routing protocols desired - DVMRP or equivalent, PIM, PGM, IGMP, Multihoming etc. Support for IPV6 Classless Interdomain routing protocol DHCP Server and Relay Agent.
For high availability, the switch should support the standards based RFC 2338 Virtual Router redundancy Protocol (VRRP) / Hot standby routing protocol.
Network Address Translation & Network Time Protocol should be supported.
Each line or I/O module should support both Layer 2 and Layer 3 forwarding.

VLAN:

support for VLANs. VLANs should be configurable on Port based, Policy based, Mac address based, and IP Subnet based. The switch shall support for Dynamic VLAN based on open standards.

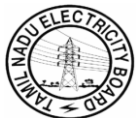
Protocols:

IEEE 802.3ad Link Aggregation or Equivalent IEEE 802.1p (Priority Queues) Gateway Load balancing protocol or equivalent
Auto-negotiation for link speed negotiation
IEEE 802.1Q VLAN Tagging/Trunking
IEEE 802.1d multiple Spanning Tree group, A minimum of 20 instance of spanning tree groups is desired on layer 3 chassis. Should provide for fast convergence of spanning tree.
IEEE 802.3ad Link Aggregation or equivalent should provide for at least 8 ports grouped in single logical link. Link aggregation shall be supported from other switches or across the similar chassis. Servers and Switches connectivity from switch should be configurable on load sharing layer2 link aggregation. Switch shall also provide configuration for port mirroring and 9000 byte jumbo Frame support for Gigabit ports.
IEEE 802.1w -Quick Convergence Spanning Tree
IEEE 802.1S-Multiple Instances of Spanning Tree
IEEE 802.3u Fast Ethernet
IEEE 802.3x Flow Control
IEEE 802.3z Gigabit Ethernet.
IEEE 802.3af Power over Ethernet (only in core switch or Distribution switch only)
Multi-Homing Support, Multicast Support & Multicast must be supported at Layer 2 in hardware so that performance is not affected by multiple multicast instances.

Policy Based Quality of Services:

comply to the IETF QoS
and DiffServ standards

Switch should support traffic classification based
on Layer2, Layer 3 and Layer 4 parameters like
ingress port, Ether Type (IP/IPX), VLAN ID, IP



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(RFC 2474 and RFC 2475) protocol type, Source IP addresses, Destination IP addresses, Source TCP/UDP ports, Destination TCP/UDP ports.
QoS based on classification, marking, prioritization and scheduling.
Bandwidth Engineering & Management - Per Port Minimum, Black-hole (Blocking), excess bursting, shaping Support for L3/L4 filtering capabilities for inter VLAN traffic, VTP or equivalent for VLAN management, Private or equivalent & Dynamic VLAN support, High Priority Transmit Queuing, Support for multiple WRED drop thresholds per queue.
QoS-based forwarding based on IP precedence
QoS implementation should support all 64 DiffServ Code Points (DSCP) and all 4 DiffServ Classes. QoS support for 4 hardware queues per port or more.
Strict priority and Weighted priority mechanisms for queuing and scheduling.
IEEE 802.1p User Priority should be supported
IEEE802.1p to DiffServ mapping also needs to be supported. Diffserv,IGMP

Management:

At least 5 levels of Management access to the switch for https, rlogin, telnet, snmp, rsh access to the switch.
SNMP Support: RFC1157 SNMP v1/v2c
TFTP Upload/Download
Port Mirroring: Port to Port, VLAN to VLAN, Bi-Directional
RMON: 4 Group (Statistics, Alarm, Events, History), on every port, no impact to performance
Switch must be remotely managed with SSH support via one telnet session for all module configuration
Should have functionality to add new features by upgrading only the central switching processor
Switch should support Remote SPAN feature to direct traffic from remote switch to the snooping device connected to central switch
Policy Based Management
Provisioned and Dynamic Policies at Layers 1-4 for QoS and Security
Real Time Multi-Port Statistics
Mac/IP Address Finder
Device and Port Groupings for Navigation and Policy Management
Private and Enterprise MIB

Security:

should provide for User level security - Discard unknown MAC addresses on the switch.
Layer 3 /4 Access Control Lists (ACLs) standard and extended Support for IEEE 802.1x authentication for edge control against denial of service attacks and other management control policy.



Packet filtering at the Network level should be supported

Security (User Access): Internal DB/External RADIUS /TACACS+, Support for IPSec protocol support for Firewall associated with core switch, Configuration Change Tracking, System Event Logging, Syslog. Support IP filtering using “deep” packet filtering with support for Layer 4 parameters and even content based filtering for Firewall associated with core switch. RADIUS authentication needs to be supported for switch access.

6.2 Distribution Switch

The switch should support 10/100 Mbps Ethernet ports.

The switch should support Gigabit Ethernet ports on fiber or copper.

The switch should have the support for 10-Gigabit Ethernet ports

The switch shall support WDM (Wave Division Multiplexing) for Optical networking.

The switch shall support FAN redundancy & switch fabric redundancy

Backplane speed : shall be 50 Gbps or more

Packet forwarding rate : 50 Mpps upgradeable to 100 Mpps

The backplane speed and packet forwarding rate specified is minimum. The SI should consider appropriate values for the proposed solution to ensure adherence to the requirements specified in the RFP.

For the following, the SI should consider appropriate value.

1. Port densities Support
2. No. of MAC Addresses support
3. No of VLAN support

6.3 Layer II Switch

The switch should support 10/100 Mbps Autosensing UTP Ports and 1000 Mbps Gigabit Ethernet 1000BaseSX ports.

For the following, the SI should consider appropriate value.

1. Port densities Support
2. No. of MAC Addresses support
3. No of VLAN support



6.4 Access Switch

The specification of Access switch at Internet gateway should be similar to core switch but this switch shall not have firewall and IDS associated with it.

The switch should support 10/100 Mbps Autosensing UTP Ports and 1000 Mbps Gigabit

Ethernet 1000BaseSX ports.

Backplane speed : shall be 100 Gbps or more

Packet forwarding rate : 100 Mpps upgradeable to 200 Mpps

The backplane speed and packet forwarding rate specified is indicative. The SI should consider appropriate values for the solution to ensure adherence to the requirements specified in the RFP.

For the following, the SI should consider appropriate value.

1. Port densities Support
2. No. of MAC Address Support
3. No. of VLAN support

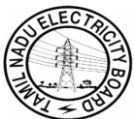
6.5 Core Switches

The switches offered shall support for Single CPU expandable to Dual CPU with both the modules either in active-active or active-standby use. The second CPU is installed/configured to provide an automate fail over control in case one of the CPU module goes down.

The Switches offered shall provide redundant power supplies to take full load of switch configuration and or on sharing basis between the modules. The redundancy may be configured with N+1 options. The power supplies offered shall be provided with cooling fans also in redundant configuration. The Core Switches shall be offered with no Single Point of failure for the chassis (failure which can bring the chassis down). The Fail over time to second module should be in milliseconds. The Switch fabric offered shall provide high bandwidth to support high-density non-blocking gigabit Ethernet and 10gigabit Ethernet aggregation configurations.

The switch offered shall provide high resiliency with multi link Trunking/Link aggregation on links between switch to switch or switch to Server Connection.

The link Trunking shall provide & enable to increase the link bandwidth. It shall also provide the link capability that can be configured with one port active and other in standby among the two ports configured under Multi link Trunking.



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The Switch shall support for spanning tree protocol structure to prevent loops in the network and optimize to minimize the path traversal /alternate route for minimum latency or failure in one of the link path. The switches offered shall provide STP with fast start providing minimum network disruption.

The Network Switches offered shall be Scalable and chassis base switch shall have at least **3 empty slots after** configuring the desired configuration in respective Core Switches.

The switches offered should support for single point Management System to monitor and configure the network. The Management System should be based on SNMP and RMON capabilities and enable the administrator to monitor the network. SNMP based management System should be able to handle basic requirements of the management of the network like managing VLANs, configuring ports and monitoring the traffic.

The QoS configuration in switches shall provide for better service availability, Throughput, Latency or minimum Delay, control for Delay variation or jitter, no packet loss, delivery of Packet in sequence, maximum Connection availability, etc.

QoS shall be configured with resource reservation and prioritization. Resource reservation (IntServ), such as RSVP, is a signaling protocol which sets up an end-to-end path with specific QoS metrics. If such a path cannot be created, the connection is refused. Prioritization (DiffServ) classifies each type of traffic according to the specific QoS metrics that it needs. Each classification is mapped into a Per-hop Behavior (PHB) which defines how each node in the network should treat the packet. For example, traffic can be differentiated into real-time (like voice or multimedia) and best-effort (like file transfer or e-mail) traffic. The real-time traffic would receive the highest priority through the network as defined by the PHB; the best-effort traffic would receive lower priority. The nodes in the network use a variety of queuing schemes such as Weighted Fair Queuing (WFQ), Random Early Detection (RED) to give each packet the priority it needs and weighted round robin de-queuing based on multiple receive and transmit queues.

The switches shall provide configuration of L2-L4 functionality

- Multiple Load Sharing Trunks
- Hot-Swapping: Fan-Tray, Module, Power Supply, Supervisor/CPU
- Redundant Load Sharing Power Supply
- Temperature Alarm and Power Monitoring
- Multifunction LED's per port for port status, switch-level status LED's for system, RPS monitoring, and switch utilization. Easily identified LED indications on all modules for visual diagnostics.
- Switch Management Capabilities: SNMP, Web, CLI, 4RMON Groups
- External PCMCIA Flash for storing OS & configuration files for High Availability Design

The switches offered shall provide shared interface for in-band and out-band management of switch fabrics with Multi layer switch feature.

The switch shall have the support for functionality for the following requirements and this functionality should be achieved by addition of an appropriate additional card in the main chassis or through a dedicated external appliance:



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- 1) In keeping with the dynamics of installation and variable needs for authorized and control access to associated servers Firewall functionality and IDS functionality should be achieved. The Firewall should have a capability of supporting 5 Gbps throughput. There should be a provision to support multiple Firewall Modules (Minimum 2 Modules) so that there is no single point of failure. The Firewall at the core switch should be able to create number of militarized (MZ) and demilitarized (DMZ) zones as per the requirement in the data center architecture.
- 2) The Switch should have support for Automatic Load Balancing across servers, which shall help in meeting the demand of high networking demands supporting upto 150000 sessions per second. The common IP protocols—including TCP and User Datagram Protocol (UDP), HTTP, FTP, Telnet, Real Time Streaming Protocol (RTSP), Domain Name System (DNS), and Simple Mail Transfer Protocol (SMTP) should be supported. The common load-balancing algorithms namely Round Robin, Weighted Round Robin, Least Connections, Weighted Least Connections, Source and/or Destination IP Hash (subnet mask also configurable) , URL Hashing and URL and Cookie-Based Load Balancing should be supported.
- 3) The switch should have Gigabit Ethernet switching Module to the latest state of art servers so that integration with servers becomes less complex and easier to manage. Independent cards may be proposed in line with specific server support if required. The card should have additional support for integration with EMS software for ease of management.

Sufficient no of priority queues shall be provided on 100Tx and on Gigabit ports and on all L3 enabled port allowing users to prioritize data packets The Switch offered by the bidder shall be fully SNMP managed device with support for SNMP Agent MIB, MIB-II. RMON support for history, statistics, alarm and events.

The device offered should preferably be 19" Rack mountable.

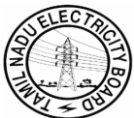
The Switches offered shall support Virtual Networking and Virtual LAN Management feature. It shall be possible to form workgroup of users Reconfiguration of workgroup and physical relocation of users shall be achievable by on-screen management software features like Moves, Adds etc. Multi-cast and Broadcast messages shall be restricted to workgroup.

The Switches offered shall provide Intrusion Detection, Firewall, and Network Analysis features through integrated modules or dedicated external appliance.

Backplane speed : shall be 100 Gbps Full duplex or more
Packet forwarding rate : 100 Mpps upgradeable to 200 Mpps

The backplane speed and packet forwarding rate specified is minimum. The SI should consider appropriate values for the proposed solution to ensure adherence to the requirements specified in the RFP.

For the following, the SI should consider appropriate value.



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1. Port densities Support
2. No. of MAC Address Support
3. No. of VLAN support

The switches shall support for Multi-service application platform to be enable advanced Security application such as Firewall, IDS and IPS, WLAN security, SSL VPN access and MPLS baseline capabilities for VPN tunneling at layer 2.

All switch ports shall be operable in Full-Duplex Operation on Ethernet and gigabit Ethernet ports.

General requirements

- The switch should be a high performance Layer 2 and Layer 3 switch.
- The switch should provide Layer2-Layer 4 functionality
- The switch should support High availability, resiliency and redundancy at the physical layer and at Layer 2 and Layer 3.

Specification of L-2 switches :

Interface Requirement -

- The following type of interfaces should be available in the offered switch and with Fast Ethernet Interfaces (RJ-45)

Architectural Features -

- 19-inch Rack-Mountable
- Should have on board memory minimum of 16MB
- The switch should have adequate flash memory to support all the features asked for and also to ensure storage of multiple software images. The switch software must support the flash file system to easily store and load multiple images.
- IEEE 802.1Q VLAN Support - Port based VLANs
- IEEE 802.1 x with voice VLAN feature that can permit access to an IP phone to the voice VLAN regardless of the authorized or unauthorized state of the port.
- RADIUS / AAA Support
- High MTBF Support
- Minimum Switch fabric capacity and forwarding rate as given below :
24 Port Switch - Minimum 8 Gbps switching fabric and 6 Mpps or more wire-speed forwarding rate



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48 Port Switch - Minimum 12 Gbps switching fabric and 10 Mpps or more wire-speed forwarding rate

Layer 2 Features

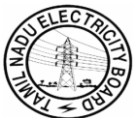
- L2 Switching Support
- L2 Link Aggregation Protocol Support
- VTP or Equivalent
- Support for Automatic Negotiation of Trunking Protocol, to help minimize the configuration & errors
- LLDP Support
- DHCP Server and Relay support
- Spanning-Tree Protocol (IEEE 802.1 D)
- Per port broadcast, unicast and multicast storm control
- Should be able to allow administrators to remotely monitor ports in a Layer 2 switch network from any other switch in the same network
- Prevent edge devices not in the network administrator's control from becoming Spanning Tree Protocol root nodes.
- Should shut down Spanning Tree Protocol PortFast-enabled interfaces when BPDUs are received to avoid accidental topology loops

Redundancy Features

- Link Aggregation
- Spanning Tree (802.1 d) with support for spanning tree per VLAN or equivalent
- The switch should have power supply redundancy solution

Security Features

- Support for External RADIUS /TACACS+ for console access restriction and authentication
- Multi-Level access security on switch console to prevent unauthorized users
- Support for 802.1x port based authentication
- 802.1 x with Port Security
- Unicast MAC filtering
- Support DHCP Snooping
- Port Security based on the MAC address of a user's device with the aging feature that removes the MAC address from the switch after a specific time to allow another device to connect to the same port.
- System Event Logging - Syslog



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Network Management

- Embedded support for Web based management using standard web browser.
- Support for SNMP v1, SNMP v2c and SNMP v3
- Support for SPAN port functionality for measurement using a network analyzer or RMON probe.
- Switch must be remotely managed via one telnet session for all module configuration
- Provisioned and Dynamic Policies at Layers 1-4 for QoS and Security
- Real Time Multi-Port Statistics
- Should have capability to diagnose and resolve cabling problems on copper ports
- Traceroute to ease troubleshooting by identifying the physical path that a packet takes from source to destination
- Device and Port Groupings for Navigation and Policy Management
- Shall support MIB
- Access Rights



- Traffic Volume/Error/Congestion Monitoring
- TFTP Download/Upload Software

Standard Compliance

- IEEE 802.1Q VLAN tagging
- IEEE 802.1 D Spanning Tree
- IEEE 802.3u Fast Ethernet
- IEEE 802.1s
- IEEE 802.1w
- IEEE 802.1AB
- IEEE 802.3ad
- RFC 768 UDP
- RFC 783 TFTP
- RFC 791 IP
- RFC 792 ICMP
- RFC 826 ARP
- RFC 854 Telnet

7) Mail / Messaging system -

The offered messaging solution shall include the required hardware and software:

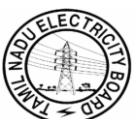
7.1 Messaging Solution Hardware requirement

The offered hardware should be a clustered solution (2 nodes) with external Storage. The solution should have -

- Two servers (identical model and configuration as given)
- External Storage -
 - Usable raw capacity with RAID 5 should be at least 1000 GB (15,000-rpm)
 - External Storage should be hot swappable
- Clustering software (Software that provides logical link between the two servers and ensures high availability)

7.2 Messaging Application Requirement

- The mail server should support standard protocols like POP, IMAP, SMTP, HTTP, HTTPS, NNTP, LDAP format.
- The mail server should have an integrated calendaring feature that is able to record meeting requests, forward meeting requests and generate alerts.
- The mail server should support public folders or discussion databases.
- Mail server should have an ability to be accessible from Internet and also accessible via Symbian, Pocket PC, Blackberry and Windows powered PDA's/Mobile Phones.
- Messaging Server should support cHTML, xHTML, and HTML mobile phone browser support.



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- It should provide with up-to-date notifications synchronization with Pocket PC, Smart phones and other devices.
- Mail server should have an ability to have an internet mail filtering functionality to separate spam; the messaging server should have built-in server-side filtering and also client-side filtering.
- The mail server should have the following security features -
 - o Connection filtering
 - o Sender and recipient filtering, including blank sender filtering
 - o Recipient lookup
 - o Real-time block list-based filtering
 - o Suppression of sender display name resolution
 - o Ability to restrict relaying
 - o Ability to restrict distribution lists to authenticated users
 - o Should support Dynamic distribution lists
 - o Should support virus scanning API
- Should support backup restore of open files
- Should have support for integrated authentication mechanism across operating system, messaging services
- Discussion databases should be capable of being replicated on multiple servers.
- Should provide tools to handle disaster recovery scenarios like re-connection to the directory services user account, support for recovery of individual or group of mailboxes, support for merging or copying recovered mailboxes
- Should provide support for group collaboration, Calendaring, Scheduling
- Should provide support for collaborative application development and support for integrated workflow scenarios and Web services.
- Should support Blocking Out of Office messages from distribution lists- Out of Office messages should not be sent to the entire membership of a distribution list that is listed in the To or Cc boxes.
- Should support workflow applications implementation

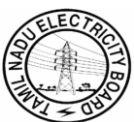
7.3 Messaging solution : should come along with appropriate webmail freeware client (approx 20000)

Messaging Client suggested for working with the Server should provide for the following functionalities:

- It should provide for rich scheduling features, including personal, group, and resource scheduling, which integrate with e mail, contacts, and tasks.
- Sender should be able to verify which recipients have accepted, partially accepted, or declined meeting requests.
- Users should be able to share their calendar information with others, enabling users to view multiple calendars simultaneously.
- Recipients of meeting requests should be able to return proposals for better meeting times. The sender should be able to review all proposals before resending new meeting requests.
- It should be possible for Contacts from the Global Address List (shared directory) to be added to personal contacts.
- Messaging Server should provide the capability for synchronizing with Symbian, Pocket PC Client, RIM and other devices enabled with GPRS or wireless.
- Messaging Client and Server should support Secure/ Multipurpose Internet Mail Extensions (S/MIME), enabling users to digitally sign and encrypt e-mails and attachments.
- There should be feature for Sent messages to be recalled by the sender.

7.4 Directory Software:

- The Directory Server should be LDAP v3 Compliant
- Should support partitioning into multiple LDAP Repository architectures for scalability.
- The Directory Server should have out of the box integration with the e-mail server.



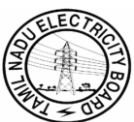
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- Should support LDAP servers in multi master configuration
- LDAP server should be able to replicate data between servers and support cascading replication.
- SNMP support for flexible network monitoring and management.
- Support for Access Control Lists (ACLs).
- Support for controlling access to the directory, a sub tree, entries, attributes by setting permissions for users, groups, roles and location information like IP addresses.
- Support for user authentication through user ID/password, X.509v3 public-key certificates, or Anonymous authentication
- Ability to keep Replicas in Synch and to enforce Replication updates
- Should have support for open standards [LDAP v.3, XML]
- Should have support for integrated authentication mechanism across operating system, messaging services.
- Should support directory services integrated DNS zones for ease of management and administration/replication.
- The directory service should support features for health monitoring and verifying replication.
- The directory service should provide support for Group policies and software restriction policies.

7.5 SPAM Filter

Messaging solution should come along with appropriate SPAM filtering solution. The solution

- Should provide at least 95% spam filtering capacity
- should be able to block emails using both lists and preset filters
- Should have various filtering options-
 - It should have the facility to block certain specific IP addresses, certain servers, or certain email addresses (Black List)
 - It should have allowing filters also (white list) depending on specific servers, IP Addresses or Email addresses.
 - The solution should have dynamic list of open proxy servers and so as to block known spam senders
- Should update filtering rules automatically
- Should allow users to customize the filtering options
- It should have customizable options to either-
 - Redirect all spam mails to one mail ID
 - Save spam mails to hard disk
 - Delete all spam mails automatically
 - Quarantine spam outside users inbox
- Should allow the users to view blocked mail through graphics on/off
- Administrative features
 - Group policies to manage filtered mail
 - Should have Automated filter delivery and deployment facilities
 - Filtering customization
 - Multiple quarantine choices (Email Client based quarantine, web based quarantine)
 - System monitoring (examining logs, producing detailed logs etc)
 - Should have Centralized Web-based administration



8) Firewalls and NIDS System -

8.1 The firewall should have following features

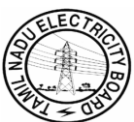
- State-full Packet Filtering - Should have a TCP State Aware Packet Filter Technology
- The firewall with throughput of 5Gbps handling a minimum of 50000 simultaneous session per second & having Gigabit Ethernet interfaces.
- Support for unlimited number of users
- Network Address Translation - Should be able to provide Dynamic NAT as well as Static NAT
- Port Address Translation - Should provide capability to redirect the port requests to user configurable ports
- Integrated Security -Should have an inbuilt Anti-spoof engine to drop all such packets
- Should drop all the IP fragment packets
- Should have protection against popular attacks such as ping-of-death attack, tear-drop attack, etc
- Administrator should be able to configure the default timeout for TCP/UDP services
- Should provide the capability to configure specific timeouts for specific services
- Should allow administrator to specify the maximum number of sessions between client and server
- Should log the number of active TCP/UDP sessions
- Should provide the firewall configuration backup and restore facility
- IP Traffic Control should be based on Source, Destination, Protocols, Ports, etc.
- Should provide administrative Access to the firewall management based on the AAA services provided by the TACACS+ and RADIUS protocols.
- Should provide different privileges for administration and management
- Should display firewall server's current date and time in remote Administrative Console
- Should be able to reconfigure the firewall parameters and policies from remote console
- Should provide Selective viewing of Logs based on Source, Destination, Source Port, destination port, rule number, time etc
- Should be able to Auto refresh the most recent logs while viewing
- Logs viewed through GUI Console should be traversable
- Should have support to work in high availability.
- Supports Message Digest Algorithm 5 (MD5)-based and plain-text routing authentication for Routing Information Protocol (RIP) and Open Shortest Path First (OSPF), preventing route spoofing and various routing-based DoS attacks.
- The firewall should be ICSA/EAL certified for firewall.
- The firewall should not create any bottleneck and performance problem.

8.2 The integrated Network Intrusion Detection system should have following features

8.2.1 Platform:

- Supports open source as an underlying OS.
- Monitoring Interface should be able to operate at layer 2.
- Minimum 8 10/100/1000 Ethernet monitoring interfaces should be provided.
- Should have in-built redundancy for storage, if applicable and power.
- Should have minimum throughput of 2 Gbps .
- Should support High availability deployments either as active-active or active-passive or both

8.2.2 Security Content



- Consists of vendor's original threat intelligence and is not overly dependent on information available in the public domain.
- Is continuously updated with new threat intelligence, including detailed help text, in an automated fashion and without physical access to the unit.
- Security information is meaningful, comprehensive and freely available to customers and non-customers via a publicly accessible database.
- Detects and blocks all known, high risk exploits along with their underlying vulnerability (not just one exploit of that vulnerability).
- Detects and blocks zero-day attacks without requiring an update.

8.2.3 Customization

- Requires minimal customization to built-in security checks.
- Automatically blocks malicious traffic out of the box and allows additional blocking upon policy customization. · Can enable/disable each individual signature. Each signature should allow granular tuning.
- Allows users to control the number of times a sensor notifies the console when a flood-type attack occurs. For example, the sensor should be configurable to send a single alert every five minutes vs. sending an alert for every single packet associated with the attack. This will avoid overwhelming the console and the internal network with alerts.
- Supports assigning of ports to custom applications. In order to monitor any type of port traffic, the user should be able to assign a service to a port, label that port with a custom name, and then monitor that port for activity. This is important in order to allow users to monitor traffic to and from custom applications or any other non-RFC standard port(s).

8.2.4 Updates

- Supports automated security check and product updates.
- Updates are frequent and regular.
- Security check updates do not require reboot of IPS unit.

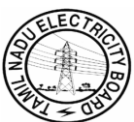
8.2.5 System Integrity

- Supports encrypted communication between all components.
- All communications should be encrypted. It should have a built-in mechanism to ensure that only legitimate users have access to the agents and to the security information stored in the database.
- Supports multiple user roles. These roles should allow or deny specific privileges to users. Privileges should include a range of management and viewing or reporting capabilities.
- Supports system management hierarchy and associated access. The system should allow different groups within an organization to maintain their own console while at the same time allowing a central security team the ability to view all events across the entire enterprise.
- Has remote log storage capability to support logging to a central repository. In the event that the log data is sent from the IDS to a separate Management server, the IP address, or any other unique identifier of the IDS shall be captured with the other recorded log data for the logged events.

8.2.6 Performance Considerations

- Does not introduce network latency. Provide independent validation.
- Fails open should a Power loss/Ethernet/hardware/software failure occur.
- Notifies console of unit interruption. Console should receive alert and/or provide additional notification to administrator should any component become non-operational or experience a communications problem. The alert should specify the type of problem encountered, and users should have the ability to enable tracing mechanisms to determine the exact nature of the issue.

8.2.7 Accuracy



- Accurately detects intrusion attempts and discerns between the various types and risk levels including unauthorized access attempts, pre-attack probes, suspicious activity, DoS, DDoS, vulnerability exploitation, brute force, hybrids, and zero-day attacks.
- Accurately prevent intrusions from occurring.
- Accurately respond to intrusion attempts.
- Resistant to evasion techniques.
- Accurately identifies attacks with correct severity level while allowing benign traffic to pass without interruption.

8.2.8 Detection Technology

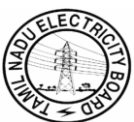
- Detects and blocks all known, high risk exploits.
- Employs full seven-layer protocol analysis of over entire range of TCP/IP internet protocols. Performs stateful packet inspection.
- Decodes backdoor communications / protocols regardless of port.
- Security checks have a pre-defined severity level associated with them. The severity of each check should also be configurable.
- Detects and blocks malicious web traffic on any port.
- Does TCP stream reassembly.
- Does IP defragmentation.
- Detects attacks within protocols independent of port used.
- The detection engine should be able to detect a protocol running on a non-standard port and automatically begin monitoring that port for events associated with that protocol. For example, it should be able to detect HTTP
- traffic running on a port other than port 80 and then start monitoring that data stream for HTTP attacks. Additionally, users should be able to customize the ports associated with any protocol or application so that the IPS automatically monitors those ports.
- Supports attack recognition inside IPv6 encapsulated packets.
- Performs real-time event consolidation of multiple events at sensor.

8.2.9 Prevention Technology

- Supports active blocking of traffic based on pre-defined rules to thwart attacks before any damage is done, i.e. before compromise occurs.
- Supports active blocking of traffic based on dynamic responses to pre-defined rules.
- Allows definition of network level filtering rules based on source and destination IP and/or network, and source and destination IP ports.
- Supports several prevention techniques including drop packet,
- TCP-RST etc.

8.2.10 Response Mechanisms

- Supports granular set of unique responses for every signature.
- Supports response adjustment on a per signature basis.
- Offers a variety of built-in responses like console alerts, database logging, email notifications, SNMP traps, offending packet captures, and packet captures..
- Is able to dynamically alter the severity of an event based on event validation features that add vulnerability state information to an alert to reduce false alarms while blocking truly malicious activity?
- Allows automatic responses based on event validation.
- Allows user-defined responses. Must support custom responses such as the execution of a command-line script.



- Must be able to transfer all relevant event data to the user defined program such as source and destination IP address, ports, attack type, event name, date and time stamp, etc.
- Supports integration with other alerting mechanism or software that can generate paging or SMS response.

8.2.11 Certifications

- NIDS/NIPS should be NSS/Tolly/JD Power-SCP/EAL approved

8.2.12 Management - Agent Command and Control

- Management platform supports command, control, and event management functions for NIPS, NIDS.
- Allows central management of signature updates. Is able to centrally push out updates from one location to multiple IDS installed across enterprise.
- Supports central management of policy configuration.
- Management platform includes an automated deployment

8.2.13 Management - Reporting

- Includes built-in reports. The console should be capable of producing graphical metrics and time-based comparison reporting. The information in the reports should be available for a group of assets, an entire Site, or an entire enterprise. Further, users should be able to drill down into these graphical reports to view pertinent details.
- Built-in reports should include high level summaries and detailed reports.
- Supports the creation of custom reports, preferable without the user having to learn a third party reporting system.
- Can export reports to other formats. Users should be able to output report data into a variety of different file formats like HTML, PDF, CSV, and Printer.
- Can schedule reports for automatic generation to all supported formats.

9) Servers

The following has to be considered by the SI while selecting the server platform -

1. The aspect of reliability, availability and serviceability features as these servers are meant for running mission critical applications in 24 X7 availability.
 2. The servers installed in the Data Center & Disaster recovery Center are for managing enterprise level solution for the entire utility, however at present utility may like to implement only in APDRP scheme area, but in future utility will cover his entire business area hence the servers shall be scalable (Scalable-capacity on demand) to meet the ultimate capacity. While selecting the server platform the care should be taken so that the selected OS should support the scalability.
- The data base servers should be in cluster fail over mode.
 - The Application servers shall be in scale out mode.
 - Independent database server cluster shall be utilized for GIS data base & Map servers (DB cluster 1) and all other applications (DB cluster 2)

The minimum no of servers for each application requirement are as follows.

1. Db server (for all other application) - 2 Nos (Cluster fail over mode)
2. Db server for GIS and map database- 2 Nos (Cluster fail over mode)



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3. Application Server - 2 Nos (Scale out mode)
4. GIS Application Server - 2 Nos (Scale out mode)
5. Data Acquisition server - 2 Nos (Cluster fail over mode)
6. Testing and QA server - 2 Nos

The bidder should specify the no of servers quoted in his offer for each type of servers.

9.0 General Information for Servers :

The Bidder should provide the following information:

- The maximum number of CPUs the vendor can supply without IVL clearance for each machine
- The bidder must explain the total system expandability in terms of CPUs, RAM , Hard drives.
- Maximum number of Fibre Channel Interface cards that can be supported in a redundant mode.
- Reliability, Availability, Serviceability, (RAS) features.
- Dimensions of the machine, weight and total floor area requirement
- Power Ratings: Voltage, Current, Frequency, Phase
- Heat dissipation in BTU/hour
- All the possible Hot Plug / Hot Swap Components in the server
- Cache per CPU
- System Bus & I/O Architecture
- Whether I/O interface cards and network cards in fail-over mode works in active-active mode
- Whether I/O slots are on independent I/O buses or otherwise
- Scope of upgrade-ability in terms of
 - o CPU, Cache
 - o Memory
 - o Number of Expansion I/O Slots
 - o The bidder must mention the minimum quantity of CPU and minimum memory which can be increased in an upgrade a process
- CPU future Roadmap for the offered machine for the next 5 years
- Details on mixing of future processors with the existing processors
- OS Details and future road map
- Bundled Software details
- Details of Clustering and other software agents offered
- Maximum size of a single file-system supported by OS
- Whether support for raw devices is offered by the OS
- Explain how the solution offered will provide 99.5% availability.
- Can the offered machine be partitioned into multiple independent systems with independent OS? If yes, provide the full details for the same.



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- ❑ The proposed server, OS, HBA and HA clustering software must be fully compatible to connect to the offered storage solutions on a SAN environment.
- ❑ Mention the name of the offered site, where the proof of concept and functionality offered can be shown to PURCHASER in a similar and live environment.
- ❑ Mention the names of all software, OS, agents and supported licenses offered with correct version to achieve the desired overall solution.

9.1 All offered machines must be Certified for

- 64-bit OS kernel
- 64-bit Database

Servers to be offered with latest CPU with highest clock speed available on the model being offered by the bidder at the time of bidding.

Maximum number of CPUs specified by IVL clearance shall not be exceeded, without compromising the desired performance

SWAP shall be configured for minimum 3.5 times the size of the RAM

9.2 Centralised server Management Solution

Central Hardware Monitoring Console for the entire landscape of servers, in redundant configuration to manage the Servers

A suitable redundancy must be built-in to ensure that console operations do not have any single point of failure. Built-in alternative solution shall be provided for management of console activities in case of console failure, without re-booting or shutting down the system.

9.3 Monitor/ Graphical Central Console

Sufficient Nos. of GUI based system management consoles for entire landscape, consisting of 15" TFT color monitor based system (Laptops), to be connected through Management LAN.

9.4 Remote Management

Equal no of licensed Terminal Emulation and licenses of X-Windows Software shall be provided for remote management of servers.

9.5 LAN Definitions

9.5.1 **Management LAN** : Management LAN has to be set up for remote management of all the servers.

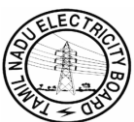
9.5.2 **SERVER LAN** : The Server LAN consists of inter-networking of DB servers and their interconnection with Application servers for inter-server traffic . The servers should support 10 Gigabit fibre optic LAN connectivity for inter server traffic.

DB servers and Application servers are to be interconnected for each application, using either separate switches or using a central switch with VLAN configuration. DB servers shall be interconnected using 10 Gbps ports and Application Servers using 1 Gbps ports. The switch(s) shall be layer3 switches.

The switch(es) shall have minimum 20% free ports of each category.

9.5.3 **Public LAN** : Public LAN consists of network connection of all the Application Servers with End-Users. All servers shall be connected to public LAN.

9.5.4 **LOAD BALANCER**: Minimum TWO (2) Nos of load balancer shall be provided and configured. The Load Balancers should have following features -



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- 24/7 Application Availability
- Fault tolerant server operation for complete IP Application access
- Schedule maintenance of application server transparent to the users.
- Should support OS as well as hardware independence of the application server. - Heterogeneous environment
- Maximum utilization and fully flexible traffic distribution across server farms and Data Center & Disaster recovery Centers for unlimited scaling of applications, server operations and handling of increased user traffic volumes for economical service growth
- Centralized application management
- Configuration, application set-up and comprehensive traffic performance monitoring for application management and visibility
- Load Balancer should have easy to use GUI providing real time activity monitoring, reports and centralized configuration management.
- Multiple Application Load Balancing: Port Address Translation.
- Load Balancer should have support to work in high availability

9.6 **Regulations:** System should meet international regulations on safety, RFI/EMI, Immunity and X-ray.

All items covered under the scope shall be offered in rack mounted configuration in OEM racks.
Availability of spares and support for the system for a minimum period of **7 years** from the date of acceptance by Owner

9.7 **RAS Features.** Reliability ,Availability and Serviceability (RAS) features

Server RAS and Security Features :

Redundant Hot swappable Power Supplies
Redundant Hot Swappable fans / cooling
Error correction and parity checking for improved data integrity
Easy replacement for most component replacements
Advanced Remote Management features
Provision for Virtual Partitions, minimum 8 partitions.

Management:

Web, CLI and GUI interfaces to manage inventory and environmental conditions of CPU, Memory, Power Supplies
Watchdog, Boot time out, automatic server restart monitoring
Monitoring Fan Speed and Status
Monitoring Power Supply Status
Hardware and Software Diagnostics
CPU Utilization Monitoring
Event and Alarm Management
Secure Remote Dynamic Management
Infrastructure Lifecycle Management Software

9.8 **Common specification for all servers(Db, Application, GIS, Testing and QA server)**

1 System Hardware



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The servers shall be enterprise level SMP RISC / Itanium / X86 - 64 bit based processor based systems. The offered systems should be high end Datacenter class servers with redundancy / N+1 features built in at every level like disk, memory, power supplies, cooling etc.

The server model quoted by bidder should be complied with the following benchmarks and the same benchmark results should be submitted along with the bid.

a. OEM must be a member of Transaction Processing Council (TPC) or Standard Performance Evaluation Corporation (SPEC)

b. Minimum benchmark parameters for each server are as given below:

- SPEC CPU CINT & CFP 2006 (or later) benchmark certificate
- TPC 2006 (or later) benchmark certificate or internal self-certification from the OEM for each database server should be provided and the TPMC value should be ≥ 3500000
- For application server, the SPECint Rate base value should be ≥ 225
- It should be Windows/Linux/Unix certified for the year 2008 or later.

The servers proposed as a part of the solution should ensure:

- Performance should not be downgraded with maximum concurrent users across the utility area.
- Horizontal and vertical scalability (Scalability-Capacity on Demand)
- High availability, Reliability and Serviceability
- Adherence to SLA's specified in appendix C and as well as all conditions mentioned in RFP.

2 Operating System

The operating system of the server shall be 64 Bit. The Operating System shall be of the latest version released by the OS vendor. The OS shall be supplied with media and complete documentation shall be provided for each server. The OS license shall be provided for each partition with separate independent instances of the OS in the server.

The OS shall have standard features and networking support i.e. TCP/IP, NFS, NIS, CDE, BSD tools etc. Disk mirroring & striping support shall be included.

OS shall be given with the latest patches as applicable and OS should have minimum features like full binary compatibility across versions, online OS updates & upgrades and online kernel patching/upgrades, standard GUI utilities for system administration, virtualization using soft partitioning with minimal or no performance overhead, online error detection and prevention of critical hardware components, provision to analyze system performance bottleneck in real-time, security features like built-in firewall, Role based access, Access control list, Process based privileges, TCP wrappers, IPSec, Smart card support, Pluggable Authentication modules and more. Vendor should provide clear reference to these features.

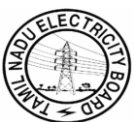
3 System RAM

DDR2 memory with ECC at least 4 GB per processor upgradable to 512 GB memory for whole system

4 HDD

Minimum 2X 146 GB hot plug SAS/ FC drive, scalable to 4 drives within the box support Raid 1,0. The HDD shall be sized for swap / virtual memory area of 3.5 times of main memory and OS.

5 System & CPU



Bidder to specify Number of CPUs in the offered solution to meet the desired performance level.
64 Bit Symmetric Multi Processor CPUs to be provided

6 CPU clock speed : 1.2 GHz (minimum)

7 DVD drive per server : 1 No

8 Network Interface:

Minimum 4 numbers of Gigabit Ethernet ports (100/1000 Mbps) based on latest PCI-e per server, in automatic fail-over / redundant configuration and auto-switching mode (In addition to those required for establishing cluster) two copper and two Gigabit Fibre Sx autosensing port to be provided. This 4 NIC cards should operate in load sharing mode / hot standby mode to dual network.

The connectivity between the application and database servers should be 10 Gbps Fiber Ethernet channel.

9 Scalability

9.1 The system shall be horizontally or Vertically scalable (by using the same type of processors as offered) twice of it's capacity without IVL clearance for each machine

9.2 Expandability with respect to additional RAM : Not less than 2 times of the offered capacity

10 Other Parameters The offered system should be Partitionable to 2 (Two) to 4 (four) partitions. Each partition should be capable of booting different instances of Operating system and have identified separate I/O sub systems.

11 Disk Management Software - Suitable disk management software shall be supplied including Volume Manager to dynamically manage the logical volumes.

12 Minimum one license per server of C Compiler & Development Package and C++ Compiler & Development Package to be provided.

9.9 For Db server and GIS and map database server

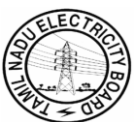
1 General feature

The DB server shall constitute two servers of the same specification as detailed hereunder in a High Availability Clustered configuration with fallback.

The High Availability cluster shall be with adequate redundancy and with equal performance and configuration, and will have access to the same database and storage.

Each system of the cluster solution shall be able to provide fail-over to the other (clustered) system for any failure arising due to:

- Hardware,
- Operating system,



- Database

2. Additional Network Interface for Db server:

4 Gbps Fibre Channel HBA cards (for SAN connectivity) with multi-path and automatic load balancing on the server side (2 no Fibre chanel HBA cards per server) - .

3 Software processes in any of the two systems.

The solution shall be able to recover automatically In case of unrecoverable errors; the process on the failed system must be automatically restarted on the other system. This switch over shall remain transparent to all the Application Servers and end-users and they shall be able to continue working without re-logging into Application.

In such a fail over scenario, no committed transactions shall be lost.

Once the failed system comes up, there shall be a scope of reverting back to the original configuration manually and automatically (both options) without disrupting the applications.

The cluster failover solution shall be a certified solution.

The solution of implementing the fail-over shall be explained in detail in the technical proposal along with logical diagrams.

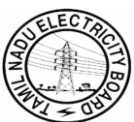
The solution shall provide for all the necessary hardware and software components required for the above including clustering.

Bidder will clearly mention the points of failure in the offered solution in an Oracle/MS SQL/MY SQL/DB2/Informix/Sybase Database environment and corresponding resolutions.

9.10 For Application Server and GIS application server, testing and QA server

Solutions offered against each of the application environment shall be required to comply with the following

1. Bidders may either offer discrete server machines or server partitions.
2. The total traffic to application servers have to be distributed to multiple servers / partitions to provide load balancing and redundancy.
3. Each Application Environment normally be configured with at least two (02) servers. The partitions on each server shall not share any I/O devices and shall have separate boot images.
4. Manageability of all the different application servers must be simple.
5. Each partition shall be able to run same or different versions of OS independently.
6. Central console in redundant configuration to manage the Application Servers with no single point-of- failure shall be provided in the solution.
7. The solution shall provide for all the necessary hardware and software components required for the above.
8. Bidder will clearly mention the points of failure in the offered solution in an Oracle/ MS SQL/MY SQL/Db2/Informix/Sybase Database environment and corresponding resolutions.
9. If the bidder proposes a large server in partitioned configuration to provide the required number of Application servers, the following points are mandatory:
10. Any configuration change in one partition shall not affect any other partition unless desired
11. An error in one partition shall not bring the entire system or other partitions down



9.11 Misc. Servers :

These Servers shall be required for use as

1. CRM server.
2. CTI Server.
3. IVRS server.
4. Anti virus server.
5. Mail Server.
6. Portal server.
7. DNS server.
8. LDAP server.
9. Reverse proxy server.
- 10.EMS Server.
- 11.NMS Server etc.

CRM/CTI/IVRS server - Should be minimum of 2 servers/systems in **cluster failover mode** for Customer care centre

Portal, DNS, Mail, LDAP, Anti Virus, Reverse Proxy server at Data Center & Disaster recovery Center.

Enterprise Management system (EMS), Network operation control Station at Data Center & Disaster recovery Center

a. OEM must be a member of Transaction Processing Council (TPC) or Standard Performance Evaluation Corporation (SPEC)

b. Minimum benchmark parameters for each server above are as given below:

- SPEC CPU CINT &CFP 2006 (or later) benchmark certificate
- The SPECint Rate base value for the above servers system to be > 150
- It should be Windows/Linux/Unix certified for the year 2008 Or later

The servers proposed as a part of the solution should ensure:

- Performance should not be downgraded with maximum number of concurrent users across the utility area.
- Horizontal and vertical scalability (Scalability-Capacity on Demand)
- High availability, Reliability and Serviceability
- Adherence to SLA's specified in appendix C and as well as all conditions mentioned in RFP.

- 1 The servers shall be offered in rack mountable configuration, mounted in 19" 41/42 U OEM racks. The server shall be of 2U form factor



2 Operating System

Latest version of OEM operating system shall be provided for each server, with required number of user license on each server.

(At least 4 for each server)

- 3 Each Server shall be offered with either 32 bit or 64 bit architecture processors
- 4 Each server shall be configured with even number of CPUs.
- 5 **Processor:** RISC/Itanium/X-86 based Processor with simultaneous Multi-threading.
- 6 Minimum Front side bus speed for each server- 1333MHz
- 7 **RAM** On each server the minimum installed RAM shall be 4 GB PC2-5300 667 MHz ECC DDR2-SDRAM per processor.
- 8 **HDD**
No. & capacity of internal HDD per server: 2x140 or 3x73.4 GB 15K RPM SAS Drive.
Internal HDDs shall be offered in hardware mirrored format.
- 9 **Slots:** Minimum 4 PCI Slots
- 10 **RAID CONTROLLER:** Dual/Dual channel hardware RAID Controllers at 320 MBPS or better and Integrated RAID 0, 1, It should not occupy PCI slot.
- 11 **Internal Optical Drive per server:** DVD drive with read & write
- 12 **Network Interface :** LAN Controller per server Four (4) number gigabit NIC and 2 Number 4 Gbps Fiber Host Bus Adaptors per server
- 13 **Centralized management Solution :** Central management solution shall be offered per rack, common to all the servers in the rack with 17" LCD TFT display, Keyboard and mouse.
- 14 **Power Supply :** Each server shall be provided with N+1 Power supply hot swappable
- 15 **Fans :** Should be Redundant hot swappable
- 16 **System Management:** Integrated system management processor for system and environmental monitoring such as temp, optical disks, fans, power supply.
- 17 **Dimm Slots:** 4 GB Scalable to minimum 32 GB
- 18 **Disk Controller - SAS controller**
- 19 **HDD Bays -** Should support upto 5 HotSwap HDD bays
- 20 **Bus - PCI-e Architecture supported**

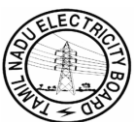


- 21 Certification: UL, FCC, and for supplied OS
- 22 OEM server management software to be provided
- 23 LEDs to identify failed components within the subsystem

EMS/ NOCS center will be provided with common - 21” TFT color monitor MPR-II certified

9.12 Access control Server

1. Shall operate as a centralized RADIUS server or TACACS+ server
2. Shall provide authentication ,user or administrator access and policy control for centralized access control
3. Shall be built around central database for all user accounts and centralized control of all user privileges which can distributes throughout the networked to network switches and access points.
4. Shall be able to provide AAA services for wired and wireless LAN, dialup, broadband, Voice over IP ,firewalls and VPNs
5. Shall be able to provide diverse type of network devices like switches, routers, firewalls, VPN using AAA.
6. Shall be able to provide IEEE 802.1X authentication services for network switches and wireless access points.
7. Shall support Lightweight Directory Access Protocol (LDAP) authentication forwarding for user profiles stored in directories from leading directory vendors including Sun, Novell, and Microsoft.
8. Shall provide features to define different access levels for each administrator and the ability to group network devices to enforce and change of security policy administration over all the devices in a network
9. Shall provide access control lists based on time-of -day network use, number of logged sessions, and a day -of -week access restrictions
10. Shall provide for defining sets of ACL's that can be applied per user or per group for layer 3 Network devices like routers, firewalls and VPNs.
11. Shall provide extensible authentication protocols like EAP, EAP-FAST, EAP TLS and Microsoft PEAP.
12. Shall provide certification revocation using the X.509 CRL profile for enhanced security with EAP - TLS.
13. Appropriate Server hardware to be provided with Access Control server
14. Shall support replication of users and groups account database

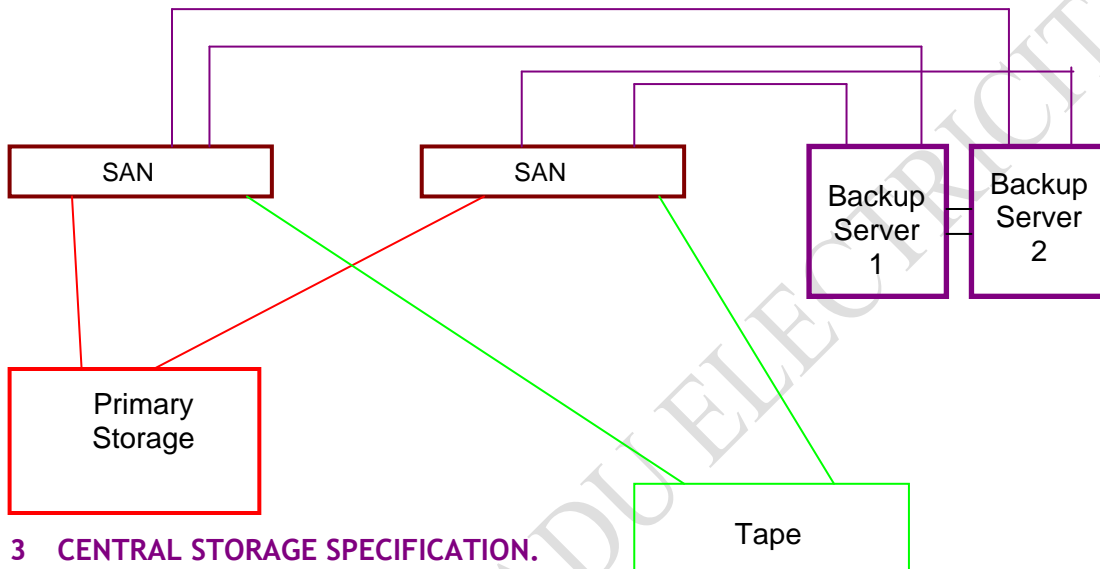


10) Storage & Backup Subsystem

1 OVERVIEW

The Owner has chosen to establish a Data Center & Disaster recovery Center and DB servers shall use an external central storage through a switched fiber channel storage area network.

2 Storage Schematic.



3 CENTRAL STORAGE SPECIFICATION.

- 3.1 The DB Servers will have access to the common single Oracle/MS SQL/MY SQL/DB2/Informix/Sybase database on an external storage through a switched Fiber Channel Storage Area Network (SAN). In case of any failure at DB Servers arising due to any of the reasons like hardware fault, Operating system, Database, Application process failures, etc., the offered Central storage must be able to remain attached to the fail-over server. The required multi pathing licenses as above shall be provided and configured for atleast 10 enterprise class servers.
- 3.2 The Central Storage System must support multi-path automatic load balancing with no single point-of-failure between Servers, Central Storage System and SAN.
- 3.3 The storage solution must have intelligent hardware based RAID support for the proposed solution. The Owner may develop a near site synchronous and remote asynchronous DR site at a later date. The storage must support hardware based (host independent) data replication to a remote site and bi-directional data copy.
- 3.4 The storage system must support dynamic reconfiguration of file-system, its growth, dynamic reconfiguration of the logical volume across different disk controllers, and spanning of logical volumes across different disk controllers.
- 3.5 The offered solution shall have Hot-Plug feature enabled disks.
- 3.6 Shall have support for multiple Operating Systems. License requirements if any for OS access for the following operating systems shall be provided for the entire storage.
 - Unix
 - MS Windows 2003 / 2008 server/ Windows server Data Centre edition
 - Linux

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- 3.7 Bidder must clearly state possible failure points, if any, in their offered solution in Oracle /MS SQL /MY SQL/DB2/Informix/Sybase environment.

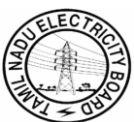
4 ARCHITECTURE

- 4.1 The storage array shall be an all-fiber technology and shall have all active components redundant to provide a No Single Point of Failure array architecture at any level.
- 4.2 The storage systems shall have required no 2/4 Gbps host Ports. Fiber-Channel Ports, shall work in load-sharing mode supporting multi-pathing, to provide in excess of 300MBps throughput, with 100% redundancy and automatic fail-over from storage to SAN switch. The FC host ports in the Storage Array should be scalable to at least 128.
- 4.3 Each storage array shall be configured in storage cluster with two active-active controller halves. Each controller half shall be configured in separate electrical power boundaries.
- 4.4 The storage system shall be configured with minimum 32 GB of cache, expandable to 64 GB (2 times of minimum). The system control cache, if required, shall be in addition to the above. The utility may be allowed to increase this as per their requirement.
- 4.5 The amount of read and write data in cache shall be dynamically managed by the cache control algorithms to provide the optimum amount of read and write cache depending on the load conditions. Cache shall be available as write or read cache dynamically as per application requirements.
- 4.6 The cache shall be duplexed for write data. The write cache shall be battery backed up to enable automatic destaging of cache to the disks in case of power failure.
- 4.7 The storage shall be scaleable to 64 active backend disk ports. Total offered capacity shall be based on configuration of minimum of 8 and maximum of 16 disks per loop on an average.
- 4.8 System shall have Intelligent Hardware RAID controllers to implement hardware mirroring at storage controller level.
- 4.9 Storage system shall be able to span/stripe Logical Storage Units across different disk controllers. System must support dynamic reconfiguration of file-systems, its growth and dynamic reconfiguration of the logical volumes.
- 4.10 Automatic detection of hotspots at disk level and dynamic re-configuration at the storage firmware level
- 4.11 System shall have N+1 configured hot swappable power supplies and cooling fans.

5 STORAGE CAPACITY.

The vendor should specify the Useable storage capacity of the system for

1. Under RAID 0+1 and under RAID 5
The preferred disc type is 140 (+/- 10%) GB 15,000 RPM FC.
Sufficient no of hot spare disc to be provided with a minimum of 1 hot spare for every 32 disks
2. Sufficient No of Cold Spare Disc (Not to be installed)of each type & capacity to be provided.



3. The system shall be expandable to 2 times the offered configuration with respect to number of disks with in the same storage subsystem.
4. The total Raw Capacity has to be calculated as per the ITIA's Solution. The Total usable storage capacity required is minimum of 80 TB each for DC and DR

6 AVAILABILITY AND DATA PROTECTION FEATURES.

System shall be online with continued access to data during replacement of

1. Interfaces
2. Disk Controllers
3. Disk Drives
4. Cache memory cards
5. Cache memory boards
6. Power supplies & battery systems
7. Cooling Fans
8. Microcode updates.

The system shall support and configured for:

1. Automatic detection of errors, error logging and notification.
2. Automatic / proactive detection of hotspots at disk level and dynamic reconfiguration.
3. Deallocation of failed components.
4. Recovery from unscheduled power failure without data loss.

The LUN security & masking software to be provided and configured to protect LUNs configured to heterogeneous hosts running different OS.

Oracle HARD technology or equivalent for data base validation.

7 MANAGEMENT

A centralized extensive monitoring, configuration and management of storage components and its connectivity components via a single console

The Storage Array shall be supported in a virtualized environment.

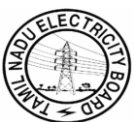
The Storage Management Software shall be a secure web based GUI based and shall be able to discover and monitor storage systems. It shall provide pro-active intelligence by monitoring performance. This storage Management software shall be used to monitor storages.

Storage management software shall be provided & configured and shall be able to move data seamlessly within the storage box to different RAID groups without stopping the host applications.

The storage management software shall support open standards based management like CIM, SNMP, etc

The storage shall be provided with single integrated management tool to provide capacity projections for capacity planning and performance matrix to resolve performance related issues. Storage performance Management software shall be provided

The system shall be configured to make and maintain time copies of the useable storage space under Raid 0+1 and raid 5



The Storage shall support HBA Load Balancing and Multi-pathing. The Software required for this should be supplied for at least 10 enterprise class servers.

System shall offer an overview of the structure of the network using icons to depict SAN resources.

Ability to monitor the status, performance and configuration with utilization.

Ability to collect, store and analyze storage performance data.

Storage management software shall have single console management for allowing centralized control of physical storage arrays

The storage management platform shall be highly scalable and shall have the capability to operate in multiple tiers like console, database, agent and servers tiers. These tiers could be installed and implemented independently distributed if required

The software shall have the capability to visually display the storage subsystem in an actual pictorial format and shall have a context sensitive management capability to identify, select and manage physical components of such subsystem.

Provide Security in SAN environments by preventing unauthorized users from accessing other server disks

8 FIBER CHANNEL (FC) SAN SWITCHES

Two numbers of chassis fiber channel switches of the same configuration shall be provided and configured. The switches shall be rack mountable and configured in 19" racks. The offered SAN switches shall be of OEM make or of Brocade / Cisco /McData.

Sufficient Nos. of fiber channel ports of 4Gbps (1/2/4 auto sensing) full-duplex to be configured, and at least 4 nos of the above shall be configurable as Long Wave ports to support up to 20 Km direct storage circuit. The switch shall be expandable to twice no of offered 4Gbps full-duplex FC ports with a minimum of 256 ports support per switch.

Shall be configured with redundant control processor modules.

Shall support 32 Gbps high speed trunking (Inter-switch links -ISL), using a maximum of 8 ports. 32 Gbps ISL shall be configured between the two SAN switches.

Fabric shortest path first (FSPF) traffic rerouting shall be supported. Using FSPF, the switch must be able to load balance at least 4 number of equal cost paths across the SAN network.

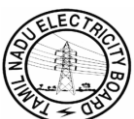
Shall support non-disruptive software updates, (hot code load and activation)

Shall support Error detection and fault isolation

Redundant 2N power supply, N+1 cooling fans.

The switch must support partitioning that provides independent FC Services, SNMP, CLI and API that can be re-started without resetting the entire switch

The switch must support FC ping & FC Trace Route that sends a FC frame through the fabric and view the route it takes to reach the destination and return to the source.



Shall have support for simultaneous multiple Operating Systems connectivity. License requirements if any for OS access for the following operating systems shall be provided.

1. Unix
2. MS Windows 2003 / 2008 server
3. Linux

The switch shall be guaranteed to be fully compatible for HBAs, Clustering solutions and OS offered with the servers.

Switch shall support advanced zoning features The switch must be configured for safe zoning mode to prevent undesired results when merging switches and zone sets. The vendor to provide Zoning details of Disk zone and Tape zone and to be configured accordingly

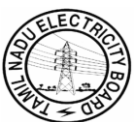
9 BACKUP

9.1 BACKUP SERVER

- The backup window shall be 8 Hours. It shall be possible to take a full backup of production data in 8 hours time. The backups shall be retained for 28 days
- TWO number backup servers shall be configured with the storage system. The servers shall be 64 bit RISC / Itanium / X86 - 64 bit family based server as per the following minimum specification and shall be configured under active-active cluster. The servers shall be configured for a maximum backup window of 8 hrs for a full copy of data base
- The operating system of the backup server shall be the same as that of the offered DB servers.
- Minimum 8 GB ECC SDRAM RAM shall be configured per processor of the offered configuration.
- Sufficient Nos of 4 Gbps fiber HBA ports, Gigabit RJ45 ports and Gigabit SX ports shall be configured.

9.2 BACKUP SOFTWARE

- The proposed Backup server Solution shall be available on 64 bit OS platforms and shall have the capability to support for all major Operating systems.
- It should provide a user-friendly enterprise console that enables the administrator to manage the Storage Manager from any platform in the enterprise via a Web-based interface. This should allow the administrator to navigate, logon and perform functions on any Backup Server or Web / Java based client from a supported Web browser.
- To achieve zero performance impact backup, it is required that the backup is taken via backup server and from the copy of the production system. The procedure of creating the copy can be either a mirror (for split mirror backup) or a copy which is synchronized with delta changes from the main production system at frequent intervals. The backup software must synchronize the copy before starting the backup.
- Full backup of data base systems shall be possible to be taken without bringing the production system down, with full data base consistency and without affecting the performance to the users in any way.
- Restore feature: System shall be configured for full restoration of the backed up data to the respective storage.
- Backup software shall support and configured Scheduled automated restores to perform periodic restore drills.
- Backup software shall offer consistent Graphic user interface.
- Backup server software shall be licensed on the offered backup servers to the offered number of CPUs in each backup server.



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- Backup client software shall be licensed to all the offered data base servers , all pre-implementation and training & testing servers to the offered number of CPUs including CPUs on COD in respective servers. The solution shall also be licensed to the Tape Library solution.
- Any CPU, RAM level upgrade on backup server and/ or any clients shall not affect the backup process and shall not have any licensing requirement whatsoever.
- Backup Software shall offer Extensive reporting capabilities to monitor the health of Backups. Shall support HTML, TEXT and CSV outputs. It shall support scheduled automated generation of the report on a daily basis. And also shall be integrated with SMS
- Software shall support event notification to notify backup administrator about events like Job Failed or Job aborted etc...
- Backup software shall support LAN FREE backup in SAN environments.
- Software shall support Scanning of Tape media to rebuild catalogs and indexes in case of disaster. It shall be supported thru Software GUI and not thru Command line utilities.
- Software shall offer centralized management console to remotely monitor backups.
- Software shall support Zero Impact Backup of SAN Storage SNAPSHOTS.
- Software shall support Raw device backup of Windows/Linux/UNIX based system
- Software shall support online backup of all the database & shall support both Online and RMAN to perform online backup.
- Database agents for all systems shall be provided and configured.
- The bidder shall provide all the software components and any new automated scripts required to achieve the backup solution.
- Backup software should be able to provide Data Protection for Desktop and Laptop environment and should integrate with the Centralized Data Center & Disaster recovery Center Backup solution.
- The Backup software should use the RDBMS to store the catalogue and configuration information.
- The Backup software should have the capability to dynamically add the storage space for the RDBMS which stores the catalogue & configuration information.
- The backup software should have capability to configure automated backups with customized frequency based scheduling based on the backup policy. In addition the software should also have capability for user-initiated backup.
- The Software should have a capability to define Polices centrally based on Business requirements. E.g. What Data to be backed up , where to store the Data , Retention period & Number of versions.
- The software should be flexible and configurable to adapt to organization's backup policy.
- The software should have capability to generate scripts and should also have support for Development kits / API for customization of scripts.
- The Polices defined centrally should be applied to Data & not restricted to tape media's. This is to optimally reuse the tape media.
- The Software should use the available media efficiently by writing the full and incremental data on to the same tape as long as the space is available on the tape media
- The Backup Software shall provide LAN based data backup and should be able to collocate the data on to separate set of tapes as per the system or group of systems
- The Backup Software shall provide web / Java based client interface, which can be accessed from any location.
- The Backup Software shall provide Operational reports for Enterprise Backup solution
- The backup software should have application awareness for software like Databases and Messaging solution provided by the vendor.
- The Backup Software shall provide restart-able restore in case of any failure during a Restore operation
- The software should have capability to retrieve selectively based on search criteria
- The software should have capability to backup the entire configuration of the server and restore it from scratch the entire system including configuration when in a scenario of hardware failure.
- The backup software should also include full fledged Media Library Management, including complete and automated offsite tape management, creation of pickup and drop lists, tracking of tapes, etc.
- The software should support Encryption & should have provision to delegate Administrative task.



- The software should support For ever incremental backup & there should not be a need to do a Full backup again.
- The software should provide a provision to restore the full backup from multiple incremental backup of file systems. This process should also take care of deleted files during the process of multiple incremental backup.
- The software should allow have the capability to restore the complete client data locally in case of Backup server not available.
- The software must have the feature to backup on to the Diskpool and later migrate to the Tape without intervention. The Diskpool space should not be limited to a physical Disk drive capacity.

9.3 CABLING FOR STORAGE & BACKUP SOLUTION

The responsibility to provide, lay, integrate, test, commission and certify for performance, the fiber link SAN cables and SAN cabling components with offered hardware for Storage & Backup will be taken as an integral part of the solution.

10 TAPE LIBRARY

- The tape library offered shall be robotic controlled to identify media, load tape media into drives and put them back into corresponding shelves automatically and should be configured in a “No Single Point of Failure” configuration like all other SAN infrastructure components.
- No single point of failure can be exclude the robotic arm, provided the bidder stocks a spare robotic arm at site and deploy the same as an when needed at no extra cost to the utility.
- The tape library shall be central library of tapes for all the servers offered in the system. The bidder to indicate no of media slots to be supplied and it’s scalability
- Bidder shall supply sufficient no blank new tape media. The library shall be configured with minimum 6 x LTO Gen4 drives and shall be scalable to 12 LTO Gen4 drives in the same frame without stacking. The tape library shall support at least 44 drives and 1000 slots.
- The media shall have a minimum uncompressed capacity of 800 GB and 1.6 TB compressed.
- The tape library shall have high performing robotics enabling to deliver minimum 180 exchanges per hour.
- The robotics should have the state of the art technology for accurate identification of bar-coded cartridges which is important for unattended and automated backup application
- The library shall be able to do continuous automatic calibration and therefore shall not require downtime for periodic alignment
- The library shall have automatic self configuring for cells, drives and Cartridge Access Ports
- The tape library shall be configured with its management software to monitor the entire backup infrastructure - drives, library assets centrally from a single console
- The vendor shall provide sufficient cleaning cartridges.

11) Enterprise Management System including Network Management, Monitoring & Performance Analysis (EMS and NMS system)

The specification covers Enterprise Management system on multiple Operating System, Databases, Messaging etc., since at present it is not known which of the systems will be offered by the bidders. However, the scope of the Management system to be limited to the solution being provided by the bidder.



11.1.0 Enterprise Management System

11.1.1 Enterprise Management System Solution Requirements

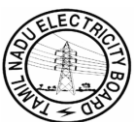
Enterprise Management System (EMS) is required to manage Servers, Desktops, Data Back-up, Database, event and compliance management . EMS would be deployed at server room and perform centralized monitoring of servers and network, manage the desktops providing Enterprise Services as described below:

- ◆ Real Time Health Management Services (For Servers)
- ◆ Server and Operating System Monitoring.
- ◆ Database Management Services.
- ◆ Historical Performance Trending of Servers & Applications.
- ◆ Software/ Patch Distribution Services to the Enterprise.
- ◆ Inventory for Hardware and Software to be collected automatically (Servers & Desktops)
- ◆ Event Correlation and Event Management Services.
- ◆ Server and Desktop Compliance.

EMS Shall integrate events to automatically create trouble tickets in helpdesk system for better and in time problem resolution.

11.1.2 Monitoring Critical Servers and Operating System

- The Monitoring system should use industry best practices to provide monitoring for essential system resources, detect bottlenecks and potential problems, and automatically recover from critical situations.
- The Monitoring tool should be able to help manage large, heterogeneous implementations by continuously monitoring essential systems resources, automatically detecting bottlenecks and potential problems while proactively responding to events.
- It should provide the technology to identify problems using built-in rules and policies, which can help prevent failures before they occur. Policies can be key metrics and thresholds that, when combined, trigger an automated action that prevents system failure. The product should provide out-of-the-box ready to use policies minimizing time-consuming configuration and setup. It should be possible to easily adjust the settings/threshold values to reflect their unique systems.
- It should be built on the highly scalable distributed architecture and provide efficient, centralized management of distributed and Web-based systems. It should also facilitate to proactively and automatically detect, correct and alert problems before they affect
- It should offer an easy, consistent way to monitor and manage key distributed resources through a centralized management interface. Monitoring parameters should be able set and updated for an entire group and applied to distributed resources in a single action. Changes to hundreds of related remote systems should take place in minutes—helping provide consistency across targeted systems.
- It should provide logic to verify system health and decide whether to trigger an event. By using built-in intelligence it should relieve the administrator from having to perform mundane tasks and provide valuable information for troubleshooting critical situations.
- It should provide an easy to use Situation Editor to modify/create your own custom Situations without any programming knowledge
- It should provide a Web based health console to view both near real-time and historical data for the systems you are monitoring. It should enable to check the health rating and status of your critical resources and resource models deployed in your environment. It should provide drill down to view specific problems affecting the system or can view historical data using Web browser provided by the vendor. It should also provide selection of key indicators and graphing them by choosing a large



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variety of graph types, which allows the administrator to quickly identify trends and potential trouble spots.

- Drag N Drop Reporting - Should provide an Enterprise Portal/Dashboard as part of the product, which can be customized to have views for individual administrators. It should be possible to create bar charts/tables/Pie charts/Online Plot charts etc using drag n drop options. Each administrator should be able to create his own custom portal view as part of the monitoring environment.

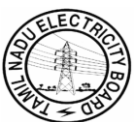
It should be possible to present the Portal information in any of the following views below:

- Table view
 - Pie chart view
 - Bar chart view
 - Plot chart view
 - Needle gauge view
 - Thermometer gauge view
 - Notepad view
 - Event console view, which shows the status of the situations associated with the system.
 - Take action view, which is used to send a command to the system.
 - Terminal view, which enables you to start a 3270 or 5250 work session.
 - Browser view, which permits you to open a browser to see HTML pages and Web sites.
- The Portal should also provide facility to create custom resource views, which can be mapped and provided to Admins. It should be easy to add country specific maps, custom network diagrams or .jpg's in the portal resource views.
 - Should provide an ability for storing historic data, which can be used for generating capacity planning reports. The historical data collection function must be customizable enabling collection of specific attributes as and when required. A few typical list given below:
 - the attribute group or groups for which data is to be collected
 - the interval at which data is to be collected
 - the interval at which data is to be stored
 - the location (either at the agent or at the Management Server) at which the collected data is to be stored
 - It should support all standard platforms for server monitoring of selected server platform and database provided by the solution provider.
 - Typical monitoring system for windows platform and Unix platform and Oracle and DB2 database is provided as sample. The vendor should indicate in the bid the details of monitoring tool based on the selected server OS and database.

11.1.3 Windows Monitoring

The tool should provide detailed information about many critical Windows areas, including:

- User, system, wait and idle CPU
- Enhanced event log monitoring
- Virtual and physical memory statistics
- Disk space and I/O statistics
- Paging information and swap statistics
- Network information
- Multiple nodes and platforms from a single view
- Historical data for trend analysis and capacity planning
- It should be possible to use this data for alerts derived from Windows NT performance and availability metrics.
- It should be possible to view/start/stop the Services running on all windows servers centrally.



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- It should be possible to view all the services, processes and tasks of all the Windows Server centrally.

It should provide performance statistics for the following Windows parameters:

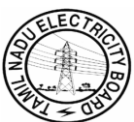
- System
- Memory
- Logical disk
- Physical disk
- Process
- Objects
- Processor
- Paging file
- Monitored logs
- IP statistics
- TCP statistics
- UDP statistics
- ICMP statistics
- IIS server statistics
- HTTP service
- HTTP content index statistics
- Active server page
- FTP server statistics
- Gopher service
- Network interface
- Network segment
- Cache
- RAS ports
- RAS totals
- Printers
- Services
- Devices
- MSMQ information store
- MSMQ queue
- MSMQ service
- MSMQ sessions

Apart from this it should also have a option to integrate the Windows NT Event log and Microsoft Active Directory Monitoring.

11.1.4 Unix Monitoring

It should provide the following key performance statistics for Unix environment monitoring :

- **System identification and activity** - Configuration of systems and checks their current activity levels. Attributes include system name, type and version.
- **CPU** - Percentages of processor activity taking place on each monitored UNIX system; use this report to check for problems such as imbalances between user and system CPU, and long CPU waits caused by I/O bottlenecks. Attributes include system name, user and system CPU, idle CPU and wait I/O
- **System virtual memory** - Includes swapping and paging activity to help determine if system performance problems are caused by memory shortages; attributes include total virtual memory, processes in run queue, processes waiting, page faults and page reclaims, and pages in and pages out



- **Load average** - Overall picture of system activity; attributes include system name, up-time and load average
- **Disk use** - Includes file system location and disk space usage to identify system performance problems caused by disk space shortages and poor distribution of space usage
- **Disk inodes** - Monitors inode usage on each file system
- **Networks** - Helps identify network interfaces, determine whether they are operational and see the amount of data traffic for each
- **Processes** - Detailed data on each currently expanding process, including identification, priority, command and size data
- **File** - File attributes, paths and time information
- **UNIX disk performance** - Helps you clearly see I/O efficiency, identify disk performance problems, get information about file system location, distribution and disk space storage, and monitor inode usage on your file systems; attributes include transfer rate, busy percent and transferred bytes
- **NFS** - Includes a client report that displays information about calls from your system to an NFS server and a server report that displays information about NFS calls to your system; attributes include number of lookups and number of read link calls
- **RPC** - Includes a client report that displays information about calls from your system to other nodes and a server report that displays information about RPC calls from other nodes to your system

It should also provide Unix System Log integration for alerting critical events centrally.

11.1.5 Linux Monitoring

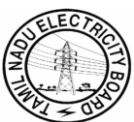
System Monitoring Specification

Service Metrics

- Availability
- Memory Size
- Resident Memory Size
- Cpu System Time
- Cpu System Time per Minute
- Cpu User Time
- Cpu User Time per Minute
- Cpu Total Time
- Cpu Total Time per Minute
- Cpu Usage
- Start Time
- Open Handles
- Threads

MultiProcess Metrics

- Availability
- Number of Processes
- Memory Size
- Resident Memory Size
- Cpu System Time
- Cpu System Time per Minute



- Cpu User Time
- Cpu User Time per Minute
- Cpu Total Time
- Cpu Total Time per Minute
- Cpu Usage

Process Metrics

- Availability
- Virtual Memory Size
- Resident Memory Size
- Cpu System Time
- Cpu System Time per Minute
- Cpu User Time
- Cpu User Time per Minute
- Cpu Total Time
- Cpu Total Time per Minute
- Cpu Usage
- Start Time
- Open File Descriptors
- Threads

CPU Metrics

- Availability
- User Cpu
- System Cpu
- Cpu Idle
- Cpu Usage
- User Cpu Time
- User Cpu Time per Minute
- System Cpu Time
- System Cpu Time per Minute
- Cpu Idle Time
- Cpu Idle Time per Minute
- Cpu Wait Time
- Cpu Wait Time per Minute

NetworkServer Interface Metrics

- Availability
- Bits Received
- Bits Received per Second
- Bytes Received
- Bytes Received per Minute
- Packets Received
- Packets Received per Minute
- Bytes Transmitted
- Bytes Transmitted per Minute
- Bits Transmitted
- Bits Transmitted per Second



- Packets Transmitted
- Packets Transmitted per Minute
- Transmit Errors
- Transmit Errors per Minute
- Receive Errors
- Receive Errors per Minute
- Transmit Packets Dropped
- Transmit Packets Dropped per Minute
- Receive Packets Dropped
- Receive Packets Dropped per Minute

Script Metrics

- Availability
- Execution Time
- Result Value

FileServer Directory and Tree Metrics

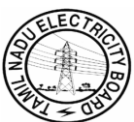
- Last Modified Time
- Last Change Time
- Last Access Time
- Permissions
- Owner User Id
- Owner Group Id
- Availability
- Regular Files
- Subdirectories
- Symbolic Links
- Character Devices
- Block Devices
- Sockets
- Total
- Disk Usage

FileServer File Metrics

- Last Modified Time
- Last Change Time
- Last Access Time
- Permissions
- Owner User Id
- Owner Group Id
- Availability
- Size

FileServer Mount Metrics

- Availability
- Use Percent
- Total Bytes Used
- Capacity



- Total Bytes Free
- Total Bytes Avail
- Disk Reads
- Disk Reads per Minute
- Disk Writes
- Disk Writes per Minute
- Disk Read Bytes
- Disk Read Bytes per Minute
- Disk Write Bytes
- Disk Write Bytes per Minute
- Disk Queue
- Free Files
- Total Files

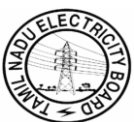
11.1.6 Database Monitoring:

The Monitoring tool should support monitoring of standard RDBMs like Oracle, MS-SQL, MY SQL, DB2, Informix, Sybase or any other RDBMS conforming to ANSI/ISO SQL-200n standards offered by the vendor as part of the overall solution.

The Database monitoring should seamlessly integrate with the same Dashboard/Portal and provide integration with the central event console.

The tool should provide you the ability to easily collect and analyze specific information, including information on:

- Buffer pools
- Databases
- Locks and other details about lock resources
- Server key events
- Table spaces
- Database Usage
- Database State
- Errors



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(a) Oracle:

Should provide out-of-box details on the following parameters for Oracle Database

Parameter	Should Provide Information on
Oracle Alert Log	error messages, timestamps for messages, message details, and the text of a message
Oracle Cache Totals	detailed usage of the dictionary, library, and redo log buffer caches
Oracle Contention	details about locks and blocking and waiting sessions
Oracle Databases	databases, tablespaces, files, and segments which includes details on size, space usage, and extents
Oracle Logging	logging activity, rollback segments, extents, extends, shrinks, and wraps
Oracle Processes	types and numbers of processes, process status, process details, and SQL text
Oracle Servers	the server instances, database and instance status, initialization parameters, CPU usage, parallel processing, and SQL tracing
	performance statistics reported as timings and throughput values for such operations as reads, writes, and recursive calls
	statistics reports as averages and percentages for such items as data caches hits, enqueue waits, disk sorts, and rollbacks
Oracle Sessions	types and numbers of sessions, session status, session details, and SQL text
Oracle System Global Area	usage and free space for the SGA and the library, dictionary, and data caches



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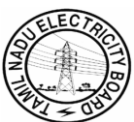
(b) DB2:

Should provide out-of-box details on the following parameters for DB2 Database

DB2 Server Connection	View information about the <ul style="list-style-type: none"> • number of connections differentiated as local, remote, in execution • agent information such as waiting on token, stolen, and idle
Server General Information	View information about the <ul style="list-style-type: none"> • server key events such as post threshold sorts, agents waiting on token, and agents stolen • server connections (local, remote, in execution) • sort/ hash join information
Database Identification	View information about the <ul style="list-style-type: none"> • number of connections • high-water mark for agents and connections • logging activity
Database I/O Activity	View information about the <ul style="list-style-type: none"> • buffer pool read and write activity • buffer pool async/sync I/O activity • direct I/O activity
Database Lock Activity	View information about the <ul style="list-style-type: none"> • locks held, lock waits, lock wait time, lock escalations • deadlocks and lock timeouts • SQL activity
Database Package / Catalog Cache Activity	View information about <ul style="list-style-type: none"> • package and catalog cache hit ratio • catalog cache overflows and heap full • database-specific identification and status details
Database Sort / Hash Join Activity	View information about <ul style="list-style-type: none"> • number of sorts and sort overflows • number of hash joins and hash join overflows • database-specific identification and status details
Database SQL Activity	View information relating to <ul style="list-style-type: none"> • SQL statement counts • number of rollbacks • row counts

11.2.0 Network Fault Management, Monitoring & Network Performance Analysis

The NMS package shall provide complete Management of Data Center & Disaster recovery Center LAN and its integrated Modules configured in various switches offered for Core, Distribution and Access Layer.



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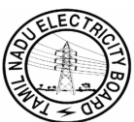
The bidder shall provide Network performance Monitoring & Management Tool for managing the Data Center & Disaster recovery Center LAN and WAN routed Traffic.

The offered Network Management Tool Shall provide to recognize common network problem, management of multi-vendor network with discovery, mapping and alarm tracking.

The NMS offered shall allow to configure & apply Template based access control lists, measure responsiveness of WAN connections to determine latency, jitter delays, and in identifying & isolating traffic bottle-neck area/point on WAN router & switches.

The NMS shall provide network analysis module for switch fabric/CPU's, monitor utilization of switch resources & in isolating the network problems, provide performance monitoring, trouble shooting, capacity planning, and report generating of various statistics.

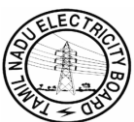
- The Fault Management Module of the NMS shall be able to process all the Fault events of the Hardware System. The Fault Management Module shall utilize an open standard database capable of processing all the events per second, allowing visibility of all alarms. It should support an interface to an external RDBMS also.
- The NMS integrated alarm system should be able to extract alarm data in all specialized networks with no severe influence on the NMS performance.
- The system should be able to access device/equipment in current networks of IP, ATM/FR, MPLS, and ADSL to collect alarm and fault data.
- The management agents/probes should be able to collect events from SNMP management data sources, API's, databases, network devices, log files and other utilities.
- The system supports original alarm data collection in modes of SYSLOG, SNMP TRAPD probe.
- All alarm/event messages shall be automatically time and date-stamped by the Fault Management Module
- All alarm related information (e.g. alarm receive-time start-time, clear-time, acknowledge-time etc) shall be logged
- The Fault Management Module shall be able to display alarm and events specified by the following criteria:
 - Alarm types
 - Time interval
 - Vendor
 - Technology
 - Customer
 - Service
 - Location
- The system should support distributed architecture to install probes/collectors to collect the event information which would result in reducing the network traffic
- To reduce the influence on the network, events should be pre-processed. The integrated alarm system should specifically analyze alarms in all specialized networks and perform the rule-based intelligent analysis to the event information, and provide functions of alarm filtering and screening.
- The system should provide a high-performance engine to meet the requirement of the integrated alarm system, which can guarantee the normal running of the integrated system especially when the event storm occurs in the network.
- The system should support the original redundancy fault information compression and centralized alarm information processing and be able to consolidate the repetitive alarm events. It should also



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record their start and end time and repetitive times so that the manager can have a clear idea of the fault process.

- The system should provide the customized event automatic processing function to improve operation efficiency of the system.
- The system should be able to automatically trigger operations of the external system for functions of alarm, notification and processing. It should also be able to define the automatic processing rules to automatically trigger functions of alarm, notification and processing. For example, the system may trigger the visual and audible alarm system, send short messages or e-mails, trigger automatic troubleshooting and alarm handling.
- The system should provide the automatic self-maintenance function and set the invalidity period for different events. Any event expiring the invalidity date will be regarded as the invalid event and will be automatically backed up or deleted.
- The system should be able to provide APIs so that various scripts and small tools can be **developed and executed**.
- A complete, practical and high-efficient fault association analysis system should be established to meet the network event correlation requirement.
- The system should perform automatic analysis to intra-network or cross-network faults through establishing an association model for NM targets; assist the network maintenance personnel to correctly analyze and locate the reason for fault events in the shortest period; and establish the association between NE faults and customer & service faults.
- If network events occur, the system should be able to:
 - 1) Implement the association between these events in real-time;
 - 2) Obtain the related equipment asset information and the related operation personnel information;
 - 3) Add these information into the alarm information;
 - 4) Display the information in the network monitoring window.
- The system should be able to provide views and tools to monitor the entire network operation in real time, so that failures can be detected or alarmed timely.
- The Fault management module should help to prioritize responses to alerts, manage escalation procedures and automate response policies.
- The Fault management module should be able to provide event enrichment with information from external data sources.
- The Fault management module should show operators in the NOC precisely which network users, customers or processes are affected by a fault.
- The Event Correlation Module shall have easy-to-use interface to help build and adapt business rules and automations quickly and easily. Rules shall be created using a GUI, which shall also provide a convenient environment for testing rules before they are put into production.
- The tool should provide a user view custom tool so that users can define and modify the monitoring interface view conveniently and a great deal of development workload can be prevented
- A graphical tool to query and define failure types shall be provided, so that users can define query conditions with much flexibility.
- The network management solution shall enable the monitoring of the operation of the entire network and provide analysis to the efficiency of devices whose links will lead to bottleneck of the network.
- Automatic inspection to the network shall be implemented through network failure diagnosis tools. The tool should be able to provide cause analysis and solution suggestions for network problems to help the network administrator for failure recovery.



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- The tool should provide history statistics and reports of failure information. Monthly and yearly failure report by equipment types, event severities, event locations shall be provided for failure analysis and statistics.
- The tool should provide for a report customizing tool to define new failure statistic reports with much flexibility and ease, and to modify the existing reports
- The NMS shall provide strict login/logout authentication, operation/access control and operation logs to ensure the security of the system
- Authenticating users through the username and password in logins, and restricting the query and operation of alarm events to the granted range
- The system should be able to do auto discovery for layer 2 and layer 3 networks including the connectivity and the interfaces
- The system should provide a visualization tool to view the network topology on a web based interface.
- The system should be able to perform topology based root cause analysis
- The system should be able provide and customize topology views in different ways.
- The system should out of the box support network technologies : IP, HSRP, CDP, Ethernet, VLAN, MPLS IP VPNs, IP over ATM without requiring additional modules.
- The system should provide functionality to integrate with Element management tools for troubleshooting MPLS network problems

It shall provide centralized quality of Service (QOS) policy manager. The QOS policy manager shall provide automated QOS analysis reporting and provisioning for Traffic Monitoring for setting & validating QOS on real time basis, defining QOS for application priority and Service classes.

It shall be possible to enable QOS selectively on intelligently grouped LAN/WAN in a converged voice/data network.

The NMS offered shall provide central control and authorization for VPNs & Firewall and for dial-up access Servers. It shall be possible to deploy rules that shall be consistently applied to firewalls modules/switches offered.

NMS Shall integrate events to automatically create trouble tickets in helpdesk system for better and in time problem resolution.

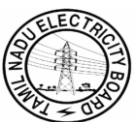
The Network Performance Analysis should provide to capture, and analyze traffic at full rate Testing at layer 2, 3, and 4 networks cover end-to-end, edge-to-core, and core-to-edge testing, test multiple technologies (LAN/WAN).

Network applications (management capabilities) the performance on each network port, Multi-Protocol Label Switching (MPLS),etc

Performance measurement testing on a per-port basis, addressing, the performance of each port, maximum throughput, average latency of the switch.

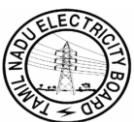
The Performance Monitoring Module shall all support the following features:

- The Performance monitoring module must support a distributed polling and data gathering architecture in order to achieve optimal performance and scalability.
- The Performance monitoring module should be capable of supporting High Availability on data collection, storage and reporting.



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- The Performance monitoring module must support the ability to poll and pull data from element management systems and network elements utilizing a variety of methods including automated scheduled polling.
- The Performance monitoring module should be capable of importing data into the single database. The single database should provide a single integrated performance management method to monitor the complete network.
- The Performance Management component shall provide a web browser-based GUI to allow users to monitor network performance and generate performance reports.
- The Performance Management component shall allow users to view real-time and historical network statistics and trends.
- The Performance Management component shall provide the ability for users to configure and generate customized reports.
- The Performance Management component shall present all collected performance data in both tabular and graphical format.
- The Performance module should have the capability of exporting any report in CSV format.
- The Performance module should have the option of making reports available to users through email and FTP.
- The Performance Management module shall have the capability aggregate data per group of resources. (per site, per customer, per service)
- The Performance Management component must be able to calculate capacity requirements and generate capacity reports.
- The performance module should be capable of generating trend analysis reports.
- The performance module should have the capability of generating baseline reports - This will allow the operator to compare current traffic volume to the average traffic volume for prior days.
- The Performance Monitoring Module shall offer powerful and flexible calendar management. Reports can be generated based on standard and customized calendars of dates or operating hours, to exclude non significant data for the calculation of indicators. Users can associate a performance indicator with a calendar and calendar is not restricted to be applied to the overall report only.
- The performance management system must be able to import, edit and browse the new MIB, to establish new rules, to generate performance reports for newly added devices and to modify and customize new reports.
- The performance management system must support lightweight and distributed data collection devices and the centralized report system, and should have one centralized database
- The Performance Management component must support the ability to set thresholds on the collected performance statistics. When a threshold is crossed, the system must generate a threshold-crossing alert. The performance module shall be able to send selective threshold crossing alert notifications to a fault monitoring module.
- The Performance Management component must have the capability to retain statistics for a specified timeframe defined by the administrator.
- The Performance management module should have the capability to store raw data for a period of 3 months and aggregated data for a period of 1 year.



- Performance Management component must make historical data available for inclusion in performance displays and reports requested by users
- Reporting
- The reports must provide global view on the network showing aggregated values per groups of network resources, resources in exception.
- The user must have the capability to drill-down from the global overview to more detailed views by simple click.

12) ROUTERS

Router - 2 Nos For MPLS-VPN Network

Router - 2 Nos For Internet Gateway

Router - 1 No each at other offices

- i. The Routers shall be compatible with Owners existing Wide Area Network. The Wide Area Links are planned for 2Mbps or higher Bandwidth capacity on leased circuits from ISPs (BSNL, MTNL etc.) Routers shall be equipped with Redundant Power Supply Unit (RPSU).
- ii. The Routers shall be configurable and manageable through local console port, http interface, NMS software and as well through Telnet.

12.1 CENTRAL ROUTER FOR MPLS- VPN Network (Qty=2 No.)

The Router offered shall deliver high performance IP/MPLS features and shall support Layer 3 MPLS VPN connection. It shall support PPP /Frame Relay transport over MPLS.

The Router shall provide built-in monitoring and diagnostics to detect failure of hardware. The Router shall be provided with LED/LCD indication for monitoring Operational status of each module.

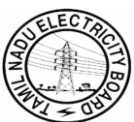
The configuration changes on the Router should take effect without rebooting the router or modules.

The router offered should have high MTBF & low MTTR.

The Router Shall be Rack Mountable on to 19”Racks.

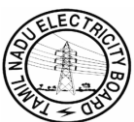
Chassis:

Shall be provided with configurable slots for interface Modules. All the modules in the Router shall be Hot Swappable Module.
Provided with Redundant Power Supply Unit. Single Power supply should support fully loaded Chassis.
Provided with high speed Redundant CPU with distributed /Shared Memory architecture.
Dual Flash support. It shall be possible to upgrade the FLASH to enhance the router software functionality.



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Memory:	(128 MB DRAM, 16 MB FLASH) Vendor to indicate Memory requirement for Minimum and maximum load.
Console Port:	RS 232 I/F for configurations and diagnostic tests
LAN Port:	8 Port of 10/100/1000BaseT and 8 Port 1000Base X ports.
WAN Ports :	32 Serial ports with synchronous speed up to 2Mbps and with interface support for <u>V.35, V.24 Ports (to be interfaced to leased circuits or SCPC / MCPC available on Multiplexer).</u> <u>2x 4nos. of G.703 Ports 75 Ohm.</u> 2x 4 ports ISDN PRI E1/channelised E1 interfaces for 120 Ohm G.703 I/f . (ISDN PRI can be given internal or external to core router) Shall also support variety of interfaces like STM-1, STM-4, channelised STM-1 and Gigabit WAN ports Additional Module/Modules for 8 Port of various interface types.
I/f Cable:	for all the WAN ports Connector Cable for connecting to SCPC / MCPC's/leased E1- V.35 Port (DB25 Connector) shall be prepared as per Pin Details to be given by owner.
Expandability:	The offered Router configuration shall have sufficient free slots to accommodate additional 16 (min.) Serial Ports by way of putting additional Line Modules.
Network Protocols:	TCP/IP and support for IPversion6. Shall provide IP address Management via NAT Support as per RFC 1631
Routing Protocols:	RIPv2, OSPFv2 (RFC1583 & RFC 1793), OSPF on demand, BGP, BGP4 with CIDR implementation as per RFC 1771. The implement should be compliant as per RFC1745 that describes BGP4/IDRP IP OSPF interaction. It shall provide Policy routing to enable changes to normal routing based on characteristics of Network traffic. ISIS protocol support.
Bridging & Tunneling Protocols:	Transparent, Spanning Tree Algorithm, Auto Learning L2TP capability.
WAN Protocols:	Frame Relay (LMI & Annex.D & ITU Annex A), PPP (RFC1661), Multi-link PPP (RFC1717), HDLC/LAPB, Frame Relay support shall include Multi-protocol encapsulation over Frame relay based on RFC1490, RFC 1293 for Inverse Arp/IP, DE bit support
Network Management:	SNMP, SNMPv2 support with MIB-II. and SNMP v3 with and Security authentication. Implementation control configuration on the Router to ensure SNMP access only to SNMP Manager or the NMS work Station. Asynch. Serial Port. RMON 1 & 2 support using service modules for Events, Alarms, History. Should have accounting facility. Shall support multilevel access. Shall be Manageable from any Open NMS platform. Shall support for telnet,ftp,tftp, http and https enabled Management. Should have debugging facility through console.



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	Authentication support shall be provided via RADIUS (Remote Authentication Dial-IN User Service), AAA support, PAP/CHAP, 3DES/IPsec encryption with hardware based encryption services using VPN module.
Optimization feature:	Data Compression for both header and payload to be supported for Frame Relay and Leased/Dial-up WAN Links. Dial restoration on lease link failure Dial on demand or congestion, Load Balancing. Support for S/W downloads and quick boot from onboard Flash. Online software re-configuration to implement changes without rebooting. Should support Network Time Protocol for easy and fast synchronization of all Routers.
QOS Support:	RSVP (Resource Reservation Protocol as per RFC 2205), IGMP (Inter Group Management Protocol Version 2 as per RFC 2236, Multicast Routing support DVMRP or equivalent, MOSPF, MBGP, etc. Policy routing (It shall be possible to affect the normal routing process for specific mission critical traffic through specified alternate routes in the network. A class based scheduling, Priority Queuing mechanism that shall provide configurable minimum Bandwidth allocation to each class and IP Precedence. Congestion Avoidance - Random Early Detection (RED). Support for Differentiated Services as per RFCs 2474, 2475, 2598 & 2597.
Backplane:	100 Gbps Full duplex
Switching Performance	100Mpps. upgradeable to 200 Mpps. The ultimate requirement and capacity with respect to Backplane speed and packet forwarding rate is to be finalized by utility to cater to ultimate requirement of state.

12.2 Router - 1 No each at other offices

The Router offered shall deliver high performance IP/MPLS features and shall support Layer 3 MPLS VPN connection. It shall support PPP /Frame Relay transport over MPLS.

The Router shall provide built-in monitoring and diagnostics to detect failure of hardware. The Router shall be provided with LED/LCD indication for monitoring Operational status of each module.

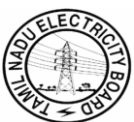
The configuration changes on the Router should take effect without rebooting the router or modules.

The router offered should have high MTBF & low MTTR.

Memory: Flash: Default 8MB and maximum 72MB
SDRAM: Default 64MB and maximum 320MB

Console Port: RS 232 I/F for configurations and diagnostic tests

LAN Port: Two fixed 10/100Mbps high speed Ethernet ports
 Two fixed high-speed synchronous ports
 Two fixed low-speed synchronous or asynchronous ports



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- One Port ISDN BRI-S/T interface and should support ISDN PRI
- One AUX

Scalability:	Should additionally support 6 sync or async ports or more for future scalability
Network Protocol:	TCP/IP and support for IPversion6 . Shall provide IP address Management via NAT Support as per RFC 1631
Routing Protocols:	RIPv2, OSPFv2 (RFC1583 & RFC 1793), OSPF on demand, BGP, BGP4 with CIDR implementation as per RFC 1771. The implement should be compliant as per RFC1745 that describes BGP4/IDRP IP OSPF interaction. It shall provide Policy routing to enable changes to normal routing based on characteristics of Network traffic. ISIS protocol support.
Bridging & Tunneling Protocols:	Transparent, Spanning Tree Algorithm, Auto Learning L2TP capability.
WAN Protocols:	Frame Relay(LMI & Annex.D & ITU Annex A), PPP (RFC1661), Multi-link PPP (RFC1717), HDLC/LAPB, Frame Relay support shall include Multi-protocol encapsulation over Frame relay based on RFC1490, RFC 1293 for Inverse Arp/IP, DE bit support
Network Management:	SNMP, SNMPv2 support with MIB-II. and SNMP v3 with and Security authentication. Implementation control configuration on the Router to ensure SNMP access only to SNMP Manager or the NMS work Station. Asynch. Serial Port. RMON 1 & 2 support using service modules for Events, Alarms, History. Should have accounting facility. Shall support multilevel access. Shall be Manageable from any Open NMS platform. Shall support for telnet,ftp,tftp, http and https enabled Management. Should have debugging facility through console. Authentication support shall be provided via RADIUS (Remote Authentication Dial-IN User Service), AAA support, PAP/CHAP, 3DES/IPsec encryption with hardware based encryption services using VPN module. IDS and Firewall features
Optimization feature:	Data Compression for both header and payload to be supported for X.25, Frame Relay and Leased/Dial-up WAN Links. Dial restoral on lease link failure Dial on demand or congestion, Load Balancing. Support for S/W downloads and quick boot from onboard Flash. Online software re-configuration to implement changes without rebooting. Should support Network Time Protocol for easy and fast synchronization of all Routers.
QOS Support:	RSVP (Resource Reservation Protocol as per RFC 2205), IGMP (InterGroup Management Protocol Version 2 as per RFC 2236, Multicast Routing support DVMRP or equivalent, MOSPF, MBGP etc. Policy routing (It shall be possible to affect the normal routing process for specific mission critical traffic through specified alternate routes in the network.)



A class based scheduling, Priority Queuing mechanism that shall provide configurable minimum Bandwidth allocation to each class and IP Precedence.

Congestion Avoidance - Random Early Detection (RED). Support for Differentiated Services as per RFCs 2474, 2475, 2598 & 2597.

Backplane: 100 Mbps or more full duplex

Switching Performance 200 Kpps

The ultimate requirement and capacity with respect to Backplane speed and Packet forwarding rate is to be finalized by utility to cater to ultimate requirement of state

Note: The router shall be mounted in the suitable wall mount rack along with all other network equipments.

12.3 Router - 2 No For Internet Gateway

The specification of Router at Internet gateway should be similar to central router but this router shall have features of firewall and IDS, The specification of firewall and IDS shall be similar to those specified for core switch. The firewall feature may be provided integral to Router or through a dedicated external appliance.

13) IP PBX and IP PHONES

The Bidder should implement and maintain Voice over Internet Protocol (VoIP) by procuring and installing VoIP phones along with their software licenses, which shall provide voice facility to the users. For operation and maintenance of VoIP, a central VoIP call registration and management device shall be procured, implemented and maintained.

The VoIP services will be given at central Data Center & Disaster recovery Center, utility offices as well as Call centers.

13.1 IP PBX Specifications

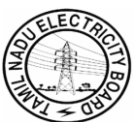
The IP Telephony solution required should follow the Centralized Call Processing and management model with the PBX at Data center. This system located at Data center will control IP Phones, Analog Phones, and Fax machines etc. located at various locations connected over IP in the state.

13.1.1 Features

- Single Call Server should be able to support up to 1500 IP phones.
- Should support at least 750 concurrent sessions.
- The system should have IP architecture and provide support for integrated telephony solution for Analog & IP Phones, E1, PRI gateways over IP architecture.
- Provides reports for calls based on records, calls on a user basis, calls through gateways etc.
- Able to add bulk add, delete, and update operations for devices and users.
- Alternate Automatic Routing & Auto route selection.

13.1.2 Protocol

- Session Initiation Protocol (SIP) Trunk support.



- Coder-decoder (codec) support for automated bandwidth selection: G.711 mu-law, a-law, G.723.1
- Shall utilize LAN QoS features for providing end to end QoS 802.1p and IP Tos/DSCP QoS features

13.1.3 General

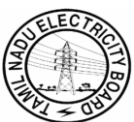
- Support for call processing and call-control.
- Support for configuration database (contains system and device configuration information, including dial plan)
- Call Admission Control—inter-cluster and intra-cluster
- Digit analysis and call treatment (digit string insertion, deletion, stripping, dial access codes, digit string translation)
- Support Distributed call processing
- Configurable operation modes: non-secure or secure Privacy: Call Server supports encryption of signalling and media.
- Intracluster feature transparency.
- Intracluster management transparency.
- Support for Survival of Telephony services at remote sites by router or through external box (capability to keep Telephony services available even when IP EAPBX is not available due to WAN or any other failure).
- Digit analysis and call treatment (digit string insertion, deletion, stripping, dial access codes, digit string translation)
- Deployment of devices and applications across an IP network
- Support Distributed call processing

13.1.4 Administrative Features:

- Having inbuilt administration software
- Call detail records
- CDR Analysis and Reporting Tools
- Centralized, replicated configuration database, distributed Web based management
- Configurable Call Forward Display
- Database automated change notification
- Date and time display
- Lightweight Directory Access Protocol (LDAP) Version 3 directory interface to successful bidder's LDAP directories
- Active Directory
- Directory Server
- Debug information to common syslog file
- Device-downloadable feature upgrades—Phones, hardware transcoder resource, hardware conference bridge resource, VoIP gateway resource
- Dynamic Host Configuration Protocol (DHCP) block IP assignment— Phones and gateways
- Simple Network Management Protocol (SNMP)
- Dialed Number Analyzer (DNA)
- Dialed number translation table (inbound and outbound translation)
- Dialed number identification service

13.1.5 User Features

- Abbreviated Dial
- Answer and answer release
- Call back busy, no reply to station
- Call forward—all (off net and on net)
- Call forward—busy



- Call forward—no answer
- Call hold and retrieve
- Call status per line (state, duration, number)
- Calling Line Identification
- Calling Line Identification Restriction call by call
- Calling party name identification
- Conference Barge
- Conference List and Drop any party
- Direct inward dial (DID)
- Direct outward dial (DOD)
- Directory dial from phone—corporate, personal
- Directories—missed, placed, received calls list stored on selected IP phones
- Distinctive rings
- Drop last conference party (ad-hoc conferences)
- Extension mobility support
- Hands-free, speakerphone
- Immediate Divert to voicemail
- Last number redial
- Malicious Call ID and Trace

13.2 IP Phone

- 10/100BASE-T Ethernet connection through an RJ-45 interface for LAN connectivity
- Differentiated Services Code Point (DSCP) tagging
- Support for G.711 μ , G.711a and G.729a/b audio compression codecs.
- Software upgrade supported using a Trivial File Transfer Protocol (TFTP) server
- Voice activity detection, silence suppression, comfort-noise generation, and error concealment.
- H.323 / SIP Support.
- Inline Power (7.5W), 802.1af POE (15.4W) and Power Adapter Options for power.
- Inline power and optional AC to DC power adapter.
- Pixel-based display.

14) Anti Virus Solution

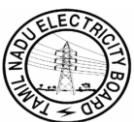
The specification covers Anti Virus solution on multiple operating systems, since at present it is not known which system will be offered by the bidders. However, it is required to provide only the relevant Antivirus system limited to the solution being provided by the bidder.

14.1 Technical Specifications for Antivirus at desktops & servers

1.	The antivirus solution should provide enhanced antivirus protection for desktops & servers.
2.	Should have a Centralized Management Console

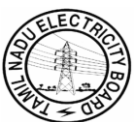
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3.	Should be a Single, Configurable Installation with centralized configuration & policy management.
4.	Should have a Common Distribution Mechanism via combination of push & pull Technology for better BW management
5.	Should have logical group based on IP addresses (Subnets). Should support integration with Active directory for directory structure of computers for better management
6.	Should be support Multi-Platform OS Support
7.	Should support Policy Enforcement
8.	Should have Common, Extensible Scanning Engine
9.	Should have Configurable Scanning. Should have the ability to control the amount of CPU resources dedicated to a scan process
10.	Should have Unknown Virus Detection & Repair. Should have behavioral & Heuristic scanning to protect from unknown viruses. Should have buffer overflow protection integrated with AV scan engine for protection from threats/exploits that uses buffer overflow vulnerability regardless of presence of signature / OS patches
11.	Should have Compressed File Detection and Repair
12.	Should have Research Centers for proper updates as well as technologies to support the outbreak
13.	Should have 24*7 Global Technical Support
14.	Should ensure security policy enforcement by integrating and centralizing installation, deployment, management & updating
15.	Should conserve n/w b/w by updating virus definitions with incremental updates. Should support daily update for definition files. Size of daily update should be optimal and in the range of 10-12MB
16.	Should be able to support the Platforms of desktops and servers of the utility
17.	Anti-Virus Software must have the capability to detect and clean Virus
18.	Should be able to detect new classes of viruses by normal virus definition update mechanisms
19.	Should provide common definitions for all operating systems supported & across all product ranges.
20.	Should be able to update definitions & scan engine on the fly, without a need for reboot or stopping of services on servers.
21.	Should be able to add files, folders or extensions to an exclude list so that they are not scanned on access.
22.	Should enable automatic submissions of unknown/suspected virus samples to vendor and automatic response/delivery of the cure.
23.	Should allow for incremental virus definition and scan engine updates.
24.	It should recognize a missed event on a machine, which was switched off, and restart the same when machine is turned on.
25.	The anti-virus software should be able to automatically detect and update definitions and scan engine form the nearest Distributed repository in the network.
26.	Should be able to set and monitor client server configuration remotely.
27.	Should be able to lock down all anti-virus configurations at the desktop.
28.	Should be able to optionally make the client user interface invisible for transparent protection.



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29.	User should be prevented from being able to uninstall the anti-virus software.
30.	Must be able to distribute new and update anti-virus software, virus definitions and configuration files automatically to clients and servers from a central location (Clients need not login to the central server to download the updates)
31.	Should be able to view all servers and clients from one console.
32.	Should be able to initiate virus sweeps remotely (central command to scan all machines in case of an outbreak Should support folder/directory/share lockdown centrally to contain virus outbreak. Should support blocking of files based on their name to stop spreading of new viruses whose signatures are not released. Should support port blocking for unknown processes (e.g. port 25 is blocked for every process except Outlook.exe). Should support to automatically block traffic coming to a clean system from malicious / infected system)
33.	Should be able to perform manual or scheduled virus scans on individual computers remotely.
34.	Must provide centralized event logging to locate and cure virus problems.
35.	Alerts on virus activity should be passed on to administrator
36.	OS INSTALLER SUPPORT- should be incorporated for a standards-based installation. Should support installation of software package in both format OS Installer & EXE file
37.	Should enables administrators to identify which machine has generated a threat that is spreading by an open file share (for example, Nimda or CodeRed).
38.	Should enable administrators to easily move clients (who have changed departments, for example) from one physical parent server to another simply by dragging and dropping through the central management console.
39.	Should store event data generated while a client is disconnected from the corporate network and forwards it when the client reconnects.
40.	Should enables administrators to launch an immediate LiveUpdate session on single or multiple clients during an outbreak.
41.	Should enable administrators to select the events that clients forward to their parent servers and those secondary servers forward to primary servers.
42.	Should extends virus, worm, and Trojan horse detection capabilities to include certain non-virus threats, such as Sypware, Trackware, Adware, Dialers, Joke Programs, Remote Access, and Hack Tools, which can be used with malicious intent.
43.	Should scan the body text and attachments of incoming e-mail messages that are delivered through POP3 / IMAP mail clients
44.	Auto Protect should be loaded on system startup, and then unloaded on system shutdown to help protect against viruses, such as Fun Love.
45.	Should scan in-memory processes on disk for threats. If a threat is detected, the running process can be terminated
46.	Should have enhanced protection from Spyware and Adware, including: Real-time protection to reduce the risk of Spyware reaching the system.
47.	Should automatic remove Spyware and Adware for easy disposal of security risks.
48.	Should have Side-effect repair to clean up registry entries, files, and browser settings after hard-to-find Spyware infection.
49.	Should have enhanced tamper protection that guards against unauthorized access and attacks, protecting users from viruses that attempt to disable security measures.



14.2 ANTIVIRUS PROTECTION FOR GATEWAY FOR SMTP

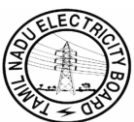
1.	Should use a multi-layered anti-spam approach to combine various blacklisting and white listing techniques, as well as heuristic detection to stop spam at the earliest point of network entry providing maximum detection with minimal false positives.
2.	Should dynamically analyze and tag spam messages by appending custom text, e.g. "SPAM", to the subject line. Should provide a high degree of reliability in detecting spam messages, especially compared to traditional content filtering techniques.
3.	Should enable administrators to use other DNS-based blacklist services (DNSBL), other than just MAPS (Mail-Abuse Prevention Systems, LLC). Should enable administrators to use Services like Reputation Service, SenderID, RBLs, SPF, DKIM other than just MAPS (Mail-Abuse Prevention Systems, LLC). Should be able to use multiple lists in combination to maximize spam detection based on the various possible sources of spam.
4.	Should enable administrators to exclude known and trusted domains from real-time blacklists and heuristic scanning.
5.	Should allow administrators to manually block e-mail from specified user addresses, as well as entire domains.
6.	Should block e-mail messages based on subject line, attachment name, and maximum message size, specific keywords with regular expressions.
7.	Should prevent external sites from bouncing or relaying messages through your customers' mail servers.
8.	Should detect non-standard MIME messages that contain malicious content.
9.	Should use any and multiple DNSBL-based blacklist services to stop spam based on source.
10.	Should customize domain/address block lists to prevent delivery of e-mail messages from specific senders or domains.
11.	Real Time Status Monitoring- Should be able to view all email performance metrics with the click of a button, providing the number of messages processed, the number of messages in queue, the number of spam mails detected, blocked, Viruses detected and blocked etc
12.	Should have mechanism to detect and block different threats like polymorphic viruses, Blended Viruses
13.	Should include an inbuilt SMTP server so that it can transparently reside behind firewalls or SMTP gateway
14.	Should support Global as well as user defined blacklists.
15.	Should have support for user specific custom whitelists and blacklists.
16.	Should support spam based filtering rules.
17.	Should support multiple levels of spam score thresholds. And Administrators can define specific handling rules based on these different spam scores
18.	Should have an X-bulk header (an optional header that is generally not shown to the end-user) can be inserted into suspected spam messages, and serves as a description for an action taken on an email.
19.	Detect non-standard MIME messages that contain malicious content.

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20.	Should protect against new virus classes that traditional virus definitions alone cannot address. The engine updates should be automatically applied as administrators download new virus definitions—without stopping or restarting scanning services.
21.	Should have central server management for virus and Spam mails. The central server should have web-based GUI for administrators to access these quarantine mails for further inspection
22.	<p>Should support comprehensive activity logging</p> <p>Keeps track of virus activity on customer networks by logging:</p> <ul style="list-style-type: none"> - System actions (logins, logoffs, virus definition updates) - Message actions (accepted, rejected, bounced, delivered, delivery failures, completed) - Virus actions (repaired, deleted, quarantined) <p>Should support a dedicated quarantine manager to handle a large number of mail environments, while the scanning engine is dedicatedly scanning the malicious mail traffic. Central Quarantine manager should support multiple mail gateways. Should provide web based GUI to the end user for their own quarantine mails management. Operating System of the appliance should be hardened to protect itself from any unnecessary services or traffic. Solution should support Bayesian filtering of mails. Solution should support lexicons for compliancy like - Data Privacy, HIPAA. Solution should support Policy based mail routing. Solution should support TLS encryption for secure communication. Solution should support mail traffic coming from different VLANs based Vlan ID. Solution should support client tool for submission of spam mails directly from Mail/messaging solution. Solution should support spam learning through user mail submission. Solution should support multi level of actions on quarantine mails. Solution should support spam scanning on PoP3 protocol as well</p>

14.3 TECHNICAL SPECIFICATIONS FOR GATEWAY ANTIVIRUS FOR HTTP & FTP

1.	Should have combined Antivirus and Content Filtering Technologies at the Gateway high performance, one-time scanning of all incoming and outgoing HTTP and FTP traffic. Should provide high performance and one time scanning of http & ftp traffic for virus and content filtering.
2.	Should let you export URL Filtering's extensive, web-based reports to a comma-separated (CSV) file for easy import into programs like Crystal Reports or Excel for creating flexible graphical reports.
3.	Should resides behind firewalls, so it is transparent to users and should not impact network performance
4.	Should filter Internet content, using extensive, pre-defined category lists (such as crime, sex, gambling, and intolerance) to get you up-and-running quickly
5.	Should go beyond simple list-based filtering to provide multilingual, real-time filtering technology that reviews Web documents on the fly, without performance degradation. Should examine Internet content based on the threat in terms of viruses, Trojans, spam, &



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	should block those web sites
6.	Should control Internet access by time of day and day of week, allowing users to access work-related sites during business hours and providing open Internet access during lunch or after hours
7.	Should Offer a flexible policy management interface to make setting guidelines for users, groups of users, or system-wide users intuitive and easy. For example, you can specify: Allow lists, which focus users' Internet access on specific sites (e.g., shipping)
8.	Should support user authentication based on Windows NTLM, Kerberos and LDAP. Should also support transparent authentication for Windows domain users
9.	Should monitor users' Web access through feature-rich reporting—increasing your awareness of all Web activity within your organization and helping to deter non-work-related surfing. Should also allow you to export data into a CSV file format for viewing. Tracks all: Content and access violations / Search engine requests/Auto Locks. Provides valuable summary reports, which identify: Top ten Web sites/ The most active users / Cache/hit ratio / Frequency and types of violations Should provide rich reporting on the user activity for web and URL filtering. Should have reports for Top URL blocked, Top Users, Executive Summary reports etc
10.	Should allow organizations that choose not to restrict employees' Internet access to monitor and report on all Internet traffic unobtrusively—still keeping them informed of their organizations Web activities and deterring inappropriate or unproductive Web surfing
11.	Should use Access Scheduling to control Internet access by time of day and day of week, helping to: 1) Curb high-bandwidth Internet usage during peak hours of demand—freeing limited resources for those that need it most. 2) Ensure your IT investment is used wisely. 3) Caches frequently requested documents, reducing network traffic.
12.	Should offer an HTML-based interface that lets you configure and manage URL Filtering from any Web browser, from any location—making administration a snap
13.	Should be an appliance based solution with hardened OS thus making it easier to manage & fit into any infrastructure
14.	Should enable administrator to manage multiple appliances from single Management console for policy, configurations and reporting. Should integrate with multiple LDAP servers to create policies based on User groups. Solution should support blocking of specific files getting downloaded from web sites

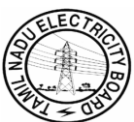
14.4 TECHNICAL SPECIFICATIONS - ANTIVIRUS PROTECTION FOR EMAIL APPLICATION

1.	Should support Windows 2000 Server/Advanced Server/Datacenter (Service Pack 3), Windows 2003 Standard/Enterprise/Datacenter, Microsoft Exchange 2000 (Service Pack 3) and Microsoft Exchange 2003
2.	Should provide a comprehensive solution consisting of multi-level anti-spam, rules-based content filtering and antivirus.
3.	Should be able to control spam more effectively by having multiple score assignment to every spam message with heuristics anti-spam detection
4.	Should allow messages to be handled appropriately based on the heuristics-assigned spam score with multiple spam disposition options.
5.	Should incorporate intelligent, rules-based content filtering to prevent unwanted content from entering and confidential information from leaving the network.
6.	Should minimize false positives by creating a trusted sender Whitelist.



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7.	Should bypass heuristic anti-spam & RBL (Real-time Blacklist) for certain recipients with recipient Whitelist.
8.	Should eliminate the entire message automatically with Mass Mailer Cleanup, not just attachments generated by mass mailer worms.
9.	Should update automatically with new virus definitions from internet to keep your protection up-to-date.
10.	Should protect against new viruses without requiring re-installation of software, helping to reduce the cost of ownership.
11.	Should automatically filter out emails with inappropriate attachment names, extensions, or content, reducing traffic on your Microsoft Exchange servers
12.	Should have an alternate to automatically update all of the Microsoft Exchange Servers from an internal virus definition server that will pick up updates from internet.
13.	Should provide immediate protection for new mailboxes and public folders.
14.	User/Group Based Rules - User/Group based rules should provide the ability to assign rules to only apply to a certain group of users or create global rules with exceptions. Users and groups can be taken from active directory or they can be entered using full email addresses or wild cards.
15.	Attachment Content Scanning - Should scan for content contained within most file types including Microsoft Office documents, Adobe Acrobat, text, RTF, and database files.
16.	True-file Typing for Multimedia and Executables - Should block/Quarantine multimedia and/or executable files based on true file type (regardless of file extension). One of the following dispositions should be applicable: delete attachment, delete message, quarantine file, or log only.
17.	Simplified Content Rule Interface - The interface for creating content filtering rules should ease the process of creating custom rules. Match lists should be added and edited within the content filtering pages. Rules should include content to match on and exceptions within the interface to better display the intent of a rule.
18.	Generate Reports across Multiple Servers– Should kick-off reports on each individual server from a central location and then browse to individual servers to view the report..
19.	Should be able to view a summary of activity and information for all Microsoft Exchange servers that are managed within a group, including consolidated spam and anti-virus data, from the home page.
20.	Expanded Protection against Security Risks– Should have the ability to detect expanded threats such as joke ware, Spyware, Adware and other non-viral risks. Separate dispositions should be applicable to detected security risks including delete file, delete message, quarantine and log-only.
21.	Auto-generated Summary Reports– Should create a summary report of all activity on a single Microsoft Exchange server, and automatically generate the report at a given date and time.
22.	Auto-generated Email Report- Once a report is generated; it should be automatically delivered to specified recipients.
23.	Graphical Reports- Reports should be generated that include charts and graphs to provide a clear picture of virus, filtering, and spam activity within an organization.
24.	Should have different log database for detection event and product. Should provide multiple scanning options like - proactive scanning, Background scanning, Transport level scanning. Should provide scanning of nested archived files for atleast 30 times

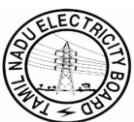


14.5 TECHNICAL SPECIFICATIONS - ANTIVIRUS PROTECTION FOR LOTUS NOTES

1.	Should provide a comprehensive solution consisting of multi-level anti-spam, rules-based content filtering and antivirus.
2.	Should be able to control spam more effectively by having multiple score assignment to every spam message with heuristics anti-spam detection.
3.	Should allow administrators to have different action options for different levels of spam mails
4.	Should incorporate intelligent, rules-based content filtering to prevent unwanted content from entering and confidential information from leaving the network.
5.	Should include a lexicon List feature that lets you create saved lists of words for use in the Content Filtering Rules that you create.
6.	Should let you create expressions of pattern-matching logic to find specific and broad categories of subject matter in email and other Lotus Notes documents.
7.	Should filter content for words that are specific to your company or industry. Should use match list for content violation.
8.	Should let administrator copy Content Filtering Match Lists to server groups
9.	Should let administrator edit any Content Filtering Rule expression. Should also include or exclude Content Filtering Rules from scheduled scans and on-demand (Scan Now) scans, as well as email and database writes.
10.	Should Allow you to create virtual groups of servers so you can set multiple policies for different groups of servers.
11.	Should let administrator easily replicate configuration files, log files, and virus definitions across all your Domino servers from a central location, easing administrative burden.
12.	Central management console should enable to control all the domino servers making it easier to choose which servers to include in a scheduled scan.
13.	Should be easy-to-use and configure because all operations, such as alerting, event logging, database scanning, and configuration, are done in native Domino format.
14.	Should support remote management via web or GUI client.
15.	Should notify virus attacks through the inherent, real-time Domino alerting mechanisms.
16.	Should collect alerts and provides a comprehensive activity log and statistics.
17.	Should provide ability to immediately start a scheduled scan or virus definition update session.
18.	Should have options for specifying one or multiple virus definition update servers in a Server Group.
19.	Should allow enabling or disabling of Content Filtering during a scheduled scan or on demand scanning.
20.	Should let administrator schedule virus definition update to retrieve virus definition updates automatically.
21.	Should let administrator have an option to create an internal virus definition server retrieves virus definition updates from internet at predetermined times or regular intervals and downloads them to an internal, centralized server Should allow to download the virus definition files from central management server instead of going to internet directly
22.	Should allow you to download the new definitions quickly and easily to your Domino servers from within the corporate firewall

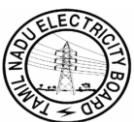
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23.	Should provide options when it discovers a virus-infected attachment: Rather than hold the entire email, it should back up and holds only the infected attachment, allowing the email text to pass through. End users can then request a new, clean file from the sender or have the administrator repair the file.
24.	Should scan the body of messages and not just the attachment for malicious code.
25.	Should eliminate redundant scanning by stamping each scanned document, then rescanning only those documents that are new or have changed.
26.	Should allow you to set scan configurations from remote computers. Should choose real-time, on-demand, or scheduled scanning. Should be able to repair or delete infected files
27.	Should scans and repair viruses within compressed files.
28.	Should allow you to schedule scans: <ul style="list-style-type: none"> - At start up - When new virus definitions arrive - On specified days of the month - Should allow schedule virus definitions update to download virus definitions at any interval—even daily.
29.	Should scan and cleanse email attachments in real-time as they enter the Lotus Domino server, rather than sending them to a separate server.
30.	Should allow scheduled scanning at off-peak hours
31.	Should support automatic multi-threading that process multiple requests and scans simultaneously, to maximize scan speed and available bandwidth. Optimizes performance automatically, based on the number of processors and memory available.
32.	Should offer a wide range of reports through central management console, allowing you to view the data by: <ul style="list-style-type: none"> - Year/month/all dates - Organization/author - Organization/server - Virus type - Scan type <p>Should be able to export data to Microsoft Excel, Crystal Reports, or other third-party reporting tools.</p>
33.	Should allow you to add customized disclaimers, such as company policies or confidentiality statements, to any email message.
34.	Should update the antivirus scanning and repair engine to protect against new virus classes that traditional virus definitions alone cannot address
35.	The engine updates should be automatically applied as new virus definitions are downloaded without stopping real-time scanning or re-starting servers. The scan engine should also enable organizations to rapidly deploy the same set of virus definitions across all machines, platforms, and network tiers.
36.	Should use heuristic technology, which detects virus-like behavior, to identify and repair unknown viruses.
37.	Should scan all incoming and outgoing SMTP, POP3, , Lotus Notes® Mail, and Lotus cc:Mail® traffic on Notes/Domino servers.
38.	Should scan and repair embedded OLE objects.



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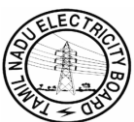
25.	User/Group Based Rules - User/Group based rules should provide the ability to assign rules to only apply to a certain group of users or create global rules with exceptions. Users and groups can be taken from active directory or they can be entered using full email addresses or wild cards.
26.	Simplified Content Rule Interface - The interface for creating content filtering rules should ease the process of creating custom rules. Match lists should be added and edited within the content filtering pages. Rules should include content to match on and exceptions within the interface to better display the intent of a rule.
27.	Auto-generated Summary Reports– Should create a summary report of all activity on a single Microsoft Exchange server, and automatically generate the report at a given date and time.
28.	Auto-generated Email Report- Once a report is generated; it should be automatically delivered to specified recipients.
39.	Should scan documents during the replication process to protect against the spread of viruses to other Domino servers.



15) HARDWARE FOR AMR BASED DATA LOGGING SYSTEM

15.1 DATA CONVERTOR UNIT At each Substation

1.	RS 485 to RS 232 data Converter unit shall be installed in the 33/11 KV Sub Station. All the Feeder meters installed in the sub station will already be having RS 485 ports. The vendor is required to loop these Meters through Rs 485 ports, using 2 core shielded cable. The Converter unit will be used to transfer the meter data from RS 485 port of all the Feeder Meters installed in the Sub station to Substation Computer system having polling software installed through a RS 232 cable. A typical specification of the Converter is described below :-
2.	The Converter shall be a fast Asynchronous bi-directional RS485 <=> RS232 intelligent interface converter for 2-wire (Single twisted wire pair) , half-duplex operations, with an automatic TX enable circuit, that will operate at data rates up to 115.2Kbps. The master port shall be configured for RS-232 and uses Transmit Data, Receive Data and Ground The unit has jumpers for bias, termination, RS232 DTE/DCE selection and operating mode settings. Galvanic (Opto/Xformer) isolation between the RS232 and RS485 ports shall be provided to eliminate noise and protect equipment from destructive transients due to switching operation of Feeders / Transformers. Power supply unit for the converter should be built inside the enclosure. Every port shall be surge protected and the unit shall be equipped with a grounding stud to allow a connection to earth for diversion of the otherwise deadly effects of induced surges.
3.	<p>Interface: Master port- RS-232; Slave ports- RS-485</p> <p>Distance : RS 485 upto 4000 ft. (1250 Mtrs)</p> <p>Operation : 2-wire, half duplex Rs 485</p> <p>Format : Asynchronous data with any combination of bits, parity, stop</p> <p>Data Rate: Upto 115.2 KBPS</p> <p>Indicators : LED's, one Red LED as TD indicator for each ports and one Green LED as RD indicator for each port and one Yellow LED for power/fault</p> <p>Protection : Transient Voltage Suppressors, auto-reset communications fuses on RS485 TX/RX data lines, 3000VDC, 1 sec. Galvanic isolation.</p> <p>Surge Protection : Response time less than 5 nanoseconds.</p> <p>Power: 220 Volts, 50 Hz , 4 Watt or less + external load</p> <p>Mounting : Stand alone or Wall</p> <p>Environment : -10° to 55° C, 5% to 95% RH non condensing</p>

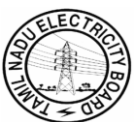


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4.	Normally, there will be 4 to 6 outgoing and 2 incoming Feeders in a sub station. The Data converter unit shall also support future expansion of sub station / feeders and should be scalable and flexible enough to accommodate the expansion.
5.	The Bidder is requested to visit each sub station, collect the various asset details and assess the exact requirement of Data Converter unit. Additional reserve capacity of twenty five percent (25%) over and above the actual requirement may be provided to accommodate future growth and expansion. This reserve capacity can be used without any additional hardware such as I/O cards and terminal blocks etc.

15.2 DATA Concentrator UNIT At each Substation

General	The DCU should have real time processor (min 266 MHZ) for reliable stand-alone operation, signal processing, control, acquisition and Real Time Deterministic Control with following capabilities
Memory	<ul style="list-style-type: none"> It should have Minimum of 128 MB Non Volatile Storage and 64 MB DRAM in built memory
Network Connectivity	<ul style="list-style-type: none"> DCU must have inbuilt support built-in TCP/IP 10/100 Mb/s Ethernet port to conduct programmatic communication over the network and host built-in Web (HTTP) and file (FTP) servers Compatibility to IEEE 802.3 with communication rates 10 Mb/s, 100 Mb/s . DCU must have RS232 serial port to communicate with peripheral devices
Communication Protocol	<ul style="list-style-type: none"> The DCU must support the MODBUS protocol to communicate with modbus enable peripheral devices.
Analog Inputs	<ul style="list-style-type: none"> DCU should have inbuilt analog input from power system devices and scalable for future expansion
Status input	<ul style="list-style-type: none"> DCU should have inbuilt digital Input to monitor the status of power system devices and scalable for future expansion.
Control Outputs	<ul style="list-style-type: none"> The DCU shall Digital output to provide the capability of controlling the Power system devices and scalable for future expansion
Power Requirements	<ul style="list-style-type: none"> Power supply voltage range 19 to 30 V DC/110-120V DC Power consumption (internal, driving no loads) Low Power Consumption
Environment	<ul style="list-style-type: none"> -5 to 60 –C temperature range
Alarming & Scheduling	<ul style="list-style-type: none"> Real-Time high speed data logging should be possible. The files shall be stored in various formats like text, CSV, Spreadsheet, ASCII, binary etc. It should be possible to implement various kinds of file compression techniques.
Inbuilt Clock on Real Time Controller	<ul style="list-style-type: none"> The real-time controller should have a very stable inbuilt clock with a battery backup. Shelf life of this battery should be 20 years.
Web Page Creation and Access	<ul style="list-style-type: none"> The real-time controller should have an inbuilt web server to help to create web pages of the front panel of the code running in the controller. The access to the web page should be given to everyone or restricted to certain IP address only.
Web File Attachment	<ul style="list-style-type: none"> The real-time controller should allow to send email with web files as attachments.



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DNS Support	<ul style="list-style-type: none"> The real-Time controllers supports DNS configuration
Dynamic and Static IP addressing	<ul style="list-style-type: none"> It should be possible to access the real-time controller from any location by configuring it on a public / Static IP address. It should also be configured with a dynamic IP address.
Remote Network Interface	<ul style="list-style-type: none"> By configuring the controller with a public IP, it should be possible to interface to any remote networks. In this state it should be possible for controller to be programmed and debugged remotely.
Day/Time Determination	<ul style="list-style-type: none"> The date and time of the controller should be possible to set remotely. At the same time it should be possible to configure to acquire the local date and time from the internet / GPRS network or using the GPS modem.
GSM / GPRS Features	<ul style="list-style-type: none"> Supported GSM bands Quad GSM band: 800/900/1800/1900 MHz GSM standard SMS, Fax, CSD (circuit), GPRS Cellular Data class 10 SIM card reader Tray Push Type SIM lock function Yes
Onboard Stack	<ul style="list-style-type: none"> UDP Upto 8 Sockets TCP/IP (Client) Upto 8 Sockets TCP/IP (Server) Upto 4 Sockets FTP HTTP SMTP POP3 The DCU should have inbuilt convertor unit for facilitating data conversion from RS 485 to RS 232.
LED Indicators	<ul style="list-style-type: none"> LEDs to display various status information.
DI & DOs and analog input	<ul style="list-style-type: none"> DCU shall have inbuilt Digital Output / Input for controlling & monitoring (Digital input 24 and Digital output 24). The unit shall have the expandability to add upto 100% Digital input & output channels to cater to the future need DCU shall have inbuilt Analog Input 8 Nos and should have the 100% expandability to add Analog input card to cater the future need. The proposed DCU at 33kV Sub Stations shall have provisions to install a PC for local monitoring.

15.1 Modems for AMR System -

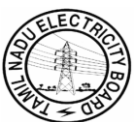
b) GSM /GPRS/EDGE/3G Modems and SIM cards -

1.	GSM Modem shall be suitable for long duration data transmission and shall be protected from
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	external interference of systems working at different bands.
2.	Mechanical Specifications :- Modem should be a compact model housed in a polycarbonate / engineering plastic / Metallic enclosure. The modem should comply with IP55 degree of protection.
3.	Environmental Specifications :- The Modem shall meet the following environmental specifications : - <ul style="list-style-type: none"> ➤ Storage Temperature : -20 degrees to +70 degree Celsius ➤ Operating Temperature: -10 degrees to +60 degree Celsius ➤ Humidity:- 95% RH (Non - Condensing)
4.	Communication Capabilities: - <ul style="list-style-type: none"> ➤ Modem should be Dual Band modem capable of operating at 900 and 1800 MHz GSM transmission. ➤ Modem should support both Data and SMS transmission. It should have both GSM and GPRS/EDGE features.
5.	Interface :- <ul style="list-style-type: none"> ➤ Modem should have an RS232 Interface through a 9 pin or 15 pin D type Connector for connection to Meter. ➤ The SIM interface should be a 3 V Interface in accordance with GSM 11.12 phase 2 with an retractable SIM cardholder, which should be fully inserted inside the modem. The holder opening should have a sliding cover with provision for sealing after placing of the SIM card. The modem shall accept the standard SIM Card. ➤ Modem should have a SMA Antenna connector
6.	Power :- <ul style="list-style-type: none"> ➤ Maximum Power Output should be 2 W at 900 MHz (Class 4) and 1W at 1800 MHz (Class 1). ➤ The RF functionalities should comply with the GSM phase II/II+ compliant, EGSM 900/GSM 1800 recommendation. ➤ VA Burden of the Modem should not exceed 3.5 VA during data communication.
7.	Sensitivity :- GSM 900 : <-100 dBm GSM 1800 : <-100 dBm
8.	Data Features: - <ul style="list-style-type: none"> ▪ Modem should use standard AT Command set (GSM 07.05, GSM07.07) for settings of the modem. ▪ TCP/IP stack access via AT commands ▪ Internet Services : TCP, UDP, HTTP, FTP, SMTP, POP3 ▪ Max. Baud Rate: for GSM Operation - 9600 bits/sec CSD Data transmission features :- <ul style="list-style-type: none"> ▪ Data circuit asynchronous, and non transparent upto 14.4 Kb/s ▪ V.110 ▪ USSD Support GPRS Data transmission features :- <ul style="list-style-type: none"> ▪ GPRS Class B Multi slot class 12 or class B Multi slot class 10 ▪ Packet channel support : PBCCH ▪ Coding Schemes: CS1 to CS4 compliant with SMG32 (Release97)



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	EDGE Data transmission features :- <ul style="list-style-type: none">▪ EDGE (EGPRS) Multi slot class 12 or Multi slot class 10▪ Mobile station Class B▪ Modulating and coding schemes : MCS 1 to 9▪ Packet channel support : PBCCH
9.	SMS Features: - <ul style="list-style-type: none">▪ Text and PDU▪ Point to point (MT/MO)▪ Cell broadcast
10.	Operational Indicator :- The Modem should have separate LED indications for transmit data, received data, carrier detects and Power ON, etc. to indicate Power on position and to indicate the availability of signal at the place of installation.

16) HARDWARE FOR CUSTOMER CARE CENTER RELATED EQUIPMENT

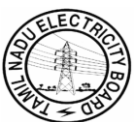
a) INTRODUCTION :

The Call Center should consist of CTI server, IVRS server and CRM server (Single server with multiple partition or discrete Server) as described in Server Section above along with ACD, Dialer and Voice Logger solution to integrate various customer services on a single point as described in detail in Section-G2 and can be either EPABX based or Server based.

The access by telephone shall be provided by interfacing the Call Center to PSTN through the standard signaling schemes or through IP Telephony . The system shall be configurable to handle the customer queries either through IVRS or manually. The call center equipment shall be designed for continuous operation.

b) HARDWARE REQUIREMENTS:

- i) The Call Center shall support PSTN interface of minimum one E1 link either in R2MFC signaling or ISDN PRI or 32 DELs (Direct Exchange lines), as per the requirement for both incoming and outgoing calls The ultimate number of links with PSTN shall be designed and provided based on the traffic projections, which will be the average number of transactions per day to be handled across the counter as well as by phone, fax, e-mail, internet etc.
- i) The hardware requirements of the Call Center shall vary depending upon the number of transactions to be performed through various accesses and the desired performance level defined at Section-G1, clause-9.
- ii) The Call Center shall support the number of agent positions of minimum of 420 to an ultimate capacity of agent positions to be designed and provided based on the traffic projections.
- iii) It shall support Voice Interface between the Call Center and local/remote agents for both incoming and outgoing calls.
- iv) The system shall support Voice Mail Customers up to 1500.
- v) The call centre shall provide a graphical console application program for the Supervisor's workstation PC.



- vi) The CSR or agent terminal must be equipped with a work station PC, Hand set, Head set, soft telephone and IP Telephones for basic telephone handling functions. Agents shall be able to perform any of the above functions through the keypad of their telephone sets/headsets or through soft-phone application inter-changeably.

c) Electromagnetic Compatibility Requirement and standards, if applicable :

The equipment to be installed in the call center shall conform to the EMC requirements as per the following standards :

- a) Conducted and radiated emissions: - To comply with Class A of CISPR 22 {2000} "Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment"
- b) Electrostatic discharge :- To comply with IEC 61000-4-2 "Testing and measurement techniques of Electrostatic discharge immunity test" under following test levels :
Contact discharge level 2 {± 4 kV}; Air Discharge level 3 {± 8 kV};
- c) Fast transients common mode burst:- To comply with IEC 61000-4-4 "Testing and measurement techniques of electrical fast transients/ burst immunity test" under level 2 {1 kV for DC power lines; 1 kV for signal control lines}.
- d) Immunity:- IEC 61000-4-3 "Radiated RF electromagnetic field immunity test" under Test level 2 {Test field strength of 3 V/m}.
- e) Surges Common and differential mode:- To comply with IEC 61000-4-5 "Test & Measurement techniques for Surge immunity tests" under test levels of 0.5 kV for differential mode and 1 kV for common mode.
- f) Radio frequency common mode :- To comply with IEC 61000-4-6 "Immunity to conduct disturbances, induced by radio frequency fields" under the test level 2 {3 V r.m.s.}; current Clamp injection method or EM clamp injection method for DC lines and Signal Control lines.

17) SPOT BILLING SYSTEM

The specification covers design, manufacture and supply of Hand Held Spot Billing computer system and its accessories meant for carrying out spot billing for LT category of consumers, comprising of domestic, commercial and industrial consumers.

The Spot Billing system shall consist of a Hand Held Equipment (HHE) and a separate Portable Printer (PP), connected to each other suitably. This scheme of two independent units provides for redundancy and better equipment utilization in the event of failure of any one unit. Specification of Handheld Equipment Unit and Portable printer are described below :

17.1 Basic Functions

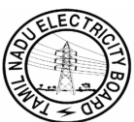
The handheld Equipment (HHE) shall have the capability to collect and store meter readings at any time of the meter reading route and should be capable of issue of bill with PP attached to the HHE. The unit shall be able to obtain all type of readings (kWh, kVAh, kVARh and max demand KW/ KVA) on any particular route without requiring :

- Reprogramming of the HHE.
- Physical change of software contained within the unit while in the field.
- Access through special software menus contained within a given route/program.

17.2 STANDARDS

HHE and PP shall conform to the relevant standards for satisfactory functioning of the system without any problem in the field. The vendor required to specify clearly which of following standard the HHE confirms.

- i) CBIP Technical Report no. 111 - Specification for common Meter reading Instrument.



- ii) IEC - 529 - Degree of Protection provided by enclosures
- iii) IS : 12063 : 1987 - Classification of Degree of Protection provided by enclosures of electrical items
- iv) IS 9000: 1979 - Basic environmental testing procedure for electronic & electronic items.
- v) IEC - 1000 - Electromagnetic compatibility
- vi) IEC - 1000-4-2 : 1995 - Electrostatic discharge immunity test
- vii) IEC - 1000-4-3 : 195 - Radiated, radio - frequency electromagnetic field immunity test, Magnetic immunity test
- viii) CISPAR 22 - Limits and method of measurement of radio disturbance characteristics of information technology equipment.

17.3 CLIMATIC CONDITIONS

The HHE must include but not be limited to the following :

The HHE shall be suitable for continuous satisfactory operation under climatic conditions listed below.

- i) Maximum Ambient Air Temperature in shade : 55°C
 - ii) Minimum Ambient Air Temperature : -10°C
 - iii) Maximum Relative Humidity : 95% (condensing)
 - iv) Minimum Relative Humidity : 10%
 - v) Height above mean sea level : Upto 1000 meters
 - v) Average number of tropical monsoon : 5 months
 - vi) Annual Rainfall : 2280 mm
- The device shall be water resistant, capable of unlimited exposure to spray or splash (such as rain).
 - The device must be protected against a static discharge without loss of data.
 - The unit must be resistant to various chemical products and must be sealed to keep out dust, humidity and water.
 - The device must be shock resistant.

17.4 QUALITY ASSURANCE

The HHE and PP shall be made out of high quality materials to ensure high reliability and longer life. It should be very compact and reliable in design to make it immune to any type of vibrations and shocks in normal field activity.

17.5 Processor and PC Compatibility

The HHE must be PC compatible and run latest MS-DOS Version or Linux or windows or higher. The Facility to upgrade the BIOS/ OS shall be available without exposing the hardware of the HHE. The additional program necessary to transfer application programs with serial port shall be provided.

17.6 Case

- The unit must be able to withstand a minimum three-foot drop to concrete.
- The HHE shall be ergonomically designed to be comfortable for handheld meter reading.
- HHE should be handy, lightweight and small in size for ease of portability.
- HHE shall be provided with a suitable holding Strap for proper gripping.
- Ruggedness : HHE shall withstand harsh field environment without physical damage or loss of data.

17.7 Display

- The HHE screen must be able to display legible characters with backlit facility
- The display must have no degradation when exposed to storage temperatures of 0°C to +70°C, and operating temperature of 0°C to + 50°C.



- Automatic contrast temperature compensation is preferable.

17.8 Keyboard

- The keyboard must have large keys with adequate separation.
- The keyboard must provide tactile feedback and be fully alphanumeric.
- There must be an audible beep indicating key has been fully depressed, there must also be an auto-repeat function on keys and a rapid response between keying and seeing results on the screen.
- The keyboard must be fully PC compatible and programmable.
- Each English alphabet and numbers shall have a separate key.

17.9 Input / Output ports (I/O Ports):

The HHE shall have a minimum one RS-232 Serial Port conforming to standard PC to communicate for Uploading and Downloading of meter data to / from the Billing system . This port must be compatible for connecting peripherals such as bar-code reader, printer, battery charger, loader charger etc. The HHE with an infrared port for communication will be preferred.

A Real Time Clock (RTC) shall be provided in the HHE, with the a minimum of 10 years battery back up.

17.10 Battery

- The battery capacity must be sufficient for at least 8 hours of meter reading.
- The HHE must come with a power management system designed to conserve power.
- The HHE must come with an integrated intelligent fast charge capability that allows for full charge in 5 hours.
- To reduce the equipment down time and inventories, there shall be provision to charge the HHE battery without being removed from the equipment. A suitable battery charger for charging of HHE battery shall be provided.
- The HHE should have low-battery detection and automatic cutoff feature to avoid further drain of the battery.

17.11 Memory

- The total RAM memory at least 8 MB or higher and be able to store approximately 1,000 readings.
- Flash ROM memory (if required) of at least 512 KB or higher (BIOS, OS, COMMUNICATION and SETUP).

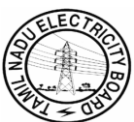
17.12 Carrying Method

A hand strap must be provided with each unit and must provide ease of use for right or left handed use.

17.13 Charging / Communications Cradles

- The communications/charging cradle will be housed in a suitable material that can be wall or table top mounted.
- It will have the capability of recharging the HHE unit and also provide the communication port connection to the computer.
- The cradle will be capable of communicating with the host computer at minimum 19,200 bps.
- HHE should have printer port to attach portable printer. Hand held hardware and OS should support various type and make of Impact printers and Thermal paper printers.

17.14 Specification of printers:



Printer should be powered only during printing and should be software controlled by HHE. Printer offered should be portable, handy, and rugged Impact printers. Indicative requirement of printers is as follows :-

- 24Col. Alphanumeric
- High speed (2.7lines/sec)

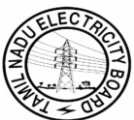


18) Work Station

A) Architecture	i) Type	Desktop PC
	ii) Orientation	Vertical Tower Type or Ultra Small /Small Form Factor Desktop Type With Mechanical Locking Arrangement for the CPU Cover/casing
	iii) Bus type / architecture	PCI
B) Processor	i) CPU CHIP	Dual Core Processor or higher
	ii) Processor internal clock speed	2 GHz or higher
	iii) Planer clock speed / FSB	1066 MHz or higher
	iv) L2 Cache	4 MB or higher
C) Memory	i) Memory (RAM)	4 GB (2 nos. of 2 GB DIMMs)
	ii) Memory (RAM) max expandability	8 GB or more
	iii) RAM speed	800 MHz or higher
	iv) RAM slots total	4 or more (in Dual Channel; 2DIMMS /channel or more)
	v) RAM type	Non ECC DDR2
	vi) Packaging	DIMM
D) Board	Mother Board	OEM Mother Board with OEM logo embossed on the Mother board
	Revision Level	Management agent should show the revision level
E)FDD	Capacity	NOT REQUIRED- DELETED
F)HDD	i) Size & Make	160 GB @ 7200RPM or better, Sync Transfer Rate 3 GBPS
	ii) Hard disk controller	Integrated SERIAL ATA II
	iii) HDD Exp Option	Option to add 2nd Serial ATA HDD-Required
G) Graphics subsystem	i) Type	built-in on the chipset
	ii) Video RAM	Shared
	iii) Resolution	1024x768 or better

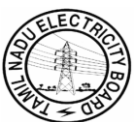
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	iv) Graphics bus interface	Integrated Graphics Media accelerator
H) Monitor (Asset Controlled)	Monitor	17" TFT, Min. Resolution 1024 x 768
I) Keyboard	Type	PS/2 or USB Std Keyboard (Mechanical)
J) Pointing device	Mouse	2 button OPTICAL scroll Mouse, OEM
L) Ports and Interfaces	i) Parallel ports	1 (EPP/ECP bidirectional)
	ii) Serial Port	1
	iii) Serial ATA Interface	4
	iv) Parallel ATA IDE Interface with UDMA 33	1
	v) USB Ver 2.0	At least 8 out of which 2 on front
	vi) Mouse	1
	vii) Keyboard	1
	vii) Graphic Media Accelerator Display	1
	ix) Audio stereo input	1
	x) Audio stereo output	1
	xi) Microphone	1
M) Expansion options	i) Slots	
	a) PCI Slots Conventional	2 Free Slots Minimum
	b) PCI Express xl Slot	1 Free Slot Minimum
	c) PCI Express xl6 Slot	1 Free Slot Minimum
	ii) 3.5 inch bays - accessible	1 or more
	iii) 3.5 inch bays - not accessible	1 or more
	iv) 5.25 inch bays - accessible	2 or more
N) Manageability & Standards	i) WLP 2.0	Yes
	ii) Plug & Play	Yes



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	iii) Power management features ACPI 1.0	Yes
	iv) EPA Energy Star compliant	Yes
O) Security features	i) Boot sequence control	Yes
	ii) Diskette boot inhibit	Yes
	iii) Power on/ Boot password	Yes
	iv) Configuration Password	Optional
	iv) Setup password	Yes
P) Audio	i) ADDA	Integrated 4 channel High Definition audio
	ii) Sampling Rate	5 KHz to 44 KHz or better
	iii) Synthesizer	4 channel or better
	iv) Internal Speakers	To be provided - 1.5 W Minimum
Q) Network Connectivity	a) Type	Integrated Gigabit N/W Connection Ethernet
	b) Support type	Wake on LAN support
	c) Connector	RJ45
R) OS	a) MS Windows, b) Linux with x-window	Latest version preloaded
		a) Recovery CDs containing all required drivers and patches
		b) OS CDs/DVDs with License declaration and
		c) Documentation on media for Lic.
	S/W Patches	Ensure that all software (OS & applications) supplied is licensed and includes supply of all patches, updates, and bug-fixes during the warranty and extended support period if any.

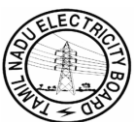


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S) Warranty		Minimum 3 Years Comprehensive OEM on-site warranty (NEXT Business DAY resolution) for all components (H/W and OS) supplied including re-loading and re-configuration of all s/w and device drivers, if required.
T) CERTIFICATION	a) Windows Certified	Compliance Required (In case supplied with Window OS)
	b) LINUX ready Certified	Compliance Required (In case supplied with Linux OS)
U) Manageability Features * (All related Client Licenses as applicable to be provided)	a) Tools for asset Tracking including serial number tracking of system, manufacturer name & model, board, CPU, memory, monitor, HDD with details of NIC, OS Etc to be provided by OEM	Required, Compliance to be demonstrated
	b) OEM health monitoring/ diagnostic tools	Required, Compliance to be demonstrated
	c) Monitoring & Pre failure alerts for the Hard Disk	Required, Compliance to be demonstrated
V) Physical Security	Hood Sensor	Required. Compliance to be demonstrated
W) Additional Information to be provided by bidder	BIOS Type	To be indicated by bidder
X) Power Supply	Power Supply Wattage	To be indicated by bidder (But not less than 300W)

The Desktop model quoted by ITIA should be complied with the following benchmarks and the same benchmark results should be submitted along with the bid. Failure of submission will result in rejection of the bid.

- It should be Windows/Linux certified for the year 2008 or later.
- The TFT monitors shall be in the ratio of 4:3 i.e wide TFT will not be accepted.



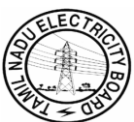
19) PRINTERS

19.1 Dot Matrix Printer

Item	Required Parameter
A) Speed	350 CPS or higher
B) No. of Pins	24 Pin, Letter Quality
C) Columns	132 or higher
D) Interfaces	Both Serial and Centronics Parallel with printer cable
E) Make & Model	To be indicated by bidder
F) Misc.	Dust Cover & requisite drivers

19.2 Network Laser Jet (B/W) Printer

Item	Required Parameter
A) Type	Dry Type Laser Electro Photocopy
B) Resolution Colour	1200 x 1200 (2400 dpi type or higher) , Image Resolution Enhancement technology
C) Speed (color)	32 PPM or higher for A4 in normal mode, first page out 10 seconds
D) Memory	128 MB or Higher, expandable to 256 MB
E) Processor	400 MHz or better
F) Paper Size	A4 and Legal including Envelops & letter
G) Type of Media	Bond Paper, Transparency Sheets, Envelopes, Labels, Cards
H) Paper Handling	250 Sheets or More Paper handling capacity on out put ,Multi-purpose Tray
I) Std Paper Trays Input	TWO (total paper Input 500 Sheets or more)
J) Fonts	Minimum 45 Scalable Fonts
K) Printing Languages	PCL 6, PCL 5, postscript 3 emulation
L) Interface	Centronics Parallel with Printer Cable USB with cable
M) Duplex printing Capability.	Yes
N) Duty Cycle	80,000 Pages per month or higher
O) Connectivity	IEEE 1284 ECP Compliant, B Size Bidirectional parallel port, One USB 1.1 port & Fast Ethernet 10/100 Internal Print Server in EIO Slot
P) N/W Print Mgmt S/W	Needed
Q) Make & Model	To be given by the bidder
R) Power Requirement	To be given by the Bidder - Wattage - Suggested UPS capacity (VA) & type (online or offline)
S) OS Support	Vendor to provide drivers for supporting all the required OS
Guaranteed per Laser Cartridge output with 5% Coverage on Letter Size Paper in Normal Mode	Guaranteed output to be indicated by bidder
Cost of Cartridges	To be indicated for the model offered



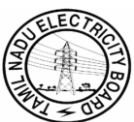
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19.3 A3 size inkjet color Printer

a) Size of Paper	Upto A3 Size
b) Print Speed for A4 Size	Black Text: Draft Mode: 12ppm, Normal Mode : 6 ppm Color: Draft Mode:10 ppm, Normal Mode:4 ppm
c) Resolution	600 x 600 dpi (Black), 4800dpi optimized (Color)
d) Memory	8 MB RAM
e) Duty Cycle	4000 pages per month
f) Print Language	PCL 3 or higher
g) Interface	Parallel with Cable/ USB with Cable
h) Misc.	Dust Cover
i) Make	Make & Model to be given by bidder
j) Print Copies with 5% coverage in normal mode Per cartridge-Black	Guaranteed output to be indicated by bidder
k) Print Copies with 5% coverage in normal mode Per cartridge-Colour	Guaranteed output to be indicated by bidder

19.4 Line Printer

Print speed	Up to 500 lines per minute (@ 10, 15 & 17.4 cpi)
Workload	200,000 pages per month
Throughput (ECMA 132) Character pitch	Constant density: 5, 10, 12, 13.3, 15, 17.1cpi Enhanced density: 5, 6, 6.67, 7.5, 8.33, 8.57, 10, 12, 13.3, 15, 16.67, 17.14, & 20cpi
Line pitch	1.5, 2, 3, 4, 5, 6, 7, 8, 9 & 10lpi
Graphics resolution	Up to 240 x 288dpi
Graphics languages	QMS code V, Printronix Graphics Language (PGL), Tally IG or equivalent
Fonts	Draft, data processing, gothic, courier, OCR-A, OCR-B, range of Arabic
Barcodes	Code 39, 2/5 Matrix, 2/5 interleaved, EAN 8, EAN 13, EAN128, UPC-A, PDF417 2 dimensional, KIX, UK Post Office, with read/right algorithm
Paper handling	2 tractors 25 inch per second slew rate (max) Paper motion detection, paper out detection
Paper size	100-466mm Length: 1 to 255 lines
Paper weight	65 to 365gsm
Multi-part stationery	Up to 6 part forms Maximum forms thickness 0.025 inches
Ribbons Emulations	'Clean hands' mono, 40 million chars, 60 and 250 million chars 'enterprise ribbon' MT660/MT690, Epson FX+, IBM ProPrinterXL, Genicom ANSI, HP2564C, Printronix P600/P6000, DEC LG01, contextual Arabic or equivalent
Interfaces	Standard: IEEE 1284 compliant parallel, serial with 38.4K baud transfer



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	Optional: fourplex: twinax and coax (+IPDS), LANPlex ethernet (+IPDS)
Noise level (ISO 7779)	52dBA

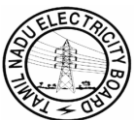
20) IDMS AND KIOSKS

Cash/cheque collection kiosks shall be installed at Customer care centers as per the requirement of the utility.

CASH/ CHEQUE COLLECTION KIOSK

Bill Payment Kiosk with dual Core or higher processor, 2 GHz or above internal clock speed, 2 GB DDR2 RAM or more, minimum 160 GB HDD, CD ROM Drive, Latest version of OS type : Windows/linux with x-window and other specifications requirements as per Section-18 above (i.e. Work Station PC Specification) , 15" TFT capacitive Touch Screen Monitor, Thermal Printer, in-built Currency Validator as per RBI guidelines (To accept notes in the denomination of Rs 500, 100, 50, 10, 5 and coins Rs 5, 1) Magnetic Ink Character Reader, Laser Printer, Speakers, Surveillance Camera, Suitable Modem, UPS (15 Min Backup and to be provided at the bottom for stability) & With Application Software. The collection information shall be updated immediately to master billing database. The UPS should activate the machine to shutdown before reaching the thresh hold level.

- a. The Machine should be able to accept both MICR and NON MICR Cheque through Motorized MICR Cheque reader with printing on back side, minimum 30 character
- b. It should be supporting an automated operation with the voice guidance.
- c. The operation of cheque deposit and printing of duplicate bill has to be interactive and user friendly.
- d. The machine should have redundant power supply provision. There should not be any information loss in case of power failure.
- e. Customer waiting time should be minimum possible.
- f. The errors should be less than $\pm 1\%$ within the active area.
- g. Touch life should be greater than 200 million touches in any one location.
- h. Machine should support configurable receipt format. The Thermal receipt Printer shall be 40 Col. with auto cutter and with print speed 180mm/sec
- i. The laser printer shall be 80 columns for duplicate bill printing.
- j. The bar code laser scanner shall be provided which should be able to read Barcodes for length upto 200mm.
- k. The kiosk should have cooling fan with exhaust vent at the top, lockable doors with three sets of keys, sliding drawers, power distribution, adequate earthing as per Electricity act and sufficient space for all the components to fit in.
- l. Dirt, grease, smoke, water droplets or other surface contaminants should not affect the touch screen.
- m. Touch screen should be resistant to corrosives.
- n. Touch screen should not be scratched using any stylus with Mhos' rating less than 6.5.
- o. The application software should have no exit buttons and provide no access to system files on touch screen. The application can be closed only through the keyboard.
- p. The monitor should be fitted at an angle of 30° from vertical to have viewing angle of less than 70° and at a height of minimum 1200 mm from ground.



- q. In case of receipt of fake currency, the system should not return the fake currency, immediately take a snapshot of the user through in-built surveillance camera and keep record such as account number, date, time etc and generate the exception reports at the end of the day or as and when required as per RBI guidelines.
- r. The housing should be High Grade steel
- s. The in-built Cheque deposit box shall have capacity to store 2000 Cheque.
- t. The depository safe should be made from thick steel with appropriate lock

21) Computer Table and Chair

Computer Table

Computer Table, Size 42" X 24" X 30" (L X W X H), made of 18 mm exterior grade, (Grade-I, Type-II) one-side laminated, pre-laminated board of approved colour as per BIS-12823 : 1990. The pre-laminated board shall have beading with 0.88 mm PVC, non-glued edge binding tape, which will be pasted, on the edges of the board with synthetic based adhesive. The computer table shall have provision for main Unit (CPU), monitor, drawer and sliding keyboard with sliders

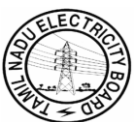
Computer Chair

The seat and back are made of minimum 1.2 cm thick hot pressed plywood, upholstered with changeable fabric upholstery covers and moulded polyurethane form of high density together with injection moulded back spine covers. minimum Back Size : 40.0 cm W x 25.0 cm H and Seat Size 45.0 cm W x 42.0 cm D. Chair should have a full 360 degree revolving mechanism with flexi back. Chair should have five prong pedestal with twin castors and pneumatic height adjustment.

22) UPS AND BATTERY SYSTEM -

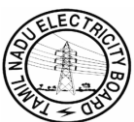
22.1 UPS & BATTERY SYSTEM for Data Center & Disaster recovery Center

1	The scope shall include design, detailed engineering, manufacture, supply, transportation, storage, unpacking, erection, testing, successful commissioning and satisfactory completion of trial operations of following for the Data Centre.
2	UPS : The Data Center & Disaster recovery Center equipment should get continuous power. The Solution uptime should be 99.5%. The redundancy should be available up to the load end. Preferred makes of UPS are Merlin Gerin, Emerson Network power, DB Power Electronics or Powerware.
3	Critical Load UPS. 2 nos UPS of adequate capacity with independent battery back up for 30 minutes for serving the critical loads.. Input / Out put details: Input Voltage : 380/400/415 V Three Phase Out Put : 415 V Three Phase (4Wire)
4	Service Load UPS. 2 nos UPS of adequate capacity with COMMON battery back up for 30 minutes for other loads.



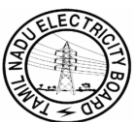
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	<p>Input / Out put details: Input Voltage : 380/400/415 V Three Phase Bypass input : 415 V Three Phase (4wire) Out Put : 415 V Three Phase (4Wire) Both the UPS should be able to operate in independent and synchronized mode.</p>
5	The critical load UPS system shall operate without synchronization at the out put. Each unit shall separately feed UPS distribution boards A&B in the power room
6	The service load UPS system shall operate in dual bus synchronized mode such that both are independent but their out put bus is synchronized forming the service UPS board, sharing the load. If any UPS is down the other shall take the entire load. They also should be able to operate in one cold stand by mode. All emergency lighting of the facility, PC /Terminal loads etc shall be fed from this system.
7	CRITICAL LOAD UPS
8	<p>Two numbers of UPS to be provided for meeting the critical load requirements. The UPS shall be designed to operate as an ON LINE Double conversion type reverse transfer system with static switch, manual bypass switch, isolation transformer at inverter out put and AC distribution boards. It shall have charger, inverter and individual VRLA type battery bank for 30 minutes power backup at full load. The rectifier shall operate on 12 pulse rectification. The offered system shall have the following operation modes.</p> <p>A. Normal - The critical AC load is continuously supplied by the UPS Inverter. The rectifier/ charger derives power from AC Input source and supplies DC power to the Inverter while simultaneously load charging power reserve battery.</p> <p>B. Emergency - Upon failure of AC Input power, the critical AC load is supplied by the Inverter, which without any switching obtains power from the battery. There shall be no interruption in power to the critical load upon failure or restoration of the AC input source.</p> <p>C. Recharge - Upon restoration of AC input power during the emergency mode of operation, the rectifier/ charger shall automatically restart, walk-in and gradually assume the inverter and battery recharge loads.</p> <p>D. Bypass - If the UPS must be taken out of service for maintenance or repair or should the inverter overload capacity be exceeded, static transfer switch shall perform reverse transfer of the load from the inverter to bypass source with no interruption in the power to the critical AC load. The static bypass switch should be double ended. The static switch should also have an overload rating of 14 times of rated load for 10 msec (1/2 cycles). The use of this static switch is at the discretion of the owner.</p> <p>E. A manually operated Maintenance Bypass Switch should be incorporated into UPS cabinet that will connect the load to AC power source bypassing the rectifier/charger, Inverter and Static transfer switch.</p>
9	The Critical load UPS shall be used to feed critical server and other equipments installed in Critical server. The sizing for the same shall be furnished along with calculations. The KVA rating of UPS shall be as required by expected loads(and include 10% spare capacity guaranteed at 40 deg. C ambient and load power factor of 0.8 lagging. Each UPS shall be sized for 100% + 10% of critical server loads. If UPS KVA rating is applicable at a lower ambient temperature than specified 40 deg.C, the Bidder shall consider a derating factor of at least 1.5%/deg.C for arriving at the specified UPS capacity at 40 deg.C ambient. The UPS shall have an over load capacity of 125 % rated capacity for 10 minutes and 150 % rated capacity for 10 seconds. The inverter shall have sufficient capability to clear fault in



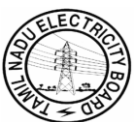
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	the maximum rated branch circuit, limited to 12 percent of finally selected UPS Capacity. The sizing of UPS shall be based on the power factor of the loads being fed subject to a maximum of 0.8.
10	The charger shall be sized to meet the 100% UPS load plus recharge the fully discharged battery within 8 hours at minimum charger efficiency of 90%. The input to the UPS shall be unregulated 3 phase AC of 415 Volts.
11	Battery Requirements: Battery should be designed for giving 30 minutes back up at full load on each UPS. Valve Regulated Lead Acid (VRLA) type suitable to be installed along with UPS to be considered. The UPS battery shall be made of 2 V VRLA cells with a design life of minimum 15 years. The battery to be installed in multi tier configuration effectively using the space available with considerations for maintenance accesses. The UPS module should have the Battery Circuit breaker mounted near to the batteries. When this breaker is opened no battery voltage should be present in the UPS enclosure. The UPS module should be automatically disconnected when the battery reaches to the minimum discharge voltage level or when signaled by other control functions. Remote tripping of Battery Circuit breaker facility shall be also incorporated. The entire tier system complete with cabling shall be supplied.
12	The UPS battery shall have sufficient amp-hour capacity (not less than 600 AH) to supply 100% full load current of UPS for 30 minutes. Battery sizing along with detailed calculation shall be provided. The UPS along with batteries are proposed to be installed in the power room under precision air conditioned environment at 22 degree C +/- 1 degree. This factor to be considered while arriving at battery sizing
13	The UPS system shall be capable of operating without D.C. battery in circuit under all conditions of load and the performance of various components of UPS like inverter, charger, static switch etc. shall be guaranteed without the battery in circuit
14	Static Inverters: The static inverter shall be of continuous duty, solid state type using proven Pulse Width Modulation (PWM)/Quasi square wave/step wave technique. Ferro resonant types Inverters are not acceptable. The inverter equipment shall include all necessary circuitry and devices to conform to requirements like voltage regulation, current limiting, wave shaping, transient recovery, automatic synchronization etc. The steady state voltage regulation shall be +2% and transient voltage regulation (on application/removal of 100% load) shall be +20%. Time to recover from transient to normal voltage shall not be more than 50 milli Sec. Frequency regulation for all conditions of input supplies, loads and temperature occurring simultaneously or in any combination shall be better than $\pm 0.5\%$ (automatically controlled). The total harmonic content shall be 5% maximum and content of any single harmonic shall be 3% maximum. The inverter efficiency shall be at least 90% on full load and 80% on 50% load. Each Inverter shall have an over load capacity of 125 % rated capacity for 10 minutes and 150 % rated capacity for 10 seconds. An isolation transformer shall be provided at the out put of the inverter. The out put of the UPS shall be 3 phase with grounded neutral (4 wire).
15	Static Switch and Manual Bypass Switch : The static switch shall be provided to perform the function of transferring UPS loads automatically without any break from faulty inverter to standby AC source in case of failure of the inverter . The transfer time shall be $\frac{1}{4}$ cycle maximum. Manual bypass switch shall be employed for isolating the UPS during maintenance. Continuous and overload capacity of the switches shall be equal to 100% of the continuous and overload rating of each invertors. Peak Capacity shall be 1000% of continuous rating for 5 cycles.
16	Static Switch: Each single phase load points shall be provided with an automatic static switch to choose from both the sources. (All racks shall be provided with one static



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	<p>switch). This is intended to make power continuity to critical loads in the event of change over of supply from one source to the other. Shall have two inputs and give one out put. One of the two AC inputs should be designated as the “preferred” source to which the Static Switch will connect the load as long as the designated input source should be within acceptable voltage limits. If the preferred source falls outside the acceptable limits, the Static Switch should be designed to transfer the output load to the other “alternate” input source, as long as the alternate source should be within acceptable voltage limits and should be synchronized with the preferred source within the selected phase synchronization window. The Static Switch shall provide fast, break-before-make transfers to prevent interconnection of the two sources, even under faulted source conditions. The maximum sense and transfer times must be within the tolerance of IEEE Standard 446 susceptibility curve for information technology equipment to allow uninterrupted load equipment operation. In case of overload, Static Switch must give the alarm. Short circuit condition of the load should be protected by a fast acting semi conductor fuse. The Static Switch should be of two modules. Fixed module should consist of the input and output connections and manual bypass transfer control switch. Second module should be hot swappable plug in type removable electronics & static switching module. The bypass / transfer control switch should be located behind a key locked hinged access cover to restrict access to qualified or designated operators. The plug in module should have key locked latches to prevent unauthorized removal of the module. The Static Switch should be designed to allow replacement of the removable electronics /switching module without having to de-energize the load equipment. The Static Switch should have a live mimic display the current status of the unit. This mimic must be located on the removable electronics module. Mimic should be active as long as at least one source is on. The fixed module of the Static Switch should also have live mimic indicating the status of source & load even if hot swappable electronic module should be removed.</p>
17	<p>specifications:</p> <ul style="list-style-type: none"> • Manual and Automatic Transfers. • Sense and transfer time: Less than 6 milliseconds. • Break-Before Make-switching. • Selectable Preferred Source. • Selectable Auto/Manual Retransfer. • In-Phase Transfer Window: Adjustable from 20 V to 100 V • Convection cooling. • Hot swappable electronic static switching module • Live mimic on electronic static switch module for indicating load supply status & alarms. • Live mimic on fixed module to indicate supply status even with electronic module removed. • Make before break manual bypass switch to transfer load from static switch to direct source 1 or source 2. Rack Mountable with 2 U size Nominal Input Voltage 220, 230 or 240 volts single phase, 2W+G, 50 Hz. Solidly grounded power sources. • Source unhealthy status - Adjustable from -10 to -20 % of nominal voltage • Maximum continuous source 25 A, 50 Hz • Load Power factor range: 0.5 to 1.0 leading or lagging • Load Crest factor: up to 3.5. • Source voltage distortion: up to 10% THD • Overload capability: 125% of continuous current for 2 hours, 1000% for two cycles minimum. • Over current Protection: By semi conductor fuse • Short circuit withstand capability: up to 20,000 symmetrical amps, protected by internal fusing.



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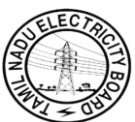
	<ul style="list-style-type: none"> • Redundant Control Power supplies. • Integral Maintenance Bypass. • Eight Isolated Normally Open alarm & static switch Status Contacts.
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22.2 600 VA Line Interactive INTELLIGENT UPS for workstation in the places other than at Data Center & Disaster recovery Center

a) Capacity	600 VA Line Interactive
b) Back up Time	10 Minutes on 450 VA Continuous Load; Overload capacity: 125% of required capacity for at least 1 Minute
c) Input Voltage	170 V to 270 V, 50 Hz + 5%
d) Output Voltage	198 to 250 (on line), 230 + 5% (On Battery) Automatic Voltage Regulation
e) General Features	Automatic Voltage Regulation, Lightning & Surge Protection Output Wave form– Modified Sine wave Audio Alarms: Low Battery; Battery ON; Overload Protection: Overload, Short circuit, spike & surge
f) Switching Time	Less than 5 MS without data loss
g) Operating Temp.	Upto 40 Deg. C.
h) Operating Humidity	Upto 90%, Non-condensing
i) Battery Type	SMF- Hitachi/Exide/Global Yuasa /Panasonic make with 2 Year warranty
j) Make	APC, Liebert, TVSE, Powerware (Invensys), Guard/NEXUS, Wep, HCL
k) Others	Output Sockets–Min 3 Nos, each 6 Amp- 3 Pin with all Sockets wired for UPS output Software : Required for health monitoring of battery & Power mgmt system RS232-C Serial port or USB port with interface cable, Min 3 Ft Long

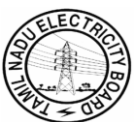
22.3 2/5 KVA UPS at utility offices -

Capacity	2/5 KVA
Model/Make	BRANDED
Technology	SPWM,IGBT/MOSFET(for more then 72 DC volt IGBT preferred)
Input	Input Voltage 230 V AC, Single phase,3 wire
Input Voltage Range	160 V AC TO 270 V AC
Input Frequency Range	45 TO 55 Hz
Input Over Voltage Protection	280 V AC
Input Under Voltage Protection	155 V AC
Over Voltage Cut Off	Should be offered externally



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Output Voltage	230 V AC Single Phase +-1%
Frequency	50 HZ +-1%
Load Power Factor	0.8 Lag to Unity
Isolation	Output load be isolated through a transformer of same rating
Output Over Voltage Protection	245 V AC Single Phase
Output Under Voltage Protection	210 V AC Single Phase
Over Load Capacity	125% of rated load for 60 sec
Total Harmonic Distortion	Less than 3%
Short Circuit Protection	Soft shut down should occur without blowing any fuse.
Crest Factor	3 : 1
Isolation	Manual Bypass Switch Should be provided of same rating
Indicators	<ol style="list-style-type: none"> 1) Over Temperature- Required 2) Load On Battery - Required 3) Battery On Charge - Required 4) Battery Low - Required 5) Mains - On Required 6) Dc - On Required 7) Inverter - On Required 8) Inverter - Tripped <ul style="list-style-type: none"> • Output Over Voltage • Output Low • Over Load System
Static Switch	Automatic Bi-directional should take care of 100% uninterrupted transfer of load from UPS Transfer Time <4 m sec Overall Efficiency >85 % Inverter Efficiency > 90 %
Metering	Separate/Single Digital Meter <ul style="list-style-type: none"> • DC Voltage • DC Current • Charge/Discharge • Output Voltage • Output Current • Input Voltage • Digital Three/Three & Half • Frequency Meter(For Both Input And Output)
Battery Period Of Backup	Sealed Maintenance Free Lead Acid Battery of ≥ 12 V each of uniform AH rating
	2 Hr with 100% load
Dc Bus Ripple	<1 %
Battery Recharge Time	From Fully Discharge Condition To 100% Charged Condition<12 Hrs Total Dc Bus Banks SINGLE
Vah Rating	FOR 2 KVA- MIN 5926 VAH



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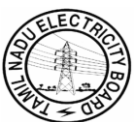
Capacity X 1 X 2hrs Inverter Eff Utilization%	FOR 3 KVA- MIN 8890 VAH FOR 5 KVA- MIN 14814 VAH
Battery Housing	Closed housing with suitable lockers
Battery Life	Minimum years replacement Guarantee
Auditable Alarm For Following Conditions	<ul style="list-style-type: none"> • Battery Low • Mains Failure • Inverter Under-Voltage • Inverter Over-Voltage • Over Temperature • Inverter Overload
Environmental	<ul style="list-style-type: none"> • Operating Temperature < 45 Deg C • Humidity 10-90 % (non-condensing) • Noise Level < 50 db at Full Load from 1 meter. Distance

23) Disaster Recovery Centre

23.1 Scope of Work For DR Centre

- a. The Supply of equipments, software etc for DR center should commence only after completion of 80% work of the package and DR center shall be commissioned only after successful go live of at least 70% Town as per his scope of work.
- b. The Bidder's scope of work as per the conditions of contract and technical specifications includes assembly, quality check, packing, supply, transportation, transit insurance, local delivery, receipt, unloading, handling, storage at site, movement of system to the location for DRC, conducting, cabling, installation, establishment of local area network (LAN) for servers, testing and commissioning of the DR System with its associated peripherals and also include documentation, warranty, and training of Owner's personnel for the said System.
- c. The Bidder's responsibility shall specifically include the following
 - The complete System including all the hardware, Software and Networking items equivalent to the items supplied at primary data center and/ or as agreed upon mutually with owner to be supplied at DR center and the same must operate at or above the guaranteed values with regard to availability.
 - Any software updates, upgrades released till the completion of warranty and FMS period shall be supplied free of cost and installed and commissioned free of cost as per instructions from owner.
 - The Bidder shall post his Service Engineers at Owner's Site till the completion of Acceptance test.
 - The bidder shall provide customized recovery documentation of all the systems and also the recovery test shall be conducted on the basis of the recovery documents.

23.2 Scope of Supply



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The Scope of supply for DR Environment shall cover complete equipment including hardware, networking and software equivalent to the items supplied at primary data center and necessary replication software and DR management suite shall be installed for creating storage & Functional based DR at the site selected by the owner for DR and to operate based on RTO (Recovery Time Objective) and RPO (Recovery Point Objective) specified in Technical specification.

The hardware, software and networking equipment including different LANs as supplied and offered for primary data center shall be supplied by the bidder. The scope of supply shall essentially consist of but not limited to the followings.

A. Main Servers

- 5) Db server - (In Cluster fail over mode)
- 6) Db server for GIS and map database- (In Cluster fail over mode)
- 7) Application Server (Scale out mode)
- 8) GIS Application Server (Scale out mode)
- 9) Data Acquisition Server (In Cluster fail over mode)
- 10) Testing and QA server

B. Misc. Servers

- 1) Anti virus server
- 2) Mail Server
- 3) Portal server
- 4) DNS server
- 5) LDAP server
- 6) Reverse proxy server
- 7) EMS/NMS Server etc.
- 8) Access Control server

C. Firewall & NIDS System

D. Switches

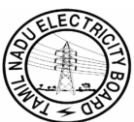
- 1) Core switch
- 2) Access Switch
- 3) Distribution Switch
- 4) Layer II switch

E. Storage & Backup System

- 1) Fiber Chanel SAN Switch
- 2) San Storage
- 3) Backup server & Backup software
- 4) Storage Management Software
- 5) Tape Library

F. Routers

- 1) Routers for MPLS/ VPN Network
- 2) Router for Internet gateway



G. UPS & Battery

- 1) Critical Load UPS
- 2) Service Load UPS

H. LAN

- 1) Dual Gigabyte Lan
- 2) Management Lan
- 3) Server lan
- 4) Cluster LAN

I. Miscellaneous Items

- 1) Software for EMS and NMS
- 2) Workstation
- 3) Printer

- J. The specification for all hardware, networking equipment, Software, LAN etc of primary data center shall be followed for DR center.

23.3 Installation and Commissioning

The scope of installation and commissioning shall include the following -

- (i) The contractor in consultation with OWNER site engineer shall determine the exact positioning of equipment's, Installation, housing of equipment and cable routing. The contractor shall prepare his proposed plan and estimate the quantities for support material required, racks, extension boards, power requirement, cables, conduit/ channels as desired within specified limit of the contract.
- (ii) The Bidder shall be fully responsible for installation and commissioning of the system including Server LAN cabling and other related activities for erection, testing and commissioning.
- (iii) All power and connecting cables, conduits/channel laying shall be as per approved routing by OWNER. Installation of all hardware and software as approved by OWNER, along with Distribution of electrical power to various equipment and LAN cabling
- (iv) Installation of equipment's, software as required..
- (v) Field testing and commissioning of system.
- (vi) Installation, configuration, and testing of the system in consultation with the Owner. Preparation of the system to make it ready for installation of Application packages.
- (vii) Commissioning of Disaster Recovery System shall be as per technical specification.

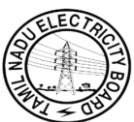
23.4 Availability Test

- (a) After successful completion of installation and configuration availability test shall be conducted for minimum 10 days continuously. The percentage availability shall be defined as:

$$\frac{(\text{Test Duration Time} - \text{System Outage Time}) \times 100}{(\text{Test duration Time})}$$

The test duration time shall be exclusive of external power failure time.

- (b) The system shall be considered as "available", if all the processors, total installed memory; all hard discs (internal & external), DAT, DVD are in service with network and external storage up and running.



- (c) The availability shall be worked out daily and shall be checked on a cumulative basis. Thus, if the available time on 2 consecutive days is x and y hours respectively and test duration time is a and b hours respectively, then the availability to be reckoned at the end of 2 days is $100(x + y) / (a + b)$. During the 30 days of continuous testing, if this cumulative availability is less than 98% then the contracted Bidder shall do the necessary rectification and/or replacement of system/sub-systems as deemed fit by him at his risk and cost. The availability of 98% shall again be demonstrated by the Bidder over a period of 10 days after the Bidder has performed necessary rectification and/or replacements.
- (d) However, if the system does not meet the availability criteria laid down as above within 90 days after installation & commissioning, the System shall be required to be replaced by a new system. The bidder shall replace the system or sub-system within 6 weeks of the direction to that effect from the owner. However the rejected system shall be allowed to be removed only on receipt of replacement system.
- (e) **Acceptance of DR Software**
- The bidder shall demonstrate all the features of the software package to OWNER who shall use the package thereafter to ensure performance without any software error/bugs for 30 days. If during the acceptance period the customer encounters any bugs/faults or incapability to execute specified application as per the manual, OWNER may cancel the order/license by giving written notice to the Bidder and return the package. Bidder shall either replace the software package or return the full payment within 15 days of the receipt of cancellation notice.

23.5 Acceptance

System shall be accepted by the owner after successful completion of Availability test and establishment of complete setup of DR as per scope of work.

23.6 Technical Specifications for disaster Recovery system

The Entire environment at disaster recovery site shall be maintained as a fully working copy of Primary site.

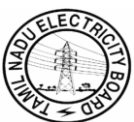
After completion of system installation and commissioning at DR site a complete copy of database files of Primary site shall be transported to the DR site in suitable Tape cartridges. This will be a onetime activity and considering the huge volume of data the same shall be copied on tapes and shall be carried to the DR site by hand rather than transporting the data communication link.

The DR site will get regular data updates from the primary site through a high bandwidth communication link so that it remains up-to-date. The methodology of replication will employ storage based replication in Asynchronous and Journal based Log Volume Shipping modes.

In case of a disaster strike at primary data center, the DR site will take over and will start functioning as the primary site.

The goal of disaster recovery is to restore the system operations in minimum possible time and with minimum data loss so that the business processes are not affected by the disaster.

Following RPO and RTO will be desirable -



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A.1	RPO & RTO																
	Recovery Point Objective is the maximum amount of time lag between Primary and Secondary storages. OWNER intends to maintain RPO as < 15 minutes for all application and data at primary site.	TBNI															
A.2	<p>Recovery Time Objective is maximum elapsed time allowed to complete recovery of application processing at DR site. In case of a disaster, the RTO shall be measured from the time when the decision is finalized & intimated to the contractor by OWNER to shift the operations to DR site. The contractor in association with owners personnel shall ensure compliance to following RTOs -</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th></th> <th>Application</th> <th>RTO</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Metering billing Collection, New Connection, Disconnection, Meter data acquisition, Energy audit</td> <td>6 Hours</td> </tr> <tr> <td>2</td> <td>MIS, Customer Care Center GIS applications and network analysis</td> <td>12 Hours</td> </tr> <tr> <td>3</td> <td>Web Self service</td> <td>24 Hours</td> </tr> <tr> <td>4</td> <td>Pre-implementation and Testing & development system</td> <td>36 Hours</td> </tr> </tbody> </table>		Application	RTO	1	Metering billing Collection, New Connection, Disconnection, Meter data acquisition, Energy audit	6 Hours	2	MIS, Customer Care Center GIS applications and network analysis	12 Hours	3	Web Self service	24 Hours	4	Pre-implementation and Testing & development system	36 Hours	
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a. Storage & Backup Subsystem

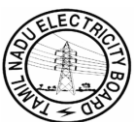
At the Disaster Recovery site the strategy for replication will be as follows :-

Setting up standby databases for all the applications, with storage to storage Log volume replication. The storage solution and backup solution need to be provided through a switched fiber channel storage area network for the above said purpose with the required hardware and software. The Storage and Backup solution offered will work along with the systems of DR site as a single, complete and integrated unit to provide the full solution for DR functionality.

The bidder's storage solution for Disaster Recovery must be compatible with the storage system installed at primary site to facilitate storage based replication. The offered storage shall have binary compatibility to the storage at primary data center.

b. DR Management Suite

One no. server as per the brief specification shall be supplied & configured for DR Management suite.



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2 X Dual core CPU with 16 GB RAM, Dual gigabit NIC, 8x146 GB HDD, N+1 power supply, Suitable server OS, Rack mounted.

c. Additional Requirements for DR at Primary Data Center

Following items shall be supplied at primary data center for establishing DR solution. The hardware items mentioned in part A of the following chapter shall be supplied along with the equipments of primary data center the balance items as per part B shall be supplied along with other items of DR center

Part A

i. FCIP Router.

One (01) number FCIP add on card with Two (02) numbers of IP ports along with minimum 16 FC ports shall be provided and integrated with each of the existing 2 nos. of SAN director switches at Primary site.

The offered equipment should be able to work seamlessly with existing SAN system of primary site. It should provide protocol conversion for storage to storage replication over IP network with the following features:

Fibre cabling for connecting FCIP IP ports to core router shall be provided. Cabling shall be done with minimum 2 runs of minimum 6 core fibre sx cable from SAN director rack to Core router rack. The cables shall be terminated using pig tail connectors. All necessary accessories like LIU at both ends shall be provided.

SAN Switch must support IPSEC encryption to ensure integrity of data over FCIP

SAN Switch must support compression of Data over FCIP.

The FCIP add-on card must support Fabric routing for FCIP to enable cross-fabric connectivity and selective transfer of data between the fabrics on primary and DR sites without merging the fabrics.

The FCIP Add-on card should have capability for tuning the FCIP link by generating varying SCSI traffic workloads and measuring throughput and response time per I/O over an FCIP link

ii. Storage Upgrade for Journal Volume

Additional one (01) TB of usable space under RAID 5 using 140 (+/- 10%) GB (Minimum) 15,000 RPM FC/SAS disks with Two (02) hot spare disks to be configured as journal disk space for Log shipment in the existing Primary storage.

Part B

i. Replication Software

Storage system shall support Synchronous, Asynchronous and Journaling / Disk based Asynchronous controller based replication.

Storage System based Remote Mirroring shall be supported for long distances over Dark Fibre, WAN, etc.

DR solution shall support synchronous replication for at-least 100 Km over dark fiber or equivalent technologies.

I/O consistent Disaster Recovery volumes at the DR site shall be supported.

Storage Subsystem shall support continuous Asynchronous replication technologies without using any buffering scheme inside data cache to reduce the recovery time objective.

DR software shall support replication configurations such as unidirectional, bidirectional, one-to-one and one-to-many replication from primary storage system to DR storage system(s).



The storage system shall be capable of maintaining consistency of data between source and Remote DR Storage subsystem.

The storage system shall support Remote management of all replicated sites from the primary site. Storage Subsystem replication shall have minimum impact on cache while doing the replication at DR storage Subsystem.

In case of Link Failure between primary and DR location, Storage shall keep the changed information either in the disk journal or sufficient cache shall be provided without degrading the performance of the primary system.

The DR solution shall maintain data consistency at secondary DR site at all times. The asynchronous replication module of the DR software shall support Time stamping for maintaining the write ordering between primary & DR site.

Data Consistency shall be maintained at all the times even while doing the incremental replication after the recovery from Link / Site failure.

Requisite replication software license for at least 2 TB log volume replication for achieving the storage based DR functionalities. The software shall support and licenses shall be configured for synchronous, asynchronous and journal based replication.

Any other software/ hardware/ accessories etc. required to meet Disaster Recovery functionality for all the application at Primary location should be included in the solution.

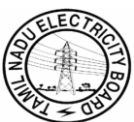
ii. DR Management Suite

To provide Disaster Recovery management and online monitoring of the DR process. The offered suite shall be implemented on all the DB instances in primary site.

The offered solution shall include the following features.

- i. The offered DR management suite shall integrate with the storage based replication.
- ii. Shall provide console to manage replication of the listed Databases, applications and web servers.
- iii. Online RPO and RTO monitoring
- iv. Shall raise alerts against set deviation thresholds for RPO/RTO.
- v. DR health check
- vi. WAN utilization
- vii. DR Drills
- viii. DR Workflow automation
- ix. Provide automated execution capability for failover procedure.
- x. Online monitoring of the failover operation.
- xi. Provide automated consistency and recoverability tests..
- xii. Custom workflow creation and maintenance
- xiii. Pre-architected workflow templates based on documented practices.
- xiv. Provide Reports on RPO, RTO, events, continuity operations and test exercises.
- xv. Provide history reports of all Databases & Applications

One no. server as per the brief specification shall be supplied & configured for DR Management suite. 2 X Dual core CPU with 16 GB RAM, Dual gigabit NIC, 8x146 GB HDD, N+1 power supply, suitable server OS.



INDEX-G4 (DGPS Survey, Consumer indexing and Asset mapping)

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Section - G4 : DGPS Survey, Consumer indexing and Asset mapping

1.0	<p>INTRODUCTION</p> <p>Geographic Information System solution consists of capturing, storing, checking, integrating, manipulating, analyzing and displaying geodata related to positions on the Earth's surface and data related to attributes of the entities/Customers in a utility. This is achieved through GIS mapping to pre-defined scale, generation of intelligence electrical network maps and super imposing them on the land base GIS maps.</p> <p>Customer Indexing is defined here as a unique coding of index process for all types (tentative list of various Customers types given at Annexure-B of Section:G6) of Customers into a data base structure, created with pre determined attributes connected to a uniquely coded electrical network including locations with a facility using GIS tools to query and retrieve information.</p> <p>The Customer indexing and Asset management system is essential for gearing of Electric Distribution utilities to maintain the system in a dynamic mode to meet the day-to-day imperative changes.</p>
2.0	<p>OBJECTIVES</p>
2.1	<p>Intent of this specification is to carry out mapping and asset coding work and Customer indexing in line with the methodology broadly prescribed under clause 7.0 and developing GIS Solution in the specified area / areas as per Annexure-A of Section: G6. The work shall cover Sub-transmission network i.e. all assets and Customers covered by 66kV/33KV/11KV and LT network entities of the UTILITY. Statistical data particulars of the areas, where this package is to be implemented at present are indicated in above Annexure-A.</p>
2.2	<p>This specification includes proposed solution/methodology of providing a GIS based Unique Customer Indexing, mapping and asset coding for the electrical network entities and develop a network information management system with GIS software in Power distribution system (66KV/33v and below) of Power Utilities. The GIS based system would provide tools to assemble intelligent information system at enterprise/circle level.</p> <p>The work shall involve DGPS survey (Sub-meter accuracy) for finding Latitude-Longitude of utility's network entities and land base features, Base map preparation, entity data collection and geo-coding, uniquely indexing each Customer based on the electrical system network information and Customer data (66KV/33kv & below) collected through door to door survey and physically link of each customer on the map with the network. In case of multi-storey apartments, additional information like floor / altitude shall also be included. This would also facilitate development of digital map of network by importing survey data into GIS application</p>

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	package. Creation of base map of project area by using satellite imagery as per Satellite Imagery Specification provided at clause no.8.0 of this Section, geo-referencing and overlaying the network map onto the base map.
2.3	This shall enable creation of GIS base application geo-database, which shall provide interfaces to the business process applications presently operational in the UTILITY and to future business applications planned to be implemented by the UTILITY. For the business processes to be implemented in future, the agency shall have to furnish desired information about s/w data structure, source code written by agency, design document, user manual etc., proprietary as well as non-proprietary as and when required at no extra cost to the utility so that the required socket for communication with the future application can be designed and made operational.
2.4	The Customer data as available with the UTILITY records is indicative and for tendering purpose. This would also be used during survey for matching/verification purposes while picking up data from the field. Unauthorized and new Customer identification is inclusive of 'Door to Door' survey to be carried out for Customer indexing. It shall be the contractor's responsibility to ensure that each and every Customer, corresponding to 'point of sale' of Power, is properly included and indexed. UTILITY shall issue necessary authorization letter / identity cards (details of the methodology to be finalized by the successful bidder in consultation with the owner) to the authorized personnel of the contractor for conducting door-to-door survey. Purpose is to ensure that no Customers are left out and all Customers are fully covered.
2.5	The indexed Customer database, when created and operational, shall be capable of being 'on line' connected to other business process software without any limitation. The database shall be based on established open database (ODBC) architecture suitable for linkage to other databases. The database shall be capable of updating through user-friendly form entries and through file transfer modes.
3.0	SCOPE OF WORK
3.1	The description given here is broad scope of work to be carried out by the bidder. However, any work even if not specifically mentioned but reasonably implied for the successful implementation and good performance of the system are deemed to be included in the scope of work. The bidder shall prepare a flow diagram showing Customer indexing and asset mapping and information management system, enumerating various interactive features with its own and other business process Software systems presently existing in the UTILITY and proposed additions as covered in this specification elsewhere, such as Energy accounting, MIS, Customer care etc. The utility shall provide existing business process as annexure. The picking of Latitude-longitude of Customers is not contemplated for Customers.



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	<p>The customers with all attributes collected from field survey shall be shown connected to their respective pole/ feeder pillar board.</p> <p>The scope of work of the bidder shall include:</p>
4.0	FIELD SURVEY & MAPPING
4.1	<p>Mapping the location co-ordinates (Latitude-Longitude) of each of the electrical network entities from 66kV/33 kV system, 11 kV systems, RMUs, DTs and poles/ feeder pillar boxes (over/ under ground) from which each customer is connected and of town's landmarks using Differential Global Positioning System method while doing field survey.</p> <p>Collecting and developing attribute data of each network entity, customer and mapped landmarks. Creation of digital map of complete network through GIS application package.</p> <p>In order to ensure that during the execution period of project, data being collected does not become stale, agency should devise a mechanism, including but not limited to clearly stating responsibilities of utility, to incorporate the changes in system.</p>
4.2	<p>Creation of base maps of project area as per Annexure-A using specified satellite imagery and geo-referencing the same. Preparation of physical area maps for the areas, based on collected information, digitization of network entities and landmarks, overlaying of features detailed in clause 7.1.1 on the base map with predefined scale for viewing graphically with the aid of suitable GIS software.</p>
4.3	<p>The mapping must be done with +/- one-meter location accuracy with differential corrections.</p>
4.4	<p>The viewing scale of vector data must be user dependent.</p>
4.5	<p>To meet the requirement indicated in the specification and depending on the specific area to be mapped, bidders may adopt satellite-imaging technique on predefined scales as suggested below :</p>
4.6	<p>Urban/Cities/Metros on 1:1000 scales.</p>
4.7	<p>Semi urban on 1:2500 scale</p>
4.8	<p>Cloud free (less than 20 %) Satellite imagery map (as per Satellite Imagery Specification provided at clause no. 8.0) to be procured by the successful bidder in digital form for the towns.</p>
4.9	<p>Map Resolution : The map resolution of GIS mapping shall be as under</p>
4.10	<p>Spatial resolution - Less than or equal to 2.5 meter GSD per pixel for Urban/Cities/Metros/Semi urban Area.</p>
4.11	<p>Satellite Imagery maps of the relevant areas are to be obtained/ prepared by contractor at his own cost. The UTILITY will issue the necessary letter of authority for obtaining any permission for acquiring such maps from appropriate authority. All information thus obtained by the successful bidder shall be treated strictly confidential and shall be used solely for the intended purpose under the contract and shall be returned to the UTILITY on completion of the work.</p>
4.12	<p>The quality assurance mechanism should be supplied by the bidder to ensure the quality of GIS survey and incorporation of data in GIS software.</p>



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5.0	INDEXING
5.1	Carry out Customer indexing through door-to-door survey, identifying the code numbers of the Customers, source (i.e. pole & phase) of supply to the Customers and develop Customer database.
5.2	Asset code of all assets (DTs, Transformers, Poles and Breakers etc including LT poles) is to be legibly painted on the asset. Surface preparation etc to be done before painting. Authorized representative of UTILITY shall specify colour scheme and quality of work.
5.3	The DT & its LT feeder circuit from where each Customer is fed shall also be identified correctly. This information shall be incorporated in Annexure-C of Section: G6.
5.4	Develop indexing philosophy for the electrical sub-transmission and distribution network in the specified circle/town from 66KV/33KV entities including HT and LT to Customers. Each of the elements likes 66kV lines/33 KV lines, power transformers, 11 KV feeders, feeder branches up to Distribution transformers to poles, LT feeder circuits, LT poles shall be uniquely indexed with defined relationships based on the normal mode of feeding LT Line.
5.5	Customer data/details shall include but not limited to information listed in at Annexure-C.
5.6	This information shall be stored with provision for revision of any of these data. For developing proper code and indexing for each Customer the exact manner shall be subject to Owner's approval before commencement of work. The asset code and Customer number so arrived at should be linked with the then existing asset code and Customer number of the UTILITY. For this purpose, the bidder will be provided with the 'as available' category wise list of Customers in each area along with the particulars such as contract demand / connected load, name of Customer, address of Customer etc.
6.0	DELIVERABLES : -
6.1	The Bidder shall deliver the following at various stages as indicated :
6.2	Supply of Base map of project area both in hard and soft copy.
6.3	Supply of Base map of project area overlaid with digital network maps of designated areas both in hard and soft copy.
6.4	Spatial and non-spatial database for electrical and non electrical objects of project area as specified in this document elsewhere.
6.5	Coded Asset database of sub-transmission and distribution networks (66/33KV & below) of the town will be delivered DT wise, feeder wise, Sub-station wise and sub-division wise as soon as they are completed.
6.6	List of Customers with their database along with the relevant codes of indexing generated to be delivered feeder wise and DT wise as soon as it is complete for each feeder.



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6.7	The deliverable outputs mainly but not limited to in a format that would enable carrying out of the following functions in the designated area satisfactorily: i. Customer Data base and indexing Management ii. Asset Management iii. Energy Accounting, analyses and Audit Management iv. Customer Relationship Management and Trouble call Management v. Network analyses Management vi. Project Management and extension in network vii. Customer Billing & Revenue Management
6.8	All the deliverables shall be computerized outputs and the vendor shall submit four (4) copies of each deliverables in both soft and hard copy forms for approval / comments by the owner. In case of comments by the owner the same would be incorporated and resubmitted by the vendor.
6.9	Satellite base maps, DGPS & Total Station based digitized network & customer maps and complete GIS System Software, Hardware and database for the designated areas.
6.10	Five copies of the final deliverables incorporating necessary changes / comments shall be submitted along with their softcopies on CD-ROM.
7.0	IMPLEMENTATION METHODOLOGY
7.1.1	Create area wise GIS based physical maps (for the areas as specified in <u>Annexure-A of Section : G6</u>) showing features as per details given below :
a)	Conduits routes as provided by utility
b)	Electric Cables routes with length as provided by utility
c)	Aerial Route of conductors with length
d)	RMUs, HT/LT Poles/ feeder pillar boxes (over/ under ground)
e)	Man holes
f)	State, district, City/Division/DC boundary and local boundaries.
g)	Landmarks such as Public Buildings, famous industrial/commercial buildings, religious places, petrol pumps, railway lines, roads, streets & lanes, type of land utilization i.e. Residential, industrial, commercial and agriculture.
h)	Address (Customer Location point)
i)	66 KV/ 33/11 KV S/S; 66kV, 33 KV, 11 KV, RMUs & LT networks associating Address to a structure or a Network Element (e.g. Associating Address to Electric Source i.e. pole/ feeder pillar box (over/ under ground) etc.)
j)	Other misc. features to be identified as point. 500 points per sq. km. for urban area and 200 points per sq. km for semi urban area.
7.1.2	Successful Bidder has to arrange the specified satellite imagery along with required GCP's, etc. of the specified areas at his own cost and by his own efforts. However, UTILITY shall issue necessary authorization letter for this purpose to the successful bidder.



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7.1.3	The broad works involved are as follow :-
7.1.3.1	Door-to-door customers survey for indexing and linking with network entity.
7.1.3.2	DGPS survey and mapping of each network entity and landmark
7.1.3.3	Mapping of each customer to its source of power supply on satellite imagery base map.
7.1.3.4	Design and collection of entities & customers attribute data.
7.1.3.5	Creation of digital network map of project area.
7.1.3.6	Processing of satellite imagery & geo-referencing of project area.
7.1.3.7	Digitization of land use features of project area.
7.1.3.8	Field survey & mapping of important landmarks as mentioned under 7.1.1 (g) above.
7.1.3.9	Creation of satellite imagery base map of project area.
7.1.3.10	Design, collection of data, entry, verification either at PDA or at upload stage and creation of Customer database through door-to-door field survey.
7.1.3.11	Linking the Customer database with the base map and electricity network entities database with the electricity network map.
7.1.3.12	Establishing relationship between electricity network entities database and Customer database so that electricity network entities can be referred spatially in relation to geographical/land based features.
7.1.3.13	Organizing the digital data in a GIS system to create a GIS based Customer-indexing and asset information management system.
7.1.3.14	Providing open GIS base application, which allows Utilities to integrate business process systems like metering and billing system, energy accounting and auditing system, outage management system etc. to form a integrated asset and Customer information management system.
7.1.4	The uniquely codified indexed Customer and asset database on the electrical system network showing the source of supply to the particular Customer is to be prepared in graphical form and should be geo-referenced and topology built up.



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7.2	Methodology of Conducting DGPS Survey, Mapping
7.2.1	The Important activities of DGPS survey and creation of digital map of the network are listed below :
7.2.1.1	The bidders shall procure/arrange DGPS Base Station and adequate number of DGPS Rovers and establish a Base Station at a central place for a particular project area.
7.2.1.2	DGPS base station and rovers used for survey shall be survey grade and shall provide sub meter accuracy after differential correction. The bidder shall provide in the bid response the Make, Type, Model and number of instruments proposed to be used for survey, with technical literature on instruments. Projection and datum for survey shall be UTM-WGS84.
7.2.1.3	Surveyors shall walk along the HV and LV feeder with a DGPS Rover and capture the spatial position of each Pole, Distribution Transformer, Sub station, Pump set and Industry.
7.2.1.4	Collect the attribute data to be acquired, while surveying. The bidder shall prepare attribute data model for the DGPS survey and obtain approval of the utility before starting the work. The typical attribute data to be collected is shown as per Annexure-D of Section: G6.
7.2.1.5	Differential correction should be performed on spatial data captured.
7.2.1.6	Collect details of internal arrangement of all Sub-stations, Distribution Transformer stations, cable route diagrams (as provided by utility) in terms of single line diagrams and kept in database which should be retrievable by clicking on the GIS map where these entities are digitized as points/polygons on the ring mains/feeders.
7.2.1.7	Crosscheck by authorized representative of Engineer-In-Charge of all the attribute data & spatial positions captured by the surveyors to the minimum extent of 3%. The bidder should maintain the documentary evidence of the cross check and submit it along the bill. The details would be finalized during detailed engineering stage along with quality checks.
7.2.1.8	Development and supply of software to import the survey data into GIS application package and create a digital map of the network and database.
7.2.1.9	On completion of survey, map on the predefined scales shall be printed and hard copies shall be submitted for approval.
7.2.1.10	Map shall be resubmitted, incorporating all the omissions pointed out by utility.



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7.2.2	Creation of base map of project area: The availability of a base map showing Land based features of area like Roads, Rivers etc., is necessary for planning new distribution network and identification of assets. The digital map of the network will be overlaid on the base map. The important activities of creation of base map and integration with network digital map are listed below :
7.2.2.1	The bidder shall procure satellite imagery. The requisition letter will be provided by the utility. The cost of satellite imagery should be a part of the bid. Vendor shall take procurement action of high-resolution data from the date of placement of LOI.
7.2.2.2	The scenes obtained shall be rectified and joined to create a Mosaic.
7.2.2.3	When the map sheets are mosaic together the various sheets should be able to be matched.
7.2.2.4	The graticules on adjacent map sheets should match, both in terms of value of the graticules and continuity.
7.2.2.5	The bidder shall identify adequate number of ground control points on the image. The number of ground control points should be at least 1 per Sq.KM of the area and 5 per satellite image.
7.2.2.6	The bidder shall capture the latitude and Longitude of ground Control points using DGPS instruments that provide accuracy of 1 meter. Wherever DGPS instruments could not be used because of building shades or any other obstructions, optical total station of 1 meter accuracy shall be used. The bidder shall provide in the bid response the Make, Type, Model and number of instruments proposed to be used for survey, with technical literature on instruments.
7.2.2.7	The bidder should geo reference the satellite imagery with ground control points captured.
7.2.3	Geometrical Accuracy :
7.2.3.1	Every feature has to be captured accurately under the object classes.
7.2.3.2	Orthogonality of the corners has to be maintained as it is
7.2.3.3	Symbols have to be produced same as paper map
7.2.3.4	Lines have to be captured accurately and wherever bend is there arc elements should be incorporated.



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7.2.3.5	Polygons should be captured accordingly.
7.2.3.6	Underground details (spatial & non-spatial) will be provided wherever required on case to case to basis as per the data available with SEB/ Utility.
7.2.4	Informational Accuracy: Every feature should be captured. No missing data will be accepted.
7.2.5	The vendor would furnish detail quality check procedure for map accuracy for approval by utility.
7.2.6	The proposed system should be capable of capturing different types of drawing such as Land base (cadastral maps) for existing data available by Owner's office in graphic and textual format, should be transformed or converted into the proposed system.
7.2.7	All data should be structured by defined hierarchical attributes, many of which spatial, for access, retrieval or display of asset management information via a map-based medium.
7.2.8	The bidder shall collect all attribute data for the Land base features. The attribute data model shall be finalized and approved by the utility after award of work.
7.2.9	The bidder shall overlay the network map on the base map and make final quality checks to ensure the perfect match.
7.2.10	The bidder shall print a base map alone and also base map with network overlaid to the predefined scales in hard copy and submit for approval. A hard-copy color output has to be given for each map in normal printing paper. The hard-copy output should be on the same scale and size as the original map.
7.2.11	Map shall be resubmitted, incorporating all the omissions pointed out by utility.
7.2.12	Dimensions: The measurements of the map in meters should be given.
7.3	Methodology Of Customer Indexing And Asset Coding
7.3.1	The survey activity shall include physical verification of electrical sub-transmission and distribution network in the specified areas as per Annexure-A from 66 kV / 33 KV to LT network corresponding to the network details collected by the bidder for the scope as defined under. In case, any changes are noticed/observed during field survey, then information and technical parameters of the assets (Line, Tower, Conductor, Transformers, breakers, isolators etc.) are to be verified and updated.



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7.3.1.1	Starting from 66 kV / 33 kV feeders radiating from EHV (220/132 kV) sub stations located in the physical area of the city/circle and from the place where 33 kV feeders enter into the physical boundaries of the city/circle and up to 66 Kv/ 33 kV bus of 66 / 33/11 kV sub stations.
7.3.1.2	66 / 33/11 KV Power Sub-stations, 66 / 33/11 KV Power Transformers, 11KV Feeders, RMUs, distribution transformers (DTs), LT feeders, LT poles/ feeder pillar boxes (over/ under ground).
7.3.2	The entire information of all the assets and object elements should be stored in a database by unique computer generated numeric code and should be correlated with existing code of the UTILITY. The coding should be on a structured pattern and have provision for insertion of new component into the system. This code is primarily for quick mapping and sorting of the asset element. The indexing scheme shall be tightly coupled with the GIS system to give data with reference to geographical location. It shall be possible to view upstream or downstream data from a selected element. The codification logic shall be developed to limit the code number digits to six to eight for Customers. Efforts shall be made to use the number already given to the Customers in the UTILITY and cross reference shall be maintained with old Customer numbers in case new numbers are given to Customers. However The vendor shall submit the codification methodology during study phase for approval by the UTILITY.
7.3.3	On query, on a Graphic display of network showing element on a computer screen as well as based on asset code, database should be able to furnish all the information of the particular element. The Geographical location of electrical division & sub-division and a candidate power sub station, electrical connectivity and technical parameters wherever applicable etc. shall be made available on query for tracking any asset or Customer.
7.3.4	The power of computer based data sorting and combining is to be used for providing support for Billing, Customer service, MIS etc.
7.3.5	The bidder shall use Personal Digital Assistants (PDA) or Hand Held Computers (HHC) for Customer indexing. The important activities of Customer indexing are listed below :
7.3.5.1	Surveyor shall walk along with the line and identify the Customers to whom supply is released from each pole / service pillar
7.3.5.2	The application software loaded in the PDA or HHC should immediately validate whether the Customer Number / the pole number entered by the surveyor is valid. This validation should be done automatically to avoid errors.
7.3.5.3	The bidder shall submit Distribution Transformer wise, LT feeder wise list of



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	Customers.
7.3.5.4	The indexing has to be carried out in a way by which it would be possible to relate the following:
a)	The administrative control hierarchy
b)	The location / geographical area
c)	The 66 KV/ 33 KV/11 KV power sub-stations
d)	The main road/landmark through which 11 KV feeder passes from the 11 KV feeder code.
e)	The 11/0.4 KV distribution transformers
f)	The location of poles/ feeder pillar boxes (over/ under ground) with respect to the main road, branch roads and lanes from the index of poles.
g)	The Customer code to indicate the type of Customer and the serial number of Customer and the 'DT' along with LT feeder from which, he is served.
h)	Each of the Customers, indexed on the basis of initial record available with the owner and later verified by field survey, has an exclusive six to eight digit numeric code. This code shall be accepted by the system. The Customer code shall provide complete identity of the Customer as well as his connectivity to the electrical system profile.
i)	Customer code number shall be used for Metering, billing and all other service functions. Hence this code number will be available on the front end.
j)	Asset code number is meant for internal linkage of Customer with nearest entity and asset entity with others.
8.0	SATELLITE IMAGERY SPECIFICATIONS
8.1	The following SOI/NRSA supplied imageries from IKONOS/Digital Globe/Quick bird/Cartosat-2/ Cartosat-1 equivalent shall be used : i. Urban --- less than or equal to 1 meter resolution ii. Semi Urban—less than or equal to 2.5 meter resolution
8.2	Required GCPs etc. required for getting the images as per specification above shall have to be arranged by the successful bidder at no extra cost.
8.3	Archive Images captured up to six months before date of LoA are acceptable.



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8.4	Licensing -
8.4.1	The license shall be for the owner.
8.4.2	All terms and conditions of SOI/NRSA associated with sale of maps shall be complied by the vendor and also applicable to owner for compliance.
8.4.3	The license of the satellite imagery should permit the user following activities:
8.4.3.1	Reformat the product for customer's use into different formats or media from those in which it is delivered.
8.4.3.2	Make an unlimited number of hard copies and soft copies of product for customer's internal use.
8.4.3.3	Distribute the product (with copy right marking) on an isolated, non commercial basis.
8.4.3.4	Modify the imagery product through manipulation techniques and / or the addition of other data, and make copies of the resulting bundled image product for customer's internal use.
8.4.3.5	Make the product available to its consultants, agents, and sub-contractors for purposes consistent with the permitted use with restrictions without the right to transfer, modify, copy or sub-license.
8.4.3.6	Should permit to post the product and derived works on Internet site in a non-downloadable fashion with appropriate credit of the satellite imagery product.
8.4.3.7	The license shall be for single organization.



INDEX(G5) : FACILITY MANAGEMENT SERVICES (FMS)

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SECTION- G5: FACILITY MANAGEMENT SERVICES

1.0 INTRODUCTION

The bidder shall be required to provide the services through Facility Management Service provider so as to manage entire IT system including all equipments, installations including hardware, software & networks and utility business related modules installed & commissioned by bid consortium members for the utility in order that they have maximum availability to enable utility to realize its desired business objectives.

System Management Services shall be provided by FMS vendor in order that maximum uptime & performance levels of IT systems installed is ensured. As such, FMS vendor is expected to provide services as per ITIL (IT Infrastructure Library) standards with performance levels meeting or exceeding those mentioned in Service Level Agreement (SLA) agreed between utility & vendor.

To achieve the desired Service Levels, the Service provider may need to interact, coordinate and collaborate with the other Service Providers as required. The Service Provider will act as the Single Point of Contact for all issues relating to the Service Levels. The Service Provider will have the responsibility to deal with the other consortium partners (during warranty period)/other vendors as selected by utility (after warranty period) as the case maybe, to provide the services at agreed service levels. However, the prime responsibility of providing desired services shall be that of lead partner of consortium during warranty period. The role of FMS vendor shall start immediately after systems are installed, commissioned and handed over to the owner by the consortium.

2.0 DURATION & PAYMENTS

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3.0 PENALTY CLAUSE

Refer Appendix C (Service Level Agreement) of RFP Document

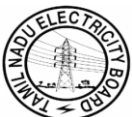
4.0 QUALIFYING REQUIREMENTS OF FMS VENDOR

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5.0 SCOPE OF WORK

The bidder shall be responsible for 24*7*365 management of all the systems as per scope of work with services rendered at least as per Service Level Agreement Appendix C of RFP Document) between utility & vendor. Scope does not include management of physical security for access to said facilities, disaster management & business continuity. The following facilities will be provided at the start of contract to **FM Vendor** by Utility for carrying out the FMS responsibilities:

- Appropriately secured lockable storage/setup area
- A meeting room for periodic meetings
- Sufficient Sitting/office space in neat & clean environment
- PC (other communication facilities like P&T telephone & internet facility are to be arranged by FMS vendor)



5.1 SERVICE DELIVERY MANAGEMENT:

FM Vendor shall provide detailed description for service delivery management for the complete project including transition plan and deliverables and project management methodology.

a. Project Management

FM Vendor will assign a Project Manager who will provide the management interface facility and has the responsibility for managing the complete service delivery during the contractual arrangement between utility and the FM Vendor.

Project Manager will be responsible for preparation and delivery of all monthly/weekly reports as well as all invoicing relating to the service being delivered..

Project Manager's responsibilities should essentially cover the following:

- Overall responsibility for delivery of the Statement of Work/s (SOW) and Service Level Agreement (SLA).
- Act as a primary interface to Utility for all matters that can affect the baseline, schedule and cost of the services project.
- Maintain project communications through Utility's Project Leader.
- Provide strategic and tactical recommendations in relation to technology related issues
- Provide escalation to FM Vendor's senior management if required
- Resolve deviations from the phased project plan.
- Conduct regularly scheduled project status meetings.
- Review and administer the Project Change Control Procedure with utility Project Leader.
- Identify and resolve problems and issues together with utility Project Leader.
- Responsible for preparation and delivery of all monthly reports as well as all invoicing relating to the services being delivered

b. Transition Management

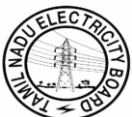
During initial six weeks viz. initial period of taking over by FMS vendor after completion of all installation & commissioning jobs by consortium members, FMS vendor shall provide minimum agreeable services. Formal SLA shall be enforced only after initial transition period.

5.2 HELP DESK

Help Desk shall act as a single-point-of-contact for all service problems pertaining to hardware, software & network. The successful bidder shall create and maintain a dedicated centralized online Help Desk with a telephone number, E-mail and call tracking mechanism that will resolve problems and answer questions that arise from the use of the offered solution as it is implemented at utility. Users can log the queries / complaints, which should be resolved as per the Service Level requirements. The helpdesk queries / complaints can be related to connectivity, messaging, security, Hardware, Software, configuration and any other issues.

Help Desk software shall take care of classification, automatic escalation, management, and status tracking and reporting of incidents as expected by the service level requirements. Status tracking should be available to users through telephone number as well as online through software.

- The Help Desk will respond to and resolve the problems as per the SLA.
- Problems shall be classified into various levels of priority mentioned in the SLA. The assigned priority for each problem shall depend upon:
 - o The extent of the problem's impact on the usability of the system



- o The percentage of users affected by the problem.
- The initial assignment of priorities is the responsibility of the Help Desk's Problem Manager on basis of SLA. However, utility can change the priority assigned to a particular problem and the procedures that exist for escalating a problem to progressively higher management levels, until agreement is secured.
- The precise definition of problem priorities should be documented in the Successful bidder's SLA.
- Helpdesk shall troubleshoot on systems (hardware), applications (software), mail related issues, network related issues, multimedia related issues, server administration, security policies, 3rd party coordination.
- After problem resolution, the logged problem in help desk will be closed and notification will be sent to user for confirmation and rate the customer service on defined parameter in helpdesk.
- Help Desk shall be responsible for change management like schedule up gradation of hardware and software components etc. Help Desk will co-ordinate and take approval from utility for the same and will inform all users for such event in advance.
- Help Desk shall also be responsible for managing problems/incidents related to LAN at each node. Help Desk shall ensure timely response and assigning the problem/incident on priority basis.

Help Desk shall be ITIL compliant & shall implement ITIL compliant help desk processes like Change Control Procedure, Call Flow Process, Incident & Problem management approach etc. FMS vendor shall utilize help desk tools, which are ITIL complaint and are open for integration with other enterprise management tools like EMS/NMS system & messaging system.

FM Vendor's Responsibilities regarding Help Desk:

A. Providing Help desk solutions application

The Service desk / help desk module shall include the Solutions application. A solution record is a predefined response to a problem or commonly asked question. A solution record consists of a symptom, a cause and a resolution. Solutions can be associated with incident and problem records. Solutions application is used to create, approve, and manage solution records. A separate application, Search Solutions, can be used to search for and view solution records.

The Solutions application includes the following features:

1. Ability to specify which solution records should be available to self-service users in the Search Solutions application.
2. Ability to specify a **Classification** for the solution.
3. Ability to indicate a Status for a solution. A solution record can have one of the following statuses: DRAFT, ACTIVE, or INACTIVE.
4. Ability to attach documents or Web sites to a solution record.
5. Ability to use the Solutions application to change the status of a solution record.

Ability to create, update and delete a solution in Solutions Application.

FMS Vendor shall integrate the help desk system with messaging system & EMS/NMS system of utility.

Flow Of Events shall be as follows: Any event triggered should be forwarded to service desk that submits & updates trouble ticket & also updates status of ticket back to EMS/NMS. EMS/NMS should automatically forward events to service desk. EMS/NMS operator should also be able to generate tickets & forward it to helpdesk. Helpdesk personnel must also be able to update ticket to EMS/NMS.

B. Hardware and Software Services



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1. Provide Level One Support for hardware and software, including incident logging, assigning incident numbers and dispatching the appropriate support personnel or AMC vendor to remedy a problem;
2. Prioritize problem resolution in accordance with the severity codes and Service Levels specified;
3. Provide system status messages, as requested;
4. Maintain the defined help desk operational procedures;
5. Notify designated personnel of systems or equipment failures, or of an emergency;
6. Initiate a problem management record (“PMR”) to document a service outage to include (for example) date and time opened, description of symptoms, and problem assignment (Level Two/Level Three), and track and report on problem status, as required;
7. Monitor problem status to facilitate problem closure within defined Service Level criteria or escalate, as appropriate;
8. Monitor PMR closure, including documented problem resolution;
9. Provide Utility with complete and timely problem status through the problem tracking system, as requested;
10. Maintain an updated help desk personnel contact listing.

C. Management Services

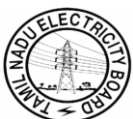
1. Provide “ownership-to-resolution” of all help desk calls, monitor and report on the progress of problem resolution, confirm resolution of the problem with the End User, and log the final resolution via the problem management system;
2. Record, analyze and report on calls received by the help desk, including:
 - a. Call volumes and duration,
 - b. Incident & Problem trends,
 - c. Call resolution time.
3. Assign priorities to problems, queries, and requests based on the guidelines/SLA provided by Utility;
4. Monitor and report to Utility on maintenance vendor performance;
5. Provide input to Utility on End User training requirements based on help desk call tracking and analysis;
6. Update contact list of users initially provided by Utility

D. Install/MAC Services (Install Move Add Change)

1. Act as the point-of-contact for install and MAC requests and status; and
2. Act as the interface for coordinating and scheduling all installations and MACs.

E. User oriented Services

1. Provide an interface for user requests, such as new user IDs, address changes, routing requests, and password changes.
2. Advise the End User to take reasonable steps to backup information, if possible, prior to attempting to effect a resolution either by phone or hands-on during Desk Side Support Service; and
3. Assist End Users with Office automation and E-mail “how to” and usage questions.



Utility's Responsibilities regarding Help Desk

1. Help FM Vendor define help desk call prioritization guidelines
2. Provide updated contact listing (as a one-time activity) for use by help desk personnel in contacting appropriate personnel of utility for assistance/notification,
3. Assist FM Vendor, as requested, in the resolution of problems outside the scope of FM Vendors responsibilities or recurring problems, which are the result of End User error
4. Provide an adequate level of system authority for all Hardware, Software and resources for which **FM Vendor** has problem resolution responsibility and communications access
5. Assist FM Vendor in the development of help desk operational procedures by providing input to, and review and approval of, such procedures (this shall be a one-time activity).

5.3 Install, Moves, Adds, Changes (IMAC) Services

This Service provides for the scheduling and performance of install, move, adds, and change activities for Hardware and Software. Definitions of these components are as follows:

- Install:** Installation of desktop machines, servers, peripheral equipment, and network-attached peripheral equipment, which form part of the existing baseline (new equipment needs to be procured by with installation services at the time of procurement).
- Move:** Movement of desktop machines, servers, peripheral equipment, and network-attached peripheral equipment.
- Add:** Installation of additional hardware or software on desktop machines and servers after initial delivery (e.g. Additional RAM, CD ROM drive, sound card etc).
- Change:** Upgrade to or modification of existing hardware or software on desktop machines and servers (e.g. Upgrade 2.4GB hard disk drive to 4.3GB).

Requests for IMAC shall be prepared by FMS vendor depending on customer/ system requirements & shall be approved by utility. Utility shall formulate guidelines for IMAC & communicate it to FMS vendor. All procurements shall be done by utility.

5.4 Asset/ Inventory Management

FMS Vendor shall provide asset-tracking services for the IT assets created for the utility by the consortium vide supply cum erection as per details mentioned in G1 to G5.

1. FMS Vendor & utility personnel shall jointly perform baseline asset tracking & inventory tracking at start of FMS contract.
2. FMS Vendor shall create/ maintain hardware asset database by recording information like configuration details, serial number, asset code, location details, warranty and AMC.
3. FMS Vendor shall ensure feeding baseline data of assets onto a software module developed for the purpose by vendor.



4. The database shall be regularly updated by the vendor .The updating shall be required due to new installations, upgradations of systems, change of location of systems, discarding of systems, sending of components for repairs etc.
5. The vendor at any time must be able to display to utility latest level of IT assets & inventories. It should be able to display assets sent for repairs & assets discarded & assets upgraded. Inventories shall be spares which FMS vendor must keep as emergency spares for upkeep of system. These spares shall be managed by FMS vendor from consortium members who are bound to provide all spares during initial warranty period of three years & also during next two years when consortium shall provide paid AMC (including spares).
6. Provide asset verification at least once a year in presence of utility personnel.
7. FMS Vendor shall provide regular MIS based on above to utility regarding need of new spares & components considering appropriate procurement time. The procurements shall be done by utility.
8. Prior to completion of contract period, FMS Vendor shall hand over all assets along with report of all services to new FMS Vendor/ Utility staff.

5.5 Vendor Management Services

As part of this activity the **FM Vendor's** team will:

1. Manage the vendors for escalations on support
2. Logging calls and co-ordination with vendors
3. Vendor SLA tracking
4. AMC Tracking
5. Management of assets sent for repair
6. Maintain database of the various vendors with details like contact person, Tel. Nos., response time and resolution time commitments. Log calls with vendors Coordinate and follow up with the vendors and get the necessary spares exchanged.
7. Analyze the performance of the vendors periodically (Quarterly basis)
8. Provide MIS to utility regarding tenure of completion of AMC with outside vendors for software, hardware & networks maintenance in order that utility may take necessary action for renewal of AMC. FMS vendor shall also provide MIS regarding performance of said vendors during existing AMC.
9. Since during initial three years, warranty is in scope of consortium members & as such, there shall be no AMC for systems installed by consortium members. During such period, FMS vendor has to interact with consortium members for maintenance services and spares. After warranty period, FMS vendor has to interact with vendors as selected by utility for providing AMC for said systems.

Utility shall provide FMS vendor with contact details of individual vendors & SLAs signed with them by utility.

5.6 Desk Side Technical Support Services



This Service provides maintenance for IT equipment (Desktop, Laptop & Printers), including preventive and predictive support, as well as repair and/or replacement/ upgradation activity. FMS vendor shall:

1. Provide a single-point-of-contact to End Users for the resolution of Desk side related problems or to request an equipment upgrade or consultation;
2. Provide Desktop maintenance services, corrective maintenance to remedy a problem, and scheduled health check to maintain the Desktop in accordance with manufacturers' specifications and warranties;
3. Identify network, operational and software related problems and escalate to respective teams
4. Implement Recovery Procedures

5.7 Anti-Virus Management

This Service includes virus detection and eradication, logon administration and synchronization across servers, and support for required security classifications. The scope of service is applicable to the servers and Anti virus patch upgrade for desktops.

5.8 LAN & local server administration

FM Vendor will provide for LAN and Server administration services including administrative support for user registration, creating and maintaining user profiles, granting user access and authorization, providing ongoing user password support, announcing and providing networking services for users and providing administrative support for the Users from a central location.

5.9 Network Monitoring & Management- WAN/VPN/ Internet

This Service provides for the Availability Monitoring of the Wide Area network environment, including network connection devices, such as routers, and communication equipment. Management includes proactive monitoring and vendor management.

FMS Vendor's Responsibilities

1. Provide a single-point-of-contact for responding to Utility's network management queries or accepting its problem management requests. **FM Vendor's** network management specialist will respond to utility's initial request within agreed service level objectives set forth.
2. Monitor availability & Escalate to service provider and Notify Utility for WAN Outages.
3. Review the service levels of the network service provider (as per pre-defined schedules on SLA performance) along with utility.
4. Provide network availability incident reports severity wise to utility in a format mutually agreed.
5. Provide SLA performance management report of the Network Service Provider.
6. **Fault Detection and Notification:** The bidder shall diagnose problems that could arise as part of the LAN/WAN network. These include connectivity problems due to failures in communication transport links, CPE, routing configuration points, or from software bugs etc.



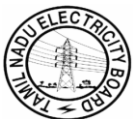
7. **Fault Isolation and Resolution:** All faults that have been identified need to be isolated and rectified appropriately. The resolution measures undertaken by the bidder and results produced accordingly shall be documented in the report.
8. **Carrier Coordination:** Carrier Coordination implies providing a single point of contact to resolve network related problems involving carrier circuits, whether equipment or circuit related. When a problem is diagnosed because of a WAN circuit, the bidder must coordinate with the corresponding carrier to test and restore the circuit. The bidder must take the responsibility and ensure that the problem is resolved.
9. **Hardware/Software Maintenance and Monitoring:** This would include problem determination, configuration issues, and hardware and software fault reporting and resolution. All such issues would need to be recorded and rectified.
10. **24x7 Network Monitoring and reporting:** The bidder shall monitor the network on a continuous basis using the NMS and submit reports on a monthly basis with instances from the NMS system. System performance is to be monitored independently by the bidder and a monthly report mentioning Service up time etc. is to be submitted to Utility. The report shall include:
 - o Network configuration changes
 - o Network Performance Management including bandwidth availability and Bandwidth utilization
 - o Network uptime
 - o Link uptime
 - o Network equipment health check report
 - o Resource utilization and Faults in network
 - o Link wise Latency report (both one way and round trip) times.
 - o Historical reporting for generation of on-demand and scheduled reports of Business Service related metrics with capabilities for customization of the report presentation.
 - o Generate SLA violation alarms to notify whenever an agreement is violated or is in danger of being violated.
 - o Any other reports/format other than the above mentioned reports required by utility

5.10 Data center Operations

FMS Vendor shall:

1. Regularly monitor and log the state of environmental conditions and power conditions in the Data center.
2. Coordinate with Utility and its vendors to resolve any problems and issues related to the Data center related to environment conditions, power, air-conditioning, fire, water seepage, dust, cleanliness, etc.
3. Co-ordinate with the utility for implementing any changes that may be required towards the placement and layout of infrastructure within the Data center.
4. Vendor shall monitor, log & report entire equipment & module operation on 24x 7 x 365 basis
5. Shall perform periodic health checkup & troubleshooting of all systems & modules installed by consortium members & implement proactive rectification measures

5.11 Server Administration/ Management



FMS Vendor will provide the server administration and monitoring service to keep servers stable, operating efficiently and reliably.

FM Vendor shall provide administrative support for user registration, creating and maintaining user profiles, granting user access and authorization, providing ongoing user password support, and providing administrative support for print, file, and directory, services.

FM Vendor's Responsibilities

1. Setting up and configuring servers
2. Installation of the server operating system and operating system utilities
3. Also reinstallation on event of system crash/failures
4. OS Administration for IT system
5. Manage Operating system, file system and configuration
6. Ensure proper configuration of server parameters, operating systems administration and tuning
7. Regularly monitor and maintain a log of the performance monitoring of servers including but not limited to monitoring CPU, disk space, memory utilization, I/O utilization, etc.
8. Regular analysis of events and logs
9. Apply OS Patches and updates
10. Monitor & verify logs files and periodically clean up log files
11. Ensure proper running of all critical services on the servers. Schedule and optimize these services
12. Maintain lists of all system files, root directories and volumes
13. Resolving all server related problems
14. Escalating unresolved problems to ensure resolution as per the agreed SLAs
15. Responsible for periodic health check of the systems, troubleshooting problems, analyzing and implementing rectification measures
16. Logical access control of user and groups on system
17. Responsible for managing uptime of servers as per SLAs

5.12 Database Administration Services

FMS Vendor shall:

1. Undertake end-to-end management of database on an ongoing basis to ensure smooth functioning of the same.
2. Undertake tasks including managing changes to database schemes, disk space, storage, and user roles.
3. Setting and tuning system parameters
4. Building appropriate indexes, specifying large enough buffers and caches, aligning the database implementation with IT infrastructure, monitoring databases and applications, reorganizing databases, etc.
5. Manage database upgrade or patch upgrade as and when required with minimal downtime

5.13 Backup/Restore management



FM vendor will perform backup and restore management in accordance with mutually agreed to backup and restore policies and procedures, including performance of daily, weekly, monthly quarterly and annual backup functions (full volume and incremental) for data and software maintained on Servers and storage systems including interfacing with utility's specified backup media storage facilities;

FMS Vendor shall ensure:

1. Backup and restore of data in accordance to defined process / procedure.
2. 24 x 7 support for file & volume restoration requests
3. Maintenance and Upgrade of infrastructure and/or software as and when needed.
4. Performance analysis of infrastructure and rework of backup schedule for optimum utilization.
5. Generation and publishing of backup reports periodically.
6. Maintaining inventory of onsite tapes.
7. Forecasting tape requirements for backup.
8. Ensuring failed backups are restarted and completed successfully within the backup cycle.
9. Monitor and enhance the performance of scheduled backups
10. Real-time monitoring, log maintenance and reporting of backup status on a regular basis.
11. Management of storage environment to maintain performance at optimum levels.
12. Periodic Restoration Testing of the Backup
13. Periodic Browsing of the Backup Media
14. Management of the storage solution including, but not limited to, management of space, volume, RAID configuration, configuration and management of disk array, SAN fabric / switches, tape library etc.,
15. Interacting with Process Owners in developing / maintaining Backup & Restoration Policies / Procedures
16. To provide MIS reports as per agreement

5.14 Mail/Messaging System management

FM Vendor will provide management of messaging systems, including administration of mail servers, monitoring performance, and management of user account, mailboxes, post office and address book, backup and archival management

5.15 Management of Utility's Enterprise Management System including Network Management, Monitoring & Performance Analysis (EMS & NMS system)

FM Vendor shall also manage EMS & NMS installed by consortium for the utility. FM vendor shall extract information from EMS & NMS system to manage & administer LAN, WAN, Internet, servers, desktops, data Centre, database etc. EMS is installed at server room to manage Servers, Desktops, Data Back-up, Database, and event and compliance management. NMS tool has been installed for managing the Data Center LAN and WAN routed Traffic & to recognize common network problem, management of multi-vendor network with discovery, mapping and alarm tracking. NMS is also designed to provide network analysis module for switch fabric/CPU's, monitor utilization of switch resources & in isolating the network problems, provide performance monitoring, trouble shooting, capacity planning, and report generating of various statistics.

5.16 Performance Monitoring & Reporting



- Regularly monitor and maintain a log of the performance monitoring of servers including but not limited to monitoring CPU, disk space, memory utilization, I/O utilization, Central Storage etc.
- Regular analysis of events and logs generated in all the sub systems including but not limited to servers, operating systems, databases, applications etc. The system administrators shall also ensure that the logs are backed up and truncated at regular intervals.
- The administrators shall undertake actions in accordance with the results of the log analysis to ensure that the bottlenecks in the infrastructure are identified and fine-tuning is done for optimal performance
- Reporting to utility for all system performance monitoring

6.0 SERVICE MANAGEMENT CONTROLS

The Bidder must adhere to well-defined processes and procedures to deliver consistent quality services throughout its contractual period. Any hardware/software to meet the requirements under this section must be provided by the bidder. The bidder is expected to have the following system management controls in place:

6.1 INCIDENT MANAGEMENT

The bidder must have:

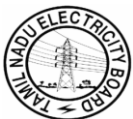
- i) Ability to create an incident record to document a deviation from an expected standard of operation.
- ii) Ability to create other ticket from the incident, if resolving the incident involves creating a service request, problem or work order.
- iii) Incident could be created automatically from sources such as email, system-monitoring tools.
- iv) Ability to have ticket template containing data that agent can automatically insert in common, high-volume records. Instead of manually entering standard information each time, vendor can apply a template that contains information such as owner, service group, service, classification, internal priority, activities, labor requirements, and activity owners.
- v) The template can add the following information, but can be modified to include: Priority, Owner or Owner Group, Service Group or Service, Classification; for Activities: Activity, Sequence, Job Plan, Site, Organization, Description, Owner or Owner Group, Priority, Vendor, and Classification.
- vi) Ability to assign ownership of an incident either to a person or a person group who is responsible for managing the work associated with that record.
- vii) Ability to assign ownership via workflow or an escalation process
- viii) Ability to associate an asset for an Incident record, if the issue you are reporting or working on involves an asset.
- ix) Ability to select related asset by hierarchical view
- x) Ability to pick the related tickets from the similar ticket search result so that the selected records are copied onto the Related Records list with the relationship RELATED.
- xi) Ability to view a list of related records and view the work and communication logs for all related records on one screen, on the global record.
- xii) Ability to create a service request from an incident with a relationship between the two records.
- xiii) Ability to create a Problem from Incident application to record an unknown, underlying cause of one or more issues. The created Problem will be related to the originating Service Request as type RELATED



- xiv) Ability to create a release in the Incident application when resolving the Incident involves releasing a set of bundled changes to your users. The created Release will be related to the originating Incident as type FOLLOW-UP and has the status of waiting-on-approval
- xv) Ability to relationships between Incidents.
- xvi) Ability to identify a global incident, which is the root cause of many other issues or that is something affecting many users.
- xvii) Ability to automatically assign one or more SLAs via Workflow or Escalation process based on SLA's criteria
- xviii) Ability to apply an incident template which contains activities that can be viewed and edited
- xix) Ability to find and attach Solution record containing information on resolving to an Incident record.
- xx) Ability to record Solution containing information on the symptom, cause, and resolution.
- xxi) Ability to create and submit a draft solution from the Incident application screen which an agent can approve the solution for general use later.
- xxii) The communication log stores inbound and outbound messages and attachments sent between users and agents.
- xxiii) Ability to view communication entries associated with a record.
- xxiv) Ability to use a communication template to fill in default data, such as the identifier, subject from the originating record when create a communication.

6.2 TICKETING MANAGEMENT

- i) Ability to specify an Owner or Owner Group and Service Group or Service for the ticket.
- ii) Ability to specify a Classification for the ticket.
- iii) Ability to specify both a Reported Priority and an Internal Priority for the ticket.
- iv) Ability to list related assets on a ticket.
- v) Ability to track time spent on a ticket via the Timer button or alike.
- vi) Ability to apply one or more service level agreements (SLAs) to a ticket.
- vii) Provide Self-Service Service Requests module to allow users to submit and view service requests.
- viii) Ability to create other ticket from the service request, if resolving the service request involves creating an incident, problem, or work order.
- ix) Ability to relate existing tickets to the service request.
- x) Service requests could be created automatically from sources such as email, system-monitoring tools.
- xi) Ability to add a classification to enable workflow processes, escalations, and service level agreements
- xii) Ability to have ticket template containing data that agent can automatically insert in common, high-volume records. Instead of manually entering standard information each time, agent can apply a template that contains information such as owner, service group and service, classification, and internal priority. The template can add the following information, but you can modify it; Priority, Owner or Owner Group, Service Group or Service, Classification, Vendor, and Organization.
- xiii) Ability to assign ownership via workflow or an escalation process
- xiv) Ability to select related asset by hierarchical view
- xv) Ability to filter the related asset list by value list: All, Public, or User/Custodian. The default User/Custodian is the affected person specified on the record.
- xvi) Ability to show similar tickets to search for and relate other tickets to the current record. The purpose is for information only.

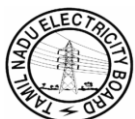


- xvii) Ability to automatically assign one or more SLAs via Workflow or Escalation process based on SLA's criteria

6.3 PROBLEM MANAGEMENT

The Vendor must develop an effective problem management system to reduce the impact of problem that occur and minimize its reoccurrence. It should help in identifying the root cause of the problem and proper recording and tracking of the problem till its resolution. In order to systematically capture, record, track and resolve the calls, robust application tools with following functionalities / features should be provided. The tools shall have following features:

- i) Ability to apply a template to a Problem. The template contains common data such Priority, Owner or Owner Group, Service Group or Service, Classification, Vendor, and Organization.
- ii) The Problem template also can contain activities, labor requirements, and activity owners
- iii) The Problem template also can contain Problem activity common data such as, Sequence number, Job Plan, Site, Organization, Description, Owner or Owner Group, Priority, Vendor, and Classification.
- iv) The status is automatically change to be QUEUED when ownership of an incident is assigned except the status is RESOLVED
- v) Ability to associate an asset for an Problem record, if the issue you are reporting or working on involves an asset.
- vi) Ability to select related asset by hierarchical view
- vii) Ability to relate other tickets and work orders to a Problem with a relationship type of RELATED
- viii) Ability to show similar tickets to search for and relate other tickets to the current record.
- ix) Ability to show similar tickets, Problems to search for and relate other tickets, Problems to the current record.
- x) The similar ticket search results only list service requests, incidents, and problems having the same Classification. Records are not included in the results if they either are global records or history records.
- xi) Ability to identify a Problem as global record. A global record captures information about an issue affecting many people. The record might be a created for a shared asset i.e. the root cause of many other issues, such as a failed network server.
- xii) Ability to relate a Problem to a Global record.
- xiii) Ability to create a service request from a problem, creating a relationship between the two records
- xiv) Ability to create a Release in the Problem application when resolving the Problem involves releasing a set of bundled changes to your users. The created Release will be related to the originating Problem as type FOLLOW-UP and has the status of waiting-on-approval
- xv) The relationship between Problem and other Problem/Ticket can be deleted.
- xvi) Ability to identify a global Problem, which is the root cause of many other issues or that is something affecting many users. A global record might have many other records related to it.
- xvii) Ability to automatically assign one or more SLAs via Workflow or Escalation process based on SLA's criteria
- xviii) When you apply an SLA that includes a response commitment to a Problem, value in the Target Start date field is set based on that SLA.
- xix) When you apply an SLA that includes a resolution commitment to a Problem, value in the Target Finish date field is set based on that SLA.
- xx) Ability to relate existing service requests, incidents and problems to a global record and manage them via the global record with the relationship RELATED TO GLOBAL type.



- xxi) Ability to manage the tickets via the global ticket, when linked with global relationships, so the statuses of related tickets can be changed by changing only the status of the global record.
- xxii) Ability to change status of each activity individually
- xxiii) Ability to apply a template, which contains activities that can be viewed and edited.
- xxiv) Ability to select labor for activities on a Problem.
- xxv) Ability to report labor time either for a Problem as a whole, for activities on the Problem, or for both types of labor time.
- xxvi) Ability to enter start and stop times.
- xxvii) Ability to select an owner for each Activity individually.
- xxviii) Ability to find and attach Solution record containing information on resolving to a Problem record.
- xxix) Ability to record Solution containing information on the symptom, cause, and resolution.
- xxx) Ability to create and submit a draft solution from the Incident application screen which an agent can approve the solution for general use later.
- xxxi) Ability to use the Work Log in the Problem application to document work that needs to be done or that was done to resolve the issue.
- xxxii) Ability to modify or delete Work Log with authorization protected.
- xxxiii) Ability to create Communication action in Problem application to send communications about a record to a requestor or other user.

Ability to use a communication template to fill in default data, such as the identifier, subject from the originating record when create a communication

6.4 CHANGE MANAGEMENT

- i) Work plan for Change Order describes the labor, materials, tools, services, and tasks you need to complete a Change.
- ii) Ability to enter, modify, or view the work plan.
- iii) Ability to select a job plan (predefined Work Plan), and modify it as needed.
- iv) When associate a job plan with a Change order, it copies the labor, materials, services, and tools to the Change order's plan.
- v) Ability to limit the list of job plans displayed for selection to only job plans associated with the asset or location that appear on the Change order.
- vi) When work with planned materials or items for a Change, it shall display item number, description, location, category and unit cost.
- vii) Ability to create a ticket or work order from within an existing ticket or work order (A change order).
- viii) When create a work order or ticket, the newly created record has a status of FOLLOW UP, and the original record is its ORIGINATOR.
- ix) Ability to create follow-up work orders. It will copy the asset, location, and GL account from the originating work order to the follow-up work order. A follow-up work order is for when you complete a job but notice that additional work is needed on the same asset or location.
- x) Ability to link work orders and tickets to a Change with a relationship type of RELATED
- xi) Ability to create a change from a change. It is needed when, for example, a technician completing a change discovers that additional work not specified on the change, such as a software upgrade, is required to solve a problem.
- xii) Ability to create an Incident, problem, release & work order from a change.
- xiii) Once a change is approved, it cannot be deleted.



- xiv) When change status of a Change it will change the status of to the child work orders, if the change is indicated to do so.
- xv) Ability to change the status of the Changes to complete (COMP), which indicates all the physical work is finished.
- xvi) Ability to execute the move or modification of assets when the status is changed as planned.
- xvii) Ability to change the status of child Change order in the screen of parent Change order.
- xviii) Ability to view information about previous status changes.
- xix) Ability to change the status of the Change order's task.
- xx) Ability to automatically assign one or more SLAs via Workflow or Escalation process based on SLA's criteria
- xxi) Ability to duplicate a change with or without its tasks or with its hierarchy.
- xxii) Ability to drilldown view the complete hierarchy of locations and assets

6.5 RELEASE MANAGEMENT

Ability to link work orders and tickets to a Release.

Ability to create follow-up work orders. It will copy the asset, location, and GL account from the originating work order to the follow-up work order. A follow-up work order is for when you complete a job but notice that additional work is needed on the same asset or location.

Ability to create a change from a release. It is needed when, for example, a technician completing a change discovers that additional work not specified on the release, such as a software upgrade, is required to solve a problem.

Ability to create an Incident, problem, service request, work order & release from a Release.

Ability to change the status of one or more work orders (Release orders) to Approved (APPR).

Once a Release is approved, it cannot be deleted

When change status of a Release, the tasks on the Release are also changed accordingly.

When change status of a Release it will change the status of to the child work orders, if the change is indicated to do so.

Ability to change the status of the Releases to complete (COMP), which indicates all the physical work is finished.

Ability to execute the move or modification of assets when the status is changed as planned.

Ability to change the status of one or more work orders to Closed (CLOSE). The Closed status finalizes a Release.

Ability to change the status of child Change order in the screen of parent Release order.

Ability to view information about previous status changes.

Ability to change the status of the Release order's task.

Ability to automatically assign one or more SLAs via Workflow or Escalation process based on SLA's criteria



6.6 E-mail LISTENER

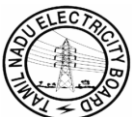
The help desk application shall have features to interface with messaging system (E-mail listener) to extract service request from messages.

The E-mail Listener Configuration application includes the following features:

1. E-mail Listener shall support post office protocol 3 (POP3) and Internet message access protocol (IMAP) e-mail protocols.
2. E-Mail Listener must have the:
 - Ability to create multiple listeners, to monitor multiple e-mail accounts.
 - Ability to support multiple attachments per message. E-Mail Listener converts any attachments into attached document records. When a ticket record is created from the e-mail, the attachments are associated with the ticket record.
 - Ability to specify a status for the listener Active/Non-Active.
 - Ability to differentiate between new service requests and updates to service requests via the subject line of a message.
 - Ability to customize e-mail handling via a Workflow process.
 - A different Workflow process can be associated with each listener.
 - Workflow processes can be configured to convert e-mail messages into service requests and communications log entries.

6.7 AVAILABILITY MANAGEMENT

- i) The bidder must define the processes/procedures which ensure the service delivery as per the required SLAs or exceed it. It should cover various equipments such as all the servers, networks, switches, SAN, Modems, data converter units, call center equipments, other site specific services, and the critical services and their supporting hardware, micro-code, firmware, and software components, as defined in scope of work. Industry standard SLA management tools should be deployed and shall have following essential features:
- ii) Ability to define the following types of SLAs: Customer (SLA), Internal (OLA) and Vendor (Underpinning contract)
- iii) Ability to define SLAs at the System, Organization, or Site level.
- iv) Ability to specify a ranking to be used for the SLA, when multiple SLAs exist for the same object.
- v) There is a setting to specify whether only one or multiple SLAs should be applied.
- vi) Ability to relate an SLA to another SLAs, for example if an SLA has supporting SLAs.
- vii) Ability to link an SLA to a key performance indicator (KPI) to monitor performance.
- viii) Ability to create an escalation for an SLA.
- ix) Ability to use the Service Level Agreements application to modify service level agreements (SLAs). When an SLA is in DRAFT or INACTIVE status, user can edit or add information on the Service Level Agreement, Assets and Locations, and Escalation.
- x) Ability to associate relationship between service level agreements (SLAs). When display an SLA record, user can build a list of the SLAs that the current SLA record supports (also known as parent SLAs), or a list of SLAs that support this one (also known as child SLAs).
- xi) Ability to associate specific assets, asset types, and locations to a service level agreement (SLA). Once an SLA and its associated escalation are activated, it shall apply the SLA to any listed assets, asset types, and locations.
- xii) When an SLA is set to ACTIVE status, it shall automatically changes the status of the escalation to ACTIVE as well.



- xiii) Ability to workflow the SLAs.
- xiv) Provide predefined action types, such as Set Owner, Status Change, or Create Ticket.
- xv) Ability to create new action types, if needed.
- xvi) Ability to define sets of actions that are grouped together in a specific sequence.
- xvii) Ability to associate an escalation point with one or more actions through the action group.

6.8 PERFORMANCE MANAGEMENT

The recording, monitoring, measuring, analyzing, reporting, and forecasting of current levels, potential bottlenecks, and enhancements of performance characteristics for the services, networks, applications, system software, and equipment within the scope shall be required. System tuning and optimization is an inherent part of this contract. Where warranted, the vendor will utilize capacity management data in combination with performance management data to identify ways to improve performance levels of the resources, extend their useful life, and request utility to approve revisions/upgrades to the computing and communications hardware, software and other equipments such that higher levels of performance of the resources are obtained.

6.9 CAPACITY MANAGEMENT

The continuous monitoring, periodic analysis, and forecasting of the changes necessary to quantify capacity and configuration of finite resources comprising the computing and communication hardware and software infrastructure supported under this initiative by the Bidder. Categories of resources to be capacity managed include but are not limited to servers & system software.

6.10 SECURITY MANAGEMENT

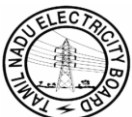
The protection from unauthorized usage, detection of intrusions, reporting as required and proactive prevention actions are to be provided by the vendor.

7.0 RESOURCES FOR PROJECT & SERVICE MANAGEMENT

The bidder shall deploy adequate number of personnel for providing Facility Management services in each shift of the day. Further there shall be one team leader available during day shift, which would also be expected to be available on call in case of emergent requirement.

The bidder shall be required to depute on-site personals to meet the Services requirement as described above.

- i) **ONSITE SERVICE ENGINEERS** - Shall be required to undertake the responsibilities of System Administrator and Trouble shooting of multi-brand Hardware. OEM UNIX certified engineer shall be required for System administration, repair & maintenance, with knowledge and expertise on the various UNIX flavors and Windows Operating System of the ERP Production Environment. Microsoft certified Professional shall be required for Intel Servers.
- ii) **OPERATIONS MANAGEMENT RESOURCES** - The Bidder shall be required to deploy adequate number of engineers responsible for day-to-day operations (including back up etc.) and monitoring in each shift on all days of the week on 24x7 days.
- iii) **GENERAL QUALIFICATION & EXPERIENCE OF RESOURCE PERSONS** - The engineers deployed for the job must have suitable qualification, experience and certification for the assigned job. If the



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service of particular personnel is not satisfactory, owner shall ask for the suitable replacement and the Bidder shall be required to provide the replacement on the next working day.
FM Vendor can assign the part of the work to the sub FM Vendor. However the complete management control should be of the FMS Vendor.



8.0 FMS DURATIONS/ SERVICE LEVELS/ CRITICALITY

Typical Facility Management Services Availability & duration of their requirement are tabulated below for reference. Utility may modify as per its own requirements.

SERVICE AVAILABILITY & CRITICALITY CHART

SERVICE	DURATION	CRITICALITY
SERVICE DESK	24 HOURS	URGENT-12X6 REST-HIGH
ASSET MANAGEMENT SERVICES	8X6	MEDIUM
VENDOR MANAGEMENT SERVICES	8X6	MEDIUM
AMC TRACKING	8X6	MEDIUM
DESKSIDE TECHNICAL SUPPORT	12X6	HIGH
DATACENTER ADMINISTRATION	24 X7	CRITICAL
DATABASE ADMINISTRATION SERVICES	8X6	URGENT
ANTIVIRUS & SECURITY ADMINISTRATION	8X6	URGENT
NETWORK MANAGEMENT-WAN	24X7	CRITICAL
NETWORK MANAGEMENT-LAN	12X7	CRITICAL
STORAGE MANAGEMENT	ON CALL	MEDIUM
MESSAGING/EMAIL MANAGEMENT	12X6	MEDIUM
BACKUP MANAGEMENT	AS PER SCHEDULE	HIGH
MANAGEMENT OF UTILITY'S EMS & NMS	24X7	CRITICAL

<Refer Appendix - C (SLA) for Severity Definition Chart>

<Refer Appendix - C (SLA) for Service Level Chart>

FMS Vendor has to sign SLA prior to start of FMS contract. During initial six weeks viz. initial period of taking over by FMS vendor after completion of all installation & commissioning jobs by consortium members, FMS vendor shall provide minimum agreeable services. Formal SLA shall be enforced only after initial transition period.

9.0 CHANGE OF SERVICE LEVELS

1. The client may inform the service provider at least one month prior to making a change in the Service Levels.
2. The client reserves the right to change the criticality, service availability duration, service levels and service level measurements with prior information.
3. The client may introduce a new Service Level that needs to be monitored - but will include the basic aspects like Expected Service Levels, Minimum Service Levels etc.
4. FMS vendor to mention percentage change in quoted value for first quarter in case of change in service levels.



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ANNEXURE-A (Geographical Particulars along with Assets and Customer information)

(Refer clause Das 2.2, clause Das 5.2 of Section : G-2 and clause 2.1, clause 4.2, Clause 7.1.1 and Clause 7.3.1 of Section : G-4)

Refer Appendix J of RFP document



ANNEXURE-B (Tentative List of Customer Types)
(Refer clause 1.0 of Section - G4)

1.0	33 KV
1.1	Coalmines
1.2	Cement Factory
1.3	Mini Steel Plant
1.4	Mini Steel Plant + Rolling Mill + Sponge Iron Plant
11.5	Government Hospital
1.6	General purpose
1.7	Other than above 1.1 to 1.6 (a) Two part tariff (b) Slab tariff
1.8	Electro chemical
1.9	Ferro Alloy
1.10	Other than Ferro Alloy as 10
1.11	Public Water Works
1.12	Agriculture/Agro based industries
2.0	11 KV
2.1	Coalmines
2.2	Cement Factory
2.3	Government Hospital
2.4	General purpose
2.5	Grid supply
2.6	Other than above 2.1 to 2.5 (a) Two part tariff (b) Slab tariff
2.7	Electro chemical
2.8	Public Water Works
2.9	Temporary Connections
3.0	LT CUSTOMERS
3.1	Domestic L/F & Power
3.1.1	General Customer
3.1.2	Board's Employees
3.1.3	Retired Employees
3.1.4	Single Point (free)
3.1.5	More than one point
3.2	Non-Domestic (Commercial L/F & Power)
3.2.1	Government Offices
3.2.2	Board's Offices
3.2.3	Others
3.3	Water Works & Sewerage Pump
3.4	Industrial Power upto 25 HP
3.4.1	Ice Factory & Cold Storage
3.4.2	Oil Mill



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3.4.3	Rice Mill & Hauler
3.4.4	Dal Mills
3.4.5	Flour Mills
3.4.6	Powerlooms
3.4.7	Others
3.5	Industrial Power Above 25 HP to 75 HP
3.5.1	Ice Factory & Cold Storage
3.5.2	Oil Mill
3.5.3	Rice Mill & Hauler
3.5.4	Dal Mills
3.5.5	Flour Mills
3.5.6	Power looms
3.5.7	Besan Mill
3.5.8	Poha Factory
3.5.9	Packaging Industry
3.5.10	Paper Mills
3.5.11	Re-rolling mills
3.5.12	Plastic Industry
3.5.13	Pharmaceutical Industry
3.5.14	Tyre Re-molding
3.5.15	Saw Mills
3.5.16	Rubber Industry/ Shoe Industry
3.5.17	Welding/ Fabrication industries (manufacturers)
3.5.18	Sizing Industry
3.5.19	Zinning Industry/ Pressing Industry
3.5.20	Bakery item manufacturing
3.5.21	Oil paints manufacturing
3.5.22	Agarbatti powder manufacturers
3.5.23	Chemical industry
3.5.24	Cones manufacturing
3.5.25	Electroplating industry
3.5.26	Wheat & Aata industry
3.5.27	Others
3.6	Industrial Power Above 75 HP to 100 HP
3.6.1	Ice Factory & Cold Storage
3.6.2	Oil Mill
3.6.3	Rice Mill & Hauler
3.6.4	Dal Mills
3.6.5	Flour Mills
3.6.6	Powerlooms
3.6.7	Others
3.7	Industrial Power Above 100 HP
3.7.1	Ice Factory & Cold Storage
3.7.2	Oil Mill



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3.7.3	Rice Mill & Hauler
3.7.4	Dal Mills
3.7.5	Flour Mills
3.7.6	Power looms
3.7.7	Others



Annexure-C (LT CUSTOMER INFORMATION)

(Refer Clause no. 5.3 and 5.5 of Section : G-4)

S No.	Customer Details	Existing number
		New CIN
1	Name of Customer:	
	Name of occupant	
	Owner or principle executive in case of commercial/industrial enterprise)	
	PAN No.	
2	Father/Husbands Name:	
3	Address	
4	Left side House Customer Index No.	
5	Right side House Customer Index No.	
6	Colony Name	
7	Ward Number	
8	Whether Under BPL	
9	BPL Number	
10	E-mail address	
11	Whether Govt. employee	
12	Name of feeder	
13	Name of substation	
14	Name of pole	
15	Connected phase R/Y/B	
16	Whether Customer of same zone or other	



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17	If other, then name of zone		
18	Khasra no. / and holding addition info. of meter		
19	Phone Number	(1) Mobile	
		(2) Landline No.	
20	Meter Reading Book No. / page No. :		
21 (a)	Type of supply	Single / Three phase	
(b)	conductor co-relation at Nearest LT Pole (for 1 Phase Customer)	Top / Middle / Bottom	
22	Tariff Category	Dom. / Ind / Com. / Agr. /	
23	Energy Meter Details	Meter Number	
		Type of Meter	Electro Mech. / Hybrid / Static
		(MAKE AND CLASS)	
		Date of Meter Installation	
		Seal No.	
24	Physical condition of meter:		
	Viewing Glass: OK / Broken / Fogged	Seals: OK / Broken /	
	Signs of tampering:		
25	Physical location of meter		
a)	Approachability	: Inside or approachable from outside	
b)	Readability	: Height of mounting	
c)	Identifiability	: Clustering of meters for multiple Customers	
26	Connected to:		
	<ul style="list-style-type: none"> • 33 KV Substation : • 11 KV Feeder : • Distribution Transformer no. : • L.T. Circuit : • Pole Number : (From the Route mapping detail)		



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27(a)	FED FROM LT FEEDER NO. (Ex. Pole) :.....		
(b)	Conductor diam. of feeder:		
28	FED FROM DT x NO. :.....		
29	Details of connected load		
	Items:	Qty. (Nos)	Load in watt
i)	Tube light :		
ii).	Bulb :		
iii).	Ceiling Fan :		
iv).	Television :		
v).	Refrigerator :		
vi).	Geyser :		
vii).	Pump :		
viii).	Air conditioner/ Air cooler :		
ix).	Plug point :		
x).:		
xi).:		
xii).:		
	Total connected Load		
30	Assessed consumption (Based on connected load & status)		
31	SANCTIONED LOAD (KW): (Based on connected load & status)		
32	Remark for other details:		



(Connected load details to be filled up as per perform for declaration of loads of respective organizations for each category of Customers).

Annexure -D (Electrical Symbols & Attributes)

(Refer Clause G 3.6.28 of Section : G-2 and Clause-7.2.1.4 of Section : G-4)

1.Line:

Conductor Type;
Conductor size;
Phase & wires;
Type of support;
Configuration

2. Distribution Transformer:

Capacity;
Percentage impedance;
HV protection;
LV protection;
Number of LV feeders;
LV feeder protection;
Transformer Mounting.

3 Sub Station

Voltage
Code
Name
Site plan Id
Date of Commissioning
Capacity
Number of Power Transformers
Painting Date
Nearest Pole number
Address
Maximum Demand

4. Distribution Transformer

High Voltage side Volts
Low Voltage side Volts
Type of Core
Customer Class code
Location Code
Capacity
Maximum Tap



Minimum Tap
Step
Adopted Tap
Vector Group
Phase

5. Power Transformer

High Voltage side Volts
Low Voltage side Volts
Type of Core
Location Code
Capacity in MVA
Impedance(%)
Iron Losses
Copper Losses
Vector Group
Tap Changer Id
Normal Tap No
Phase

6. Three Panel RMU

Voltage
Name
Location Code
Type

7. Switch /Closed Switch

Voltage
Location Code
Amps Capacity
Phase

8. Feeder Line/ Feeder Poly Line /Cable

Voltage
Configuration
Section Length
Phase
Conductor Code

9. Switch Gear

Voltage
Name
Type
Serial Number
Location
Code
Current Transformer Id
Potential Transformer Id



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Description
Location Code

10. Shunt Capacitor

Voltage
Location Code
Capacity (in kVAR)
Shunt Reactance Multiplication factor
Phase
On Setting
Off Setting
Vector Group

11. Series Capacitor

Voltage
Location Code
Phase
Capacity (in Kvar)
Reactance
Amps

12. Regulator

Voltage
Location Code
Phase
Capacity (in Kva)
Amps
Impedance (%)
Tap Changer Id
Tap Number
Vector group
Potential Transformer Ratio
Current Transformer Ratio
Band width
Hold Voltage Setting
R-Setting
X-Setting

13. Pole

Structure Id
Location Code

14. HT/ LTCustomer

Code
Name
Customer Class Code
Cumulative Maximum Demand
Unit



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Phase
Priority
Date of Supply Release

15. Boundary/Polygon

Polygon class
Polygon Type
Polygon Code

16. Meter

Code
Type
Location
Kw
Kvar
Kva
Power Factor
Ampere
Voltage
Phase
Kwh
Date and Time

17. Busbar

Voltage
Type
Rated Amps
Class
Phase

18. Cable Joint

Type
Class
Location Code
Date

19. Distribution Station

Voltage
Code
Name

20. Switching structure

Voltage
Name
Location Code

21. Fuse

Voltage



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Type
Phase
Location Code
Rating

22. Tower

Type
Location Code

23. Feeder Pillar

Voltage
Code
Name

24. Service Pillar

Voltage
Code
Name

25. Reactor

Voltage
Location Code
Reactor Capacitance
Inductance (MilliHenry)

26. Earth Switch

Voltage
Normal Rated Current
Rated Current
Equipment Location Code
Phase

27. Current Transformer

Voltage
Code
Core Number
Location Code

28. Lightning Arrestor

Voltage
Discharge Current Rating
Location Code
Phase

29. Potential Transformer

Voltage
Code
Core Number



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Location Code

30. Load

Load Model Code
Phase
Data Type Code
Rated Voltage
Kva
Kw
Kvar
Ampere
Power factor
Kwh
Load factor
Bus Vector group

31. Drop Out Fuse

Voltage
Type
Section Number
Phase
Location Code
Rating

32. Sub Sectioning Post

Voltage
Code
Name

33. Sectioning Paralleling Post

Voltage
Code
Name

34. Sub Sectioning Paralleling Post

Voltage
Code
Name

35. Feeding Post

Voltage
Code
Name

36. Insulated Overlap

Voltage
Phase
Location Code



37. Double Pole Isolator

Voltage
Phase
Location Code

Annexure - E (Land based features)

(Refer Clause G 3.6.28 of Section-G2)

	Attribute Fields	Enumerators List
Buildings	Name of the property	
	Authority	
	Type	
		Residential/Commercial Sector, Industrial Estates, Suburban, Rural, Others
Water Bodies	Name	
	Depth	
	Type	
		River, Canal, Seasonal Water Bodies, OH Water Tanks, Open Drain, Nallah, Dams, Others
Transport Facilities	Name	
	Type	
		Air Port, Railway Station, Bus Depot, Taxi Stand, Bus terminal, Rickshaw Stand, Others
Rails	No. of Tracks	
	Width	
	Type	
		Rail Route, Others
Roads	Name	
	Width	
	Surface	
	Type	National Highway, State Highway, Major Road, Minor Road, Lane, Rural Road, Backside Service Lane, Fly-Over, Others



Annexure - F (Typical List of Meter reading exceptions)

(Refer Clause M2 of Section-G2)

1	List of Meters beyond reach for meter reading e.g. meter installed above 7 feet height or any other hindrance
2	List of cases, where meter numbers at site are not matching with data base. In such cases, the alternative site address and Connection Id where the meter found at site is supposed to be installed as per Discom records should get displayed
3	List of cases of temporary dis-connection
4	Cases of misused category i.e. domestic connection being used for commercial and industrial purposes.
5	Identification of the cases, where meter is bypassed
6	List of cases, where terminal/meter seals are broken or missing
7	Identification of meters, which are suspected as faulty
8	Identification of cases of abnormal consumption after analysis e.g. reverse reading, consumption not commensurate with connected load, consumption not commensurate with maximum demand indicator, sudden dip in consumption with respect to past consumption etc.
9	Identification of cases with previous details older than six months, having arrears and meters not traceable.
10	Identification of cases with previous details older than six months having arrears and meters found working at site.
11	List of arrears with wrong address in data base.
12	List of meters not traceable
13	List of addresses, where meters are installed but records are not appearing in



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	data base. Hence no reading and billing is being done
14	Identification of cases, where meter numbers are absurd like 0000000 but these meters exist at site
15	Consumer no long occupying the premises, i.e. cases where permanent disconnection is required
16	Connections disconnected on records, but meter found at site and reading advancing
17	Any discrepancy or abnormality in meter books such as very few consumers in one book or addresses are of different locations quite away from each others
18	Verification of cases, where meter readings are usually not taken at the pretext of premises locked etc. and provisional bills are raised.
19	Consumer refusing access for survey
20	System should capture mode of reading (download v/s manual keying) with date and time stamp, and apply different sets of checks on each mode.
21	Checks should be applied on all of the following : i. KWH reading ii. KVAH reading iii. MDI
22	List of multiple consumer records created for the same connection (ghost double billing)
23	In case of multiple site visits in the same billing cycle fetching different readings for the same meter, system should decide which reading to be used for billing based on predefined criteria.
24	In case of manual entry of reading in an MRI, MRI should record and the system should capture the number of attempts made by the Reader to record each reading, i.e., the number of times the reading violated validation checks and was over-written to arrive at the final reading.



Annexure - G (IMPLEMENTATION SCHEDULE)

(Refer Clause 18 of Section-G1)

Refer Appendix N of RFP Document



Annexure-H (PROJECT SYNOPSIS AND GEOGRAPHICAL SCOPE)

(Refer Clause 3.7 and 13.0 of Section-G1)

Refer Appendix F to L of RFP Document



ABBREVIATIONS

NUMERICAL

1. 100B-FX	-	100 Base-FX
2. 100B-T	-	100 Base-T
3. 100B-TX	-	100 Base-TX
4. 100BVG	-	100 BaseVG
5. 10B2	-	10 Base2
6. 10B5	-	10 Base5
7. 10B-F	-	10 Base-F
8. 10B-FB	-	10 Base-FB
9. 10B-FL	-	10 Base-FL
10. 10B-FP	-	10 Base-FP
11. 10B-T	-	10 Base-T
12. 1GL	-	First-Generation Programming Language
13. 286	-	Intel 80286 processor
14. 2B1Q	-	2 Binary 1 Quaternary
15. 2GL	-	Second-Generation Programming Language
16. 386	-	Intel 80386 processor
17. 3GL	-	Third-Generation Programming Language
18. 486	-	Intel 80486 processor
19. 4B5BLF	-	4 Byte 5 Byte Local Fiber
20. 4GL	-	Fourth-Generation Programming Language
21. 586	-	Intel Pentium processor
22. 5GL	-	Fifth-Generation Programming Language
23. 686	-	Any of the Intel Pentium Pro, Pentium II, Pentium III, and Pentium 4 processors
24. 8B10BLF	-	8 Byte 10 Byte Local Fiber

A

1. AA	-	Anti-Aliasing
2. AAA	-	Authentication Authorization, Accounting
3. AABB	-	Axis Aligned Bounding Box
4. AAC the	-	Advanced Audio Coding (audio compression format defined by MPEG-2 standard)



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- | | | |
|-------------|---|---|
| 5. AAL | - | ATM Adaptation Layer |
| 6. AALC | - | ATM Adaptation Layer Connection |
| 7. AARP | - | AppleTalk Address Resolution Protocol |
| 8. ABI | - | Application Binary Interface |
| 9. ABM | - | Asynchronous Balanced Mode |
| 10. ABR | - | Area Border Router |
| 11. ABR | - | Auto Baud-Rate Detect |
| 12. ABR | - | Available Bit Rate |
| 13. AC | - | Acoustic Coupler |
| 14. AC | - | Alternating Current |
| 15. ACD | - | Automatic Call Distributor |
| 16. ACD | - | Automatic Call Distribution |
| 17. ACF | - | Advanced Communications Function |
| 18. ACF NCP | - | Advanced Communications Function-Network Control Program |
| 19. ACID | - | Atomicity Consistency Isolation Durability |
| 20. ACK | - | ACKnowledgement |
| 21. ACL | - | Access Control List |
| 22. ACL | - | Active Current Loop |
| 23. ACM | - | Association for Computing Machinery |
| 24. ACME | - | Automated Classification of Medical Entities |
| 25. ACPI | - | Advanced Configuration and Power Interface |
| 26. ACR | - | Allowed Cell Rate |
| 27. ACR | - | Attenuation to Crosstalk Ratio |
| 28. AD | - | Active Directory |
| 29. AD | - | Administrative Domain |
| 30. ADB | - | Apple Desktop Bus |
| 31. ADC | - | Analog-To-Digital Converter |
| 32. ADC | - | Apple Display Connector (DVI variant) |
| 33. ADCCP | - | Advanced Data Communications Control Protocol/Procedures |
| 34. ADDA | - | Analog Digital Digital Analog |
| 35. ADO | - | ActiveX Data Objects |
| 36. ADSL | - | Asymmetric Digital Subscriber Line (variant of DSL) |
| 37. AE | - | Adaptive Equalizer |
| 38. AES | - | Advanced Encryption Standard |
| 39. AF | - | Anisotropic Filtering |
| 40. AFP | - | Apple Filing Protocol |
| 41. AGI | - | Association for Geographic Information |
| 42. AGP | - | Accelerated Graphics Port (sometimes used with a suffix |
| indicating | | the port's bandwidth, like AGP4x) |
| 43. AH | - | Active Hub |



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- 44. AI - **Artificial Intelligence**
- 45. AIX - **Advanced Interactive Executive**
- 46. Ajax - **Asynchronous JavaScript and XML**
- 47. AL - **Access List**
- 48. AL - **Active Link**
- 49. ALGOL - **Algorithmic Language**
- 50. ALSA - **Advanced Linux Sound Architecture**
- 51. ALU - **Arithmetic and Logical Unit**
- 52. AM - **Access Method**
- 53. AM - **Active Matrix**
- 54. AMS - **Active Monitor**
- 55. AM - **Amplitude Modulation**
- 56. AM/FM - **Automated Mapping and Facilities Management**
- 57. AMD - **Advanced Micro Devices**
- 58. AML - **ARC Macro Language**
- 59. AMR - **Audio Modem Riser**
- 60. AMR - **Automatic Meter Reading**
- 61. ANI - **Automatic Number Identification**
- 62. ANN - **Artificial Neural Network**
- 63. ANSI - **American National Standards Institute**

- 64. ANT - **Another Neat Tool**
- 65. AoE - **ATA over Ethernet**
- 66. AOP - **Aspect-Oriented Programming**
- 67. APCI - **Application-Layer Protocol Control Information**
- 68. API - **Application Programming Interface**
- 69. API - **Application Program Interface**
- 70. APIC - **Advanced Programmable Interrupt Controller**
- 71. APIPA - **Automatic Private IP Addressing**
- 72. APL - **A Programming Language**
- 73. APR - **Apache Portable Runtime**
- 74. APS - **Accunet Packet Service**
- 75. ARIN - **American Registry for Internet Numbers**
- 76. ARM - **Advanced RISC Machines**
- 77. ARP - **Address Resolution Protocol**
- 78. ARPA - **Address and Routing Parameter Area**
- 79. ARPA - **Advanced Research Projects Agency (see also DARPA)**
- 80. ARPANET - **Advanced Research Projects Agency Network**
- 81. AS - **Access Server**
- 82. ASCII - **American Standard Code for Information Interchange**
- 83. ASG - **Abstract Semantic Graph**



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- 84. ASIC - **A**pplication **S**pecific **I**ntegrated **C**ircuit
- 85. ASMP - **A**symmetric **M**ultiprocessing
- 86. ASN.1 - **A**bstract **S**yntax **N**otation **1**
- 87. ASP - **A**pplication **S**ervice **P**rovider
- 88. ASP (MS ASP) - **A**ctive **S**erver **P**ages
- 89. ASP - Active server pages
- 90. ASR - **A**synchronous **S**ignal **R**outine
- 91. ASSP - **A**pplication **S**pecific **S**tandard **P**roduct
- 92. AST - **A**bstract **S**yntax **T**ree
- 93. AT - **A**ccess **T**ime
- 94. AT - **A**ctive **T**erminator
- 95. AT - **A**dvanced **T**echnology
- 96. ATA - **A**dvanced **T**echnology **A**ttachment
- 97. ATAG - **A**uthoring **T**ool **A**ccessibility **G**uidelines
- 98. ATAPI - **A**dvanced **T**echnology **A**ttachment **P**acket **I**nterface
- 99. ATM - **A**synchronous **T**ransfer **M**ode
- 100. AVC - **A**dvanced **V**ideo **C**oding
- 101. AVHRR - Advanced Very High Resolution Radiometer
- 102. AVI - **A**udio **V**ideo **I**nterleaved
- 103. AWT - **A**bstract **W**indowing **T**oolkit

B

- 1. B2B - **B**usiness-**t**o-**B**usiness
- 2. B2C - **B**usiness-**t**o-**C**onsumer
- 3. Bash - **B**ourne-again **s**hell
- 4. BASIC - **B**eginner's **A**ll-Purpose **S**ymbolic **I**nstruction **C**ode
- 5. BBP - **B**aseband **P**rocessor
- 6. BBS - **B**ulletin **B**oard **S**ystem
- 7. BCD - **B**inary **C**oded **D**ecimal
- 8. BEEP - **B**locks **E**xtensible **E**xchange **P**rotocol
- 9. BELLCORE - Bell Communications Research
- 10. BER - **B**it **E**rror **R**ate
- 11. BFD - **B**inary **F**ile **D**escriptor
- 12. BFS - **B**readth-**F**irst **S**earch
- 13. BGP - **B**order **G**ateway **P**rotocol
- 14. BiDi - **B**i-**D**irectional
- 15. BIN - **B**inary
- 16. BINAC - **B**inary **A**utomatic **C**omputer
- 17. BIND - **B**erkeley **I**nternet **N**ame **D**aemon
- 18. BIOS - **B**asic **I**nput **O**utput **S**ystem



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- 19. BIT - Binary digit
- 20. BJT - **B**ipolar **J**unction **T**ransistor
- 21. BLOB - Binary Large Object
- 22. Blog - **W**eb **L**og
- 23. BLPU - Basic Land and Property Unit
- 24. BLUE - Best Linear Unbiased Estimate
- 25. BMP - **B**asic **M**ultilingual **P**lane
- 26. BNC - **B**ayonet **N**eill-**C**oncelman
- 27. BOINC - **B**erkeley **O**pen **I**nfrastructure for **N**etwork **C**omputing
- 28. BOOTP - **B**ootstrap **P**rotocol
- 29. BPDU - **B**ridge **P**rotocol **D**ata **U**nit
- 30. BPEL - **B**usiness **P**rocess **E**xecution **L**anguage
- 31. BPL - **B**roadband over **P**ower **L**ines
- 32. BPS - Bits **p**er **s**econd
- 33. BPS - Bid proposal schedule
- 34. BRR - **B**usiness **R**eadiness **R**ating
- 35. BSA - **B**usiness **S**oftware **A**lliance
- 36. BSD - **B**erkeley **S**oftware **D**istribution (Unix variant)
- 37. BSoD - **B**lue **S**creen **o**f **D**eath
- 38. BSS - **B**lock **S**tarted by **S**ymbol
- 39. BSU - Basic Spatial Unit
- 40. BT - **B**it**T**orrent
- 41. BTAM - **B**asic **T**elecommunications **A**ccess **M**ethod (an IBM OS/360 API)
- 42. B-TRAPP (Belinda Trapp) - A term meaning crappy computer, or Scott Sharps mom.
- 43. BTU - British Thermal Unit
- 44. BW - **B**andwidth

C

- 1. CA - **C**ertificate **A**uthority
- 2. CAD - **C**omputer-**A**ided **D**esign
- 3. CAE - **C**omputer-**A**ided **E**ngineering
- 4. CAI - **C**omputer-**A**ided **I**nstruction
- 5. CAID - **C**omputer **A**ided **I**ndustrial **D**esign
- 6. CAL - Computer Assisted Learning
- 7. CAM - **C**omputer-**A**ided **M**anufacturing
- 8. CAM - Computer Aided Mapping
- 9. CAPTCHA - **C**ompletely **A**utomated **P**ublic **T**uring **T**est to tell **C**omputers and **H**umans **A**part
- 10. CAQ - **C**omputer **A**ided **Q**uality



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11. CASE	-	C omputer-Aided S oftware E ngineering
12. CC	-	C ompiler
13. CCITT Telephonique	-	Comite Consultatif International de Telegraphique et Telephonique
14. CCS	-	Customer Care System to use
15. CCT	-	Computer Compatible Tape
16. CD	-	C ompact D isc
17. CDASSL	-	C ommon D ata S ecurity A rchitecture S ecure S ockets L ayer
18. CDE	-	C ommon D esktop E nvironment
19. CDE	-	Computer-Aided Engineering
20. CDMA	-	C ode D ivision M ultiple A ccess
21. CDP	-	C ontinuous D ata P rotection
22. CDPD	-	Customer Database Provided Digits
23. CD-R	-	CD -Recordable
24. CD	-	ROM- CD Read-Only M emory
25. CDRs	-	Call Detail Records
26. CD	-	RW- CD -Rewritable
27. CED	-	Caller entered digits
28. CEN	-	Comite Europeen de Normalisation
29. CERCO	-	Comite Europeen des Responsables de la Cartographie Officielle
30. CERT	-	C omputer E mergency R esponse T eam
31. CES	-	C onsumer E lectronics S how
32. CF	-	C ompact F lash
33. CFD	-	C omputational F luid D ynamics
34. CFG	-	C ontext-Free G rammar
35. CFG	-	C ontrol F low G raph
36. CFWS	-	C omment and/or F olding W hite S pace
37. CG	-	C omputer G raphics
38. CGA	-	C olor G raphics A rray
39. CGI	-	C ommon G ateway I nterface
40. CGI	-	C omputer- G enerated I magery
41. CGM	-	Computer Graphics Metafile
42. CGT	-	C omputational G raph T heory
43. CHAP	-	C hallenge- H andshake A uthentication P rotocol
44. CHS	-	C ylinder- H ead- S ector
45. CI server	-	Cluster integration servers
46. CIBS	-	Customer Information and Billing System
47. CIDR	-	Classless Inter-Domain Routing
48. CIFS	-	C ommon I nternet F ilesystem
49. CIM	-	C ommon I nformation M odel
50. CIN	-	Customer Identification Number



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51. CINFO	-	Caller Information Forwarding
52. CISC	-	C omplex I nstruction S et C omputer
53. CJK	-	C hinese, J apanese, and K orean
54. CJKV	-	C hinese, J apanese, K orean, and V ietnamese
55. CLI	-	C ommand L ine I nterface
56. CLI	-	Caller line identification
57. CLR	-	C ommon L anguage R untime
58. CM	-	C onfiguration M anagement
59. CM	-	C ontent M anagement
60. CMOS	-	C omplementary M etal- O xide S emiconductor
61. CMP	-	Communications Plenum Cable
62. CMRI	-	Common Meter Reading Instruments
63. CMS	-	C ontent M anagement S ystem
64. CN	-	C anonical N ame
65. CNC	-	C omputer N umerical C ontrol
66. CNR	-	C ommunications and N etworking R iser
67. COBOL	-	C ommon B usiness- O riented L anguage
68. COGO	-	Co-ordinate Geometry
69. COM	-	C omponent O bject M odel
70. CORBA	-	C ommon O bject R equest B roker A rchitecture
71. CoS	-	Class-of-service
72. COTS	-	C ommercial O ff- T he- S helf
73. CP	-	Change proposal
74. CP/M	-	C ontrol P rogram/ M onitor
75. CPA	-	C ell P rocessor A rchitecture
76. CPA	-	C ontrol P anel A pplet
77. CPA	-	C onverged P acket A ccess
78. CPAN	-	C omprehensive P erl A rchive N etwork
79. CPS	-	Characters p er s econd
80. CPU	-	C entral P rocessing U nit
81. CR	-	C arriage R eturn
82. CRAN	-	C omprehensive R A rchive N etwork
83. CRC	-	C yclic R edundancy C heck
84. CRLF	-	C arriage R eturn L ine F eed
85. CRM	-	C ustomer R elationship M anagement
86. CRM	-	Customer Relationship Module
87. CRS	-	Customer Request Services
88. CRT	-	C athode R ay T ube
89. CS	-	C able S elect
90. CS	-	C omputer S cience
91. CSE	-	C omputer S cience and E ngineering



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92. CSI	-	Common System Interface
93. CSRF	-	Cross-Site Request Forgery
94. CSS	-	Cascading Style Sheets
95. CSS	-	Closed Source Software
96. CSS	-	Content-Scrambling System
97. CSS	-	Cross-Site Scripting
98. CSSM	-	Content Standards for Spatial Metadata
99. CSV	-	Comma-Separated Value/Variable
100. CT	-	Computerized Tomography
101. CTAN	-	Comprehensive TeX Archive Network
102. CTCP	-	Client-To-Client Protocol
103. CTI	-	Computer Telephony Integration
104. CTM	-	Close To Metal
105. CTS	-	Clear To Send
106. CTSS	-	Compatible Time-Sharing System
107. CUA	-	Common User Access
108. CVS	-	Concurrent Versioning System

D

1. DAC	-	Digital-To-Analog Converter
2. DAC	-	Discretionary Access Control
3. DAO	-	Data Access Objects
4. DAO	-	Disk-At-Once
5. DAP	-	Directory Access Protocol
6. DARPA	-	Defense Advanced Research Projects Agency
7. DAT	-	Digital Audio Tape
8. DB	-	Database
9. DB server	-	Data base server
10. DBA	-	Database Administrator
11. DBCS	-	Double Byte Character Set
12. DBMS	-	Database Management System
13. DC (LAN)	-	Dual circuit LAN
14. DCC	-	Direct Client-to-Client
15. DCCA	-	Debian Common Core Alliance
16. DCE	-	Data Circuit-Terminating Equipment
17. DCL	-	Data Control Language
18. DCMI	-	Dublin Core Metadata Initiative
19. DCOM	-	Distributed Component Object Model
20. DCW	-	Digital Chart of the World



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21. DD	-	Double Density
22. DD	-	Design document
23. DDE	-	Dynamic Data Exchange
24. DDL	-	Data Definition Language
25. DDL	-	Data Definition Language
26. DDoS	-	Distributed Denial of Service
27. DDR	-	Double Data Rate
28. DEC	-	Digital Equipment Corporation
29. DES	-	Data Encryption Standard
30. DES	-	Data Encryption Standard
31. dev	-	device
32. DFA	-	Deterministic Finite Automaton
33. DFD	-	Data Flow Diagram
34. DFS	-	Depth-First Search
35. DGM	-	Digital Geospatial Metadata
36. DGPS	-	Differential Global Positioning System
37. DHCP	-	Dynamic Host Configuration Protocol
38. DHTML	-	Dynamic HTML
39. DID	-	Direct Inward System Access
40. DIGEST standard	-	Digital Geographic Information Working GroupExchange
41. DIME	-	Dual Independent Map Encoding
42. DIMM	-	Dual Inline Memory Module
43. DIN	-	Deutsches Institut für Normung
44. DIP	-	Dual In-line Package
45. DIP	-	Digital Image Processing
46. DIVX	-	Digital Video Express
47. DKIM	-	Domain Keys Identified Mail
48. DL	-	Download
49. DLG	-	Digital Line Graph
50. DLL	-	Dynamic Link Library
51. DLP	-	Digital Light Processing
52. DMA	-	Direct Memory Access
53. DMCA	-	Digital Millennium Copyright Act
54. DML	-	Data Manipulation Language
55. DMR	-	Dennis M. Ritchie
56. DN	-	Distinguished Name
57. DND	-	Drag-and-Drop
58. DNIS	-	Dialed Number Identification Service
59. DNS	-	Domain Name System
60. DNSBL	-	DNS-based blacklist services



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- 61. DOCSIS - **Data Over Cable Service Interface Specification**
- 62. DOM - **Document Object Model**
- 63. DoS - **Denial of Service**
- 64. DOS - **Disk Operating System**
- 65. DoS - **Denial Of Service / Disk Operating System**
- 66. DP - **Dot Pitch**
- 67. DPI - **Dots Per Inch**
- 68. DPMI - **DOS Protected Mode Interface**
- 69. DPMS - **Display Power Management Signaling**
- 70. DRAM - **Dynamic Random Access Memory**
- 71. DRI - **Direct Rendering Infrastructure**
- 72. DRM - **Digital Rights Management**
- 73. DRM - **Direct Rendering Manager**
- 74. DSCP - **Diff Serv Code Points**
- 75. DSDL - **Document Schema Definition Languages**
- 76. DSDM - **Dynamic Systems Development Method**
- 77. DSL - **Digital Subscriber Line**
- 78. DSL - **Domain-Specific Language**
- 79. DSLAM - **Digital subscriber line access multiplexer**
- 80. DSN - **Database Source Name (ODBC)**
- 81. DSN - **Dataset Name? (OS/390)**
- 82. DSP - **Digital Signal Processor**
- 83. DSSSL - **Document Style Semantics and Specification Language**
- 84. DTD - **Document Type Definition**
- 85. DTE - **Data Terminal Equipment**
- 86. DTP - **Desktop Publishing**
- 87. DTR - **Data Terminal Ready**
- 88. DTR - **Distribution transformers**
- 89. DVD - **Digital Versatile Disc**
- 90. DVD - **Digital Video Disc**
- 91. DVD-R - **DVD-Recordable**
- 92. DVD-ROM - **DVD-Read Only Memory**
- 93. DVD-RW - **DVD-Rewritable**
- 94. DVI - **Digital Visual Interface**
- 95. DVMRP - **Distance Vector Multicast Routing Protocol**
- 96. DVR - **Digital Video Recorder (see also PVR)**
- 97. DXF - **Digital Exchange Format**

E

- 1. EAI - **Enterprise Application Integration**



TAMIL NADU ELECTRICITY BOARD
SRS DOCUMENT FOR APPOINTMENT OF IT IMPLEMENTATION AGENCY

- | | | |
|------------|---|---|
| 2. EAP | - | Extensible Authentication Protocol |
| 3. EBCDIC | - | Extended Binary Coded Decimal Interchange Code |
| 4. EBML | - | Extensible Binary Meta Language |
| 5. ECC | - | Elliptic Curve Cryptography |
| 6. ECMA | - | European Computer Manufacturers Association |
| 7. ECP | - | Enhanced/Extended Capabilities Port |
| 8. EDI | - | Electronic Data Interchange |
| 9. EDIFACT | - | Electronic Data Interchange For Administration, Commerce and Transport |
| 10. EDO | - | Extended Data Out |
| 11. EDSAC | - | Electronic Delay Storage Automatic Computer |
| 12. EDVAC | - | Electronic Discrete Variable Automatic Computer |
| 13. EEPROM | - | Electrically-Eraseable Programmable Read-Only Memory |
| 14. EFF | - | Electronic Frontier Foundation |
| 15. EFI | - | Extensible Firmware Interface |
| 16. EFM | - | Eight-to-Fourteen Modulation |
| 17. EGA | - | Enhanced Graphics Array |
| 18. EGP | - | Exterior Gateway Protocol |
| 19. EIA | - | Electronic Industries Association |
| 20. EID | - | electronic ID card |
| 21. EIDE | - | Enhanced IDE |
| 22. EIFOV | - | Effective Instantaneous Field of View |
| 23. EIGRP | - | Enhanced Interior Gateway Routing Protocol |
| 24. EISA | - | Extended Industry Standard Architecture |
| 25. ELF | - | Executable and Linkable Format |
| 26. ELF | - | Extremely Low Frequency |
| 27. ELFEXT | - | Equal Level Far-End Crosstalk |
| 28. ELM | - | Electronic Mail |
| 29. EMACS | - | Editor Macros |
| 30. EMI | - | Electromagnetic Interference |
| 31. EMS | - | Expanded Memory Specification |
| 32. ENIAC | - | Electronic Numerical Integrator And Computer |
| 33. EOF | - | End of File |
| 34. EOL | - | End of Life |
| 35. EOM | - | End of Message |
| 36. EOS | - | Earth Observation Satellite |
| 37. EPP | - | Enhanced Parallel Port |
| 38. EPROM | - | Eraseable Programmable Read-Only Memory |
| 39. ERIN | - | Environmental Resources Information Network |
| 40. ERP | - | Enterprise Resource Planning |
| 41. ERTL | - | Electronics Regional Test Lab. |



- 42. ESCON - Enterprise **S**ystems **C**onnection
- 43. ESD - Electro**s**tatic **D**ischarge
- 44. ESR - Eric **S**teven **R**aymond
- 45. ETL - **E**xtract, **T**ransform, **L**oad
- 46. EUC - **E**xtended **U**nix **C**ode
- 47. EULA - **E**nd **U**ser **L**icense **A**greement
- 48. EUROGI - European Umbrella Organisation for Geographic Information

F

- 1. FAP - **F**ORTRAN **A**ssembly **P**rogram
- 2. FAQ - **F**requently **A**sksed **Q**uestions
- 3. FAT - **F**ile **A**llocation **T**able
- 4. FBDIMM - **F**ully **B**uffered **D**ual **I**nline **M**emory **M**odule
- 5. FC-AL - **F**iber **C**hannel **A**rbitrated **L**oop
- 6. FCB - **F**ile **C**ontrol **B**lock
- 7. FCC - Federal Communications Commission
- 8. FDD - **F**loppy **D**isk **D**rive
- 9. FDDI - **F**iber **D**istributed **D**ata **I**nterface
- 10. FDMA - **F**requency-**D**ivision **M**ultiple **A**ccess
- 11. FEC - **F**orward **E**rror **C**orrection
- 12. FEMB - **F**ront-**E**nd **M**otherboard
- 13. FET - **F**ield **E**ffect **T**ransistor
- 14. FGCC - Federal Geodetic Control Committee
- 15. FGDC - Federal Geographic Data Committee
- 16. FHS - **F**ilesystem **H**ierarchy **S**tandard
- 17. FICON - **F**iber **C**onnectivity
- 18. FIFO - **F**irst **I**n **F**irst **O**ut
- 19. FIPS - Federal Information Processing Standard
- 20. FLAC - **F**ree **L**ossless **A**udio **C**odec
- 21. FLOPS - **F**loating-**P**oint **O**perations **P**er **S**econd
- 22. FLOSS - **F**ree/**L**ibre/**O**pen **S**ource **S**oftware
- 23. FOLDOC - **F**ree **O**n-line **D**ictionary **O**f **C**omputing
- 24. FOSDEM - **F**ree and **O**pen source **S**oftware **D**evelopers' **E**uropean **M**eeting
- 25. FOSI - **F**ormatted **O**utput **S**pecification **I**nstance
- 26. FOSS - **F**ree and **O**pen **S**ource **S**oftware
- 27. FPGA - **F**ield **P**rogrammable **G**ate **A**rray
- 28. FPU - **F**loating **P**oint **U**nit
- 29. FQDN - **F**ully **Q**ualified **D**omain **N**ame
- 30. FS - **F**ile **S**ystem
- 31. FSB - **F**ront **S**ide **B**us



- 32. FSF - **Free Software Foundation**
- 33. FSM - **Finite State Machine**
- 34. FSPF - **Fabric shortest path first**
- 35. FTP - **File Transfer Protocol**
- 36. FTTC - **Fiber To The Curb**
- 37. FTTH - **Fiber To The Home**
- 38. FTTP - **Fiber To The Premises**
- 39. FUCT - **Failed Under Continuous Test**
- 40. FUD - **Fear Uncertainty Doubt**
- 41. FWS - **Folding White Space**

G

- 1. G11N - **Globalization**
- 2. GAM - **Geographical Analysis Machine**
- 3. Gb - **Gigabit**
- 4. GB - **Gigabyte**
- 5. GBF/DIME - **Geographic Base File/Dual Independent Map Encoding**
- 6. GCC - **GNU Compiler Collection (formerly GNU C Compiler)**
- 7. GCJ - **GNU Compiler for Java**
- 8. GCR - **Group Code Recording**
- 9. GDB - **GNU Debugger**
- 10. GDI - **Graphics Device Interface**
- 11. GFDL - **GNU Free Documentation License**
- 12. GIF - **Graphics Interchange Format**
- 13. GIGO - **Garbage In, Garbage Out**
- 14. GIMP - **GNU Image Manipulation Program**
- 15. GIMPS - **Great Internet Mersenne Prime Search**
- 16. GIRAS - **Geographic Information Retrieval and Analysis**
- 17. GIS - **Geographic Information System**
- 18. GKS - **Graphics Kernel System**
- 19. GLUT - **OpenGL Utility Toolkit**
- 20. GNOME - **GNU Network Object Model Environment**
- 21. GNSSCB - **Next-Generation Secure Computing Base**
- 22. GNU - **GNU's Not Unix**
- 23. GOMS - **Goals, Operators, Methods, and Selection rules**
- 24. GPG - **GNU Privacy Guard**
- 25. GPGPU - **General-Purpose Computing on Graphics Processing Units**
- 26. GPIB - **General-Purpose Instrumentation Bus**
- 27. GPL - **General Public License**
- 28. GPL - **General-Purpose Language**



TAMIL NADU ELECTRICITY BOARD
SRS DOCUMENT FOR APPOINTMENT OF IT IMPLEMENTATION AGENCY

29. GPRS	-	General Packet Radio Service / Global Positioning Remote
30. GPS	-	Global Positioning System
31. GPT	-	GUID Partition Table
32. GPU	-	Graphics Processing Unit
33. GRASS	-	Geographic Resources Analysis Support System
34. GRUB	-	Grand Unified Boot-Loader
35. GSM	-	Global System for Mobile Communications
36. GSS	-	Grid Sub Station
37. GTK+	-	GIMP Toolkit
38. GUI	-	Graphical User Interface
39. GUID	-	Globally Unique Identifier
40. GWT	-	Google Web Toolkit

H

1. HA	-	High Availability
2. HAL	-	Hardware Abstraction Layer
3. HBA	-	Host Bus Adapter
4. HCI	-	Human Computer Interaction
5. HD	-	High Density
6. HDD	-	Hard Disk Drive
7. HD-DVD	-	High Definition DVD
8. HDL	-	Hardware Description Language
9. HDLC	-	High-Level Data Link Control
10. HF	-	High Frequency
11. HHC	-	Hand Held Computers
12. HDD	-	Hybrid Hard Drive
13. HID	-	Human Interface Device
14. HIG	-	Human Interface Guidelines
15. HIPS	-	Host based Intrusion prevention system
16. HIRD	-	Hurd of Interfaces Representing Depth
17. HMA	-	High Memory Area
18. HMI	-	Human-Machine Interface
19. HP	-	Hewlett-Packard
20. HPC	-	High-Performance Computing
21. HPFS	-	High Performance File System
22. HRV	-	High Resolution Visible
23. HT	-	Hyper Threading
24. HTM	-	Hierarchical Temporal Memory
25. HTML	-	Hypertext Markup Language
26. HTML	-	HyperText Markup Language



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SRS DOCUMENT FOR APPOINTMENT OF IT IMPLEMENTATION AGENCY

- 27. HTTP - **H**ypertext **T**ransport **P**rotocol
- 28. HTTPd - **H**ypertext **T**ransport **P**rotocol **D**aemon
- 29. HTX - **H**yper**T**ransport **eX**pansion
- 30. HURD - **H**ird of **U**nix-**R**eplacing **D**aemons
- 31. HV - **H**igh **V**oltage
- 32. HVD - **H**olographic **V**ersatile **D**isc
- 33. Hz - **H**ertz

I

- 1. I/O - **I**nput/**O**utput
- 2. I18N - **I**nternationalization
- 3. I²C - **I**nter-**I**ntegrated **C**ircuit
- 4. IAC - **I**nter application **C**ommunication
- 5. IANA - **I**nternet **A**ssigned **N**umbers **A**uthority
- 6. iBCS - **I**ntel **B**inary **C**ompatibility **S**tandard
- 7. IBM - **I**nternational **B**usiness **M**achines
- 8. IC - **I**ntegrated **C**ircuit
- 9. ICANN - **I**nternet **C**orporation for **A**ssigned **N**ames and **N**umbers
- 10. ICE - **I**n-**C**ircuit **E**mulator
- 11. ICE - **I**ntrusion **C**ountermeasure **E**lectronics
- 12. ICMP - **I**nternet **C**ontrol **M**essage **P**rotocol
- 13. ICP - **I**nternet **C**ache **P**rotocol
- 14. ICSA - **I**nternational **C**omputer security **A**ssociation
- 15. ICT - **I**nformation and **C**ommunication **T**echnology
- 16. IDE - **I**ntegrated **D**evelopment **E**nvironment
- 17. IDE - **I**ntegrated **D**rive **E**lectronics
- 18. IDF - **I**ntermediate **D**istribution **F**rame
- 19. IDL - **I**nterface **D**efinition **L**anguage
- 20. IDMS - **I**ntelligent **D**isplay **M**anagement **S**ystem
- 21. IDRP - **I**nter-**D**omain **R**outing **P**rotocol
- 22. IDS - **I**ntrusion **D**etection **S**ystem
- 23. IE - **I**nternet **E**xplorer
- 24. IEC - **I**nternational **E**lectrotechnical **C**ommission
- 25. IEEE - **I**nstitute of **E**lectrical and **E**lectronics **E**ngineers
- 26. IETF - **I**nternet **E**ngineering **T**ask **F**orce
- 27. IFL - **I**ntegrated **F**acility for **L**inux
- 28. IFOV - **I**ntermediate **F**ield of **V**iew
- 29. IGDS - **I**nteractive **G**raphics **D**esign **S**oftware
- 30. IGES - **I**nternational **G**raphics **E**xchange **S**ystem
- 31. IGMP - **I**nternet **G**roup **M**anagement **P**rotocol



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SRS DOCUMENT FOR APPOINTMENT OF IT IMPLEMENTATION AGENCY

32.IGRP	-	Interior G ateway R outing P rotocol
33.IHV	-	Independent H ardware V endor
34.IIOP	-	Internet Inter- O rb P rotocol
35.IIS	-	Internet I nformation S ervices
36.IM	-	Instant M essaging
37.IMAP	-	Internet M essage A ccess P rotocol
38.IME	-	Input M ethod E ditor
39.IMS	-	Internet map server
40.INFOSEC	-	I nformation Systems S ecurity
41.IP	-	Intellectual P roperty
42.IP	-	Internet P rotocol
43.IPC	-	Inter- P rocess C ommunication
44.IPL	-	Initial P rogram L oad
45.IPP	-	Internet P rinting P rotocol
46.IPS	-	Intrusion prevention system
47.IPsec	-	Internet P rotocol s ecurity
48.IPsec	-	Internet Protocol Security
49.IPTV	-	Internet P rotocol T ele v ision
50.IPv6	-	Internet Protocol version 6
51.IPX	-	Internetwork P acket E xchange
52.IPX	-	Inter network Packet Exchange
53.IRC	-	Internet R elay C hat
54.IrDA	-	I nfrared D ata A ssociation
55.IRDS	-	Information Resource Dictionary System
56.IRQ	-	Interrupt R equ e st
57.IS	-	Internal systems
58.IS	-	Information S ystems
59.ISA	-	Industry S tandard A rchitecture
60.ISAM	-	Indexed S equential A ccess M ethod
61.ISDN	-	Integrated S ervices D igital N etwork
62.ISDN	-	Integrated Services Digital Network
63.ISO	-	International O rganization for S tandardization
64.ISO	-	International Standards Organization
65.ISO	-	International Organization for Standardization
66.ISP	-	Internet S ervice P rovider
67.ISPF	-	Interactive S ystem P roductivity F acility
68.ISR	-	Interrupt S ervice R outine
69.ISV	-	Independent S oftware V endor
70.IT	-	Information T echnology
71.ITU	-	International T elecommunication U nion
72.IVL	-	Independent VLAN Learning



73.IVRS - Interactive Voice Response System

J

1. J2CE - **Java 2 Cryptographic Edition**
2. J2EE - **Java 2 Enterprise Edition**
3. J2ME - **Java 2 Micro Edition**
4. J2SE - **Java 2 Standard Edition**
5. JAXB - **Java Architecture for XML Binding**
6. JAXP - **Java API for XML Processing**
7. JAX-RPC - **Java XML for Remote Procedure Calls**
8. JBOD - **Just a Bunch of Disks**
9. JCL - **Job Control Language**
10. JCP - **Java Community Process**
11. JDBC - **Java Database Connectivity**
12. JDK - **Java Development Kit**
13. JDS - **Java Desktop System**
14. JFC - **Java Foundation Classes**
15. JFET - **Junction Field-Effect Transistor**
16. JFS - **IBM Journaling Filesystem**
17. JINI - **Jini Is Not Initials**
18. JIT - **Just-In-Time**
19. JMS - **Java Message Service**
20. JMX - **Java Management Extensions**
21. JNDI - **Java Naming and Directory Interface**
22. JNI - **Java Native Interface**
23. JPEG - **Joint Photographic Experts Group**
24. JRE - **Java Runtime Environment**
25. JS - **JavaScript**
26. JSON - **JavaScript Object Notation**
27. JSP - **Jackson Structured Programming**
28. JSP - **Java Server Pages**
29. JTAG - **Joint Test Action Group**
30. JUG - **Java Users Group**
31. JVM - **Java Virtual Machine**
32. jwz - **Jamie Zawinski**

K

1. K&R - **Kernighan and Ritchie**



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- 2. KB - **Keyboard**
- 3. Kb - **Kilobit**
- 4. KB - **Kilobyte**
- 5. KB - **Knowledge Base**
- 6. KDE - **K Desktop Environment**
- 7. kHz - **Kilohertz**
- 8. KISS - **Keep It Simple, Stupid**
- 9. KVM - **Keyboard, Video, Mouse (switch)**

L

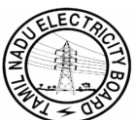
- 1. L10N - **Localization**
- 2. L2TP - **Layer Two Tunneling Protocol**
- 3. LAMP - **Linux Apache MySQL (Perl, PHP, or Python)**
- 4. LAN - **Local Area Network**
- 5. LAPB - **Link Access Procedure Balanced (protocol)**
- 6. LBA - **Logical Block Addressing**
- 7. LCD - **Liquid Crystal Display**
- 8. LCOS - **Liquid Crystal On Silicon**
- 9. LDAP - **Lightweight Directory Access Protocol**
- 10. LE - **Logical Extents**
- 11. LED - **Light-Emitting Diode**
- 12. LF - **Line Feed**
- 13. LF - **Low Frequency**
- 14. LFS - **Linux From Scratch**
- 15. LGPL - **[GNU] Lesser General Public License**
- 16. Lib - **Library**
- 17. LIF - **Low Insertion Force**
- 18. LIFO - **Last In First Out**
- 19. LILO - **Linux Loader**
- 20. LILO - **Loop-In-Loop-Out**
- 21. LIS - **Land Information System**
- 22. LKML - **Linux Kernel Mailing List**
- 23. LLC - **Logical Link Control**
- 24. LM - **LanManager**
- 25. LOC - **Lines of Code**
- 26. LPI - **Linux Professional Institute**
- 27. LSB - **Least Significant Bit**
- 28. LSB - **Linux Standard Base**
- 29. LSI - **Large-Scale Integration**
- 30. LTO - **Linear Tape Open**



31.LTR	-	Left-to-Right
32.LUG	-	Linux User Group
33.LUN	-	Logical Unit Number
34.LUT Look	-	Up Table
35.LV	-	Logical Volume
36.LVD	-	Low Voltage Differential
37.LVM	-	Logical Volume Management
38.LZW	-	Lempel-Ziv-Welch

M

1. M&C	-	Measurement and Control
2. MAC	-	Mandatory Access Control
3. MAC	-	Media Access Control
4. MAN	-	Metropolitan Area Network
5. MANET	-	Mobile Ad-Hoc Network
6. MAPI	-	Messaging Application Programming Interface
7. MAPS	-	Mail-Abuse Prevention Systems
8. Mb	-	Megabit
9. MB	-	Megabyte
10. MBC	-	Metering Billing and Collection
11. MBCS	-	Multi Byte Character Set
12. MBGP	-	Multicast Border Gateway Protocol
13. MBPS	-	Megabits/bytes per second
14. MBR	-	Master Boot Record
15. MCA	-	Micro Channel Architecture
16. MCO	-	Meter Change Order
17. MCPC	-	Multiple Channel per carrier
18. MCSA	-	Microsoft Certified System Administrator
19. MCSD	-	Microsoft Certified System Developer
20. MCSE	-	Microsoft Certified System Engineer
21. MD5	-	Message Digest Algorithm 5
22. MDA	-	Mail Delivery Agent
23. MDA	-	Model-Driven Architecture
24. MDA	-	Monochrome Display Adapter
25. MDF	-	Main distribution frame
26. MDI	-	Multiple Document Interface
27. MDL	-	Master document list
28. ME	-	[Windows] Millennium Edition
29. MEGRIN	-	Multi Purpose European Ground Related Information Network
30. MF	-	Medium Frequency



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31. MFC	-	Microsoft Foundation Classes
32. MFM	-	Modified Frequency Modulation
33. MGPT	-	Machine Generated Problem Tracking
34. MHz	-	Megahertz
35. MIB	-	Management Information Base
36. MICR	-	Magnetic Ink Character Reader
37. MIDI	-	Musical Instrument Digital Interface
38. MIMD	-	Multiple Instruction, Multiple Data
39. MIME	-	Multipurpose Internet Mail Extensions
40. MIMO	-	Multiple-Input Multiple-Output
41. MIPS	-	Microprocessor without Interlocked Pipeline Stages
42. MIPS	-	Million Instructions Per Second
43. MIS	-	Management Information Systems
44. MISD	-	Multiple Instruction, Single Data
45. MIT	-	Massachusetts Institute of Technology
46. MMDS	-	Mortality Medical Data System
47. MMI	-	Man Machine Interface.
48. MMIO	-	Memory-Mapped I/O
49. MMORPG	-	Massively Multiplayer Online Role-Playing Game
50. MMU	-	Memory Management Unit
51. MMX	-	Multi-Media Extensions
52. MNG	-	Multiple-image Network Graphics
53. MoBo	-	Motherboard
54. MOM	-	Message oriented middleware
55. MOO	-	MUD Object Oriented
56. MOSFET	-	Metal-Oxide Semiconductor FET
57. MOSPF	-	Multicast Open Shortest Path First
58. MOTD	-	Message Of The Day
59. MPAA	-	Motion Picture Association of America
60. MPEG	-	Motion Pictures (Coding) Experts Group
61. MPL	-	Mozilla Public License
62. MPLS	-	Multi-Protocol Label Switching
63. MPO	-	Multi Fibre Push On (Connector)
64. MPU	-	Microprocessor Unit
65. MS	-	Memory Stick
66. MS	-	Microsoft
67. MSA	-	Mail Submission Agent
68. MSB	-	Most Significant Bit
69. MSDN	-	Microsoft Developer Network
70. MS	-	DOS-Microsoft DOS
71. MSI	-	Medium-Scale Integration



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72. MSS	-	Multispectral Scanner
73. MT	-	M achine T ranslation
74. MTA	-	M ail T ransfer A gent
75. MTBF	-	Mean time between failure
76. MTBF	-	Mean Time Between Failures
77. MTP	-	Media Termination Point
78. MTTR	-	Mean time to repair
79. MTU	-	M aximum T ransmission U nit
80. MUA	-	M ail U ser A gent
81. MUD	-	M ulti- U ser D ungeon
82. MVC	-	M odel- V iew- C ontroller
83. MVP	-	M ost V aluable P rofessional
84. MVS	-	M ultiple V irtual S torage
85. MX	-	M ail exchange

N

1. NACK	-	N egative A CKnowledgement
2. NAD	-	North American Datum
3. NAK	-	N egative A c K nowledgement Character
4. NAS	-	N etwork- A ttached S torage
5. NAT	-	N etwork A ddress T ranslation
6. NCP	-	N et W are C ore P rotocol
7. NCQ	-	N ative C ommand Q ueuing
8. NCSA	-	N ational C enter for S upercomputing A pplications
9. NDPS	-	N ovell D istributed P rint S ervices
10. NDS	-	N ovell D irectory S ervices
11. NEC	-	Nippon Electric Company
12. NEP	-	N etwork E quipment P rovider
13. NEXT	-	N ear- E nd C ross T alk
14. NFA	-	N ondeterministic F inite A utomaton
15. NFAS	-	Non-Facility Associated Signaling
16. NFS	-	N etwork F ilesystem
17. NGD	-	National GeoSpatial Database
18. NI	-	N ational I nstruments
19. NIC	-	N etwork I nterface C ard
20. NIDS	-	Network Intrusion Detection System [Unisys]
21. NIM	-	N o I nternal M essage
22. NIO	-	N ew I/O
23. NIPS	-	Network I/Os Per Second
24. NIS	-	Network Information Service [Unix]



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25. NIST	-	N ational I nstitute of S tandards and T echnology
26. NLIS	-	National Land Information Service
27. NLP	-	N atural L anguage P rocessing
28. NLS	-	N ational L anguage S upport
29. NMI	-	N on- M askable I nterrupt
30. NMS	-	Network Management System [Novell]
31. NNTP	-	N etwork N ews T ransfer P rotocol
32. NOC	-	N etwork O perations C enter
33. NOCS	-	Network Operations Centre System
34. NOP	-	N o O peration
35. NOS	-	N etwork O perating S ystem
36. NP	-	N on-Deterministic P olynomial-Time
37. NPL	-	N etscape P ublic L icense
38. NPU	-	N etwork P rocessing U nit
39. NS	-	N etscape
40. NSA	-	N ational S ecurity A gency
41. NSPR	-	N etscape P ortable R untime
42. NSS	-	N ame S ervice S witch
43. NSS	-	N etwork S ecurity S ervices
44. NSS	-	N ovell S torage S ervice
45. NT (Windows)-	-	N ew T echnology
46. NTF	-	National Transfer Format
47. NTFS	-	N T F ilesystem
48. NTLM	-	N T L an M anager
49. NTP	-	N etwork T ime P rotocol
50. NUMA	-	N on- U niform M emory A ccess
51. NURBS	-	N onuniform R ational B - S pline
52. NVRAM	-	N on- V olatile R andom A ccess M emory

O

1. OASIS	-	O rganization for the A dvancement of S tructured I nformation S tandards
2. OCR	-	Optical Character Recognition
3. ODBC	-	O pen D atabase C onnectivity
4. ODBC	-	Open Database Communication
5. ODBC	-	Open database architecture
6. OEEPE	-	Organisation Europeene d'Etudes en Photogrammetrie Experimentale
7. OEM	-	O riginal E quipment M anufacturer
8. OFNP	-	Optical fiber, nonconductive, plenum



TAMIL NADU ELECTRICITY BOARD
SRS DOCUMENT FOR APPOINTMENT OF IT IMPLEMENTATION AGENCY

- | | | |
|------------|---|---|
| 9. OFTC | - | Open and Free Technology Community |
| 10. OGC | - | Open GIS Consortium |
| 11. OGC | - | Open Geospatial Consortium |
| 12. OGIS | - | Open GeoData Interoperability Specification |
| 13. OLAP | - | Online Analytical Processing |
| 14. OLE DB | - | Object Linking and Embedding database |
| 15. OLE | - | Object Linking and Embedding [Microsoft] |
| 16. OLED | - | Organic Light Emitting Diode |
| 17. OLPC | - | One Laptop per Child |
| 18. OLTP | - | Online Transaction Processing |
| 19. OM | - | Object Manager |
| 20. OMG | - | Object Management Group |
| 21. OO | - | Object-Oriented |
| 22. OO | - | Open Office |
| 23. OOo | - | OpenOffice.org |
| 24. OOP | - | Object-Oriented Programming |
| 25. OPML | - | Outline Processor Markup Language |
| 26. ORB | - | Object Request Broker |
| 27. ORM | - | Object-Relational Mapping |
| 28. OS | - | Open Source |
| 29. OS | - | Operating System |
| 30. OSCON | - | O'Reilly Open Source Convention |
| 31. OSDN | - | Open Source Developer Network |
| 32. OSF | - | Open Systems Foundation |
| 33. OSI | - | Open Source Initiative |
| 34. OSI | - | Open Systems Interconnection |
| 35. OSP | - | optical Storage Processor |
| 36. OSPF | - | Open Shortest Path First |
| 37. OSPF | - | Open Shortest Path First |
| 38. OSS | - | Open Sound System |
| 39. OSS | - | Open-Source Software |
| 40. OSS | - | Operational Support Systems |
| 41. OSTF | - | Ordnance Survey Transfer Format |
| 42. OSTG | - | Open Source Technology Group (formerly OSDN) |
| 43. OUI | - | Organizationally Unique Identifier |

P

- | | | |
|--------|---|---|
| 1. P2P | - | Peer-To-Peer |
| 2. PAN | - | Personal Area Network |
| 3. PAP | - | Password Authentication Protocol |



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4. PARC	-	Palo Alto Research Center
5. PAT	-	Port Address Translation
6. PATA	-	Parallel Advanced Technology Attachment
7. PBCCH	-	Packet Broadcast Control Channel
8. PBX	-	Private Branch Exchange
9. PC	-	Personal Computer
10. PCB	-	Printed Circuit Board
11. PCB	-	Process Control Block
12. PCCCH	-	Packet Common Control Channel
13. PCI	-	Peripheral Component Interconnect
14. PCIe	-	PCI Express
15. PCM	-	Pulse-Code Modulation
16. PCMCIA	-	Personal Computer Memory Card International Association
17. PCRE	-	Perl Compatible Regular Expressions
18. PD	-	Public Domain
19. PDA	-	Personal Digital Assistant
20. PDF	-	Portable Document Format
21. PDP	-	Programmed Data Processor
22. PE	-	Physical Extents
23. PEAP	-	Protected Extensible Authentication Protocol
24. PERL	-	Practical Extraction and Reporting Language
25. PGA	-	Pin Grid Array
26. PGM	-	Pragmatic General Multicasting
27. PGP	-	Pretty Good Privacy
28. PHB	-	Per-hop Behavior
29. PHIGS	-	Programmer Hierarchical Interactive Graphics System
30. PHP	-	PHP: Hypertext Preprocessor
31. PIC	-	Peripheral Interface Controller
32. PID	-	Process ID
33. PID	-	Proportional-Integral -Derivative
34. PIM	-	Protocol-Independent Multicast
35. PIM	-	Personal Information Manager
36. PINE	-	Program for Internet News & Email
37. PIO	-	Programmed Input/Output
38. PKCS	-	Public Key Cryptography Standards
39. PKI	-	Public Key Infrastructure
40. PL/I	-	Programming Language One
41. PL/M	-	Programming Language for Microcomputers
42. PL/P	-	Programming Language for Prime
43. PLC	-	Power Line Communication
44. PLC	-	Programmable Logic Controller



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45. PLD	-	Programmable Logic Device
46. PLT	-	Power Line Telecoms
47. PMM	-	Personal Memory Manager
48. PMM	-	POST Memory Manager
49. PMT	-	Pole Mounted Transformer
50. PNG	-	Portable Network Graphics
51. PnP	-	Plug-and-Play
52. POD	-	Ping-of-death
53. PoE	-	Power over Ethernet
54. POP	-	Point of Presence
55. POP3	-	Post Office Protocol v3
56. POSIX	-	Portable Operating System Interface
57. POSIX	-	Portable Operating System Interface
58. POST	-	Power-On Self Test
59. PP	-	Project plan
60. PPC	-	PowerPC
61. PPI	-	Pixels Per Inch
62. PPP	-	Point-to-Point Protocol
63. PPPoA	-	PPP over ATM
64. PPPoE	-	PPP over Ethernet
65. PPTP	-	Point-to-Point Tunneling Protocol [Microsoft]
66. PS	-	PostScript
67. PS ACR	-	Power Sum Attenuation to Cross Talk Ratio
68. PS NEXT	-	Power Sum Near End Cross Talk
69. PS/2	-	Personal System/2
70. PSELFEXT	-	Power Sum Equal Level Far-End Crosstalk
71. PSTN	-	Public Switched Telephone Network
72. PSU	-	Power Supply Unit
73. PSVI	-	Post-Schema-Validation Infoset
74. PV	-	Physical Volume
75. PVG	-	Physical Volume Group
76. PVR	-	Personal Video Recorder
77. PXE	-	Preboot Execution Environment
78. PXI	-	PCI Extensions for Instrumentation

Q

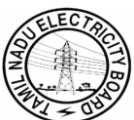
1. QA	-	Quality Assurance
2. QDR	-	Quad Data Rate
3. QFP	-	Quoted For Permanence.
4. QoS	-	Quality of Service



- 5. QoS - Quality Of Service
- 6. QOTD - **Quote of the Day**
- 7. Qt - **Quasar Toolkit**
- 8. QTAM - **Queued Telecommunications Access Method (an IBM OS/360 API)**

R

- 1. RACF - **Resource Access Control Facility**
- 2. RAD - **Rapid Application Development**
- 3. RADAR - Radio Detecting and Ranging
- 4. RADIUS - **Remote Authentication Dial In User Service**
- 5. RADIUS - Remote Authentication Dial - In User Service
- 6. RAID - **Redundant Array of Independent Disks**
- 7. RAID - **Redundant Array of Inexpensive Disks**
- 8. RAIT - **Redundant Array of Inexpensive Tapes**
- 9. RAM - **Random Access Memory**
- 10. RAR - Type of archive file run on WinRAR
- 11. RARP - **Reverse Address Resolution Protocol**
- 12. RAS - Reliability, Availability, Serviceability
- 13. RC - **Release Candidate**
- 14. RC - **Run Commands**
- 15. RC - **Runtime Configuration**
- 16. RCO - Reconnection Order
- 17. RCS - **Revision Control System**
- 18. RDBMS - Relational Database Management System
- 19. RDF - **Resource Description Framework**
- 20. RDM - Relations Database Management
- 21. RDS - Relations Database System
- 22. RED - Random Early Detection
- 23. REFAL - **REcursive Functions Algorithmic Language**
- 24. REGEX - **Regular Expression**
- 25. REST - **Representational State Transfer**
- 26. RF - **Radio Frequency**
- 27. RF - Radio Frequency Interference
- 28. RFC - **Request For Comments**
- 29. RFE - **Request For Enhancement**
- 30. RFI - **Radio Frequency Interference**
- 31. RFID - **Radio Frequency Identification**
- 32. RFM - Request-for-modification
- 33. RGB - **Red, Green, Blue**
- 34. RGBA - **Red, Green, Blue, Alpha**

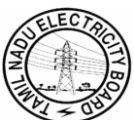


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SRS DOCUMENT FOR APPOINTMENT OF IT IMPLEMENTATION AGENCY

35. RHEL	-	Red Hat Enterprise Linux
36. RHL	-	Red Hat Linux
37. RIA	-	Rich Internet Application
38. RIAA	-	Recording Industry Association of America
39. RIP	-	Raster Image Processor
40. RIP	-	Routing Information Protocol
41. RISC	-	Reduced Instruction Set Computer
42. RLE	-	Run - Length Encoding
43. RLL	-	Run Length Limited
44. RMAN	-	Recovery Manager
45. RMI	-	Remote Method Invocation
46. RMON	-	Remote Monitor/Monitoring
47. RMS	-	Richard Matthew Stallman
48. ROM	-	Read Only Memory
49. ROMB	-	Read - Out Motherboard
50. RPC	-	Remote Procedure Call
51. RPG	-	Report Program Generator
52. RPM	-	RPM Package Manager
53. RPS	-	Remote Processing System
54. RSA	-	Rivest Shamir Adleman
55. RSA	-	RSA algorithm for public - key encryption.
56. RSI	-	Repetitive Strain Injury
57. RSS	-	Rich Site Summary, RDF Site Summary, or Really Simple Syndication
58. RSVP	-	Resource Reservation Protocol
59. RTC	-	Real - Time Clock
60. RTE	-	Real - Time Enterprise
61. RTL	-	Right - to - Left
62. RTOS	-	Real Time Operating System
63. RTS	-	Ready To Send

S

1. S/MIME	-	Secure/Multipurpose Internet Mail Extensions
2. SAN	-	Storage Area Network
3. SAR	-	Search And Replace[1]
4. SATA	-	Serial Advanced Technology Attachment
5. SAX	-	Simple API for XML
6. SBIN	-	superuser binary
7. SBP-2	-	Serial Bus Protocol 2
8. SCADA	-	Supervisory Control And Data Acquisition



TAMIL NADU ELECTRICITY BOARD
SRS DOCUMENT FOR APPOINTMENT OF IT IMPLEMENTATION AGENCY

9. SCID	-	Source Code in Database
10. SCM	-	Software Configuration Management
11. SCN	-	Service Connection Number
12. SCO	-	Service Connection Order
13. SCP	-	Secure Copy
14. SCPC	-	Single Channel Per Carrier
15. SCPI	-	Standard Commands for Programmable Instrumentation
16. SCSI	-	Small Computer System Interface
17. SD	-	Secure Digital
18. SDDL	-	Security Descriptor Definition Language
19. SDI	-	Single Document Interface
20. SDIO	-	Secure Digital Input Output
21. SDK	-	Software Development Kit
22. SDL	-	Simple DirectMedia Layer
23. SDML	-	Spatial Data Manipulation Language
24. SDN	-	Service Delivery Network
25. SDR	-	Software - Defined Radio
26. SDRAM	-	Synchronous Dynamic Random Access Memory
27. SDSL	-	Symmetric DSL
28. SDTS	-	Spatial Data Transfer Standard
29. SE	-	Single Ended
30. SEAL	-	Semantics - directed Environment Adaptation Language
31. SEI	-	Software Engineering Institute Sensing
32. SFTP	-	Secure FTP
33. SFTP	-	Simple File Transfer Protocol
34. SFTP	-	SSH File Transfer Protocol
35. SGI	-	Silicon Graphics, Incorporated
36. SGML	-	Standard Generalized Markup Language
37. SHA	-	Secure Hash Algorithm
38. SIF	-	Standard Interchange Format
39. SIGCAT	-	Special Interest Group on CD - ROM Applications and Technology
40. SIGGRAPH	-	Special Interest Group on Graphics
41. SIMD	-	Single Instruction, Multiple Data
42. SIMM	-	Single Inline Memory Module
43. SINES	-	Spatial Information Enquiry Service
44. SIP	-	Session Initiation Protocol
45. SIP	-	Supplementary Ideographic Plane
46. SISD	-	Single Instruction, Single Data
47. SLA	-	Service Level Agreement
48. SLD	-	Single Line Diagram



TAMIL NADU ELECTRICITY BOARD
SRS DOCUMENT FOR APPOINTMENT OF IT IMPLEMENTATION AGENCY

49. SLI	-	Scalable Link Interface
50. SLIP	-	Serial Line Internet Protocol
51. SLM	-	Service Level Management
52. SLOC	-	Source Lines of Code
53. SMA	-	SubMiniature version A
54. SMB	-	Server Message Block
55. SMBIOS	-	System Management BIOS
56. SMC	-	SMC Networks (company)
57. SMI	-	System Management Interrupt
58. SMIL	-	Synchronized Multimedia Integration Language
59. SMP	-	Supplementary Multilingual Plane
60. SMP	-	Symmetric Multi - Processing
61. SMP	-	Symmetric Multiprocessor
62. SMS	-	Short Message Service
63. SMS	-	Systems Management Server
64. SMS	-	SAN MANAGEMENT SOFTWARE
65. SMT	-	Simultaneous Multithreading
66. SMTP	-	Simple Mail Transfer Protocol
67. SNA	-	Systems Network Architecture
68. SNIA	-	Storage Networking Industry Association
69. SNMP	-	Simple Network Management Protocol
70. SOA	-	Service - Oriented Architecture
71. SOAP	-	Simple Object Access Protocol
72. SoC	-	System - on - a - Chip
73. SO	-	DIMM - Small Outline DIMM
74. SOHO	-	Small Office/Home Office
75. SOI	-	Silicon On Insulator
76. SP	-	Service Pack
77. SPA	-	Software Process Assessment
78. SPA	-	Single Page Application
79. SPARC	-	Scalable Processor Architecture
80. SPF	-	Sender Policy Framework
81. SPI	-	Serial Peripheral Interface
82. SPI	-	Stateful Packet Inspection
83. SPMD	-	Single Program, Multiple Data
84. SPOT	-	Satellite Pour l'Observation de la Terre
85. SQL	-	Structured Query Language
86. SQL/MM	-	Structured Query Language/MultiMedia
87. SRAM	-	Static Random Access Memory
88. SRG	-	Standardised Raster Graphic
89. SSD	-	Software Specification Document



TAMIL NADU ELECTRICITY BOARD
SRS DOCUMENT FOR APPOINTMENT OF IT IMPLEMENTATION AGENCY

90. SSH	-	Secure Shell
91. SSI	-	Server Side Includes
92. SSI	-	Single - System Image
93. SSI	-	Small - Scale Integration
94. SSID	-	Service Set Identifier
95. SSL	-	Secure Socket Layer
96. SSP	-	Supplementary Special - purpose Plane
97. STEP	-	Standard for the Exchange of Data
98. SU	-	superuser
99. SUS	-	Single UNIX Specification
100. SVC	-	Scalable Video Coding
101. SVD	-	Structured Vlsi Design Methodology
102. SVG	-	Scalable Vector Graphics
103. SVGA	-	Super Video Graphics Array
104. SWT	-	Standard Widget Toolkit

T

1. TACACS+	-	Terminal Access Controller Access Control System
2. TAO	-	Track – at - Once
3. TB	-	Terabyte
4. Tcl	-	Tool Command Language
5. TCP	-	Transmission Control Protocol
6. TCP/IP	-	Transmission Control Protocol/Internet Protocol
7. TCU	-	Telecommunication Control Unit
8. TDMA	-	Time Division Multiple Access
9. temp	-	Temporary (variable, file, directory, etc.)
10. TEOS	-	Trusted Email Open Standard
11. TFT	-	Thin Film Transistor
12. TFT	-	Thin - Film Transistor
13. TI	-	Texas Instruments
14. TIA	-	Telecommunications Industry Association
15. TIGER	-	Topologically Integrated Geocoding and Referencing
16. TIN	-	Triangulated Irregular Network
17. Tk	-	
18. TLA	-	Three - Letter Acronym
19. TLD	-	Top - Level Domain
20. TLS	-	Thread - Local Storage



TAMIL NADU ELECTRICITY BOARD
SRS DOCUMENT FOR APPOINTMENT OF IT IMPLEMENTATION AGENCY

- 21. TM - Thematic Mapper
- 22. TMP - Temporary (variable, file, directory, etc.)
- 23. TNC - Terminal Node Controller
- 24. TNC - Threaded Neill - Concelman
- 25. TSO - Time Sharing Option
- 26. TSP - Traveling Salesman Problem
- 27. TSR - Terminate and Stay Resident
- 28. TTA - True Tap Audio
- 29. TTL - Time To Live
- 30. TTL - Transistor - Transistor Logic
- 31. TTS - Text - to - Speech
- 32. TTY - Teletype
- 33. TUCOWS - The Ultimate Collection of Winsock Software
- 34. TUG - TeX Users Group

U

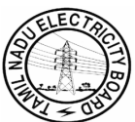
- 1. UAAG - User Agent Accessibility Guidelines
- 2. UART - Universal Asynchronous Receiver Transmitter
- 3. UCS - Universal Character Set
- 4. UDDI - Universal Description, Discovery, and Integration
- 5. UDMA - Ultra DMA
- 6. UDP - User Datagram Protocol
- 7. UE - User Experience
- 8. UEFI - Unified Extensible Firmware Interface
- 9. UHF - Ultra High Frequency
- 10. UI - User Interface
- 11. UL - Upload
- 12. ULA - Uncommitted Logic Array
- 13. UMA - Upper Memory Area
- 14. UMB - Upper Memory Block
- 15. UML - Unified Modeling Language
- 16. UML - User - Mode Linux
- 17. UMPC - Ultra - Mobile Personal Computer
- 18. UNC - Universal Naming Convention
- 19. UPS - Uninterruptible Power Supply
- 20. URI - Uniform Resource Identifier
- 21. URL - Uniform Resource Locator
- 22. URN - Uniform Resource Name
- 23. USB - Universal Serial Bus
- 24. USR - U.S. Robotics



25. USR	-	User
26. UTC	-	Coordinated Universal Time
27. UTF	-	Unicode Transformation Format
28. UTM	-	Universal Transverse Mercator
29. UTP	-	Unshielded twisted pair
30. UUCP	-	Unix to Unix Copy s
31. UUID	-	Universally Unique Identifier
32. UVC	-	Universal Virtual Computer

V

1. VAX	-	Virtual Address eXtension
2. VB	-	Visual Basic
3. VBA	-	Visual Basic for Applications
4. VBS	-	Visual Basic Script
5. VCPI	-	Virtual Control Program Interface
6. VEE	-	Validation, Editing and Estimation
7. VESA	-	Video Electronics Standards Association
8. VFAT	-	Virtual FAT
9. VFS	-	Virtual File System
10. VG	-	Volume Group
11. VGA	-	Video Graphics Array
12. VHF	-	Very High Frequency
13. VIRUS	-	Vital Information Resource Under Seize
14. VLAN	-	Virtual Local Area Network
15. VLB	-	Vesa Local Bus
16. VLF	-	Very Low Frequency
17. VLSI	-	Very - Large - Scale Integration
18. VM	-	Virtual Machine
19. VM	-	Virtual Memory
20. VOD	-	Video On Demand
21. VoIP	-	Voice over IP
22. VPF	-	Vector Product Format
23. VPN	-	Virtual Private Network
24. VPU	-	Visual Processing Unit
25. VR	-	Virtual Reality
26. VRF	-	Vector Relational Format
27. VRML	-	Virtual Reality Modeling Language
28. VRRP	-	Virtual Router redundancy Protocol
29. VSAM	-	Virtual Storage Access Method
30. VSAT	-	Very Small Aperture Terminal



31. VT - **V**ideo **T**erminal?
32. VTAM - **V**irtual **T**elecommunications **A**ccess **M**ethod

W

1. W3C - **W**orld **W**ide **W**eb **C**onsortium
2. W3C - World Wide Web Consortium
3. WAFS - **W**ide **A**rea **F**ile **S**ervices
4. WAI - **W**eb **A**ccessibility **I**nitiative
5. WAIS - **W**ide **A**rea **I**nformation **S**erver
6. WAN - **W**ide **A**rea **N**etwork
7. WAP - **W**ireless **A**ccess **P**oint
8. WAP - **W**ireless **A**pplication **P**rotocol
9. WAV - **W**AVEform audio format
10. WBEM - **W**eb - **B**ased **E**nterprise **M**anagement
11. WCAG - **W**eb **C**ontent **A**ccessibility **G**uidelines
12. WCF - **W**indows **C**ommunication **F**oundation
13. WDM - **W**avelength **D**ivision **M**ultiplexing
14. WDM - Wave Division Multiplexing
15. WebDAV - **W**WW **D**istributed **A**uthoring and **V**ersioning
16. WEP - **W**ired **E**quivalent **P**rivacy
17. WFQ - **W**eighted **F**air **Q**ueuing
18. Wi-Fi - **W**ireless **F**idelity
19. WiMAX - **W**orldwide **I**nteroperability for **M**icrowave **A**ccess
20. WinFS - **W**indows **F**uture **S**torage
21. WINS - **W**indows **I**nternet **N**aming **S**ervice
22. WLAN - **W**ireless **L**ocal **A**rea **N**etwork
23. WMA - **W**indows **M**edia **A**udio
24. WOL - **W**ake - **o**n - **L**AN
25. WOM - **W**ake - **o**n - **M**odem
26. WOR - **W**ake - **o**n - **R**ing
27. WPA - **W**i - **F**i **P**rotected **A**ccess
28. WPAN - **W**ireless **P**ersonal **A**rea **N**etwork
29. WPF - **W**indows **P**resentation **F**oundation
30. WRED - **W**eighted **R**andom **E**arly **D**etection
31. WSDL - **W**eb **S**ervices **D**escription **L**anguage
32. WSFL - **W**eb **S**ervices **F**low **L**anguage
33. WSRP - **W**eb **S**ervices for **R**emote **P**ortal
34. WUSB - **W**ireless **U**niversal **S**erial **B**us
35. WWAN - **W**ireless **W**ide **A**rea **N**etwork
36. WWID - **W**orld **W**ide **I**dentifier



- 37. WWN - **World Wide Name**
- 38. WWW - **World Wide Web**
- 39. WYSIWYG - **What You See Is What You Get**
- 40. WZC - **Wireless Zero Configuration**

X

- 1. XAG - **XML Accessibility Guidelines**
- 2. XAML - **eXtensible Application Markup Language**
- 3. XCBL - **XML Common Business Library**
- 4. XDM - **X Window Display Manager**
- 5. XDMCP - **X Display Manager Control Protocol**
- 6. XHTML - **eXtensible Hypertext Markup Language**
- 7. XML - **Extensible Markup Language**
- 8. XMMS - **X Multimedia System**
- 9. XMPP - **eXtensible Messaging and Presence Protocol**
- 10. XMS - **Extended Memory Specification**
- 11. XNS - **Xerox Network Services**
- 12. XP - **Cross - Platform**
- 13. XP - **Extreme Programming**
- 14. XPCOM - **Cross Platform Component Object Model**
- 15. XPI - **Cross Platform Installer**
- 16. XPIDL - **Cross Platform IDL**
- 17. XSD - **XML Schema Definition**
- 18. XSL - **eXtensible Stylesheet Language**
- 19. XSL-FO - **eXtensible Stylesheet Language Formatting Objects**
- 20. XSLT - **XSL Transformations**
- 21. XSS - **Cross - Site Scripting**
- 22. XTF - **Extensible Tag Framework**
- 23. XUL - **XML - based User - interface Language**

Y

- 1. Y2K - **Year Two Thousand**
- 2. YACC - **Yet Another Compiler Compiler**
- 3. YAML - **YAML Ain't Markup Language**
- 4. YAST - **Yet Another Setup Tool**



Z

1. ZCAV - **Z**one **C**onstant **A**ngular **V**elocity
2. ZCS - **Z**ero **C**ode **S**uppression
3. ZIF - **Z**ero **I**nsertion **F**orce
4. ZIFS - **Z**ero **I**nsertion **F**orce **S**ocket
5. ZISC - **Z**ero **I**nstruction **S**et **C**omputer
6. ZMA - **Z**one **M**ulticast **A**ddress
7. ZOPE - **Z** **O**bject **P**ublishing **E**nvironment

