CORRIGENDUM – II to TENDER NOTICE NO. SLDC-01/2023-24
TENDER NOTICE NO. SLDC-01/2023-24

"Design, Development, Supply, Installation, Testing & Commissioning of SAMAST Software Scheme with Data Centre & Disaster Recovery Centre Set up and Comprehensive AMC"

(A) Following modifications are made in respect of the Part-I Section-II, Clause. 21.0 Payment terms and conditions, Table 4 Payment terms and Part-I, Section-III, ANNEXURE-III (SCHEDULE OF QUANTITY & DELIVERY) of the above mentioned tender notice.

Part-I Section-II, Clause. 21.0 Payment terms and conditions:

Table 4 Payment terms

Sl. No.	Deliverables	Hardware payment	Software Payment
1	Submission of functional design, over all architecture, prepared design documentation and software requirement specification including fields survey and IT infrastructure for implementation of complete software solution and approval of Engineer in Charge of SLDC		10%
2	Demonstration of developed SAMAST software modules for Unit Testing and (System Integration Testing) SIT and approval of Engineer In charge.		30%
3	Supply of IT hardware and associated Items at Data Center and DR with approval of Engineer In charge.	70%	
4	Installation and commissioning of IT hardware and associated Items at Data Center and DR with approval of Engineer In charge.	20%	
5	Site Acceptance Test UAT approval of Engineer In charge.		30%
6	Go-Live	10%	30%

ANNEXURE-III: SCHEDULE OF QUANTITY & DELIVERY

SCHEDULE OF QUANTITY AND DELIVERY ALONG WITH INSTALLATION & COMMISSIONING

SCHEDULE OF QUANTITY & DELIVERY

Table 9 Schedule of quantity

Sr. No.	Description	Unit	Quantity
1.00 Data Centre Hardware			
1.01	Database Server	Nos.	2
1.02	Application Server	Nos.	2
1.03	AMR (MDAS) Server	Nos.	2
1.04	Web Server	Nos.	2
1.05	Backup Management Server with Backup & Recovery Management Software	No.	1
1.06	42 U Server / Network Rack	Nos.	2
1.07	NAS (with Minimum 10TB Usable data storage as per technical specification)	No	1
1.08	Storage Area Network (SAN) based Storage Solution with Minimum 15TB Usable data storage as per technical specification.	No.	1
1.09	SAN Switches	Nos.	2
1.10	24 Port (Layer 3) 10 Gig Network Switches as per Technical Specification	Nos.	2
1.11	Router as per technical specification (AMR)	Nos.	2
1.12	Firewall (NGFW)with HA license as per technical specification	No.	2
1.13	KVM Switch 16 Port with 17" Console	No.	1

Sr. No.	Description	Unit	Quantity
1.14	Server Management Console for centralize monitoring, NMS, Patch Management Etc. along with Network Management Software, Patch Management Software, End point Protection of Servers & Clients (As per Technical Specification for required nos of nodes at DC & DR)	Lot	1
1.15	GPS Time Synchronization system (These will be configured as dual redundant)	Nos.	2
1.16	RDBMS Software (robust RDBMS with configuration and development cost), Enterprise edition.	Lot	1
1.17	Antivirus for all servers/ Workstation etc.	Nos.	17
1.18	Windows / Linux OS License for Servers (Latest Edition)	Nos.	13
1.19	Virtualization software platform with high availability and resilience for all nodes.	No.	1
2.00 DISASTER RECOVERY CENTER Hardware			
2.01	DR Server	Nos	3
2.02	AMR (MDAS) Server	Nos	1
2.03	NAS (with Minimum 10TB Usable data storage as per technical specification)	No	1
2.04	24 Port (Layer 3) 10 Gig Network Switch as per Technical Specification	No	1
2.05	Router as per technical specification (AMR)	No.	1
2.06	Firewall as per technical specification	No.	2
2.07	42 U Server / Network Rack	No.	1
2.08	Storage Area Network (SAN) based Storage Solution with Minimum 15TB Usable data storage as per technical specification	Nos	1
2.09	SAN Switches	Nos.	1
2.10	UPS System (5 kVA) with 4 hours backup.	No	1
2.11	KVM Switch 8 Port with 17" Console	No.	1
2.12	Virtualization software platform with high availability and resilience for all nodes.	No.	1
3.00 SLDC OPTCL Hardware			

Sr. No.	Description	Unit	Quantity
3.01	Workstation with Windows 10 Pro OS, MS Office, PDF Reader cum Editor	Nos	4
3.02	Multifunction Printer	Nos	1
4.00 SAMAST Software Module			
4.01	ABT scheduling system	Nos.	1
4.02	Open Access transaction management system for Open Access (OA) with payment Accounting.	Nos.	1
4.03	Outage Management System (Transmission Outage Planning)	Nos.	1
4.05	Energy accounting system	Nos.	1
4.05	Settlement system (Deviation, Reactive, Congestion)	Nos.	1
4.06	Integrated MIS, Dashboard, Reporting and Data Integration.	Nos.	1
4.07	Meter/ Master Data Management software module with data Archival & Retrieval.	Nos.	1
4.08	Design and development of dynamic and interactive website of SLDC	Nos	1
4.09	Mobile Application	Nos	1
5.00 Training			
5.01	Training for personnel at Generating/ Transmission/ Utility substation	No of user	50
5.02	Training programs for system users	No of user	25
5.03	Training program for system hardware and software support team	No of user	10
	Group Subtotal		
6.00 AMC and Audit			
6.01	5 years AMC for the entire project including Disaster Recovery Centre and DC Hardware, commencing from one year after Go-live.	Lot	1
`6.02	Cyber audit from CERT-IN 3rd party empaneled supplier for 5 years during AMC period	Year	5
6.03	VAPT test by empaneled agencies	Nos	10

(B)   (i) The **Part-I, Section-V, TECHNICAL SPECIFICATIONS** of the **Tender Notice No. SLDC-01/2023-24** has been revised and is enclosed as **Annexure** to this Corrigendum notice. The bidders are advised to go through the revised Technical Specification before submitting the bid.

(ii) The Techno-Commercial excel workbook and Price-Bid excel workbook of the above mentioned tender notice have been revised accordingly and re-uploaded in the tender portal.

(C)   The following revisions are made in respect of the Corrigendum-I to TENDER NOTICE NO. SLDC-01/2023-24

Part-I Section-I, Clause.11 (ii) (Earnest money deposit)
Clause.11 (ii):

Bank Guarantee: To be drawn in favour of Odisha Power Transmission Corporation limited, Bhubaneswar.

Part-I, Section-II, G.T.C.C., Clause. 41.1 General (i)

41.1 (i):

"The Bidder" means any eligible **FIRM or COMPANY** registered under Company act 1956 (Amended in 2013) or Limited Liability Partnership (LLP) registered under the LLP Act, 2008 and should have been in operation in India, whose primary business is software development and implementation and must have relevant experience in Data Centre Hardware and software installation as on the date of bid opening and will have their registered offices in India.

ANNEXURE-I

PROFORMA OF SELF DECLARATION-
BLACK LISTING/ DEBARRING ACTION

(To be filled in non-judicial stamp paper of worth Rs.100/- and to be Notarized)

Name of the Bidder: ----------------------------

e-Tender Notice No: ---

Sir,

I.   I/We, the undersigned do hereby declare that, I/We have never been blacklisted and / or there were no debarring actions against us for any default in executing the Turnkey Contract or in the performance of the contract entrusted to us in any of the Electricity Transmission Utilities of India.

II. In the event of any such information pertaining to the aforesaid matter found at any given point of time either during the course of the contract or at the bidding stage, my bid / contract shall be liable for rejection/ cancellation / termination without any notice at the sole discretion of OPTCL.

Yours faithfully,

Place-

Date-

Signature of the bidder

With seal

Note: The bidder shall also disclose, if he was debarred/black listed by any utility in the past and if the debar/blacklisting order was subsequently withdrawn by the utility suo-moto or set aside by any court order.

(This form shall be duly filled-up, signed by the bidder (including each of the Joint Venture/Consortium partner) & uploaded as an attachment)

(D)   The bidders who have already submitted the tender documents in the tender portal are hereby requested to resubmit the bid as per the revised Technical Specifications (Part-I, Section-V), Techno-Commercial excel workbook, Price-Bid excel workbook and clauses of this corrigendum notice. The bids submitted earlier to publication of this corrigendum shall not be considered for technical bid evaluation.

(E)   The last date and time of online requisition of the bid document, submission of the bid document and opening of Techno-Commercial bid against Tender notice no-SLDC-01/2023-24 are rescheduled as below.

SL.NO	DESCRIPTION	EXISTING SCHEDULE	REVISED SCHEDULE
1	Online request of Tender document at www.tenderwizard.com/OPTCL	Up to dt: 11-09-2023 (12.30 Hrs)	Up to dt: 21-09-2023 (12.30 Hrs)
2	Last date & time of online submission of bid document	Date: 11-09-2023 (16.30 hrs)	Date: 21-09-2023 (16.30 Hrs)
3	Date & time of online opening of Techno- Commercial bid	Date: 12-09-2023 (11.00 hrs)	Date: 22-09-2023 (11.00 Hrs)

Sd/-
Director (SLDC)

PART-I

SECTION – V

REVISED TECHNICAL SPECIFICATIONS

SCHEDULE OF TECHNICAL REQUIREMENTS AND DETAILED TECHNICAL SPECIFICATIONS FOR DESIGN, DEVELOPMENT, SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF SAMAST SOFTWARE SCHEME WITH DATA CENTRE & DISASTER RECOVERY CENTRE SET UP FOR STATE LOAD DESPATCH CENTER, OPTCL, ODISHA.

ABBRIVATION

Acronyms	Definitions
ABT	Availability Based Tariff
ALDC	Area Load Dispatch Centre
AMC	Annual Maintenance Contract
AMI	Advanced Metering Infrastructure
AMR	Automated Meter Reading
API	Application Program Interface
ARR	Annual Revenue Requirement
ATC	Available Transfer Capability
BIOS	Basic Input / Output System
CDCS	Central Data Collection System
CEA	Central Electricity Authority
CEO	Chief Executive Officer
CERC	Central Electricity Regulatory Commission
CIM	Common Information Model
CMRI	Common Meter Reading Instruments
COD	Commercial Operation Date
CPP	Captive Power Plant
CPU	Central Processing Unit
CT	Current Transformer
CVT	Capacitor Voltage Transformer
DBMS	Database Management System
DC	Declared Capacity
DCU	Data Concentrator Unit
DISCOM	Distribution Company
DLMS	Device Language Message Specification

Acronyms	Definitions
DPR	Detailed Project Report
DSM	Deviation Settlement Mechanism
DVD-ROM	Digital Versatile Disc Read-only memory
DVD-RW	Digital Versatile Disc Re-Writable
EA	Electricity Authority
EHT	Extra High Tension
EMASS	Energy Metering Accounting and Settlement System
EMS	Energy Management System
ERLDC	Eastern Region Load Dispatch Centre
ERP	Enterprise Resource Planning
ERPC	Eastern Regional Power Committee
FC-AL	Fiber Channel Arbitrated Loop
FOR	Forum of Regulators
Gbps	Gigabytes per second
G-DAM	Green Day-ahead market
G-TAM	Green Term-ahead market
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile
HES	Head End Server
HT	High Tension
HTTP	Hypertext Transfer Protocol
HV	High Voltage
HVDC	High Voltage Direct Current
I/O	Input-Output
ICCP	Inter Control Centre Protocol
ICU	Interface Converter Unit

Acronyms	Definitions
IDS	Intrusion Detection System
IEM	Interface Energy Meter
IMS	Information Management System
ISTS	Intra-state Transmission System
IPP	Independent Power Producer
IPS	Intrusion Prevention System
ISMS	Information Security Management System
ISP	Internet Service Provider
IT	Information Technology
JITPL	Jindal India Thermal Power Ltd.
Kv	Kilovolt
KVM	keyboard, video, and mouse
KYC	Know Your Consumer
LDC	Load Dispatch Centre
LT	Low Tension
LTOA	Long Term Open Access
LUN	Logical Unit Number
MIS	Management information system
Mgmt.	Management
MPLS	Multiprotocol Label Switching
MTOA	Medium Term Open Access
MTPS	Mejia Thermal Power Station
MU	Million Unit
NEFT	National Electronic Funds Transfer
NGFW	Next Generation Firewall
NLDC	National Load Dispatch Centre
NL-SATA	Near Line Serial AT Attachment
NPC	National Power Committee

Acronyms	Definitions
OA	Open Access
OEM	Original Equipment Manufacturer
OHPC	Odisha Hydro Power Corporation Ltd
OPGC	Odisha Power Generation Corporation
OPGW	Optical Ground Wire
OS	Operating System
PCI	Peripheral Component Interconnect
PDU	Protocol Data Unit
POSOCO	Power System Operation Corporation
PPA	Power Purchase Agreement
PSDF	Power System Development Fund
PT	Potential Transformer
QCA	Quality Control and Assurance
QCA	Qualified coordinating agency
RAID	Redundant Array of Independent Disks
RE	Renewable Energy
REC	Renewable Energy Certificate
REMC	Renewable Energy Management centre
RES	Renewable Energy Sources
REST	Representational State Transfer
RLDC	Regional Load Dispatch Centre
RPC	Regional Power Committee
RPM	Revolutions per minute
RPO	Recovery Point Objective
RRF	Renewable Regulatory Fund
RTGS	Real Time Gross Settlement
RTO	Recovery Time Objective
S/S	Substation

Acronyms	Definitions
SAMAST	Scheduling, Accounting, Metering and Settlement of Transactions in Electricity
SAN	Storage Area Network
SAS	Statistical Analysis System
SCADA	Supervisory Control and Data Acquisition
SGS	State Generating stations
SHP	Small Hydro Project
SLDC	State Load Dispatch Centre
SRS	Software Requirements Specification
SSD	Solid State Drive
SSGS	State Sector Generating Stations
STOA	Short Term Open Access
STPS	Super Thermal Power Station
STU	State Transmission Utility
TDS	Tax Deducted at Source
TFT	Thin-film Transistor
TOD	Time of Day
TOU	Time of Use
TRAS	Tertiary Reserve Ancillary service
TSTPP	Talcher Super Thermal Power Plant
UI	Unscheduled Interchange
UPS	Uninterrupted Power Supply
URS	User Requirement Specifications
UTM	Unified Threat Management
VAP	Vulnerability Assessment and Penetration Testing
WBES	Web based Energy Scheduling
WEG	Wind Energy Generator

SECTION – V: TECHNICAL SPECIFICATIONS

The technical specifications are broadly elaborated in following chapters

Sl. No	Chapter
1	Software and Hardware Standards & Requirements
2	Hardware at Data Centre & DR
3	SAMAST Software Stack
4	API integration of third-party application /Data Integration
5	Detail architecture of development, testing & production phase of software modules:
6	Documentation Management
7	Test plan and procedure FAT & SAT/UAT
8	Training and Capacity Building Requirement
9	Backup and Restoration

1.0   CHAPTER 1: Software and Hardware Standards & Requirements

The software supplied should support redundant servers for database, applications, web servers for online users. Storage device to store data for minimum 7 years shall be in the form of SAN. The bidder has to ensure that the system proposed will be conforming to the requirements of cyber security, reliability, Data integrity and consistency and all modern techniques used in any modern IT system. The system should be user friendly graphical user interface. There would be frequent requirements to modify the calculation, logic as per changes in various regulations / SLDC requirements, hence the system proposed should have configurable workflow and rules engine to make it flexible enough to enable users in SLDC to modify the work flow and rules using graphical user interface without the need to have knowledge of programming languages.

1.1   Software Details

The Supplier will adopt the following preferred software platform / environment for developing the solution:

Bidder to establish different environment setup for development, production, testing and Training as per the direction of Engineering in charge of SLDC for SAMAST project.

Table 1 Platform/ Environment for Development of Solution.

Development Platform	Angular, React, Dot.net, MVC , PHP, Java, Node.JS, Python
Architectural Approach	N Tier
Web Server	IIS, Apache, Apache Tomcat, JBoss, Node
Application Server Operating System	Linux/Windows
Web Server Operating System	Linux/Windows
Database Server Operating System	Linux/Windows
Database (Enterprise version)	Oracle/MS Server/Equivalent Enterprise version
Security Technologies	SSL, Data Encryption
Application Communication technologies	http, https, xml, SOAP, WSDL, UDDI

Reputed RDMS software database viz. Oracle, MS Server database being utilized in RLDC/SLDC/NLDC.

1.2   Software Requirement Specification

Software's will be Web based application. All the additional plugin / server software licensing cost will be included in scope and taken care by the bidder. Supplier will develop the following Software modules and their Software Requirement Specifications are specified below:

1.2.1 Meter (Master) Data Management

1.2.2 Scheduling and Generation dispatch

1.2.3 Energy Accounting & Settlement

1.2.4 Deviation Settlement Mechanism

1.2.5 Open Access transaction management system

1.2.6 Outage planning management

1.2.7 Integrated MIS, Dashboard, Reporting and Data Integration.

1.2.8 Dynamic and interactive Website for SLDC

1.2.9 Mobile Application

1.3 General Features of Software: -

a. The software will have authentication and authorization with role based access.

b. The integrated operation software will be user friendly, scalable etc. Some of the features of the application are as:

   i. All logs should be highlighted with a notification.

   ii. Uniformity/Standard should be maintained for all data base.

   iii. Nomenclature/ Aliases should be decided by the supplier and SLDC

   iv. Common front end for all the modules

   v. Integration of all the modules with each other

   vi. Integration of any other related third-party application in the common front end.

   vii. Upgrading the modules as per extant and amended regulations of CERC/OERC.

   viii. Output of all these modules should be configured with the other modules of SAMAST.

   ix. The software shall be designed in extensible manner so that it can accommodate future changes and could be easily maintained.

   x. The software will have facility to add/block/edit users having different levels of rights and authorizations.

   xi. The software design shall take care of system performance tuning & other configuration details as may be required.

   xii. The software shall prompt alerts and /or confirmation before any major changes like marking for deletion, updating etc.

   xiii. Software shall have usual GUI and operating aids like Tool Tips, Menu that are not conflicting with the end user browser settings.

   xiv. The software shall have compatibility with PC and Mobile based internet browsers such as Microsoft Internet Explorer, Mozilla Firefox, Google Chrome and Safari etc.

xv. There shall be facility for import / export of data through Excel sheet / Open office spread sheet/csv files.

xvi. Option for exporting reports to PDF and excel / csv formats.

xvii. Suitable scheduling of back-up (application and database) through the application/ automatically as per the requirement of data security.

xviii. The developed software shall have the facility to register requirement/ modification and bugs reported by various users during operation.

xix. The system developed shall have facility of help by way of FAQs and User Documentation to the users of the system.

xx. The software shall have provision for sending auto-generated e-mails/SMS, as identified by the system administrator.

xxi. The software shall maintain the version details and changes carried out in respective version. These details shall be available to all users.

xxii. Audit: The system shall provide defined audit trail of various activities performed by the users as required.

xxiii. The solution must have option of working on multiple windows simultaneously.

xxiv. System must have proven capacity for simultaneous use of users trouble free and in real time.

2.0 Chapter 2: Hardware Architecture for Data Centre and DR

i. Typical hardware requirements for a centralized data center (DC) are as under:

a) This section describes the technical requirements of all the hardware & basic design philosophy of IT System envisaged in the BOQ for Data Center at DC for and DR establishment of IT infrastructure for SAMAST project at SLDC, OPTCL. The minimum technical specifications for hardware of all equipment are specified in following sections. sections and the bidder have to submit the details of the supplied hardware along with the bid as per GTP format attached in Annexure-III. The Bidder shall assess the adequacy of hardware specified in the BOQ & if any additional hardware or higher end hardware configurations are required to meet all the requirements of the technical specifications, the same shall be included in the offer. The Bidder's proposal shall include necessary calculations to clearly establish that the proposed hardware meets the functional and performance requirements of the technical specification.

b) The proposed system shall include redundant Application, Database, Web & Communication/API servers. They shall work on 100% load sharing basis. In case of failure of one server other should take over the load of it.

c) Hardware configuration shall involve redundant / failover virtual servers configuration at DC, where Main & Redundant / Failover Servers and other critical hardware shall be configured in High Availability (HA) mode. Disaster Recovery (DR) System shall have the complete backup of the Application Software, web server binaries & Database to provide critical system recovery protection. Keeping in view of ensuring adequate protection of the backup data of main IT System at DC, the DR System shall be hosted at different premises other than the DC System location. SAMAST Data Center (Main IT System at DC) & DR System are proposed to be connected for data communication through Fiber Optic communication medium. Bidder should ensure High Availability (HA) mode in DC and Active-Passive (hot-standby) configuration between DC & DR as well. The RPO shall not be more than 5 Minutes and RTO shall not be more than 10 Minutes.

d) For storage of complete database of the system, SAN Storage system is to be provided (storage sizing to be done for availability of usable storage capacity for 7 years data storage). SAN shall connect with database servers over Fiber Channel using redundant SAN Switch. SAN Storage system shall store the complete database using RAID **configuration**. Database of the system on SAN shall contain all the data of ABT, Reports, Open Access, Automated Meter Reading and other software system in any one of the provided Industry Standard RDBMS (Enterprise Edition) i.e., Oracle, MS SQL Server, MySQL etc.

e) For backup of the database available at SAN Storage & image backup of the Servers, NAS has been provided.

f) All the Equipment at Data Center shall be connected through 10G redundant LAN.

Switches are to be provided for establishment of Local area network & wide area network connectivity & to secure the system traffic based on the predetermined rules & efficient network data traffic movement.

g) New Generation Firewall (NGFW) devices to provide all the network security functions (i.e., firewall, IDS/IPS, antivirus etc.) in one device. NGFW are to be provided to monitor & control the incoming & outgoing network traffic based on predetermined cyber security rules & requirements for the implemented IT infrastructure at DC.

h) Dual redundant GPS is to be provided for time synchronization of the complete system and to synchronize the DC's Server time, which will also time synchronize with hardware at Sub- Stations for ensuring end to end time synchronization from ABT meter up to SAMAST IT system at DC. The GPS system will be in redundant configuration. In case of failure of one system, the other one should take over the entire work automatically.

i) All the servers and networking equipment (Firewalls, LAN equipment etc.) shall be mounted in rack panel.

j) Disaster Recovery (DR) System is required to be installed at different location other than DC through suitable data communication connectivity probably through Fiber optic communication medium for efficient & reliable data transfer from SAMAST main IT Infra System to DR & vice-versa. DR System primarily comprises NAS Storage system (storage sizing to be done for availability of usable storage capacity for 7-year data storage) with Data Management Server & network equipment's to have connectivity with Main DC.

k) The bidders may optimize the requirement of hardware for servers for various applications, which can be combined with redundancy.

l) A general schematic of hardware layout and interface with software applications at DC and DR is presented in Figure below: -
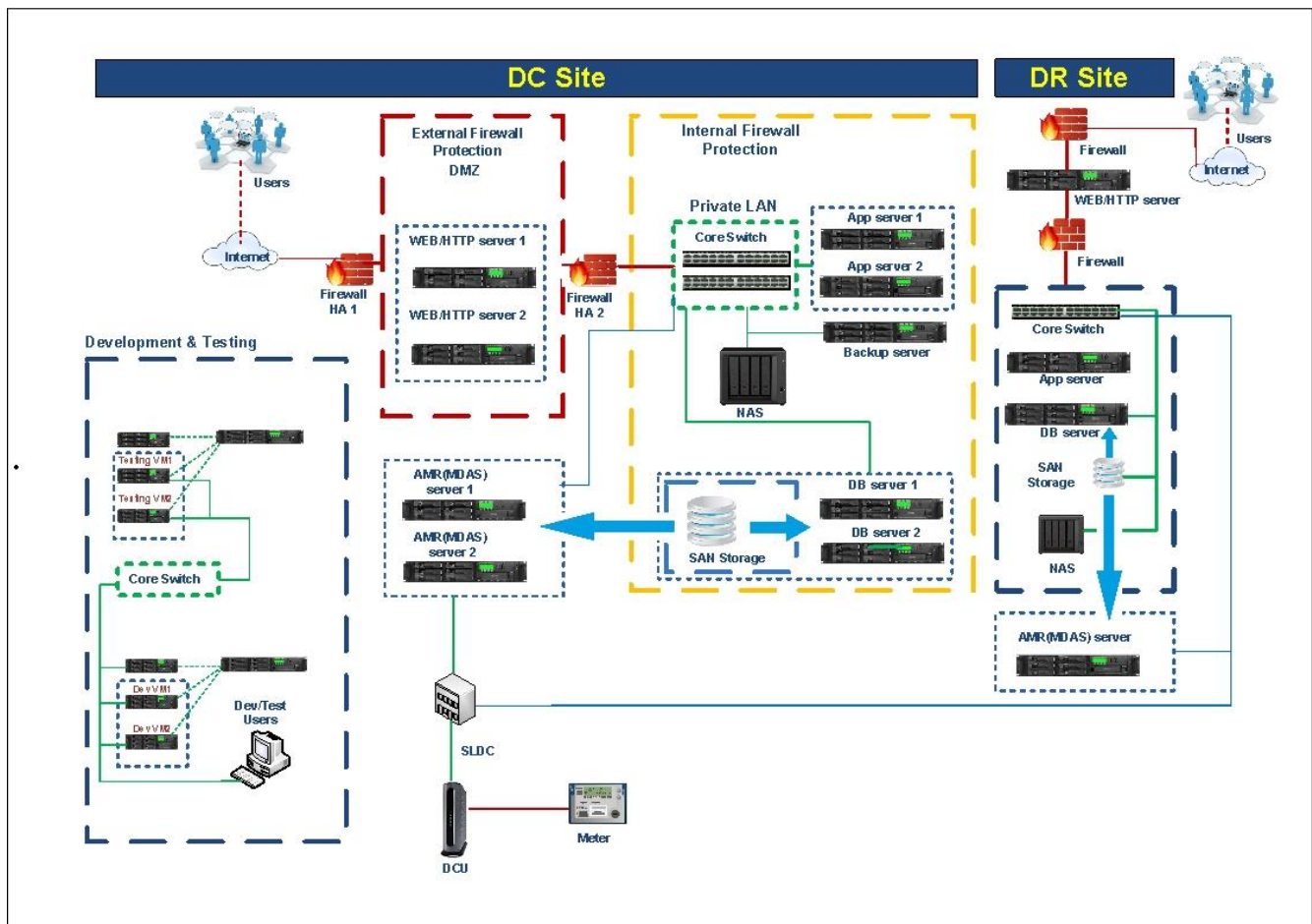
Figure 1 Schematic of Hardware layout and Interface

Two nos. of AMR (MDAS) servers at DC and one no. of AMR (MDAS) server at DR are to be deployed by the bidder with virtualization/ optimization which shall be used for AMR solution.

Table 2 Configuration of the required Servers

Sl. No.	Server	Type of configuration	Purpose
1	Application Servers	Spread across multiple VMs across multiple physical host to ensure HA in load balance manner	For Installation of all Applications of SAMAST IT Solutions The failure of one APP VM shouldn't impact services.
2	Database Servers	Spread across multiple VMs across multiple physical host to ensure HA in an active-passive OS cluster	Management of complete database System. The failure of one DB VM shouldn't impact services.
3	Web Servers	Spread across multiple VMs across multiple physical host to ensure HA in load balance manner	For installing HTTP Server Software which acts as a web Server that is used for serving HTTP requests The failure of one Webserver VM shouldn't impact services.
4	Backup Management Servers	Non-Redundant, All VMs should be backed up on daily basis. Incremental DB backup should happen every day, full back up once a week	For Installation of Backup Software – For backup & restoration of the Database & images of Servers

2.1 Configuration of other Required Hardware for the Implementation of SAMAST

Table 3 Configuration of other Required Hardware

Sl. No.	Equipment	Type of Configuration	Purpose
1.	NMS /Server Management Console	Non-Redundant	Network Management System for Monitoring, Managing, Configuring etc of DC equipment as well as Field equipment viz DCUs, gateway switches IEMs etc (to be installed by SLDC, OPTCL). Patch Management Application, Centralized Console for Anti- Virus & other Security Software & Appliance configuration & management.
2.	SAN Storage	Non-Redundant. and Configured for 100 % availability	For Complete System Database Storage & Data base Management
3.	NAS Storage	Non-Redundant	Backup storage of Database from SAN & image backup of Servers. Backup Equipment at DC & DR Site
4.	Switch (L-3 Switch)	Redundant	Switch:- For establishment of LAN for network connectivity of IT Equipment of Data Center
5.	SAN Switch	Redundant	For providing HA connectivity between SAN Switch & Database Servers
6.	Firewall(NGFW)	Redundant, High Availability (Active-Active)	To monitor & Control the incoming & outgoing network traffic based on predetermined cyber security rules & requirements

7.	GPS	Redundant	For Time Synchronization of the Servers at Centralized Data Centre
8.	Server Rack with Patch Panel	Non-Redundant	For installation of Servers, Network Equipment, KVM & GPS at Data Center
9.	KVM Switch with console	Non-Redundant	For Servers Operation Management
10.	Workstation	Non-Redundant	Clients at SLDC
11.	High Performance Laptop	Non-Redundant	For Field and DC
12.	Multifunction Printers	Non-Redundant	Various printing work at SLDC

2.2 The main objective of the proposed solution is to achieve the following but not limited to:

a. Achieving High Availability of the Applications and databases.

b. Achieving High Availability of Web Servers.

c. Software is to be tested on the supplied hardware for required functionality and performance.

d. Centralized backup and restoration along with data archival.

e. Network performance monitoring & server health monitoring for better visibility of the overall infrastructure.

f. Fulfilling DR (disaster recovery) objective.

g. Cyber security of System as per CERT-IN guidelines.

2.3 Design of the solution must satisfy the following but not limited to:

a. The solution aims to achieve the high availability and redundancy of servers deployed at DC.

b. Database Servers will connect to SAN storage through redundant SAN Switch over fiber channel to achieve high availability. There must be multiple path connectivity onto the storage to eliminate single point of failure from storage to hosts.

c. Considering the volume of data to be stored for running all the applications as well as estimated data sizing in 7 years down the line, storage conforming to the minimum specification as detailed in subsequent chapters with high-speed disk drives of minimum 10TB usable space in RAID configuration to be offered. This should be expandable up to 100% than the provided storage capacity in SAN Storage system without replacement of main equipment.

d. Secured access to application servers and database servers to prevent unauthorized or unwanted access and protecting data through automated backup technology to restore in minimum downtime in case of any disaster.

e. The Backup Server will execute the schedule backup of all the Servers and the databases from physical DB servers and will store in a separate NAS Volume. For this purpose, separate NAS conforming to the minimum specification as detailed in subsequent chapters to be provided. NAS as detailed herein to be provided will be acting as the central storage for all types of backups and archived data.

f. The backup application to be provided should be capable of providing automated, scheduled backup of the Servers data (file system) and bare metal backup of Servers, suitable for recovery of entire Servers to its last good state during any failure with minimum downtime.

g. The bidder will ensure that at the time of final approval of hardware configuration and

BOQ, all the hardware is as per the latest industry standard models and that

h. The equipment manufacturer has not established a date for termination of its production/service and consumables are available with more than one supplier locally. Any hardware changes, except version upgrade in same series, proposed after contract agreement shall be subject to the following: -

- Such changes/updates shall be proposed and approval shall be obtained from Purchaser along with the approval of Drawings/documents.
- The proposed equipment shall be equivalent or with better features than the equipment offered during bidding /included in the Contract.
- Changes/updates proposed will be at no additional cost to the employer.
- Complete justification along with a comparative statement showing the original and the proposed hardware features/parameters including brochures shall be submitted to the employer for review and approval.

Minimum Technical specification of various equipment are mentioned below

2.4 Servers

The Servers shall have provision for expansion of the Processor, auxiliary memory and Main memory (RAM) by 100% of the delivered capacity. This expandability shall be possible at site with addition of plug-in modules only. Servers shall be mounted in a rack (panel) and a single rack mountable LED monitor, keyboard and mouse using a KVM switch to access all servers & peripherals in the panel. However, the grouping of servers in a rack shall be such that the primary and backup servers for a system function are located in different racks. All servers shall have dual redundant power supplies, capable to operate on single power supply module. And there shall not be any interruptions in the operation of servers when there is a failover between the two AC Power Supply of the server.

2.4.1   COMMON SPECIFICATION FOR DATABASE/ APPLICATION/ WEB/ AMR (MDAS) SERVERS:

Table : 19 Common Specification for Database/ Application/ Web/ AMR (MDAS) Servers

Sl. No.	Item	Characteristic/Features
1	Server Type	Rack Mount / Blade
A	Processor	2 x Intel Xeon Gold processor (Latest Generation) with 2.2 GHZ or better, Min. 18 Cores
B	Number of Processor/Core	2* 18Core/36T or better
2	CPU/Clock Speed	Minimum 2.2 GHz or above

3	RAM	Installed RAM: Min.256 GB DDR 5, 4400 MHz or better
4	Hard Disc	2x 480 Gb SSD Drive, Hot pluggable. Support for RAID configurable 0, 1,5,6,10.
5	RAID Controller	12Gbps PCIe 5.0, Min 4 GB cache support for RAID 1, 5, 10, 50
6	OS Compatibility	Windows Server Latest Edition/Linux Enterprise Latest Edition with full Virtualization support/equivalent enterprise edition
7	Supports SNMP v1/v2/v3	Yes
8	Supports both IPv4 and IPv6	Yes
9	Interfaces	
A	I/O Ports	Should Support 1xDB-9 Serial Port, Standard VGA Port
B	USB Ports	4 port (At least 2 USB 3.0 port)
C	Ethernet ports	Minimum 4 ports of 10 Gbps
D	Expansion slots	2 x PCIe gen 5.0 slots
10	SAN Connectivity	Should provide 2*16GBps dual port Fiber Card
11	Power Supply	Redundant, Hot Swappable, 230V AC Input
12	Warranty and Support	Five years on-site comprehensive OEM Warranty Support with 24x7 coverage and access to OEM TAC/support

2.4.2   BACKUP MANAGEMENT SERVER

Table 4 Backup Management Server

Sl. No.	Item	Characteristic/Features
1	Server Type	Rack Mount / Blade
A	Processor	1 x Intel Xeon Gold processor (Latest Generation) with 2.2 GHZ or better, Min. 18 Cores
B	Number of Processor/Core	2* 18Core/36T or better
2	CPU/Clock Speed	Minimum 2.2 GHz or above
3	RAM	Minimum 32 GB DDR 5, 4400 MHz or better
	Hard Disc	For Web Server : 2 x 1.2TB, 10K, 12GBPS, SAS Hot Pluggable/Swappable with RAID 1 For Backup Server & DR Server : 2 x 1.2TB, 10K, 12GBPS, SAS Hot Pluggable Support for RAID configurable 0, 1,5,6,10
4	OS Compatibility	Windows Server Latest Edition/ Linux (RHEL) Enterprise Latest Edition with full Virtualization support
5	Supports SNMP v1/v2/v3	Yes
6	Supports both IPv4 and IPv6	Yes
7	Interfaces	
A	I/O Ports	Should Support 1xDB-9 Serial Port, Standard VGA Port
B	USB Ports	4 port (At least 2 USB 3.0 port)
C	Ethernet ports	2 x 10Gbps dual Ethernet Ports
D	Expansion slots	2 x PCIe gen 5.0 free slots
8	Power Supply	Redundant, Hot Swappable, 230V AC Input
9	Warranty and Support	Five years on-site comprehensive OEM Warranty Support with 24x7 coverage and access to OEM TAC/support

The above-mentioned server specification is minimum requirement, if the vendor ABT application requires higher configuration then vendor has to quote for the same. After supply of material during commissioning or during observation period, if any server hardware/software upgradation is required, then it will be in vendor's scope.

2.5 NAS (Network Area Storage)

A NAS (Network Area Storage) based storage will be provided for minimum 7 Years Data storage & will be sized adequately for storage capacity. NAS is being used for keeping data backup i.e. file level backup, application backup and database backup. NAS capability shall be scalable up to 100% of the delivered NAS. The NAS should have replication feature for replication of data to disaster recovery site. NAS shall be of reputed make like HP, Dell, Fujitsu, IBM or equivalent.

The followings are various backup requirements for NAS box:

- Various Applications and Databases hosted in the servers.
- Development/testing databases.
- Image Backup of the Servers
- Any others backup required for the Systems.

Table 5 NAS (Network Area Storage)

Sl. No.	Item	Characteristic/ Features
1	OS Support	Support for multiple operating systems connecting to it, including of Windows, UNIX, Linux, etc. with virtualization
2.a	Processor	Minimum 1 x Intel Xeon-Bronze 3104 or better
2.b	Processor Sockets HDD Bays	Minimum 14 X 3.5" drive bays
2.c	CPU/Clock Speed	1.7 GHz or better
3	RAM	Installed RAM: 64 GB
4.a	Hard Disk	Minimum 10 TB usable capacity in RAID with Hot pluggable disks
4.b	Drive types and capacities	Support for NL-SAS and SATA; NL-SAS 7.2K RPM – 1TB, 2TB, 4TB, 6TB, 8TB,12TB

5	RAID Controller	Internal RAID Controller with minimum 2GB Cache
6	Supports both IPv4 and IPv6	Yes
7	Supports SNMP v1/v2/v3	Yes
8	Network Interfaces	
A	Ethernet ports	Minimum 10 GBPS dual Ethernet port
B	Network Interface	Minimum 2port x 1G Should support 2Port x 10G Ethernet Card
9	Power Supply	Redundant (1+1), Hot pluggable, 230V AC Input
10	Fans	Standard redundant cooling fans
11	Management	Management console to be provided by same OEM
12	Data Protection Features	Replication, Snapshots
13	Rack Support	Rack mountable with support for optional tool less maintenance, cable management arm
14	Slots	Min. 2 x PCIe 5.0 slots
15	Protocols Supported :	CIFS,NFS (v2, v3, v4.1), FTP, SMB (2.0,2.1, 3.0, 3.02 and 3.1.1) iSCSI, HTTP/HTTPS, WebDAV
16	Form factor	Min. 2U Rack Mount System

17	Back Up and recovery Software/Agent	• Licensed Back Up agent/software for setting up backup and recovery solution shall be provided as per follows: • The back software must support application backup for, Oracle MySQL, MS SQL, PostgreSQL etc. • The software/agent should support full, incremental, differential backup. • The software should support reduction of data volume by deduplication/ compression. • The software must integrate with all kind of hypervisor to backup different platforms like VMware, Hyper V, RHEV etc. • The software should have the capacity to restore any backup and run any server from the backup.
		• License for 6 TB front end active capacity or for the full volume shall be provided • Backup & Replication Software OEM should be on Leader Quadrant in Gartner for at least last 5 years
18	Warranty and Support	Five years on-site comprehensive OEM Warranty Support with 24x7 coverage and access to OEM TAC/support

2.6 SAN (Storage Area Network)

A SAN (Storage Area Network) based storage shall be provided for minimum 7 Years Data storage & shall be sized adequately for storage capacity. SAN storage capability shall be scalable up to 100% of the delivered SAN. The SAN should have replication feature for replication of data to disaster recovery site. This shall be of reputed make like HP, Dell, Fujitsu, IBM or equivalent.

The following are various storage requirements for SAN box:

  i.   Various Applications and Databases hosted in the servers
  ii.   Development/testing databases
  iii. Any others backup required for the Systems.

Minimum requirement of SAN configuration is mentioned below:

Table 6 SAN (Storage Area Network)

Sl. No.	Item	Characteristic/Features
1	Feature	Dual controller with dual 230 V AC Input Power Supply. The storage should support connectivity with current latest version of windows/Linux/VMware etc.
2	Storage Capacity	Minimum 15 TB usable capacity in RAID with Hot pluggable redundant SAS SSD disks
3	Spare HDD	1 Disk should be configured for hot spare
4	Expandability	50% spare slots required
5	RAID	Capable for RAID 0,1,5,6,10 configuration
6	SAN Type and Interface ports	Fiber channel - Minimum 4 x 16 Gbps Fiber channel Ports per controller should be available for connecting with Data base (host) servers.
7	Snapshot feature	Snapshot feature enabled with required licenses for whole capacity
8	Replication	Optional Storage to Storage Replication feature
9	Thin provisioning	Thin provisioning capacity enabled with required license for whole capacity
10	Hard Drives	SAS SSD
11	Back Up Agent	Should be compatible with supplied backup agent/software for image/incremental back up.
12	Management	The storage will support CLI, Web and rest API based management
13	Preferred Manufacturer	Leader's quadrant of Latest Gartner's Magic quadrant Report
14	Number of Controllers	2 Minimum

15	Controller Cache	Min 16GB per controller
16	Availability	There must not be any single point of failure in entire storage solution. Storage solution must have minimum dual active controllers
17	Warranty and Support	Five years on-site comprehensive OEM Warranty Support with 24x7 coverage and access to OEM TAC/support

2.7 SAN Switches

Table 7 SAN Switches

Sr. No.	SAN Switches Specifications
Architecture/Scalability/Performance/Management/Availability:	
1	Minimum Dual SAN switches will be configured where each SAN switch will be configured with minimum of 12 Ports.
2	Required scalability will not be achieved by either by cascading the number of switches or shall be offered within the common chassis only
3	Should deliver 32 Gbit/Sec Non-blocking architecture with 1:1 performance for up to 24 ports in a energy-efficient fashion
4	Should protect existing device investments with auto-sensing 8, 16, and 32 Gbit/sec capabilities.
5	The switch shall support different port types such as F_Port, E_Port, M_Port, D_Port.
6	The switch should be rack mountable
7	Offered SAN Switch shall support less than 900 nano second for port-to-port latency with no contention.
8	The switch shall provide Aggregate bandwidth of 768 Gbit/sec end to end.
9	Switch shall have support for web-based management and should also support CLI.
10	The switch should have USB port for firmware download, support save, and configuration upload/download.
11	Offered SAN switches shall be highly efficient in power consumption.
12	Switch shall support POST and online/offline diagnostics, including RAS trace logging, environmental monitoring, non-disruptive daemon restart, FCping and Pathinfo (FC traceroute), port mirroring (SPAN port).
Intelligent Networking:	
13	Offered SAN switch shall support services such as Quality of Service (QoS) to help optimize application performance in consolidated, virtual environments. It should be possible to define high, medium and low priority QOS zones to expedite high-priority traffic
14	The switch shall be able to support ISL trunk up to 256 Gbit/sec between a pair of switches for optimal bandwidth utilization and load balancing.
15	SAN switch shall support to restrict data flow from less critical hosts at preset bandwidths.
16	It should be possible to isolate the high bandwidth data flows traffic to specific ISLs by using simple zoning
17	The Switch should be configured with the Zoning and will support ISL Trucking features when cascading more than 2 numbers of SAN switches into a single fabric.

| 18 | Offered SAN switches shall support to measure the top bandwidth-consuming traffic in real time for a specific port or a fabric which should detail the physical or virtual device. |
| 19 | Five years on-site comprehensive OEM Warranty Support with 24x7 coverage and access to OEM TAC/support |

2.8 L-3 Switch & Router

The System shall have dual LAN architecture. All LANs shall be configured as redundant. All equipment will have dual LAN connectivity. For Network connectivity of the Data Center IT infrastructure, 10 Gig Network Switches shall be provided. Routers shall be provided for connectivity with Existing SCADA/EMS System at SLDC, For connectivity with AMR/Metering System, Disaster Recovery System and any other external system with which Data exchange/communication is envisaged in the project. These shall be of reputed make like CISCO, Dell, Hewlett Packard or equivalent.

SWITCH (Layer -3 managed Switch)

Table 8 Layer -3 managed Switch

S. No.	Item	Characteristic/ Features
1	Type	Rack Mount / Blade
2	Physical	Ports : At least 24 x10G Base T ports. 4 x fixed SFP+ Ports
3	Stack	Stacking using dual 10Gb ports (copper or fiber)
4	Uplink	Should have provision for at least 2 SFP/SFP+ uplink
5	MAC address	Should support at least 15000 MAC addresses
6	Switching capacity	Should support at least 128 Gbps
7	Throughput	240 Mpps or better (64-byte packets)
8	Routing table	512 entries
9	Power Supply	Dual Hot swappable Redundant 230V AC Input Power Supply
10	Warranty	Five years on-site comprehensive OEM Warranty Support with 24x7 coverage and access to OEM TAC/support

Router:

Table 9 Router specifications

Sl. No.	Item	Characteristic/ Features
1	Feature	
A	High performance routing for data exchange with external world	Yes
B	Layer-2 Switching & Layer-3 routing and dynamic discovery of routing	Yes
C	Throughput	Minimum 2 Mpps or better
D	Features to support:	QoS, MPLS, Security, Broadband, Multiservice, Voice IP2IP Gateway
E	Routing Protocols:	IP, OSPF,IP Forwarding VLAN & MPLS, PPPetc..
F	Network protocols:	TCP/IP, IPv6 OSI, Telnet, UDP, DSCP
2	Inbuilt Security Features	
A	Data encryption supported	DES (56 Bites) 3des(168 Bites) and hashing algorithm like MD5 and SHA-1
B	Filtering of packets	Based on source addressed, destination address, protocol type, users, port No., URL
C	Filtering of protocols	FTP, SMTP,HTTP, SNMP, UDC, ICMP, RPC, DNS, DHCP, ARP etc.
D	VPN tunnels support	100 IPSec
3	Network management using SNMP Protocol	Yes, using SNMPv1, v2 & v3
4	Interface	
A	LAN Ports	10G , Minimum 2
B	WAN Ports	Minimum 2x 1G, Ethernet WAN Ports
5	Mounting	Rack Mounted
6	Power Supply	Redundant 230V AC Input
7	Warranty and Support	Five years on-site comprehensive OEM Warranty Support with 24x7 coverage and access to OEM TAC/support

2.9 FIREWALL (NGFW)

The Firewall should have two separate hardware boxes to be configured in HA mode. Firewall should include Intrusion Detection and Prevention system to detect and prevent intrusion, worm, virus etc. Definition updates for virus, signatures, software patches etc. which should be done up to completion of Maintenance period. The firewall must separate Internet from DMZ. **However, any improvement of the network structure to accommodate cyber security recommendation can be suggested by the bidder**. The firewall settings and network set-up should be in line with CERT-In guidelines. This will be of reputed make like CISCO, Sophos, Hewlett Packard or equivalent.

Table 10 Firewall

Sl.No	Item	Features
1	Technical requirement	The offered NGFW Product/appliance should not have been declared End of Sales/End of Life/End of support on or before the last date of the bid submission.
		Offered Product must be supported for at least 5 years (Five Years) from the date of installation w.r.t technical support, hardware replacement and firmware, Web filter, application filter, Antivirus, IPS/IDS signature, sandboxing updates.
		The offered NGFW product should be capable of providing firewall, application visibility, and IPS, antivirus functionality in a single appliance.
		Offered Next Generation Firewall & IPsec should be ICSA Lab certified.
		Offered Next Generation Firewall should be Common Criteria (CC) Certified.
		Offered NGFW product and its software and services/portal/any management tool should be from same OEM. Any open source and third party solution is not accepted.
		Offered OEM will provide 24x7 supports on call, on email and also provide response in 4hrs of ticket raise. In case of hardware failures replacement should be provided on next business day.
		The offered NGFW product have to be proposed with 5 Years of support bundle with 24x7x365 days TAC support, RMA, HA License, software updates and subscription update support. The NGFW must be proposed with 5 years subscription licenses for NGFW, NGIPS, Anti-Virus, URL Filtering, Anti Spyware, Anti Botnet, Anti APT and SSL VPN Users License.

		Offered OEM will provide publicly accessible and authentication based web portal login to log, track technical support tickets and its status. OEM will also provide publicly accessible and authentication based web portal login to track warranty status, provided support and subscription status of the offered NGFW product.
		Offered OEM should have provision for retaining logs at least for one year.
2	Hardware	i. The offered NGFW product should be supplied with at least 8x 1GE RJ-45 interfaces and 2x 10G SFP+ , 4x GE SFP slot, 4x 1G SFP or if offered 10G SFP+ can work on 1Gbps then no need to offer separate 4x 1G SFP slots. ii. Console and management ports to access device in case of no network availability iii. Appropriate energy efficient redundant (N+N) hot swappable power supplies. iv. The NGFW product should be a multicore CPU architecture with a hardened 64-bit operating system. v. Any accessory to mount the unit in rack and power cables should be provided.
3	Performance and Throughput	i. **NGFW:-** 1.6 Gbps or higher ii. **Threat Protection:-** 1 Gbps or higher iii. **IPS Throughput:-** 2.6 Gbps or higher iv. **SSL-VPN Throughput:-** 1 Gbps or higher v. **IPsec VPN Throughput:-** 10 Gbps or higher vi. **Firewall: -** 10 Gbps of throughput on 64 byte packets. Performance should not degrade while IPv6 is enabled in future vii. **Concurrent sessions:-** At least 1.5 Million, expandability should be provided. viii. **Sessions per second:-** 56 000 or higher ix. **VLANs**- At least 100 VLANs should be supported x. **VPN users**- At least 500 concurrent VPN users should be supported Any additional performance offered please specify and attach document for the same

4	General Requirement	i. Offered NGFW product should provide application detection for DNS, FTP, HTTP, SMTP,ESMTP, LDAP,MGCP, RTSP, SIP, SCCP, SQLNET, TFTP, H.323, SNMP
		ii. Offered NGFW product should support creating accessrules/policies with IPv4 & IPv6 objects simultaneously
		iii. Offered NGFW product should support operating inrouted & transparent mode. Both modes can also beavailable concurrently using Virtual Contexts. Minimum 10 virtual firewall license to be provided from day 1
		iv. Offered NGFW product should support Static, Policy route, RIP, OSPF, OSPFv3 and BGP routing protocols
		v. Offered NGFW product should support manual NAT and Auto-NAT, Static NAT, Dynamic NAT, DynamicPAT
		vi. Offered NGFW product should support NAT66 (IPv6-to-IPv6), Nat 64 (IPv6-to-IPv4),NAT46/NPTv6 (IPv4- to-IPv6) DNS64 & DHCPv6 functionality
		vii. Offered NGFW product should support Multicastprotocols like IGMP, PIM, etc.
		viii. Offered NGFW product should support securitypolicies based on group names in source or destination fields or both.
		ix. Offered NGFW product should support capability to limit bandwidth on basis of apps, groups, networks,geo locations, ports, etc.
		x. Offered NGFW product should be supplied with 1500or more SSL VPN users license
		xi. Offered NGFW product's Security control (like Firewall, antivirus, IPS, web filtering, application filtering,) must not have any licensing restriction onthe number of users.
		xii. Offered NGFW product should support Dual Stackwith IPv4 and IPv6 functionality.
		xiii. Offered NGFW product should support Sandboxing(Zero day threat prevention)
		xiv. Offered NGFW product should support network trafficclassification which identifies applications across all ports irrespective of port/protocol/evasive tactic.
		xv. Offered NGFW product must allow policy rule creationfor application control, user-based control, host profile, threat prevention, Anti-virus, file filtering, content filtering, QoS and scheduling using single web based dashboard.
		xvi. Offered NGFW product should be able to handle, alert, block or allow/deny unknown / unidentified applications like unknown UDP & TCP
		xvii. Offered NGFW product must provide web basedmanagement interface

		xviii. Offered NGFW product must have VPN clients for Windows, Linux(Ubuntu, Redhat), MacOSx, Android,IOS operation systems

2.10 Server Rack/Network Panel for Housing of Server, Network Equipment & GPS along with KVM switch & Screen

The Bidder will provide Panel/ Enclosures / Racks for housing of servers and networking equipment meeting the following requirements:

a) The enclosures shall be finished inside and out.

b) The enclosures shall be free standing; floor mounted and shall not exceed 220 cm in height.

c) The enclosure shall be built up as a 48.26 cm (19-inch) rack-mounted system with hinged units provided as necessary.

d) The structural frame of the panels shall be of cold rolled sheet steel of thickness not less than 3 mm for the weight bearing members of the panels such as base frame, front sheet & door frames and 2mm for sides, door, top and bottom portions.

e) Maintenance access to the hardware and wiring shall be through lockable, full height, frond doors.

f) Provisions for top and bottom cable entry shall be provided with wiring gaskets and stuffing glands on cabinet mounting plates.

g) Signal and safety ground networks within the enclosure shall be provided. The safety ground shall be isolated from the signal ground and shall be connected by the Bidder to the ground network and to the ground wire of the ac power input. The signal ground shall terminate at a separate stud connection sized for a lugged 16 mm^2 ground wire. Each ground network shall be a copper bus bar, braid or cable. Use of the enclosure frame, skins or chassis mounting hardware for the ground network is not acceptable.

h) All enclosures shall be supplied with 230 V AC, 50 Hz, single-phase convenience out-lets compliant with local Indian standards.

i) All enclosures shall be provided with an internal maintenance lamp, gaskets and eyelets for bundling and routing internal wearing.

j) All enclosures shall be indoor, dust-proof with rodent protection, and meet ISO-IP41 class specifications.

k) All materials used in the enclosures including cable insulation or sheathing, wire troughs, terminal blocks, and enclosure trim shall be made of flame retardant material and will not produce toxic gasses under fire conditions.

l) Document Holder shall be provided inside the cabinet so as to keep test report, drawing, maintenance register etc

This shall be of reputed make like COSMOS, Netrack, APW, Selrack, PENTAIR, Emerson or equivalent.

Table 11 Server Rack/Network Panel

Sl. No.	Specifications / Key Features / Parameters
1	19" Rack: 42Ux 600mmwidth x 1000mm depth, Alloy Aluminum extruded frame fully Allen bolted construction all x,y,z axis, metal top vented all along the width and depth , 4 fan provision and cable entry provision covered with cover plate edge protected rubber grommet provide/bottom cover cable entry provision covered with cover plate edge protected rubber grommet provide , 3 pairs of support channel and castor provision at bottom side. Powder coated finish Texture Matt - 60 to 80uM
2	Side panels are detachable with slam latches ventilation slot on side panels, full vented top cover & bottom cover with the cable entry provision.
3	Front perforated metal single door with cam lock & key
4	Rear mesh Single door with cam lock & key
5	Castors - 1Set
6	Front panel mounting hardware. -1No.
7	230V A/C 90 CFM fan mounted on top cover - 4 Nos.
8	Earthing Kit - 1No.
9	PDU 10 sockets 6/16 A Sockets with MCB - 2 Nos.(Reputed Make i.e. Anchor etc.)
10	Monitor Tray 700mm D -1Nos.
11	Warranty: 5 Year Onsite Support Warranty

2.11 KVM SWITCH with Screen/CONSOLE

Table 12 KVM SWITCH with Screen/CONSOLE

S. No.	Characteristic/ Features
1	Minimum 16 -ports console to connect all the servers, with a common mouse, keyboard in a rack tray.
2	Dual Interface - supports computers and console with PS/2 or USB keyboards and mouse
3	Multiplatform support - Windows, Linux
4	Supports multimedia USB keyboards for PC
5	USB interface detection
6	USB I PS/2 keyboard and mouse emulation - computers boot even when the console focus is elsewhere
7	KVM Console : 17" LCD Monitor with Keyboard & Mouse
8	This shall be of reputed make like ATEN, Raritan, ACL, Avocent or equivalent.
9	Five years on-site comprehensive OEM Warranty Support with 24x7 coverage and access to OEM TAC/support

2.12 Workstation/ Server Management Console (Network Management System cum Centralized management console):

It will consist of 23" LED monitors, a single keyboard and a mouse. All Workstation will support full-graphics displays. The Bidder will provide all other interface hardware, such as cables, switches and connectors as required. These will be of reputed make like Dell, HP, Lenovo, Fujitsu, IBM or equivalent.

Table 13 Workstation/ Server Management Console

Sl. No.	Item	Characteristic/Features
1	OS	Licensed Windows 10 Pro or latest
a	Processor	For Server Management Console(NMS):-Intel (R) Core (TM) i7 8th generation or above Workstation:- Intel (R) Core (TM) i5 8th generation
b	Clock Speed	3.0 GHz or above

c	RAM	For Server Management Console(NMS):-Intel Installed RAM: 32GB, Expandable up to 128 GB Workstation:- Installed RAM: 8 GB, Expandable upto 64 GB
d	Hard Disc	1 TB SATA
e	Storage Drive	DVD+/- RW (Latest version)
2	Interfaces	
a	Ethernet Ports	02 Nos. 1 Gbps Ports
b	I/O Ports	Should Support 1 x DB-9 Serial Port
c	USB Ports	4 (At least 2 USB 3.0)
d	Graphics controller	Intel HD Graphics/AMD Radeon/ NVDIA 2 GB
3	User Interface	
a	Monitor	For Server Management Console(NMS):-Two 23"Wide Screen , Resolution (1920x1080) Workstation:- 23 "Wide Screen , Resolution (1920x1080)
b	Keyboard	Yes, USB Keyboard
c	Mouse	Yes, USB Optical Mouse
d	Speakers	External dual speaker
e	Display Ports	For Server Management Console (NMS):- Display Port for monitor, atleast 2 HDMI Port, 1 VGA Port Workstation:- 1 HDMI Port / 1 VGA Port
5	Mounting	Desktop Mounting
6	Power Supply	Standard Minimum 250 W, Input PS- 230 VAC
7	Utility Softwares	• MS Office • PDF reader cum editor
8	Warranty and Support	Five years on-site comprehensive OEM Warranty Support with 24x7 coverage and access to OEM TAC/support

2.13 MFP (Multi-Function Printer):

To be provided for document printing function requirement i.e. Status/ Reports etc. at SLDC. These Colored and Black & White printing MFPs are to be integrated with overall System over LAN. These will be of reputed make like Canon, HP, EPSON, Xerox or equivalent.

Table 14 MFP (Multi-Function Printer):

S. No.	Item	Characteristics / Features
1	Functions	i) Print, ii) Scan, iii) Copy, iv) Fax
2	Paper size	A4/Letter/Legal
3	Print speed	30 pages/minute of A4/Letter/Legal size
4	Print resolution	1200x1200 dpi
5	Scan resolution	600x600 dpi
6	Paper weight	75-200 GSM
7	First page out time	12 sec for Black & White
8	Duty cycle	100000 pages per month
9	Paper handling capacity	Minimum 500 sheets of input tray & 500 sheets of output tray
10	AutomaticDuplex Printing	Yes
11	Landscape and portrait orientation	Yes
12	Interface	1G Dual LAN ports
13	Power supply	220-240 V, 50/60 Hz
14	Warranty	Five years on-site comprehensive Warranty

2.14 GPS Time Synchronization system

A dual redundant Satellite based GPS (Global Positioning System) clock along with its accessories shall be implemented at SLDC and integrated with Data Center LAN. In case of failure of one system, the other one should take over the entire work automatically. It shall be used to synchronize DC Equipment time with standard reference time via satellite so that synchronization of servers/ clients in Data Center is possible on continuous basis. The Application Server / DC Server shall in turn synchronize the time with all the meters while acquiring online data from them. If DC clock synch signal is not available to substation equipment , it as a second source should be able to synchronize with the station GPS, if available. This will be of reputed make like Hathaway, Arbiter, Meinberg, SEL, SERTEL, ACEB or equivalent.

Table 15 GPS Time Synchronization system

Sl. No.	Item	Characteristics / Features
GPS Receiver		
1	General Features:	
A	Timing Accuracy	<30 ns (with respect to UTC/USNO) with Selective availability & tracking 12 satellites
B	Input frequency	1575.42 MHZ L1 C/A code
C	Positioning Accuracy	< 25m
D	Acquisition time	Hot Start < 15 sec, Warm Start < 40sec, Cold Start< 150sec
E	Detection of loss of signal from source	GPS lost Alarm output will be provided through SNMP
F	Internal Time base Stability	1ppm
G	Time Return after reacquisition of signal	Within 90 sec of reacquisition of signal, the time returns to within 1.5 micro-second of UTP
H	Reverting to internal time base upon loss of UTC source	Yes
I	GPS Panel displays Year & Time in the Year &Time in the format DDD: HH:SS where hour Display Format(00 to 23 hour) & Date Format (DD:MM:YY)	LCD Display: Local /UTC time and date Day of the year, days of the week, Position latitude, longitude Status of the GPS receiver, Current data format of COM2. Day Display Format:- MONDAY thru SUNDAY Date Display Format:- DD/MM/ YY Time Display Format:- HH:MM:SS
3	Interfaces and Configuration:	
A	Network Connectivity – Two EthernetPort,10/100/1000 Mb ps; supporting NTP/SNTP	Yes
B	Input Power Supply	110 -240V AC
4	Warranty	Five years on-site comprehensive Warranty

GPS ANTENNA		
1	Type	Active L1.GPS,25 dB gain
2	Antenna Cable	RG 6/ RG 8 (Optional coaxial cable)
3	Min. length -50 Meters.	150 meters
4	Antenna feeder surge protection device	GPS.(LDY-TK)

2.15 5 kVA ONLINE UPS SYSTEM / MINIMUM 4 HOURS BACK UP for DR

Table 16 5 kVA Online Ups System

Sl. No.	Item	Characteristics / Features
1.	POWER RATING 5 KVA	BATTERY BACKUP Minimum 4 HOURS SMF BATTERY
2.	UPS TYPE	True Online Double Conversion IGBT based latest Technology.
3.	INPUT PARAMETERS	Nominal- 415V ± 15% at 100% load Frequency Range- 47 to 53Hz Phase- Three Phase, Input Power Factor ≥0.99
4.	OUTPUT PARAMETERS	Voltage- 230.V AC Voltage Regulation- ± 1% Typical Frequency- 50Hz Frequency regulation: ± 0.05Hz in free running mode and ± 3Hz in sync mode. Phase-Single Phase Wave Form- True Sine wave Harmonic Distortion- < 2% with Linear load < 5% on Non Linear Load. Power Factor: 0.8 Lagging Crest factor: 3:1. Efficiency: Inverter >90%.
5.	D.C.PARAMETERS	Voltage ≥180V DC DC Ripple: < 1%. Battery Isolation from DC Bus.
6.	INVERTER	Sine wave PWM Technology with IGBT as switching devices. Overload rating: 110% for 30mints/150% for 10 sec.

7.	CHARGER	Has automatic float cum boost charging capability with settable float & boost charging voltages and Current levels and boost charger timer.
8.	Warranty	Five years on-site comprehensive Warranty

2.16 System Management Software Products

Network Management System cum Centralized Management Console (NMS-cum- CMC):

Network management System cum Centralized management console (NMS-cum- CMC) shall be used for integrated monitoring and configuration of the firewall and network elements.

The NMS cum CMC Server shall have the following Network Management capabilities:

i. Security Management to protect systems and network from unauthorized access, manage user access, authorizing rights and privileges.

ii. Inventory Management to collect information about computers in the system such as processors, memory, peripherals and processes running on computers.

iii. Performance Management to monitor system and network performance.

iv. Fault Management to recognize, log, identify and inform fault on network and connected machines, nodes, devices.

The network management platform proposed shall be capable of managing an infrastructure that consists of multi supplier network elements (Router, switch, Mux etc).

The network management platform proposed shall be capable of managing an infrastructure that consists of multi supplier network elements (Router, switch, Mux etc). The network management software will be based on the secured version of Simple Network Management Protocol (SNMP) for fault management and performance monitoring platform for long term performance management and trending. The NMS system will have a simple browser based user interface to provide all the pertinent information about the system. The Network Management System shall monitor the performance, resource usages and error statistics of all the servers, workstations, routers and LAN devices. IT asset inventory management with Discover and maintain IT asset inventory with efficient auto-discovery feature should be provided with the server. External Asset management software/tool if required is to be provided by the bidder for discovering IT assets from Windows, Linux as well as printers, routers, switches etc. This shall be of reputed make like NEX, IBM, HP, Dell, Microsoft, or equivalent.

Table 17 System Management Software products

Sl. No.	Specification/Description
1	Network management Server cum Centralized management console (NMS-cum-CMC) shall be used for integrated monitoring and configuration of the firewall and network elements at DC end as well as Field end viz DCUs, gateway switches, Meter etc.
2	Network Management capabilities: (SW)
A	Security Management to protect systems and network from unauthorized access, manage user access, authorizing rights and privileges.
B	Inventory Management to collect information about computers in the system such as processors, memory, peripherals and processes running on computers.
C	Performance Management to monitor system and network performance.
D	Fault Management to recognize, log, identify and inform fault on network and connected machines, nodes, devices
3	The network management software shall be based on the secured version of Simple Network Management Protocol (SNMP) for fault management and performance monitoring platform for long term performance management and trending.
4	The NMS system shall have a simple browser based user interface to provide all the pertinent information about the system.
5	The Network management system shall monitor the performance, resource usages and error statistics of all the servers, workstations, routers and LAN devices.
6	IT asset inventory management with Discover and maintain IT asset inventory with efficient auto-discovery feature should be provided with the Server/Workstation.
7	**Standard 6 year support for Software maintenance & patch update till completion of warranty & AMC period**

2.17 Backup & Archival Software / Backup System

The system shall consist of Back-Up Server and required NAS storage. The system shall maintain automatic backup copies of all applications/software and databases without requiring any manual intervention, so that system operations may continue in the event of Server, device, or software failure. The backup data shall be updated with the current contents of the primary data as configured in the back up agent/software. The backup system shall be provided with a backup agent/ software for taking image backup and incremental backup of the installed system. The backup frequency should be configurable and should not affect the live application performance. In case of contingency, the Backup agent/software shall have the capability to run any application on any other server (subject to meeting minimum hardware requirement to run the specified application) from the backup data taken in the storage.

Table 18 Back-Up Server

Sl. No	General specification/ features
1	Backup software must support GUI with centralized management / single interface for management of all backup activities.
2	The offered software must support advanced sharing of different media across the environment (disk and optical)
3	The offered software must support multiple level of backups including full, incremental, differential and synthetic full
4	The offered software must include following application and database backup without the need of temporary disk space for MS SQL, Oracle. , MySQL, PostgreSQL etc.
5	The software must keep single copy across server backup & file archival with the help of block-level de-duplication for data across different electronic data repository for storage optimization.
6	The software must be able to compress and encrypt data at the client-side and this feature should be available even during de-duplication.
7	The offered software must support complete integration of server backup, virtual machine backup, archival and replication solution with a single console to manage all the solutions
8	Backup solution must support multi tenancy feature for creation of distinct data zones.
9	The offered software must support flat file data archival with seamless access for Windows / Linux.
10	The offered software solution must support ipv4 and ipv6 addressing system.
11	The offered software solution must have capability to do trend analysis for capacity planning of backup environment.

12	Proposed software must support secure protection for business-critical data through source-side deduplication, policy-based scheduling, and intelligent bandwidth throttling.
13	Backup software must support policy-based data protection, deduplication, compliance and discovery, reporting, and analytics features.
14	The backup & archival software should be offered for following license capacity; - 10 TB application & database backup license
15	**Standard 6 year support for Software maintenance & patch update till completion of warranty & AMC period**

2.18 Anti-Virus Software

All workstation and servers will be provided with the latest antivirus software as on date of supply. The antivirus software will have the capability of having its virus definitions updated from time to time. This shall be of reputed make like McAfee, Nortan, Microsoft, Symantec or equivalent.

Table 19 Antivirus software

Sl. NO.	COMPONENTS	DESCRIPTIONS
1	Environment	The solution must provide single platform for complete server protection over physical, virtual (server/desktop)
2	Defense mechanism	Provides layered defense against advanced attacks and shields against known vulnerabilities in web and enterprise applications and operating systems.
3	Malware protection	Web reputation prevents access to malicious web sites
4	Platform support	Protects a wide range of platforms: Windows, Linux etc
5	Self defense	The proposed solution provides self-defending servers; with multiple integrated modules below providing a line of defense at the server: firewall, anti-malware ,hips, application control etc.
6	Warranty & Support	Standard 6 Year OEM support for update till completion of warranty & AMC period

2.19 Patch Management

The bidder shall be responsible for providing updates/patches for the software products supplied under the project. All other patches of third party product like Operating System and Anti-virus shall be tested by the Bidder prior to installing in the employer's network. A secure patch management and deployment system is to be established which shall be provided with single point of Internet connectivity. Internet connectivity shall be provided by the Employer.

All the patches will be downloaded through this single point of connection.

The Bidder shall provide a mechanism for patch management so that it is known that what patches have been applied, what all patches are pending but available with us and what is the recent release of patches for the various products. Any patch will be applied only with consent of the Purchaser's representative. This shall be of reputed make like McAfee, Nortan, Microsoft, Symantec or equivalent.

Table 20 Patch Management

Sl. No.	Description
1	Deployment - Transparently deploy Windows OS patch or application (.exe, .msi) to multiple Windows machines simultaneously. Deployments can install, uninstall, execute scripts, reboot, copy files, sleep, send messages, etc. Instructions and files are sent to the target computer, executed, monitored, and reported
2	Should support Remote locations deployment
3	Should have Scripting support
4	Should be able to create package as needed or download the same.
5	Should be able to notify by Email on completion.
6	Standard 6 Year support till completion of warranty/AMC period

2.20 Environmental Conditions

Equipment located in the computer/ control room will operate over an ambient temperature range of 16°C to 30°C, with a maximum rate of change of 5°C per hour. Relative humidity will range from 20% to 80% non-condensing. Further, all Hardware to be supplied under the project will be RoHS complaint (Restriction of Hazardous Substance) in Electrical & Electronics Equipment.

2.21 Acoustic Noise Level

The noise level of any equipment located in the server room will not exceed 60 dbA measurements at three feet from the enclosure. The noise level of equipment located Sound- deadening enclosures shall outside the server room will not exceed 50 dbA three feet from the enclosure. Sound-deadening enclosures shall be provided where necessary to meet these requirements.

2.22 General Construction Requirements

The enclosures/panels used for mounting or placement of equipments, shall be constructed in accordance with the following requirements.

2.22.1 Panels

In case the equipment are mounted in panel type of enclosures, then such enclosures shall be finished inside and out. All cabinet metal shall be thoroughly cleaned and sanded to obtain a clean, smooth finish. All surfaces shall be treated to resist rust and to form a bond between the metal and the paint.

Moving assemblies within the enclosure, such as swing frames or extension slides, shall be designed such that full movement of the assembly is possible without bending or distortion of the enclosure or the moving assembly. Enclosures shall not require fastening to the floor to preclude tipping of the enclosure when the moving assembly is extended. No cables shall be visible, all cables shall be properly clamped, and all entries shall be properly sealed to prevent access by rodents.

Cooling air shall be drawn from the conditioned air within the room. Ducted or directed cooling air to the enclosures will not be supplied by Purchaser.

All wiring shall use copper conductors. Conductors in multi core cables shall be individually colour coded.

Wiring within the enclosures shall be neatly arranged and securely fastened to the enclosure by non-conductive fasteners. Wiring between all stationary and moveable components, such as wiring across hinges or to components mounted on extension slides, shall allow for full movement of the component without binding or chafing of the wire.

All materials used in the enclosures including cable insulation or sheathing, wire troughs, terminal blocks, and enclosure trim shall be made of flame retardant material and shall not produce toxic gasses under fire conditions.

The finish colours of all enclosures/panels will be finalized during detailed engineering.

2.22.2 Enclosure Grounding

A safety ground in accordance with Indian standards shall be provided within each enclosure and

will connect to the ground (green) wire of the ac power input.

2.22.3 Interconnections and device interfaces

Servers and peripheral devices are connected to each other on a local area network (LAN) using Cat 6 cable and accessories. All signals cabling between component units of the computer systems shall be supplied by the Bidder. Plug-type connectors with captive fasteners shall be used for all signal interconnections. Both ends of each interconnection cable shall be marked with the cable number and the identifying number and location of each of the cable's terminations through suitable cable /wire tagging. Each cable shall be continuous between components; no intermediate splices or connectors shall be used. Terminations shall be entirely within the enclosure. Supply and lying of power cable from UPS room of SLDC to various device locations shall be the responsibility of the Bidder.

2.23 General Software and Hardware Requirement

2.23.1   General Software Requirements

All software will meet the following general software requirements: -

A. Software updates: - Software which shall be provided as a part of present scope will receive updates, patches, bugs, fixes to keep software up to date all the time. The firmware/software upgrade may include

A.1. General software updates.

A.2 Adding new features and functionalities, such as supporting new data format and communication protocols.

A.3 Fixing bugs and deficiencies.

- ▪ The Supplier shall keep SLDC, OPTCL informed of the latest software updates of revisions available after the system is shipped.
- ▪ Users shall be able to perform the necessary software update in the field.

B. Software Security Requirements at Delivery: - The development of the software for MDM system will be done in consultation with SLDC. Software at delivery will meet following requirements in accordance with general software security assurance practices.

B.1 Security Tested and Configured: -All software and associated application software modules shall be the most secure version of the software available at the time of start of the Factory Acceptance Test. The delivered software shall be tested to ensure the followings:

- Free of computer viruses, worms, Trojan horses, and other software contaminants
- Unused services are disabled / removed; this includes device drivers for devices not included in the hardware.
- Unused networking protocols.
- Unused administrative utilities, diagnostics, network management, or system management functions.
- Administrative utilities, diagnostics, network management, or system management functions or workstations unused by administrators.
- Backups of files, databases, and programs, used during system installation/upgrade but not needed in the operational system.
- Accounts that are not End -User Administrator will be removed, this include any guest accounts (with and without passwords) or default administrator or maintenance accounts other than the initial system administrator account for Procurement Entity or any guest accounts or default administrator or maintenance accounts for any third party software.

B.2 Maximum Initial Security Settings: - The software shall be shipped with all security settings at their maximum setting. All software shall be delivered with all the latest relevant patches installed. All security-related parameters and options shall be placed at their most restrictive settings at the delivery, i.e. affording the access and execution privileges to the smallest class of users consistent with meeting the functional specifications, and restricting their rights to the narrowest range of privileges.

B.3 No Automatic Downloading and Execution of Executable Code: - It shall not be possible to download any executable code into the DC and execute the downloaded software code automatically without system administrator's (SLDC) approval. All software shall be removed that would otherwise make it possible to execute a scripting language (such as Active X, Java, Java scripts, etc.), including software in the browser and e-mail processor, where applicable.

B.4 File Access Control: - The DC software shall support controlled access privileges for files, including at least access, read, write, execute and combinations of these. The access privileges for each user can only be assigned by system administrator of DC as the case may be, and shall be assigned on an individual user account basis. The default access privileges for each new user account shall be no access to any file on the system at all. No user, including system administrator, shall be given the privilege of modifying operating system files and other files that are never supposed to change while the system is running.

B.5 Free of "Electronic Self-Help" Enabled Software: -It will be strictly prohibited for delivered software to contain embedded faults or back- door mechanisms that allow the software manufacturer to remotely disable some or all of the functions of the software, or affect their performance, or in any way degrade its operation (so-called "electronic self-help" in the terms of the Uniform Computer Information Transactions Act). The software shall not contain any mechanism that automatically disables some of all of its functions or degrades their operation on a certain date or upon the occurrence of a specific event.

B.6 Application Software Modification: -Modifications in application software to comply with the prevailing CERC/OERC regulations for energy accounting and/or to implement the decisions at the ERPC, SLDC, OPTCL level shall be in the scope of the supplier. These modifications shall be considered as a part of Scope. The modification shall be done in consultation with SLDC.

C. Configuration, Credentials with proper documentation: - After implementation of the project, Table Structures, data structure and of all the functional modules (with proper detail documentation) with ER diagram/Table description diagram shall be handed over to SLDC, OPTCL. Interface for any required changes in the configuration for ex. Addition/deletion of interface points, data extraction in the required format etc.

As per SLDC, OPTCL requirement, all the credential (user name & password) of any software (Standard/customized)/hardware/OS/database developed should be shared with SLDC, OPTCL through proper channel.

Execute all documents that may be necessary to effectively transfer the ownership and title, including OEM warranties in respect of all leased equipment and handover the list of all IT

Assets, passwords at all locations to the Purchaser.

D. Essential characteristic of system:- Target system provides following essential properties

a) **Accessibility:** The system should able to provide all access to all data in open format which is generated by all entities which is required for decision making irrespective of the support of supplier who has supplied the component.

b) **Durability:** The system should provide full data guarantee irrespective of any type of hardware, network or any such failure. The system should sustain for all types of failure and provide plan to overcome from such failures. The system should also ensure that there should not be any data loss due to operating conditions.

c) **Security:** The system should ensure be foolproof for any security hacks.

d) **Scalability:** The system should be scalable system at each level so that scalability should be achieved by adding component not by replacing them.

e) **Functional Completeness**: The target system should be fully functionally complete and provide data & processing for all external systems like accounts and finance.

f) **Performance:** The system should have real time response and such measures should be provided for each level

g) **External interfaces**: The system should be able to interact with external system like SCADA/EMS and GIS system to accomplish total system optimization. It should also accommodate the external system and should provide uniform data views.

h) **Standard:** The component which will be used to provide build the system should indicate and maintain standards.

i) **Maintainability:** The system can be fully maintained by the SLDC,OPTCL in future.

The supplier should provide the full configurable software, data dictionary, data flows, documentation to incorporate new changes as well as operations, adequate training at each level.

E. General Hardware Requirements

Complete Software System including MDM will meet the following hardware requirements.

a) **Operating Environment**:- DC and DR hardware will be supplied that will be suitable to operate in environment under climate conditions of Bhubaneswar / Odisha without any significant effect on its performance.

b) **Security Requirements**:- DC and DR hardware and packaging design will meet physical security requirements like measures to prevent unauthorized access to certain system hardware components.

c) **Network Monitoring Tool**:- MIS Reports: Bidder shall submit the following reports on a weekly basis in a mutually decided format.

- Summary of issues/complaints logged with the OEMs.
- Summary of changes undertaken in the Data Centre including major changes like

configuration changes, patch upgrades etc.

- Summary of any configuration changes or any service/hardware installed in primary Data centre.
- Summary of system's rebooted.
- Detail report of issues/complaints which are un-resolved with appropriate reason.
- All relevant reports required for calculation of SLAs.
- Consolidated report for resource wise availability and resource utilization.
- Report showing resource wise exceed of pre-defined threshold parameter.

F. System Security & Cyber Security

Third party security audit by CERT-in certified auditor is to be done prior to commissioning or Go Live whichever is earlier. Ensuring compliance with CERT-in standards for all software modules has to be ensured by Supplier prior to handing over. Supplier/Supplier will document and implement a Cyber Security Policy in line with CERT-In latest guidelines (http://www.cert-in.org.in) to secure the system and the Supplier will keep updating the Security settings as per the revised guidelines of CERT-In at time to time. Below listed basic strategies shall be followed by the Supplier for making the entire Control Centre immune to Cyber-attacks.

- All the Hardware, OS and application software shall be hardened.
- Network partition and DMZ through use of Firewall as required maximizing the security of SAMAST Data Center System while facilitating access for data and information to all stake holders.
- All default user id & passwords shall be changed.
- All log in/log out and cable plug in/plug out shall also be logged in the System.
- Prevent unauthorized users from reading or writing data or files, executing programs or performing operations without appropriate privileges
- Document all user sign on procedure
- Record all network traffic for detecting unauthorized activity, unusual activity and attempts to defeat system security (Supplier to propose and document what constitutes normal activity/traffic)
- Supplier must identify and list the entire network and other protocols that communicate with physical systems and limit what is not required.
- No user shall be allowed to access remote network zones other than the adjacent zone.
- In normal condition all USB ports of all servers/workstations shall be disabled.

G. Scope of SLDC, OPTCL

i) Installation and testing of energy meters.

ii) Providing connectivity as detailed:

    a. An Ethernet port shall be provided for the same at terminal equipment's (SDH/Router/Switch) at the Datacenter and DR

    b. Wired Broadband Internet (An Ethernet port at modem at DC & DR).

iii) SIM with data plan for GSM Modem. (Where no other communication channels are available)

iv) The cooling and power (UPS Power)

v) Internet connectivity with public IP at DC and DR

H. Scope of the supplier:

(1) The Supplier shall meet the SLA for the networking elements, including replacement of the defective/ or end-of-life parts, throughout the entire Warranty and AMC/ATS period.

(2) Availability of meter data shall be calculated based on the downtime of all meters aggregated over the assessment period, excluding the downtime due to defect of meters, feeders or machine outages, outage of communication channel, but including failure of networking components supplied by the supplier.

3.0 Chapter-3: SAMAST Software stack
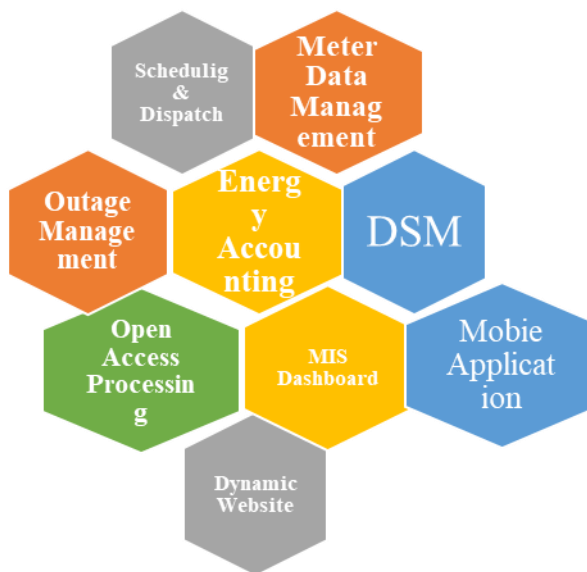
Figure 2 SAMAST Software stack

3.1 Module-1 Scheduling and Generation dispatch

General Over view:

Scope of the software module

i. Provision to capture details of generators like name, total installed capacity, unit wise installed capacity and auxiliary consumption, ramp-up and ramp-down values, technical minimum etc. category of the generating station (Thermal, Hydro RE-Solar, Non-Solar-wind/SHP/Co-gen, LHP)/ and CGP/IPP along with share of GRIDCO/other beneficiaries as per the PPA/PSA.

ii. Incorporate provisions of day ahead and current day scheduling basis decentralized and centralized MOD principles and relevant CERC and OERC regulations and subsequent amendments thereof.

iii. Provide web access to stakeholders i.e. GRIDCO, Generators, Discoms, for submission of DC, requisitions/ reporting etc.

iv. Provision to upload/ add/edit generator/ state entity (Discom) wise allocation from available sources (ISGS/SGS).

v.   System shall have features for entering inputs like Ramp Up, Ramp Down, Technical Maximum / Minimum of generation etc.

vi.   Provision to Recommend SLDC for surrender/ schedule in real-time, on the available power from intra- state and inter-state generators on basis the MOD stack.

vii.   System shall have inbuilt provision of validating DC input at the time of submission. System shall not allow generators to submit DC more than the ex-bus capacity.

viii. Entitlement shall be prepared based on share allocation for DISCOMs/Beneficiary as approved by OERC. DISCOM/ beneficiary shall be able to submit requisition.

ix.   Provision for DISCOM / Beneficiary to view entitlement and submit requisition as 'day-ahead' or 'revised' requisition for the current day, i.e., for 'day of operation' or for 'day-ahead' as per timelines specified in State Grid Code.

x.   Details of transmission constraints/grid incidents to be incorporated in real-time for suspension of deviation settlement mechanism. Report of transmission constraints/grid incidents to be prepared in real-time basis.

xi.   Provision to capture inter-state schedules from RLDC (LTA, MTOA, STOA, Exchange, DAM, G-DAM & RTM etc.) and generate implemented injection schedules for intra-state generators and drawal schedule for distribution utilities (by incorporating the source wise Inter-state OA drawl schedule of the embedded buyers of each discom) after capturing the implemented schedules of intra-state OA transactions from the OA module.

xii.   Provision to integrate the details of source wise schedule (RE/Non RE) of the inter-state generating stations having LTA/MTOA with GRIDCO and the power scheduled to GRIDCO through STOA vide G-DAM G-TAM, REMC as in the WBES of ERLDC for ascertaining the RE(Solar, Non Solar-Wind LHP) and Non RE breakup of the power scheduled to GRIDCO through inter-state transactions which can be simultaneously summed up with the RE/Non RE break up of intra-state generating stations scheduling power to GRIDCO. This would help in determining the RE /Non-RE break-up of the scheduled power available in the GRIDCO Pool for monitoring the RPO of GRIDCO.

xiii. Daily and Monthly Reports not limited to DC received, DC accepted-Scheduled Generation, Implemented Schedules of buyers and Discoms including open access for any specific period, but also reports as per the requirements of SLDC on as when required basis both in view as well as downloadable editable formats.

xiv.   There shall have provision to make certain consolidated reports in display mode /downloadable editable formats mode as per the requirements of SLDC for access by the registered users of the portal along with provision to migrate certain reports like final daily/weekly/monthly/period specified approved schedules etc. to SLDC website for access by general public at large as per the regulatory requirements and customized needs of SLDC.

xv. Integration with Energy Accounting and Open Access modules for seamless data transfer for timely issuance of energy accounts.

xvi. Dashboard for SLDC and Generator/ DISCOMs to view real-time scheduling activities along with providing the dashboard view only to SLDC for viewing the status of block wise power surplus/deficit available due to under/over requisition with respect to the DISCOM entitlement so as to enable the system operator in optimizing the real time decision making.

Functional Requirements:

The objective of this module is to implement a web based online ABT scheduling system (Portal) for Intrastate scheduling as per OERC / CERC regulations in force and subsequent amendments therein.

Scheduling of power essentially involves collecting availability data from state generating stations, IPPs, State's share entitlement from ISGS and other sources and allocating to constituents/beneficiaries as per their respective share, decided by OERC. Other collateral subjects that need to be considered while scheduling are Open Access transactions, Data from Demand forecast, ATC declaration, Real time revision of schedules by SLDC System operators subject to Power regulations, Ancillary Market services and regulatory amendments from time to time.

IConfiguration of generating stations

The details of registered entities in Open Access module shall be auto migrated to scheduling module. Provision to input some additional parameters as detailed in the table below shall be kept this module. The software shall have a portal for configuring the details of Generators/IPPS/RE Sources/ Developer/ OA Customers/QCA, having following details:

Table 21 Configuration of generating stations

Sl.no.	Field Name	Source
1	Name of Generator.	To be entered by the user.
2	Address of the Generator or Project	To be entered by the user.
3	Unit wise particulars- Installed capacity, Auxiliary consumption, Ex-bus capacity	To be entered by the user.
4	ABT Meter installed at Generator. (Yes/No)	To be entered by the user.
5	Meter Sr. No. (Main)	To be fetched from metering module/ with a provision to upload valid document,

		validated by SLDC during registration.
6	Meter Sr. No. (Check)	To be fetched from metering module/ with a provision to upload valid document, validated by SLDC during registration.
7	Connected to feeder/circuit with Voltage level.	To be fetched
8	Whether a consumer of Discom- Discom details/ contract demand with the Discom	To be entered by the user.
9	Type of generator- Fuel type (Thermal, Hydro, RE-Solar/Non solar, LHP as the case may be)	To be displayed
10	Capacity of generator in MW	To be entered by the user.
11	Unit wise date of commissioning / date of commercial operation	With a provision to upload valid document, validated by SLDC during registration.
12	Existing OA details- (LTA, MTOA/GNA with the Reserved capacity/contacted Quantum in MW, duration of such contract - from date and to date. Drawee entity particulars with whom the contract/PPA has been signed (Nature of Drawee entity i.e. Whether it is state utility or a consumer of state Discom with the name of the Discom	To be entered by the user. With a provision to upload valid document, validated by SLDC during registration.

*In addition to above parameters/details any other requirements of SLDC on as and when need basis

II   Scheduling

This software module will enable users to submit Declared Capacity (DC) and Requisition/ Punching; Publish / View / Download Dispatch and Drawal schedules with provisions for Revision on Day Ahead and Real time basis. (in line with scheduling method of ERLDC).

Provision shall be there to mention the reasons of such revision in the remark column as an optional field.

Scheduling is a timeline activity, and any post-facto correction of schedules will be permitted by system administrator to limited supervisory users through additional password configuration. These corrections/modifications will be logged and archived appropriately to identify report and scrutinize such cases at a later date in audit trail.

The proposed web-based energy scheduling software shall be modular, menu-based, web enabled

application. The software shall have provision for interfacing with ERLDC server to archive the State's entitlement share from ISGS and inter-state open access/ collective transactions of state embedded entities on real time basis. All user interaction will be through appropriate interfaces after due authentication only. The application will manage all data using RDMS database. Apart from facilitating a uniform approach to scheduling activity, web-based scheduling software will encourage transparent participation from stakeholders through a structured and user-friendly interface. The application will be capable of simultaneous interaction in a multi-user environment.

The software will facilitate SLDC to prepare Day-ahead/ current day Schedules as per IEGC 2010 (or any later version)/ OGC Regulations, currently in force and subsequent amendments thereof. It will also facilitate the Constituent (Authenticated Users) members to Submit / revise Declared Capacity (DC) and requisition and View / Download Schedules and related information as per respective members' roles & privileges.

The Supplier will provide application process interface (API) for addition, modification, replacing modules as per regulatory requirement to facilitate user updating.

III   Scheduling Process:

i)   Inputs

The inputs that will be provided to the system are:

Technical maximum, Ex-bus PP capacity of generator, technical minimum, ramp up and ramp down rates, type of fuel used-for distinguishing the type of RE source such as Solar, Non solar, LHP from the State's pool power (for cap rate), type of ownership, commercial operation date (to find firm or infirm power), normative plant availability factor, normative plant auxiliary consumption, annual fixed charges, energy charge rate, etc., of generating stations

- a) Capability declaration by SGS/IPPs/LTOA /MTOA customers
- b) State's ISGS entitlement from ISGS
- c) Discom's Share/ Entitlement Table
- d) Requisition by Discom/beneficiaries
- e) Applicable system losses (Transmission, Distribution, ISTS)
- f) Open access approved quantum, period, injection point details, drawal point details
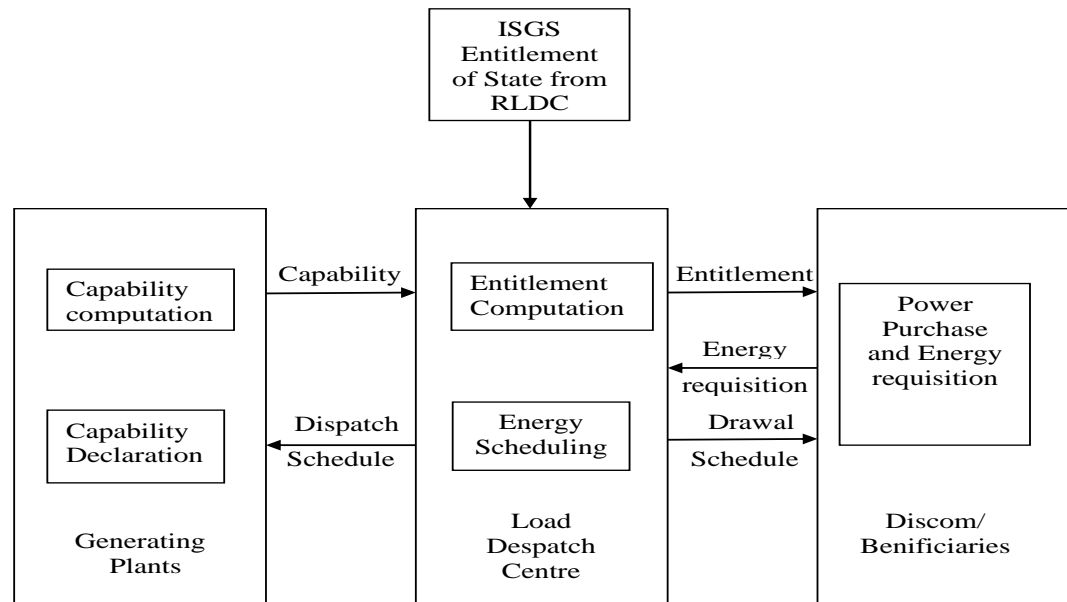
*Scope of Load Dispatch Center

Figure 3 Entity engagement chart for dealing with the power LTA and MTOA of the beneficiaries/state/Discom with the generating stations.
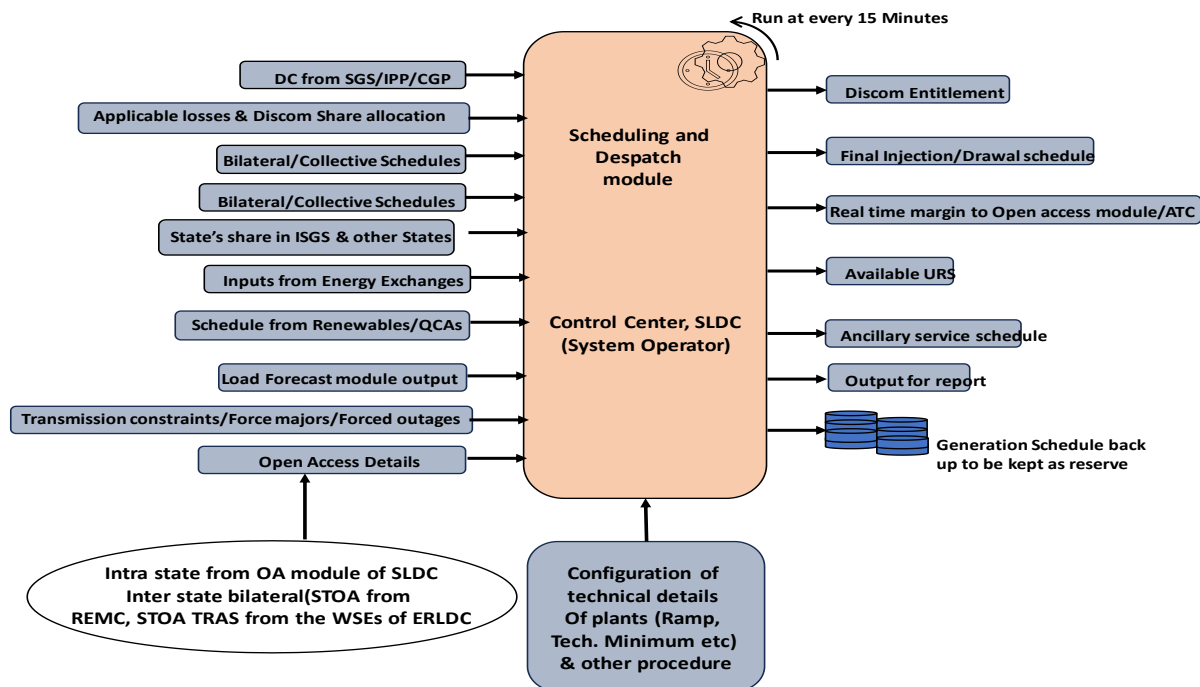

Figure 4 Scheduling &Dispatch Module

ii) Output

The outputs expected form the scheduling module are:

    a) Entitlement of beneficiaries

    b) Dispatch schedule for generating plants

    c) State's drawal schedule from ISGS.

    d) Drawal schedule for Discoms/beneficiaries

    e) OA Dispatch schedules for OA generating plants

    f) OA drawal schedules for OA consumers

    g) Consolidated dispatch schedule for generating plants

    h) Consolidated drawal schedule for beneficiaries

    i) Implemented declared capability

    j) Implemented dispatch schedule

    k) Implemented drawal schedule.

IV   Scheduling concepts addressed

    a) Capability declaration

    b) Entitlement

    c) Requisition

    d) Considering applicable system losses (Transmission, Distribution, ISTS)

    e) Day ahead dispatch and drawal scheduling

    f) Same day dispatch and drawal scheduling

    g) Surplus handling

    h) Approval of Implemented schedules

    i) Mis-declaration audit

    j) Suspension of ABT

    k) Curtailment

    l) Scheduling approved OA contracts, bilateral (long, medium, and short term) and collective transactions.

    m) Ex-Bus periphery of the power plant will be used for the purpose of scheduling.

    n) List of Users:

The following designated users of scheduling system will be provided with login ID and password using which they can perform their functions.

    i.   State Load Despatch Centre Users:

      a. LD Admin: This user will have all rights including authentication of entries made by other users, and different checks and validations as per the requirement

      b. LD Operator: This user will have the permission for data entry and scheduling on day ahead and real time basis and any such other requirements.

    ii. Power Plant Users: These users can perform their functions like submission of declared capability, view and download of dispatch schedule, deviation charges, state energy account, payment of deviation charges, etc.,

iii. Discom User: Discom can perform its functions like view and download entitlement of Discom, submit day ahead drawal request and revisions for same day and day ahead, view and download drawal schedule, deviation charges, state energy account, payment of deviation charges, etc.,

iv. Open Access Applicant Users: LTOA & MTOA users can perform their functions like submission of quantum they want to avail from approved quantum, while for STOA users the approved quantum in the OA module shall automatically get scheduled, view and download dispatch schedule of seller, drawal schedule of buyer, deviation charges, payment of deviation charges, etc.,

v. All configurations will have a validity period.

vi. Short Term Open Access configuration details will be fetched from Open Access Module.

V Scheduling and Despatch Module with revisions

General description

(i) The Scheduling and Dispatch module will need to have the relevant functionalities to aid SLDC in implementing the Scheduling process flow as per the Scheduling and Dispatch Code of CERC/OERC and Guidelines for the operation of Merit Order Dispatch (MOD). This module will receive data from other relevant software modules. Some of the provisions of the MOD guidelines are as follows:

a) Periodicity and Date of preparation of MOD Stack.
b) Basis of preparation of MOD Stack, including the Variable Charge to be considered.
c) Guidelines for operating the Generating Units.
d) Guidelines for Capacity Declaration by Generating Units.
e) Guidelines for Zero Schedule instructions to the Generating Units.
f) Guidelines for Reserve Shut Down (RSD) instructions to the Generating Units.
g) Identification of 'Must Run' Stations, and guidelines for operating Hydro Stations
h) Technical Minimum of Generating Units.

(ii) The designing of functionalities of Scheduling and Dispatch module will be developed as per the procedure defined under Scheduling and Dispatch Code. The Supplier will refer to the final Scheduling and Dispatch Code as and when finalized by the OERC/CERC and the subsequent amendments thereof to be followed.

(iii) SLDC will prepare generator wise Merit Order Stack for Day Ahead scheduling process for each month and Centralized Merit Order Stack for Intra-Day operation in an approved format.

(iv) Scheduling and Despatch module Software Requirements. The Scheduling and

Despatch software module will aid SLDC in performing the following activities.

a) Provision for granting remote/ online access to Generators, Licensees and other users for carrying out various activities related to day-ahead / current- day scheduling.

b) Provision to capture details of generators and users (like name, total installed capacity, unit wise capacity and auxiliary consumption, ramp-up and ramp-down values, technical minimum, etc.

c) Availability Submission: Each SGS / generator will need to submit, the ex-power plant Declared Capacity (DC) in MW (at 5 minutes/15-minute/Regulations specific time block interval) foreseen for the next day, i.e., from 0000 Hrs to 2400 Hrs of the following day.

d) Each generator will be able to submit DC as 'day-ahead' or 'revised' declaration for the concerned day, i.e., for 'day of operation' or for 'day-ahead' as per relevant regulation/ timelines specified in the State Grid Code.

e) System will have feature for entering inputs like Ramp Up, Ramp Down, Technical Maximum / Minimum of generation etc.

f) System will have inbuilt provision of validating DC input at the time of submission. System will not allow generators to submit DC more than the ex-bus capacity.

g) In case where generator is supplying power to entities other than the state discoms through open access, provision will be made to capture injection schedule against specific drawee entities.

h) Gate closure provision will be available.

i) The scheduling and dispatch module will be able to generate Seller/Buyer schedule comprising of 96/288-time blocks, each of 15/5-minute/Regulations specific time block interval duration starting from 00:00 hours (IST) ending with 24:00 hours (IST). The first-time block of scheduling period will commence from 00:00 hours (IST) to 00:15 hours (IST), second time block of scheduling period will commence from 00:15 hours (IST) to 00:30hours (IST) and so on or any such other period as specified by the Commission.

j) Entitlement & Requisition: Entitlement will be prepared based on share allocation for Discom / Beneficiary requisition and Discom/ beneficiary will be able to submit requisition.

    i. Once the availability from SGS /IPPs and ISGS Entitlement for State from RLDC are received, system will prepare entitlement for each discom / Beneficiary based on the share allocation.

    ii. Each Discom / Beneficiary will be able to view entitlement and submit requisition as 'day-ahead' or 'revised' requisition for the current day, i.e., for 'day of operation' or for 'day-ahead' as per timelines specified in State Grid Code.

iii. Available URS power to be displayed generator wise (injecting entity)/ discom wise (drawee entity) in real-time incorporating RLDC URS data.

k) Intra-day revisions and intra-day Scheduling of Buyers and Sellers

l) Display of real time schedules.

m) Issue Dispatch or Curtailment instructions during real time operation with provision to incorporate the schedule of the generators due to backing down instruction of SLDC considering the declared ramp rate and the logic provided by SLDC.

n) Provision to capture /upload Entitlement/ Drawal Schedule from RLDC simultaneously. RLDC schedule will be automatically updated in the state software for further scheduling to respective Discom.

o) The entity wise drawl/injection schedule shall be fetched from the formats /platforms of all power exchanges for different type of market segments (DAM, GDAM, RTM etc.) both on day ahead and real time basis and subsequently it shall be able to get migrated to the drawl/injection schedules under respective discom with appropriate and distinct transaction specific identifiable tagging of the buyer/seller/type of OA.

p) Provision for Application Program Interface (APIs) for sharing the data from Scheduling and Dispatch module to DSM software application /any third-party applications if required.

q) Email communication of schedules and re-schedules to state entities and other parties involved in state pool account.

r) The output of the scheduling process will be Dispatch Schedule of Generating Stations/Sellers, Drawal Schedule of Discoms/Buyers and Open Access Consumers, State's drawal schedule from ISGS. The list of forms and formats that needs to be generated under Scheduling and dispatch module are given in table below.

Table 22 List of Forms in Scheduling and Despatch Module

Sl.No	Particulars
1	Registration Form for Sellers for Scheduling and Re-Scheduling
2	Registration Form for Buyers for Scheduling and Re-Scheduling
3	Submission of Day Ahead Drawal at User Periphery
4	Submission of Unit – wise Ex-bus Day Ahead availability by Seller
5	Day Ahead Drawal Schedule of Buyers by SLDC at User periphery
6	Intra-day Drawal Revision at User periphery by Buyer
7	Intra Day Declared Capacity of Seller unit wise (at Ex-bus periphery)
8	Final Drawal Schedule of Buyer at User periphery

(v) The entitlements, requisitions, and schedules will be rounded off to the nearest two decimal, to have a resolution of 0.01MW for Buyers and Sellers and reference frequency will be rounded off to the nearest two decimal to have resolution of 0.01Hz as mandated by the applicable regulations and amendments from time to time.

(vi) The Buyer Schedule will be based on De-Centralized Merit Order Stack for Day Ahead scheduling process and Centralized Merit Order Stack for Intra-Day considering the principles specified.

(vii) In case of break down/ forced outage of any utilities, the stand-by power as allocated by SLDC against that generator will be allocated to the utilities in the proportion of their share in that generator as per the Orders of the Commission. Further there shall be provision for the generators to punch the details of unit wise forced outage and the reasons of tripping/backing down along with revised declared capacity for auto migration to the DSM module.

(viii) The Scheduling and Dispatch module will have provisions for display of the following parameters in real-time for the participating users and will be able to download the schedule/revisions of the same in formats such as .CSV,.PDF,.XML, .XLSX and .XLS etc.

a) Declared capacity (DC)

b) Entitlement in 15/5 Minute time block from SLDC

c) Bilateral and Collective Transaction Schedules

d) Drawal Schedule of the Buyers, including Open Access

e) Generation Schedule of the Sellers (IPPs, CPPs, Intrastate Open access)

(ix) The Real Time scheduling data from the Scheduling and Dispatch module will be accessible to view by the public. However, only users will be able to schedule or re-schedule the drawal or generation schedule over the internet in a secured way whose user access has been approved by the SLDC after due registration process.

(x) Schedule / Revisions:

a) Software to be equipped with logics to create schedule as per Merit Order and as per provisions of IEGC / OGC without any manual intervention.

b) Injection schedule entity wise will be computed as per the requirement of beneficiaries considering the technical minimum and ramping up / down if required. Drawal schedule of the discoms will be computed on the basis of requisition and considering the bilateral/ collective transactions of power if any and technical minimum, ramping up / down for the generators if required.

c) Injection and drawal schedule of all intra-state entities to be prepared in real-time including RLDC/ Power Exchange real-time revisions for scheduling and despatch of power. This will be an automatic process and it will not require any manual intervention.

There will not be a time delay of more than 60 sec for updating RLDC real-time scheduling data.

d) Any Bilateral / collective transaction schedule for any entity will be directly uploaded and the same will be displayed on website (generator wise / Discom specific drawee entity wise as per user requirement).

e) Economic merit order to be selected automatically for surrender/thermal backing/URS power scheduling based on their variable charges. Surrender/ URS of scheduled Power will be done in line with ERLDC procedures, applicable GRID Code and shall be configurable as per the operational requirement of SLDC.

(xi) Activity log with time stamping to be maintained for each transaction of all entities and to be displayed entity wise/category wise/for all entities together as per requirement of system operation.

(xii) Details of transmission constraints/grid incidents to be incorporated in real-time for suspension of deviation settlement in accordance with Intrastate DSM as and when it is notified. Report of transmission constraints/grid incidents to be prepared in real time by integrating with outage module.

(xiii) All injection and drawl schedules finalized to be automatically migrated to Energy Accounting and Deviation Settlement module week-wise / month-wise for preparation of deviation settlement account and monthly energy account.

(xiv) Integration of Scheduling System with an internal e-mailing server through SLDC email accounts for facilitating two-way communications between SLDC and the injecting/drawee entities.

(xv) Provision of SMS/e-mail for each revision from any entity. Also, a flash on the screen along with an alarming notification for SLDC and concerned entity for each revision either from SLDC or from drawee /injecting entity.

(xvi) Provision for archival of data older than 7 days for smoother Scheduling System Operation. This process will make sure only weekly data is present in database and rest is archived. Archived data must be readily available and accessible for all other purposes.

(xvii) Treatment of loss in case of scheduling of LTOA/MTOA and STOA will be customized based on OERC/CERC regulations/orders/notifications.

(xviii) Reports

a. Time block wise DC/SG/ injection schedule/ drawl schedule for all entities to be displayed in a report form in real-time so that, it may integrated in the SCADA system for display of real-time deviation from schedule.

b. Reports for drawal schedule including SGS, Bi-lateral, share projects, MTOA, and Energy Exchange, RE to be displayed in real-time category wise.

c. Reports in line with RLDC formats.

d. Daily, weekly, Monthly, period specific Reports on DC, Injection Schedule & Implemented Schedule

e. Energy Loss due to Transmission Constraint

All the above provisions, procedures and workflows shall be in compliance with and configurable as per the OERC/CERC Regulations and Rules, Orders/ directives of state/Union governments in force from time to time and case specific operational requirements of SLDC.

3.2 Module-2 Meter / Master Data Management (MDM) Software

i. Meter data: The SEMs (ABT type) record active energy (export & import separately), reactive energy and other parameters in 15 minutes/ 5 minutes/ regulation specified time intervals. The SEMs (ABT type) are installed at the interface points. The SEMs (ABT type) data is collected at SLDC either from Advanced Meter Infrastructure (AMI) system or other electronic means e.g., email, web portal etc.

ii. This module covers collection of energy meter data from all meters (ABT/Non ABT) installed at interface points and the upcoming ABT meter data from data acquisition software (HES/AMI) to be installed at DC as well as through email, web-portal and other electronic medium, checking of data for its completeness and correctness and processing of data for the purpose of computation of Energy Accounting

iii. The Software should be able to fetch the Meter data from AMI server automatically and will validate in the MDAS for further processing in MDM The software will have following features tailor-made to serve the various requirements of SLDC.

iv. System will prepare a database during configuration taking into account the details of location (Area/District/DISCOM etc.) and details of each meter (Start time, stop time, feeder point, MF, Account types, DISCOM etc.) to be defined by user, along with incorporation of inter-DISCOM sharing feeders etc. which shall be used to generate various reports.

v. System will have the feature to integrate and fetch data from AMI system and also provide option for MRI upload from remote location by registered users (from Meter Site /Sub-station site).

vi. System should be able to check data for its completeness and correctness. The data uploaded will be checked for completeness and missing data reports will be generated for collecting the meter data through email/Portal/AMI from the Sub-station.

vii. System should be capable to read data of all kinds of meters automatically. Further SLDC may provide the meter manufacturer software if necessary.

viii. System will have the interface for configuration of ABT meters details such as location of installation - Entity & sub-entity name, feeder name, Meter - Sr. No, Accuracy Class, CT/PT

ratio etc. On the basis of details entered by the User, Multiplying Factor (MF) will be computed automatically and will be stored in the database along with time stamp and modifier details. System should have the feature for manual entry of total energy data (which should be equally divided in the time blocks of the specified period)), MF etc. for a meter, if required, with configured adequate approval.

ix. System will allow uploading meter data from installed energy meters of interface points on Grid sub-station level manually as per approved authorisation from SLDC in the software.

x. System will have the interface for configuring / linking the ABT meters with polarity to the entities. Also, categorize and prioritize meters as Main, Check, Audit & Standby which will be used while computing energy for any interface point / entity.

xi. System should be capable of maintaining the history of meters and service points like transformers, CT, PT, MF, feeders etc.

xii. Provision to enter month end final energy readings for each interface point. Provision for entering multiple set of readings due to change in energy meter during the month. While entering manual energy readings, standard validations will be provided to validate current month reading against last month reading,

xiii. Provision for manual entry of auxiliary power consumption at sub-station level by designated users and with additional feature of uploading the excel sheet of auxiliary consumption of different substations. (The Auxiliary energy should be equally divided in the time blocks of the specified period)

xiv. Fetching of CGS/GRIDCO SEM data available in ERLDC website for calculation of transmission losses, DSM and for such other purposes. It should be able to fetch and modify all kinds of text files (Tertiary, Frequency, OPGC, DULUNGA etc.) from ERLDC website for accounting purpose as defined by SLDC. Further provision should also be available for manual processing of above data in this application server.

xv. Software will have the provision to read 15minutes/5minutes or regulation specified block wise all parameters (e.g. active export, import values, reactive high / low, midnight values, VA, voltage etc.) and update the same in the database as per the period defined by the user and use of the same for various necessary reports.

xvi. The software should have provision of authentication based on user roles (like user management). Admin role should have access to edit/modify/create all module functionalities.

xvii. The software should have provision to view all desired parameters (like active MWH, Reactive power MVARH, VA, voltage etc.) in a customised and formatted way (in tabular as well as graphical view).

xviii. The software should have provision to generate graphical and tabular report based on meter output data.

xix. The software should have provision to calculate the fictitious meter power reading in MWH,

MVAR, VA etc. for selected fictitious meters for a particular date range as per logic defined by SLDC.

xx. The proposed software is required to be integrated with existing meters (ABT/Non ABT) data and with the data acquisition software to be installed at SLDC for ABT meter data acquisition (AMI). The file generated through the data acquisition software is to be uploaded in the database. Presently AMI facility is not provided at all the interface point, therefore software will also have the provision for automatic downloading of load survey data from email/ portal and converting into readable format XML / NPC/CSV/ASCII etc. and uploading the same into database, in addition to updating meter data from the system.

xxi. Data migration from existing system: -

The objective of this data migration strategy is to seamlessly transfer data from multiple sources, including legacy software systems, Excel spreadsheets files, and database, to state-of-the art new SAMAST applications.

The supplier shall be responsible for successful migration of data from existing system to the new system during the contract period. The migration process will ensure the continuity and integrity of the data while leveraging the advanced features and functionalities of the new software. The process encompasses data extraction, transformation, and loading, adhering to stringent data quality and security standards throughout the migration process.

xxii. The system will be able to read in XML, NPC, text format etc. for ABT meter data and store it in database, to be integrated with the Metering module. The system will also be capable to read meter data of any other meters installed at interface points.

xxiii. Event reports must be generated by extracting the events recorded in the meters for all the interface points as per SLDC requirement weekly/monthly/yearly/user defined period etc.

xxiv. The software should have the provision to display one or more meter data in the same window for analysis purpose in tabular and graphical view. (For all Parameters)

xxv. The system will be capable to generate the following reports. –
   a) Data Non-availability report
   b) Injection/drawal report of sellers / buyers
   c) Any other report based on meter parameters as required by SLDC
   d) Dynamic report: User defined report using available meter data parameters.
   e) Analytical report: Feature to display same meter data or different meter data of different periods in a single window and generation of the same.

xxvi. The module should have a dashboard feature displaying various information and shortcuts as defined by SLDC.

xxvii. All the above functions and reports should have the print option at every steps/window and save options in formats like csv, pdf, xls, xlsx, text, word format etc.

3.3 Module-3 Energy Accounting

Development and Implementation of State Energy Accounting Module:

    A. State Energy Account

    B. State Reactive Energy Account

    C. State Transmission Loss

  A. **State energy Account:**

The module will implement solution, which can generate provisional and final statement for State utility in line with SEA (State Energy Accounts). The Energy Account of all entities (SGS, IPP, CPP, ISGS, Renewable Generators, DISCOMs etc), will be the output of this module.

Energy Accounting Management for EBC (Energy Billing Centre)

The objective of this module is to implement solution which can generate provisional and final statement of energy drawal/injection for State utilities in line with SEA (State Energy Accounts)

a) Software should be flexible enough to configure and process both 15/ 5-minute or regulation specified block wise meter data for compliance with future requirements.

b) Software should be able to generate various reports by processing all the parameters available in MDM module (Energy meter dump data as received from either AMI or other electronic means like email, portal etc.) along with the flexibility of modifying and generating new reports as per requirement.

c) System should able to generate reports for block wise (15 minutes /5 minutes/ or any) active export and import values, reactive energy, VA, phase wise current, phase wise voltage etc. values for all interface points using the meter data (Main, Check ,Audit and Standby).

d) Solution should compute the accounting by default on main meter along with provision for, selection facility to select/reject the Main/Check/ Standby meter that has to be considered for billing on approval basis (in case of time synchronisation, duplicate rows etc.), when required. In case of absence/ any issues in main meter data, check meter data should be selected for billing automatically along with provision to consider Audit/Standby meter data (by managing parameters) and incorporating loss.

e) Software will generate Main-Check comparison report and Main-Check-Audit-Standby comparison report for each entity, indicating the percentage difference weekly/monthly/ user defined period.

f) Software will have provision to generate Tabular/Graphical comparison of two or more meters for different parameters in weekly/monthly/ user defined period in a single window for analysis purpose.

g) Solution should also be able to generate high voltage, low voltage, Average voltage, maximum loading, minimum loading , Average loading, Total loading reports etc. for

each interface points/Entity/ Substation/ Area wise and voltage level wise etc., along with date and time of occurrence as per logic given by SLDC, weekly/monthly/yearly/ User defined period. The minimum value considered should be zero and other than zero.

i. The Substation wise voltage reports generated should always be by considering the energy meter with no critical events (like PT fuse fail, Under voltage, Missing potential etc.) or managing such events as per user requirement.

ii. The above Loading reports should always be generated by considering the meters and estimations used in billing procedure.

h) Software should have features for addition, deletion, estimation, selection etc. features for user identified events during certain periods due to various reasons as per the logic provided by SLDC, using one or more meter data. This feature should be accompanied by a comments/remarks section which may later be generated as a report (Billing Information Report) for the billing period. This feature should be accompanied by the frequency of computation like weekly/monthly/yearly/user defined period etc.

i) Provision must be provided in the software for calculation of energy drawal for a particular interface point considering various energy meter data and implementing various logics by SLDC.

j) Software must generate a report of transformer loss by considering the energy meter data of HV and LV side calculated for selected period and line loss considering both end meter data.

k) Software must be able to calculate Simultaneous Maximum Demand (SMD) of each DISCOM separately and State as a whole. And also Grid wise Maximum/ Minimum/ Average demand of a month/ range specified period along with date and time of occurrence.

l) Event reports must be generated by extracting the events recorded in the meters for all the interface points as per SLDC requirement viz. weekly/ monthly/ yearly/ user defined period etc.

For the above events fetched from meter data, the software should display a window for user approval w.r.t. events (like time set request/duplication of dates/meter power off/under voltage/Low potential/CT terminal Open etc.) to consider Check/Standby/Audit meter instead of Main Meter in the billing procedure. The said selections and respective reasons/comments should be incorporated in the Billing Information report.

m) The Station consumption (auxiliary) report should be generated for each billing cycle, which should be subtracted from total energy consumption of DISCOMs. (The Auxiliary energy should be equally divided in the time blocks of the specified period)

n) Provision to generate Frequency (SEM data as extracted from ERLDC site) report showing the percentage of frequency occurs in various ranges defined by user and maximum/ minimum/ Average frequency, weekly/ monthly/ yearly/ user defined period .

o) Provision to generate monthly/ range specified Energy Abstract covering Energy inputs, Voltage/ load profile, OA energy, Net Energy etc. for each Entity/Discom/State etc.

p) Provision for tailor-made reports as per user requirement for Substation/Entity/DISCOMs etc. considering Active import, Active Export, Net Active (Import-Export) etc. and logics defined by user.

q) Implement dynamic report feature to apply user-defined filter criteria and generate reports at State, Discom, sub-station, transformer, feeder, consumer level, etc.

r) **Bill revisions:** Provision should be available for bill revisions at different points of time with regard to various reasons/ issues, which should be mentioned during re-billing as re-bill reason and an abstract should be generated for each billing cycle mentioning the no. of revisions with reasons with date and time, user account etc.

The software should maintain the history of each bill revisions

s) **Net energy bill statement:** A consolidated report should be generated after Final DISCOM billing for BST bill purpose, mentioning the Net DISCOM energy consumption (Excluding Station consumption), SOLAR import, Net Open Access energy (Min. Of Actual Vs schedule), and also have the provisions to accommodate revisions.

The software should be able to compute block wise OA energy by comparing the OA schedule and Actual energy drawal from meter data, for determining the quantum of OA of the customer as per the logic defined by SLDC. This will be used as input for Discom Net Energy Statement and Wheeling computation.

While preparing the above statement for Discoms, various Solar, CGP etc. Energy injection/drawal, as applicable shall also be taken into account for final Energy statement.

t) **Wheeling bill:** A consolidated report must be generated for each DISCOM separately after Final DISCOM billing for wheeling bill purpose, mentioning the Net DISCOM energy consumption (Excluding Station consumption), 33/11kv export (Solar, CGP etc.), Net Open Access energy (Min. Of Actual Vs schedule) etc., and also have the provisions to accommodate revisions. The said bill will be as per OERC regulation and following amendments.

u) **Power banking**: System should have feature to address banking of power for RE generators as per OERC regulations like banked energy, withdrawn energy, compute lapsed energy and generate associated reports.

v) **REC Account:** Development of a module to prepare report of monthly/ yearly/ Range Specified energy data i.e. Energy Injection Report (EIR) for REC (MWh) issued by NLDC, Total Energy Generated in a month, Aux Consumption, Self-Consumption, Opening & Closing Balance of REC of the REG registered in State/NLDC.

System should have feature to address the energy accounting for Open Access Consumers

(OAC) as per OERC regulations and generate associated reports.

B. **State Reactive Account (SRA):** The software should have the provision for generation of Monthly / weekly/user specified State Reactive Account (SRA) in accordance with OERC / CERC regulations in force and subsequent amendments thereof, which comprises of monthly / weekly /user specified reactive energy charges payable / receivable by the Discoms, Open Access Customers and Open Access Generators and other such entities based on actual net reactive energy drawn /injected under high and low voltage condition

a) The software will maintain the Reactive energy pool account by settlement of Reactive Energy Charges considering the Regional Reactive charge amount obtained from REC Pool Account of RLDC. The respective reports shall be generated as per user requirement.

b) The software shall have a mechanism to verify the Regional Reactive Charges computed by ERPC and regional reactive amount computed by ERLDC for pool balancing of reactive energy charges

c) System will also generate detailed day-wise net reactive energy injection / drawal during low voltage and high voltage condition in KVARH and summary statement for each DISCOM(s), OAC, OAG, each DISCOMs embedded OAC and OAG

d) Provision should be available for Reactive energy charge bill revisions at different points of time with regard to various reasons/ issues, which should be mentioned during re-billing as re-bill reason and an abstract should be generated for each billing cycle mentioning the no. of revisions with reasons with date and time, user account etc. A notification should be generated for revision of reactive bill after each revision of reactive energy accounting.

e) The software should maintain the history of each reactive energy bill revisions

f) Entity wise Bill Statement must be generated for each billing cycle (monthly/ weekly/ regulation specified) and also for subsequent revisions.

g) **Supplementary reports:** System will be able to develop following reports as per OERC / CERC regulations:

i. **State Energy Account (SEA):** Monthly / Regulation Specified/ User Specified State Energy Account (SEA) to be prepared as required by SLDC for the billing and settlement of Capacity Charges and Energy Charges. After due approval of appropriate user, the said report should be displayed in website.

ii. Monthly/ Regulation Specified/ User Specified SEA report will comprise of availability of generating stations and Ex-Bus energy scheduled to DISCOMs from generating stations (SGS, ISGS, CPPs, and REGs) including energy purchase / sale by the OPTCL under MTOA/ STOA / Bilateral / Collective transactions.

iii. System will be integrated with scheduling module to automatically exchange

data of final Declared Capacity (DC), Requisitions and Implemented Schedule etc.

iv. System will have the interface for recording COD status, Auxiliary Consumption, Normative DC and PLF etc. to be used for computation for SEA

v. In addition to SEA, system will also generate following reports

a. Computation of Plant Availability Factor (PAFM) achieved during the month and cumulative during the FY in percentage (%) for each SSGS as per PPA contracts/ OERC regulations/ CERC regulations/ logic provided by SLDC for which the energy accounting module must be integrated with Scheduling module. Provision of report revision for various reasons must be present along with saving of said history.

b. Details of energy entitlement to DISCOMs which includes month- wise and day-wise or user specified entitlements.

c. Firm and Infirm energy purchased by DISCOMs from CPP and other sources.

d. Details of bilateral / collective transactions details for power purchase, sale and banking from various sources on Short Term and Medium-Term basis.

e. Other details like share allocation, drawal schedule, etc. will be made available.

f. All the reports must be month wise basis or user specified dates.

g. All the major accounts / reports will be posted on website automatically after internal approvals.

h. Integration of Energy accounting with an internal e-mailing server through SLDC email accounts for facilitating two-way communications between SLDC and transmission / generator / DISCOMs users.

i. Email / SMS notifications to be sent to users on generation of major reports.

j. The said module should have a dashboard feature displaying various information and shortcuts as defined by SLDC.

C. **Transmission Loss Account:** System should be capable of computing monthly/ user specified loss (% and KWh) on 132kV/ 220kV/ 400kV/765 kV etc. as per CERC/OERC Regulations using all G-T, T-D and other energy handled within intra-state. The loss data will be migrated and used in Scheduling module for day-ahead scheduling. In addition, the software should provide summary report indicating the net injection from SSGS and ISGS, net drawal by the Discoms/ other entities and loss in Kwh& % round off and Meter wise details of net injection from SSGS & ISGS and net drawal by the Discoms and OAC's etc..
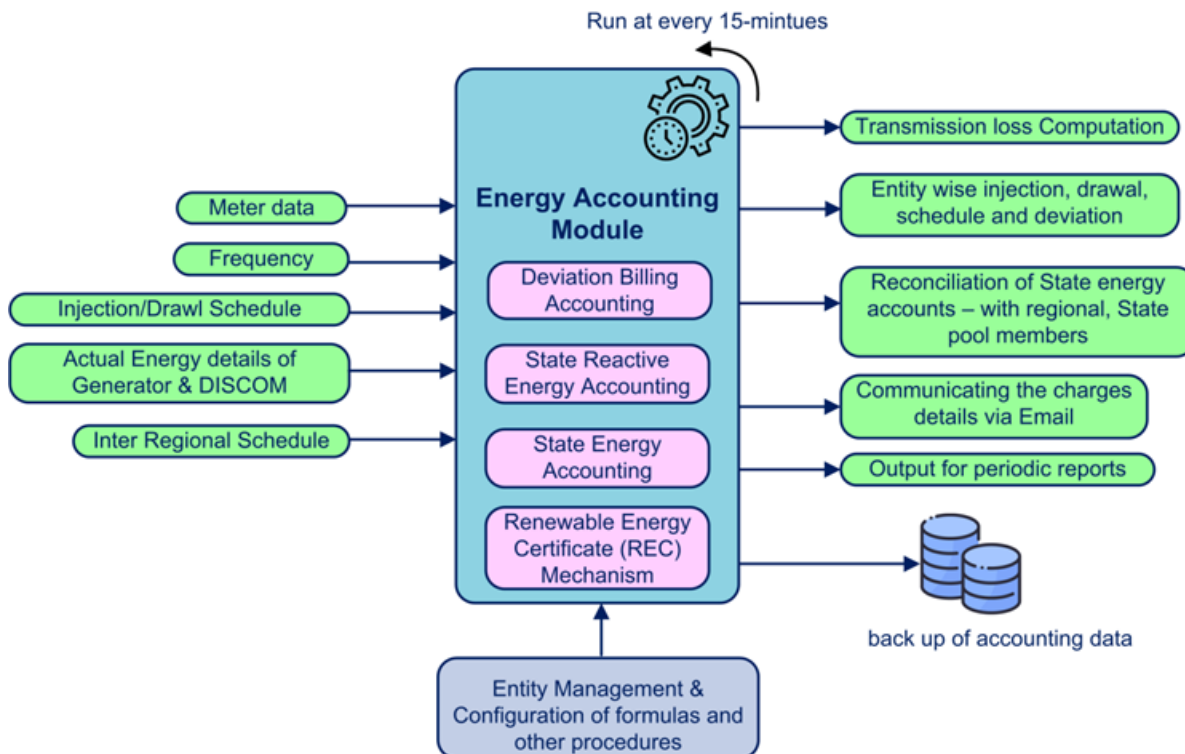
Figure 5: Energy Accounting Module

REC Mechanism Features:

I. The software will have the provision for configuration of Renewable Energy Generators qualified for REC mechanism. The details required to be configured are Name of RE Generator, Type, Address, installed capacity, location of installation, connectivity details, Accreditation No, Registration No., date of registration, Validity from Date & Validity to date, Metering details, sale details, applicability of REC/RRF mechanism etc.

II. The software will have the interface for entering the monthly energy injection received from concerned wing/ real time of Renewable Energy Generators (Wind Electric Generators (WEG's), Solar Generators, Small Hydro, Biomass and others) at the common metering point generator-wise and Discom agreement-wise, energy purchased by GRIDCO and energy wheeled to DISCOMs for own use / third party sale as furnished by respective DISCOMs.

III. The software will be able to generate the following reports –

    a. Summary report indicating the total installed capacity for wind, solar, biomass, biogas or any REG type.

    b. Report indicating the configuration details for each REG grouped into type of renewable power.

    c. Monthly / weekly energy injection report for each type of renewable energy generation.

    d. Any other report required by SLDC.

3.4 Module-4 Deviation Settlement Mechanism (DSM) Deviation Accounting and Additional DSM Charges and Settlement Module:

This module should be capable for generation of daily/ weekly/ monthly/ yearly or user specified Deviation Bills.

i) State Deviation Settlement Account (SDSA): This modules objective is to prepare Monthly / weekly / user specified State Deviation Settlement Account (SDSA) by SLDC for the billing and settlement of Deviation charges. It comprises of monthly / weekly / user specified Deviation energy as a deviation in actual net generation / drawal from scheduled generation / Drawal and corresponding Deviation charges payable / receivable by the respective entities (SGS, IPPs, CGP's, Discoms and OACs).

ii) Computation of deviation charges will be as per the OERC / CERC regulations in force and subsequent amendments thereof. The State DSM Pool account shall be prepared considering the above deviation charges and Regional Deviation charges (payable/receivable) amount obtained from the Regional DSM account prepared by ERPC.

iii) System will be able to compute energy settlement (if any, in place of DSM) for open access customers as per OERC/ CERC procedure.

iv) System will be integrated with scheduling module to automatically exchange data of Implemented Schedule. It will use Frequency, ABT meter data in 15 / 5 minutes or regulation specified block wise for computation of Deviation charges.

v) The system should be able to access frequency, ACP and GRIDCO drawal etc. data from ERLDC/NLDC/ Energy Exchange website for deviation calculation as per OERC/CERC regulation. Further provision should also be available for manual processing of above data in this application server.

vi) In addition to SDSA, system will also generate following reports (weekly/monthly/user specified)

    a. Detail statement of Day-wise and total Deviation (weekly/monthly/user specified) for each entity, which include Scheduled Energy, actual energy, Deviation Charges, additional Deviation Charges, Reference charge rate etc.

    b. Deviation Pool Summary indicating adjusted Deviation Charges, Capping Amount, Additional Deviation Charges, net amount payable & receivable by the Intra-state Entities and GRIDCO for intra state transaction.

    c. Details of mis-declaration of Declared Capability by State generating Station (if any).

    d. Details of Time-Blocks of suspension of Deviation due to transmission constraints and

grid disturbances.

e. Block wise details of Deviation Charges for each entity.

f. Deviation status report, Report on entity wise deviation amount paid and received monthly in tabular form, Bill Summary report & Quarterly Reconciliation Report in tabular form to be generated

g. System will be able to maintain and generate a report of DSM charges paid/received by entities along with withstanding amount and interests to be paid.

h. Entity wise Bill Statement shall be generated for each billing cycle (monthly/ weekly/ regulation specified) and also for subsequent revisions.

vii) Congestion charges/ Account for intra-state entities:

a. Provision in software to maintain/ capture details/ time interval of congestion period as notified by RLDC/ SLDC.

b. Software should have the provision to calculate congestion charges for intra-state entities for the congestion period as per OERC/CERC regulation.

viii) Billing, Collection and Disbursement: System will have feature of recording the payment received against Deviation Charges and Reactive Energy Charges. Maintaining the State Deviation Pool Account and State Reactive Pool Account. The principal and interest component of each Intra-state entity will be maintained separately. Generate report indicating the payment received or due on the entities or any other report required by SLDC.

ix) All the major accounts (SEA, SDSA, SRA etc.) will be posted on website automatically after internal approvals.

x) Integration of Settlement System with an internal e-mailing server through SLDC email accounts for facilitating two-way communications between SLDC and transmission / generator / discom etc. users.

xi) Email / SMS notifications to be sent to users on generation of major accounts - SEA, SDSA, SRA etc.

xii) The said module should have a dashboard feature displaying various information and shortcuts as defined by SLDC.

Deviation Bill Preparation Module:

This module should be capable of generating UI/DSM bill as per the OERC/CERC Regulations and amendments from time to time, for Generators/ Buyers/ Discoms/ OA customers etc.

The module to be designed for recording details of payments related to energy imbalance settlement such as amount, mode of payment, date of payment, etc. The module will have general ledger, accounts payable, accounts receivable and will generate necessary reports as desired by SLDC, OPTCL.

DSM Bill Revisions: Provision should be available for bill revisions at different points of time with regard to various reasons/ issues, which should be mentioned during re-billing as re-bill reason and an abstract should be generated for each billing cycle mentioning the no. of revisions with re-bill reasons with date and time, user account etc.

The software should maintain the history of each bill revisions

Payments Accounting Module:

SLDC, as per OERC/ CERC regulations, collects One time/ Monthly/ Annual fees and charges from generators/ open access entities/ drawing entities for the services pertaining to various functions like scheduling operations, open access approvals, energy accounting, DSM and Reactive billing etc. The objective of this module is to manage all such transactions at one place by aggregating relevant information from various functional modules for the purpose of accounting and audit. Following functionalities should be developed:

a. Feature of calculation and verification of all kinds of fees & charges as per the OERC /CERC orders for SLDC.

b. Provision of managing user/ beneficiary records, share allocation data (ISGS/ MTOA/ LTOA/ STOA etc.), generating station installed capacities, transmission licensee circuit Kms. and other data for the calculation and verification of SLDC charges as per the OERC /CERC regulations.

c. Repository of weekly/ monthly/ annually or user specified bills for all registered beneficiaries.

d. Pool account management, receipts, disbursements, delay payment charges etc.

e. Provision to generate revised bills.

f. Entry, verification and approval of payments made towards the generated bills.

g. Payment entry and approval.

h. SLDC annual charges management.

i. TDS/ GST and Reconciliation.

j. Billing Summary which includes details of current bill along with arrears/dues/outstanding if any and Payment reports.

k. **Log Module:** This module should be capable of logging all types of events with time stamping e.g., Server H/w Problem, UPS tripping, User Login/Log out Timings etc.

l. **Administrator Module:** For one Time Critical Data, User Management and permission etc.

m. **Pool Account:** This module should be capable of:

Maintaining, producing, monitoring Deviation System Pool account, Congestion Charge pool Account, Reactive Energy Pool Account, Interest Charge on the said Pool accounts etc. accommodating subsequent revisions and revision reason.

n. Validation of State Active & Reactive Energy account of State (Energy imported from ISGS & other inter-state energy charges)

o. Monthly Energy account of LTOA, STOA, MTOA Customers for recovery of Transmission charges as per prevailing regulations.

All the above functions and reports of all the modules should have the print option at every steps/window and save options in formats like csv, pdf, xls, xlsx, text, word format etc.

All the modules should have the provisions for custom defined reports which can be created at user end.

All the modules should have interlinking that needs to be displayed in the Dashboard of each module as WORK QUEUE as per requirement of SLDC.

The system should prompt consequences and conformation before doing any major changes such as deleting, updating etc.
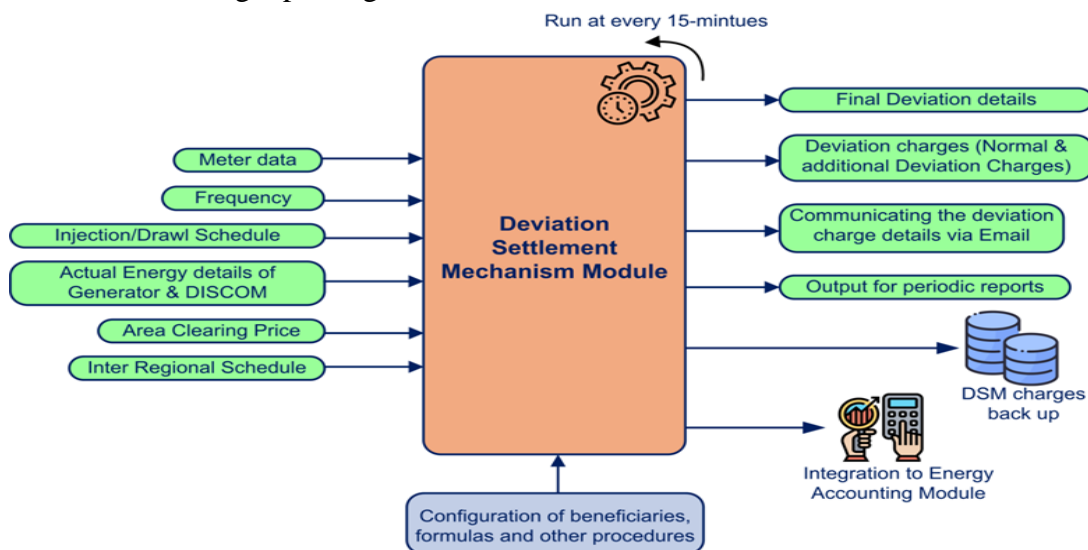
Figure 6: Deviation Settlement Module Input /Output diagram

3.5 Module-5: Open Access transaction management (Short term / Medium term/ Long Term) Module with payments accounting.

General Provisions:

Develop workflow based online system for facilitating registration of intra-state entities/ OA customers, submission and approval of OA applications with the following provisions.

1. Processing of applications for intra-state STOA/MTOA/LTA by SLDC/STU as per the applicable regulations of appropriate Regulatory commissions from time to time.

2. Processing the applications for issuance of concurrence by SLDC/STU for inter-state STOA bilateral transactions.

3. Processing the applications for issue of NOC for inter-state LTA/MTOA as applicable.

4. To realign the features of the software module in accordance with change in rules, regulations and orders of governments /appropriate Regulatory commissions from time to time.(eg.Full-fledged implementation of GNA Regulations of CERC and Green Energy Open access Rules of MOP, Govt. of India)

5. Registration facility for STU, CERC registered traders and Open Access customers for intra-state and inter-state categories in line with OERC / CERC regulatory formats for specific duration, quantum, corridor, etc with In-built validation and escalation mechanism to be incorporated to ensure that applications are processed by the respective approving authority within the specified time limit in accordance with the relevant OERC/CERC regulations and orders.

6. Feature of linking application with registrations with necessary in-built validations

7. Provision to validate and process the application as per the allotment priority as stipulated by the relevant OERC regulations and orders for granting permission for short term open access transaction as per availability of transmission Margin for STOA.

8. Web access to the Distribution Licensees (only for granting the consent with in the cut-off date as applicable) so as to enable the OA customers for seeking the consent of the distribution licensee prior to submission of OA application to SLDC. Facility with rights of the distribution licensee to send back the application to the applicant by applicable cutoff date for communicating deficiency or defect in application. Also there shall be Facility to direct the application to SLDC if the Distribution Licensee does not grant the consent by the cutoff date or otherwise.

9. Web access to the STU only for granting the consent to SLDC. Only after the success of the above work flow, the application shall reach SLDC with a parallel notification to the STU and if the STU does not grant its consent within 3 working days, then SLDC shall approves the application.

10. Ability to capture details like TTC, ATC, LTOA, MTOA etc. for CTU-STU corridors, various Zones within State for calculating margin for various open access categories.

11. Develop provisions for calculation of different open access charges applicable to OA applicants andgeneration of applicable payment schedules.

12. Integration with NOAR application of fetching registration and NOC approvals.

13. Provision to incorporate the approved transactions details in day-ahead/intra-day scheduling in accordance with the provisions of the relevant OERC regulations and orders in respect of intra-state ABT/CERC Regulations as applicable.

14. Provision to incorporate real time curtailment of implemented schedules arising out of system constraints along with the down ward revision/surrender requests received from the

STOA customers thereby facilitating the issuance of revised STOA approval/ schedule in accordance with the provisions of the relevant OERC regulations/Amendments and orders in respect of intra-state ABT

15.   Generation of energy accounts for Open Access entities as per period specific/entity specific requirements of SLDC/Users.

16.   Details of approved/concurrence or rejected open access schedule transaction details with time andblock wise in summarized form for specific period.

17.   Provision for calculating/generating bill for the wheeling charges against the inter-state bilateral transactions of the STOA customers having their point of connection with a voltage level of distribution system (33kv and below)

18.   Details of customer wise payment schedule including the transmission charges, wheeling charges, cross subsidy surcharges, etc. and operating charges along with scheduling details (requested and accepted) for specific period of open access with a provision for generating consolidated monthly/Time period specific report comprising all such details.

19.   Web access to OA customers for filling in the details of payment made by them against the OA charges such as transmission charges, wheeling charges, application fee, operating charges and TDS details (if any) for facilitating further refund/reconciliation and disbursement along with provision for generation of monthly consolidated statement of such records. Auto tracking of the outstanding dues of the applicant and not allowing to punch new applications in case of such outstanding amount.

20.   Dashboard for SLDC with a provision for generating customized view of the entity wise as well as monthly/date wise/ Discom wise OA transaction details (details of requested/implemented schedule and payment of OA charges with outstanding dues considering the calculation methodology for applicable delay payment surcharge.)

21.   Facility to view the status of application vis-a-vis consent/approval pending with whom and for what /approved etc at each step

22.   All the payments to be made through single payment gateway system only from the bank account of the applicant registered with the portal through any acceptable means of payment instruments like Net banking, cards, Drafts, cheques while keeping record of such payments.

Functionalities

The software module is to create a Portal / Registry for SLDC for processing of Intra-state Open Access approval and to issue NOC for Inter-state Open Access transactions with a single payment Gateway for payment of all charges related to Open Access Transactions. The Portal will provide access to Users such as all Licensees i.e. STU (All Zones), all Discoms and Open Access Customers such as Trader/ /Power Exchange/Discom/ Generator/ Consumer applying for Medium/Short Term Open Access and NOC.

Following Modules to be developed to manage Open Access Transaction
1. Registration
2. Application Dashboard
3. Payment
4. Reporting and Analytics
5. Admin

1. **Registration Module:**
   The users listed above shall get themselves registered in the portal by submitting the following details.
   a. **Demographic Details-**Name of the Utility, Parent Company Name as per PAN, Postal Address of the Utility, User Category (PX/Trader/STU-Specific Zone/Distribution Licensee/CGP/IPP/State Generator, Utility Type (Injecting/Drawee/Both).
   b. **Injecting/Drawee Details-**Total Installed Capacity (MW), Auxiliary Consumption (MW), Ex bus quantum (MW) along with unit wise details like fuel type and COD particulars/First time charging Certificate etc along with provision to upload the supporting documents-in case of injecting utility
   c. **Connectivity Details-**Voltage Level and feeder Name at point of connection, connected with (STU/ Distribution Licensee), Name of Distribution Licensee with whom the utility has connected and Contract demand in MW, Documentary proof of connectivity Certificate, System study report of STU with validity period (automatic notification when system study expires), Uploading of Single Line Diagram
   d. **Metering details-**for uploading valid document bearing the main meter and check meter serial nos jointly signed by STU/DISCOM along with the SLD clearly showing the metering points.
   e. **Contact Details-**Name, Designation, Mobile No, Email id (primary and Secondary)
   f. **Financial Details-**PAN, TAN, GSTIN, Bank Account Details with IFSC Code/Cancelled Cheque and uploading the relevant Documents.
   g. **Waiver Details-** RE Utility with source of generation /State Utility (GRIDCO).
   h. Additional documents if any

2. **Application Dashboard:**
   a. Submission of Application: It shall be capable of allowing the applicants to submit / edit/withdraw an application for open access and to upload various documents like payment details of application fees, Consent of the buyer and seller, PPA's/PSA's etc. in accordance with the OERC/CERC applicable regulations as the case may and subsequent amendments from time to time there in.
   b. Tracking of Application: It shall allow users to track the applications as submitted above in the following modes.
   c. View Status: to view the current status of the application

d. View Application details: to view the application details related to capacity, period & time block etc.

e. View transactions: to view the application information for different application category including Pending, Approved, Rejected, Scheduled and revised applications and reasons in case of revision/rejection.

f. Search: to see the Application details related to applied maximum ceiling, date of application, approval/rejection date and time block etc. Software should be able to check the quantum and duration of power sold / purchase by the seller / buyer through power exchange / bilateral mode. The Applicant cannot be able to apply the quantum of power more than its capacity / contract demand through power exchange/bilateral put together

g. Message: to view Message received for various processes/documents deficiency.

h. SLDC shall be able to issue approval/concurrence or seek for more information from the applicant as per the applicable regulations while STU and distribution licensees shall be able to access and issue their consent/denial thereof.

i. There shall be a sub section for allowing the applicants to submit their surrender/downward revision/relinquishment request along with quantum and time period against their already approved transactions and accordingly SLDC shall be able to issue revised approvals in accordance with the applicable regulatory provisions and time limits laid down in the GRID Codes.

j. There shall be provisions for SLDC to revise an approved transaction in real time basis in case of transmission constraints and other force majeure conditions as per the regulations and Grid Codes applicable.

k. All the audit trail of the aforesaid activities shall be time stamped and saved in the system software ready for future access.

l. Provision shall be there for uploading and down loading of various documents/ approvals in excel and pdf formats as desired by the Users.

3. **Payment Module:**
   a. Shall be capable of allowing the applicants to make payments from their registered bank account against different heads of open access charges like application fees, Transmission charges, Wheeling Charges, Scheduling Charges and any other charges as per the applicable rules and regulations.
   b. Shall have scope for reconciliation and disbursement of different charges by SLDC to different entities.
   c. Shall be able to calculate and keep track and facilitate SLDC suitably in making the refunds arising out of revisions/curtailments due to surrender/relinquishments/transmission constraints and other reasons as applicable by the rules and regulations.

d. Shall be capable of generating reports related to entity wise payment receipts under specific charges of open access along with TDS particulars, UTR no, Date etc as per the configurable requirements desired by SLDC.

e. Shall be capable of identifying and enlisting the defaulters there by calculating the delay payment penalties while being able to generate such reports and auto notifications to the defaulting entities on weekly /monthly basis.

f. Shall be capable of retrieving and interpreting the formats of reconciliation/payment details of all the power exchanges of India and RLDC's on monthly/weekly basis so as to consolidate and generate reports on as and when required basis.

4. **Reporting and Analytics:**

a. Application/Approval detail Report: This Report lists all the applications applied/approved between the specified dates listing the details of the injection/drawal points, quantum applied/approved, region, time blocks, Open access charges applicable and the routes etc.

b. Payment Receipt and Disbursement Report: This report shows the details of the amount received and to be disbursed to different entities involved the transaction for which Applications are processed /approved during a particular time period.

c. Payment Disbursed: This report shows the details of the payment disbursed for a particular month of the year.

d. Quantum View Report: Shows the surplus margin available in the State Network to be approved for all the applications in the approval also the margin available for each customer for a specific open access transaction after deducting the already approved open access quantum from the maximum allowed /permissible ceiling.

e. User Tracking Report: This report details the processing done by any user identified by login between the specified dates.

f. User Permissions Report: This report shows the different users of the application and their privileges.

g. Refund Report: This report shows the amount to be refund/reconciliation during a particular month of the year against any surrender or curtailment of power for any particular approval.

h. ATC Report: This report shows the Available Transfer Capability for an Element/corridor(s) during the specified dates.

i. All the approvals shall be downloadable in pdf format for easy access by the applicants and the STU whereas the approvals involving the charges of distribution licensees shall be downloadable by the distribution licensees.

j. The system software shall be capable of communicating the approvals with the scheduling module for generating consolidated time block wise approved schedules for the open access customers. Further, it shall be capable of organizing these schedules discom wise for any particular time period as desired by SLDC/any User. It should also be able to generate entity wise report considering the energy source (differentiating RE-Solar/Non-Solar/ LHP and Conventional sources for any time period on as and when basis as per the customized

requirements of SLDC.

k. There shall be provision to generate the consolidated time block wise as well as entity wise abstract for both injecting and drawee entities at defined points of injection and drawl taking in to account the applicable losses thereof along with group captive wheeling details.

l. Facility for uploading the historical data in the data base and enabling populating in SLDC website as per the requirements defined by SLDC.

5. **Admin**

There shall be provision to make a repository of the approved open access charges like Application fees, Scheduling charges, Charges STU and Distribution licensees, Losses for STU and Distribution licensees applicable for a time period as notified by appropriate commissions keeping the modifying rights lying with SLDC along with updating the bank holiday list. Other configuring rights like changing various parameters/information related to but not restricted to the entity's details shall be provided to SLDC/other users as per the operational requirements that may arise from time to time.

6. **Platform Integration**:

a. The Open Access web portal shall be integrated with existing website of SLDC. A link shall be provided on the existing website of SLDC by clicking on which, user/applicant shall be redirected to the login page of web portal. After entering the user id and password successfully from this option, open access portal will get opened and user can work accordingly.

b. Provision shall me made to follow a standard practice for seamless integration with the various platforms/Reports of NOAR, GOAR, RLDC, Power Exchange platforms for better data retrieval and unique identification of entities.

7. **Software/web portal availability:** Software/web portal shall be designed/ maintained in such a way so that, it remains available for applicants/users for more than 99.99% of the time.

8. All the above provisions, procedures and work flows shall be in compliance with and configurable as per the applicable regulations by OERC/CERC and the rules orders/directives of state/Union governments in force from time to time and case specific operational requirements of SLDC.
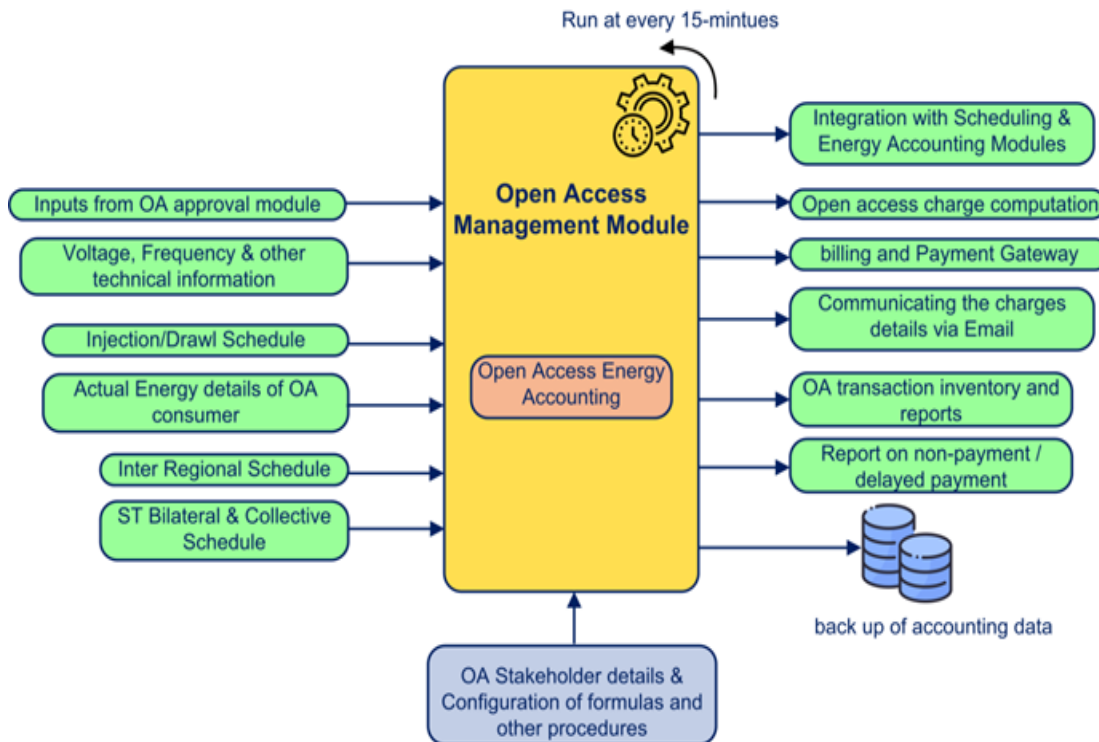
Figure 7: Input / Output Diagram for Open Access Management Process

Cross Subsidy Charges Billing for OA consumers

The approved OA Schedule such as Bilateral, Collective and Intra-state transactions and actual drawal will be the inputs for preparing cross subsidy surcharge bill by the SLDC for Discoms.

3.6 Module-6 Outage planning Management including First time charging approval for New Connectivity.

Outage Planning Procedure & Scope

i. Annual Outage Planning

Annual outage planning for state transmission system elements (Lines/ Tfr. and other) report shall be prepared and finalized by OPTCL as per the provision of OGC/ IEGC and implemented on real time basis.

ii. Real time outage planning

a. Intra-state transmission elements:

The designated officer of OPTCL shall submit the shutdown proposal to SLDC on web-based on-line application for planning and managing outages before three days. In case there will be any area load interruption due to the outage proposal, consent of the

DISCOM authority shall to be attached with the proposal. SLDC after scrutiny considering system stability and other factors shall allow the outage proposal. For 400kV and above transmission element outage, SLDC shall forward the proposal to ERLDC for concurrence and allow after ERLDC concurrence.

b.   Inter-state transmission elements:

The designated officer shall submit the proposal by 12.00 hr of 6th day (preferably working day otherwise on previous working day) of previous month to SLDC for availing shutdown of any Inter-state transmission elements owned by OPTCL / intra-state transmission elements above 400 kV Voltage level. SLDC shall upload the proposal in ERLDC portal for approval. The proposal will be approved in the Outage meeting of ERPC. After approval by ERPC, the designated officer will submit requisition for shut down on D-4 basis (Four working days in advance for shut down proposed on the Dth day). The requisitions will be forwarded to ERLDC for final approval, which will be communicated by ERLDC on D-1 basis after detailed study. Approval is intimated before one day to the authority.

c.   Inter-regional transmission elements:

The designated officer shall submit the proposal by 12.00 Hrs of 4th day (preferably working day otherwise on previous working day) of previous month to SLDC. SLDC shall upload the proposal in ERLDC portal for approval. The proposal will be approved through Outage meeting of ERPC / NLDC. Subsequent to approval by ERPC / NLDC, the designated officer will submit requisition for shut down on D-4 basis (Four working days in advance for shut down proposed on the Dth day). The requisitions will be forwarded to ERLDC for final approval, which will be communicated by ERLDC on D-1 basis after detailed study. Approval shall be intimated before one day to the authority.

d.   Emergency shutdown of transmission elements:

The designated officer shall submit the proposal to SLDC on real time. SLDC shall allow the proposal in case of intra-state transmission elements.

In case of Intra–State transmission elements of 400KV and above / Inter-state / Inter-Regional tie line, the designated officer shall submit the proposal to SLDC on real time with proper   proof (Photograph of affected portion with time stamp) which will be forwarded to ERLDC for approval.

e.   Generator outage planning:

Hydro stations shall avail unit shut down between November to June of the year for

annual maintenance for a period of one month. Thermal generator shall avail shut down during monsoon season. Outage proposal of thermal generators shall be approved in the Yearly LGBR (Load Generation Balance Report) Meeting of ERPC held normally during December to January every year. Any alteration in the outage program if required by the Generating entity has to be approved by ERPC in the Monthly OCC Meetings.

f. First time charging approval in case of New Connectivity and outage planning required there of:

In case of new connectivity of Inter-regional /Inter-state tie line and intra-state transmission elements of Voltage level 400KV & above, outage permission required for new connectivity will be given by ERLDC only after issue of first-time charging approval by them. The necessary formats for application of first time charging of above said elements are available at SLDC Website.

Similarly, in case of intra – state transmission elements, Generators & CGPs, outage permission required for new connectivity will be given by SLDC, only after issue of first-time charging approval. The necessary formats for application of first time charging for intra – State elements are available at SLDC Website.

Objective of Software: -
The objective of this module is to design, develop and implement a web-based on-line application for planning and managing outages (shutdowns) along with emergency shutdowns for faulty transmission elements of transmission system for maintenance or other purposes. Also, shall have provision for first time charging approval for transmission elements in case of new connectivity as per provision under OGC/IEGC. This application would be hosted on server(s) located at SLDC. This system will facilitate SLDC, in receiving shutdown requests from field offices, processing and approving such requests and keeping track of elements which are out of service at any specific instance.

Functionality:
I Creation of master database of transmission elements (Lines & Transformers etc.):

Master data base & updating data base of all transmission elements (power transformers, Auto Transformers, ICTs, Reactors, Buses, Bus section, Bay, Circuit Breaker, Auto Reclosure, Generators and transmission lines etc.) at various voltage (765KV/400KV/220KV/132KV) levels within SLDC control area. SLDC will provide necessary details of existing power transformers and transmission lines to the Service Provider in MS Excel / MS Word documents. The transmission elements will be captured along with basic parameters, such as:

a) For power transformers: Name of the sub-station**,** voltage ratio, MVA capacity, identification number, Maintenance Division etc.

b) For transmission lines: Name of both end sub-stations & in case of T-connected lines name

of three end sub-stations, Voltage level, D/C/S/C conductor configuration, identification number, corridor(s) to which it belongs to (These specific inputs will be provided by SLDC), Line length, Maintenance division, DISCOM area etc.

II   The database will be created with assistance of SLDC officials with information available/ collected by SLDC. The database will be validated by Nodal Officer. Further modifications, additions or deletions facilities shall be available for SLDC.

III   Creation of shutdown request: Various transmission users will be able to view list of transmission elements available in the system and raise request for shutdown of specific transmission element for certain duration (from Date/Time to Date/Time) and purpose of shutdown etc as per prescribed format provided by SLDC with uploading facility for supporting documents.

    a. Prior to final submission of shutdown request information, user shall have a preview of data entered and asked for confirmation or edit, print option in formats like PDF, Excel, word etc of said request should be available.

    b. There shall have provision to add/change/cancel /approve the request up to a certain date in a month/certain days before the commencement of the shutdown.

    c. System shall be able to generate popup indication if defined number of elements are already

       out in the same/nearby corridor (This business logic will be provided by SLDC)

    d. Integration of this system with an internal e-mailing system for facilitating two-way communications between SLDC and transmission utilities.

    e. Users will be able to record tripping of transmission element with reasons. Relay indication & time (tripping & charging/Faulty) and restored details of those elements.

    f. Users access for above operations (other than SLDC member) shall be given to specific users with limited operations/functions as defined by SLDC.

    g. This module should have provision to add the faulty declared transmission elements to the Forced Outage list.

IV   Processing of requests by SLDC: Concerned officials in SLDC shall have provision to view the requests of shutdown by users from various transmission utilities and record approval/rejection/modification/ deferment in requests for shutdown with remark (optional).

    a. The module will have in-built validation and escalation mechanism to ensure that applications are processed by the respective approving authority within the specified time limit (inputs to be provided by SLDC).

    b. SLDC shall have facilities to record tripping of specific transmission element with relay indications & time (tripping & charging) and restoration details of those elements.

    c. On approval of any shutdown, message shall be sent to the requisitioning user along with respective division/circle/zone through an internal e-mailing system integrated with the system.

    d.   Users shall have provision to record the time of availing the approved shutdown followed by charging time of the said element after completion of shutdown work (LC procedure) with a remark (optional).

V   SLDC Administrator shall have the following facilities:

    a. Create/change/remove users (user management):

    b. Add/delete/modify/any element users:

    c. Allow users to submit/change their requests after due date:

    d. Manually enter a request on behalf of transmission utility

    e. Add approval status based on discussions in OCC meeting and

    f. Permission to different user access.

VI   The business logics for this module process flow, request form template for shutdown, timelines and escalation matrix for approval, technical details like categorizing transmission elements into corridors etc. Will be provided by SLDC.

VII Other features:

    a.   The system and flow will be user friendly and designed in manner to accommodate future changes.

    b.   The system shall have the provision of role-based access to the user so that data pertaining to specific user only are accessible.

    c.   The system will have well-defined SLDC data.

    d.   Data validation will be provided on server as well as client (work station) side.

    e.   The system shall have provision for backup and recovery procedure/option for database.

    f.   The system will have provision for audit trail functionality. The system will log database transactions (add, delete, modify) and maintain user, application related logs and error trapping.

    g.   The system will prompt consequence and confirmation before any major changes like deleting, updating etc.

VIII **First time charging approval in case of New Connectivity:**

    a.   **Creation of FTC request:** Various transmission users/authorities will be able to raise request for new connectivity of transmission elements (Grid Sub-stations/ line/ CGP unit/transformer etc.) or any modification in existing transmission elements etc as per prescribed format provided by SLDC (with uploading facility for supporting documents) .

    b.   **Processing of requests by SLDC:** Concerned officials in SLDC shall have provision to

view the requests of FTC requests by users from various transmission utilities and record approval/rejection/modification in requests for new connectivity.

c. History shall be maintained in case of any change (LILO/ T-connections) in transmission line configurations and accordingly database of transmission elements shall be updated automatically.

d. This module shall have provision: In case of new connectivity (First Time Charging) of any Transmission elements (line/transformer/bay etc.), Generators & CGPs in the system shall be added in the database automatically.

e. This module shall be integrated/ linked with Energy accounting module with appropriate approval of SLDC.

IX   REPORTS

Following is the tentative list of key reports expected to be generated from this module. The exact number of reports and content of each report will be finalized in consultation with SLDC during development phase.

i.   For OPTCL & Other transmission utilities if any

a) List of various transmission elements with all relevant details & specifications.

b) Requests made by individual users from transmission utilities.

c) Approved/rejected shutdowns by SLDC with reason/remarks.

d) Pending requests for shutdowns from transmission utilities.

e) Planned& Forced Outage, Emergency outage & tripping history and other reports of elements week wise, month wise and year wise or user specified dates along with graphical views.

f) List of First-time charging elements with all relevant details & specifications and other related reports of elements week wise, month wise and year wise or user specified dates.

ii.   For SLDC

a.   Requests made by individual users from transmission utilities with all relevant details & specifications (Voltage level/Grid/type of element/LR basis/ DISCOM area etc.)

b.   Approved/rejected shutdowns by SLDC

c.   Pending requests for shutdowns from transmission utilities

d.   Tripping details filled by SLDC & Users (Voltage level/Grid/type of element/LR basis/ DISCOM area etc.)

e.   Outage schedule of elements (Grid Substation or sub-division/division/circle/zone wise etc.)

f.   Report of outages taken during a period with tags (annual planned, forced emergency, tripping details etc.) Voltage level/Grid/type of element/LR basis/Zone wise with graphical views.)

g.   List of First-time charging elements and other related reports of elements week wise,

month wise and year wise or user specified dates. (Inter regional/Intra state/ Interstate, Voltage level, Grid/ type of element/ DISCOM area etc.)

h.   The outage time thus system calculated from restoration time & time of tripping should be

facilitated for custom hour interruption report.

iii.   For SLDC Administrator

a. Consolidated requests from transmission utilities

b. Tripping details as filled by SLDC & Users from field end.

c. List of elements that cannot be taken under shutdown due to other elements being already out (if such criteria is set)

d. Consolidated report of approved shut downs

e. Any other type of complex or selected field reports.

The said module should have a dashboard feature displaying various information summary & shortcuts (links) as defined by SLDC.

All above functions & reports should have the print option at every steps/window and save options in formats like PDF, Excel, word etc.

All reports should be generated for daily/weekly/monthly/annually or range specified along with a graphical view.

3.7   Module-7 MIS Dashboard and data management

Integrated MIS/Dashboard for SLDC, OPTCL

Objective of Software: -

There will reporting from each module under the solution catering to the SLDC requirement, but these modules warrant the integrated MIS /Dashboard platform should be able to undertake the following: -

i. Single platform to pull Enterprise Dashboard/Reporting requirement across all the functional modules

ii. Data Integration & Management (including connecting to Scheduling system, Open Access system, SCADA, EASS, Energy Accounting, Load dispatch and others as deemed necessary)

Functionality

The integrated MIS module should have following functionalities / features:

1. Ability to generate standard reports (formats will be defined by SLDC)

2. Ability to generate dynamic reports:

a. User should be able to select fields/parameters dynamically and generate the report

b. User should be able to generate own customised report and save it for future reference

    c. User should be able to export the report in pdf/ excel formats

3. Ability to provide dynamic dashboard with graphical and tabular representation for top and middle management

4. MIS module should be compatible with prevailing mobile devices

5. Ability to incorporate formulas in report formats

6. Ability to provide filtering and selection capabilities in reports with easy-to-integrate metadata/common action elements such as radio buttons, drop-down/combination boxes, check boxes and sliders

7. Ability to send reports / alerts via e-mail

8. MIS module should have facility for multiple viewing of data (summary level to lowest level with drill down feature)

9. Users should be able to view MIS reports / dashboards on all major web browsers."

3.8 Module-8 Dynamic and interactive Website for SLDC

The objective of this module is to design, develop and implement a dynamic interactive content management system website for SLDC. This module will have the desired functionality for extraction of summary data/ reports from the software modules of the proposed SAMAST software and display the same on the website for stakeholder access. The customized website for SLDC will be based on the industry practices and fulfilling the functional requirements to perform the following activities. SLDC Website will be a part of web application portal and will present information intended to be in public domain without logging in. If logged in, it will present dashboard/interface based on role of user.

I . SLDC Homepage.

   a) The layout and main content of the home page will be designed in consultation with SLDC;
   b) Provide menu links/ tabs for SLDC's key functional areas (About Us, Scheduling, Open Access, Energy Accounting, Real Time Data, SCADA, Grid, Reports, Useful Links, Documents Repository etc.);
   c) The home page of SLDC website will have provision to display latest news/ messages/ alerts.
   d) Display of current schedule, revision and demand met on the Homepage.

II SLDC website will have provision to display organization structure, information about formation of SLDC, roles and responsibilities, contact list of SLDC officials and other relevant information pertaining to SLDC.

III Create provision for displaying Generation and Drawal Summary along with Generator wise Declared Capacity (DC), Scheduled Generation (SG), Actual Generation (AG), Discom wise Requisition, Scheduled Drawal (SD) and Actual Drawal (AD) etc. on the web- site.

IV Create provision to display monthly TTC / ATC details, Intra-state / Inter-state open access / NOC approvals/refusals/pending, merit order stack, charges for STOA transactions, etc. on the website.

V Create web-inter face for monitoring TTC / ATC violation status.

VI Create links to RLDC website for downloading daily reports, scheduling data, graphs and other information available on RLDC website.

VII Create provision to display DC, entitlements, SG, Un-requisitioned surplus, STOA, transmission constraints, implemented schedule etc.

VIII Create web interface / web-link on the website for open access applicants/ consumers for registration.

IX Create provision to display approved outages, tripping data, availability information etc.

X Create provision to upload relevant documents / office orders / OERC / CERC / CEA regulations on website by authorized users. Documents will be listed under various

categories as per requirements of SLDC.

XI   Provision to display/documents/ notices and circulars listed date-wise.

XII   Provision to integrate any other module relating to SLDC activities developed in-house/other agency.

XIII   Supplier will follow the Government of India guidelines to ensure proper standardization of all content. Website will have clean and professional design.

XIV   Implement/ configure Role-based and module-based access rights for end users to protect the content from unauthorized access.

XV   Admin section must be protected by username and password and using salted encryption and MFA. At database level also, password will be stored in encrypted format. The admin will be able to add links / sub-links in the website.

XVI   Conduct security audit of website from CERT-In empaneled agency.

Reports consolidation and transmission:

i.   Based on the Demand, generation and Energy computation, various reports will be prepared by the system, format for which will be provided by SLDC.

ii.   Automatic email facility to the various authorities after verification by Control room officials.

iii.   Automatic updating of SLDC website.

iv.   All the reports will be available in Microsoft excel/PDF/HTML etc.

v.   Software will be able to upload the historical data in the database and software will also be able to transfer data in predefined format in excel for day-to-day requirement.

vi.   User will be able to select fields/parameters dynamically and generate the reports.

vii.   User will be able to export the report in pdf / excel formats

viii.   Software will be able to cater to various requirements of different types of reports required for Odisha Legislative Assembly/ Lok Sabha questions, RTI, reporting to various agencies like State Regulatory Commission, RLDC, ERPC, NLDC etc. from time to time and on need-based basis.

ix.   ABT Meter Reading details will be shared to consumers.

x.   Ability to send reports / alerts via email.

xi.   Users will be able to view MIS reports on all major web browsers. MIS module will be made compatible with mobile devices.

xii. Control Room Management:

a) E-Logbook - facilitates automation of logbook. It will provide option for creating logbook to keep track of Shift Users, Statistics, Issues, Outages, Tripping, Scheduling, Violation Message, Approved Shutdown activities during the shift.

b) Will provide an end-to-end management of tripping, shutdown, line, bus, outages etc.

c) Will provide an interactive real-time dashboard for all tracking outages of the important power elements which can be customized as per user preferences.

d) Code generation for creating Opening/Anti-Theft code/third party opening/ Closing Codes.

e) Violation messages issue and Letter generation

f) Facilitate Duty Roaster Creation and manage Control shift user in log book

g) Provide Shift Summary Report for keeping track of control room attendance log.

h) Integrate with SCADA

i) Provide a mechanism for Line Clearance and Outage Workflow.

Reporting Requirement for all modules of SAMAST software stack

Scheduled data is required for user defined pre-formatted reports and same will be facilitated through appropriate interface/templates.

The application will provision for generation of Textual (Data) reports and Graphical (Pie- Chart, Bar-Chart, Line Graph, 3-D, worm plots, etc) reports. Internal users within SLDC & Back-office will also be able to prepare custom reports using the tool. Application will have provisions for porting relevant data through docx/xlsx, (latest MS Excel format), csv, pdf, and xml formats.

Supplier and SLDC will define the formats of predefined reports and data to be ported during post award discussion as envisaged through customization under Supplier scope. Typical report samples will be submitted during post award discussion. Supplier will prepare these predefined reports formats and these predefined reports will be a deliverable item.

a. All the report sheets should have block nos. as well as block in time. All reports to have the name of OPTCL emblem.

b. Every report to have a space for remarks.

c. All reports will be in printable/downloadable form.

d. All the reports will be within the paper margin. In case of reports with tabulated data which may exceed the paper margin, the section of report consisting of the data exceeding

the paper margin should be generated along with all the other features (column and row labels, header, footer, etc) that were present in the earlier section of the report.

e. A blank template will be provided so that required queries/reports can be generated from the database.

f. All report sheets to have an uploading/print preview feature before final uploading to public domain. Data from all the report sheets will be exportable in excel/ pdf/doc forms as and when required.

g. All reports will be archived on daily basis for maximum possible days/months (minimum 3 years). Reports will be retrievable/ printable with print preview option. Master list of reports and their formats along with samples (if required) will be decided/supplied by SLDC, OPTCL during SRS finalization stage.

3.9 Module -9 Mobile Application

Software will integrate the Modules with the existing web site of SLDC and will develop android base mobile app for SLDC. The mobile app should have following features.

a. Display of important parameters like Schedule, Frequency, current revision and demand met etc.

b. Information on power maps, generator details and important transmission system elements.

c. Load graphs for last three days including current day.

d. Links of various reports of SLDC (Statutory documents/Regulations/SLDC Reports/ Office orders etc.)

e. Day ahead margin of open access applicants

Above specified are the functional requirements only. provision has kept for optimization of these requirements in the software and hardware modules.

4.0   Chapter 4: API integration of third-party application /Data Integration

a) The software provider will design and develop integration modules as part of SAMAST software to share or exchange data with other internal and external systems as per SLDC requirements. The list of software applications proposed to have integration with SAMAST software along with tentative data sharing requirements is provided below.

b) Software Provider will develop and implement necessary application interfaces (APIs) as well as documentation, for integration (export of data/information) from SAMAST software (under this tender) with the existing application systems, like SCADA. SLDC to ensure necessary APIs are available to Software Provider from other suppliers for integration (import of data/information) to SAMAST software (under this tender). For integration of SAMAST software with other SLDC, OPTCL owned software, required API will be provided by SLDC, OPTCL.

c) These integration requirements would be required to be fulfilled by SAMAST provider in the event of any changes/ replacements of the existing application system like SCADA, SLDC website/ SLDC, OPTCL website etc. during the currency of current project as well as AMC period.

The block diagram in Figure 7 explains the proposed SAMAST software's application and its integration with existing software application.
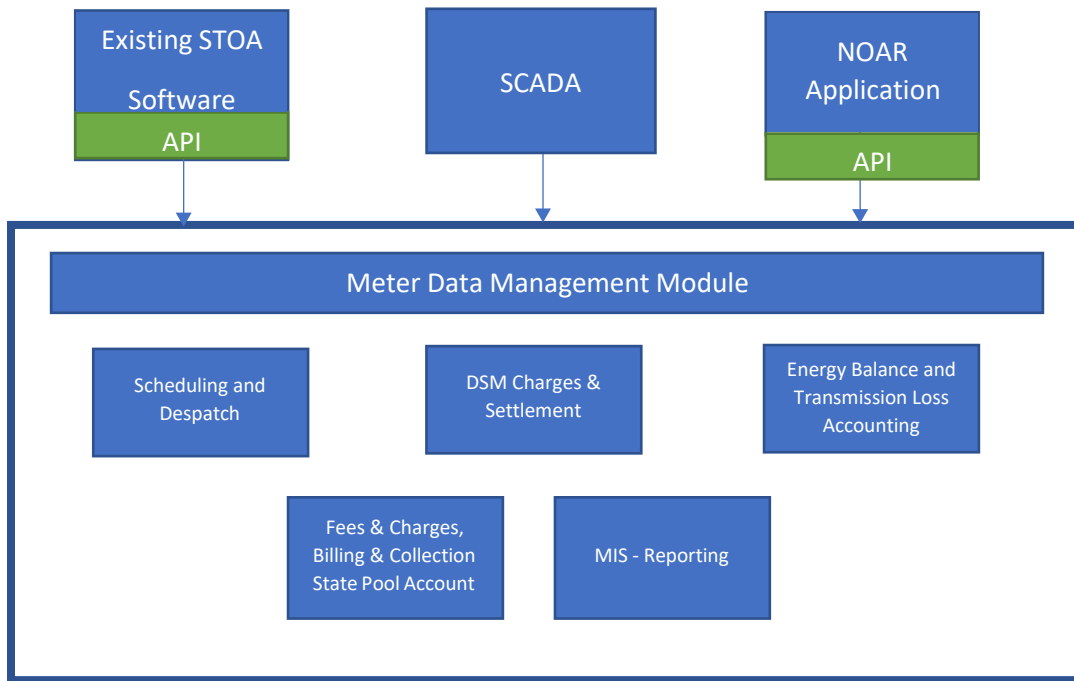
Figure 8 Modules under SAMAST software and its Integration with other software

Table 23 IT Application areas

Sl. No	IT Application	Functionality Required
1.	SLDC, OPTCL website	SLDC developed website integration with SLDC, OPTCL website
2.	SCADA	Data integration between SAMAST software and SCADA for displaying real-time information on website etc.
3	System (proposed)	Automatic Meter Reading (AMR) software and AMR system for getting meter data from AMR system for energy Accounting
4	DISCOMs	Data sharing to / from DISCOMs

5.0   Chapter 5: Detail architecture of development, testing & production phase of software modules:
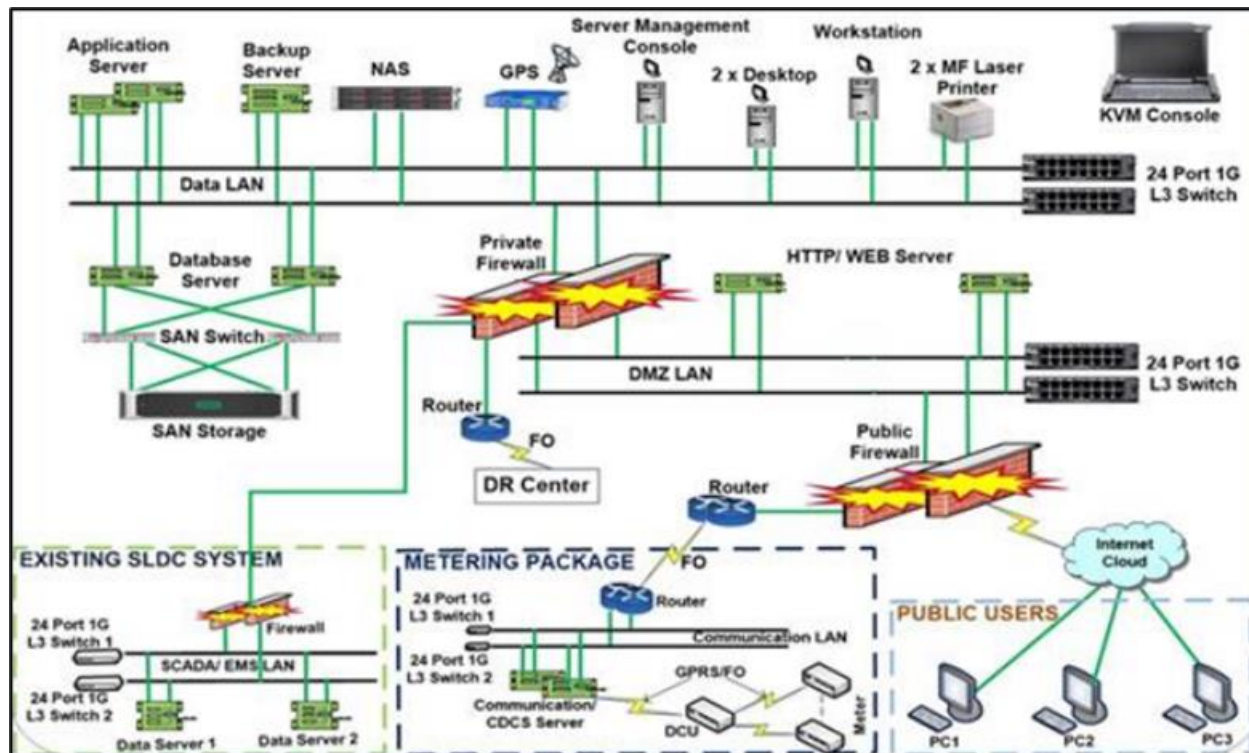
Deployment Architecture:

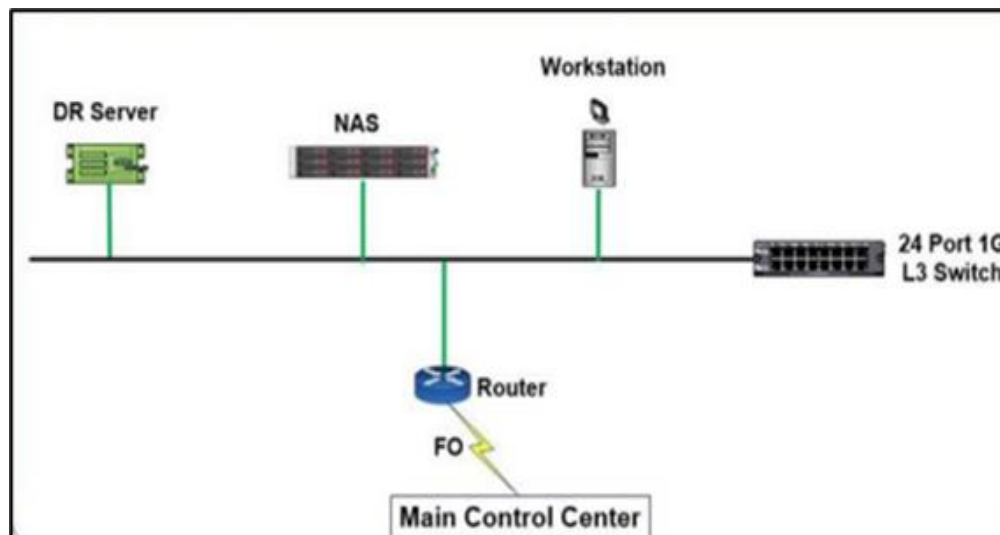Figure 9 IT Infrastructure for Control Centre

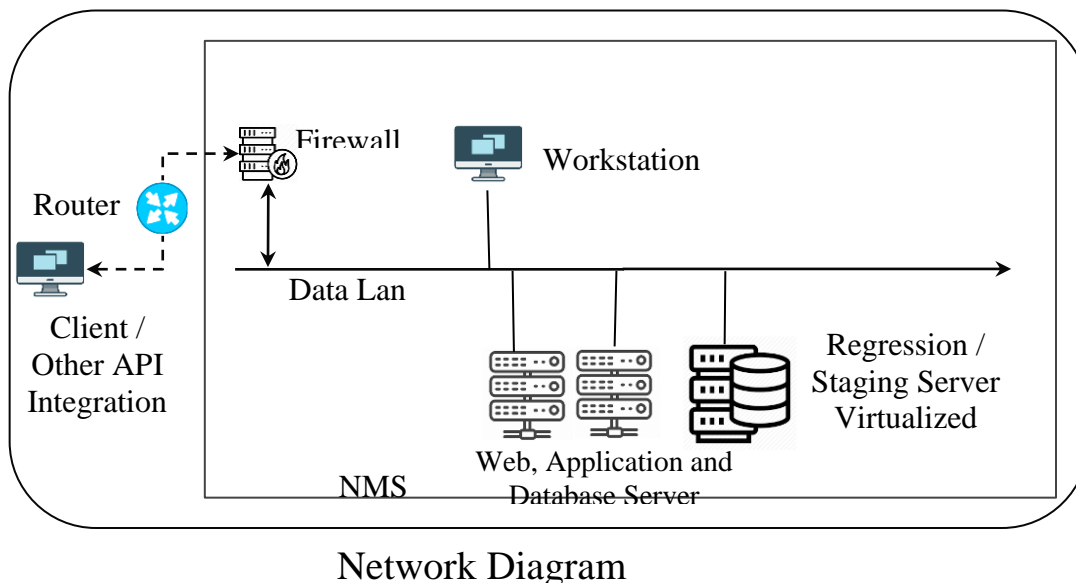Figure 10 IT Infrastructure for Disaster Recovery System

Network Diagram

Figure 11 IT Infrastructure for Regression and Deployment (Staging)

The major components that are considered in the system architecture proposal are Web server, Application server, Database Server and other network components.

The Development and Staging/ Testing environment will be established by creating virtual machines that can be used to host corresponding application/web/Database applications curved from any of the available servers in Data Lan. These VMs will be installed on the existing deployment servers which are running in the Active and Backup server configuration in one of the servers. The position of the development and testing environment can be decided at the time of detailed engineering based on the load and size constraints.

The application server shall host the Web Interface, Backend Business Logics, and APIs to interact with the other software modules. A filesystem shall be created in this server to store and manage all the images / files that shall be captured during the image collection process & scrutiny process. The database server shall be used to host the RDBMS MySQL database service which shall predominantly manage the datasets of the entire project during its lifecycle.

The system shall include redundant Application, Database, Web & Communication/API servers. They shall work on a 100% load sharing basis. In case of failure of one server, the other should take over the load of it.

Table 24 Server functions

S. No.	Server	Purpose

1	Application Servers	For Installation of all Applications of SAMAST IT Solutions
2	Database Servers	Management of complete database of System
3	Web Servers	For installing HTTP Server Software which acts as a web Server that is used for serving HTTP requests
4	Communication (API) Servers	For ABT Meters data availability & communication of meters Data to Applications/Database Server of SAMAST Data Center

6.0   Chapter 6: Documentation Management

Documentation of and Complete Software will meet following requirements. All documents will be supplied in hard copies as well as soft copies: -

6.1   Design Documents

Before starting the development of Software solution system components, a design document will be submitted for approval by SLDC OPTCL. The design document must essentially (but not limited to) included: -

- System Overview
- Hardware architecture
- Functional diagram
- Data Flow diagram
- Functions of each major component
- Physical details of each major component
- Functional Design Document
- Overall networking scheme
- System configurations
- Cyber Security Provisions

Similarly the design document for Complete Software System including MDM will also include (not limited to) the above sections.

6.2   Software Requirement Specifications Document

After approval of Design document, Detailed Software Requirements Specifications (DSRS) document for the application software for DC should be prepared and submitted for approval. This SRS should be prepared as per IEEE standard 830 of latest version for recommended practice for software requirements specifications. Software should be designed as per approved SRS.

6.3   Audit trail and Analysis

 i. An audit trail is a series of records of computer events, about an operating system, an application, or user activities. A computer system may have several audit trails, each devoted to a particular type of activity. Auditing is a review and analysis of management, operational, and technical controls.

 ii. The supplier shall develop a comprehensive and complete audit trail for all software modules so that, they can track back and find process breakdowns, if any and when they happen. Audit trail records shall also help identify outside data breach issues.

 iii.   The application shall log all the actions done by individual users with username, date and time and the administrator shall be able to generate detailed audit logs and history of the process instance.

 iv.   It should enable availability of user wise online audit trails/ logs which should be archived based on user, date, time etc. as part of audit records keeping.

 v.   All the edited and deleted (if any) records should be traceable and copy of all records should be kept in the system and which should be available with MIS reporting of thesame.

6.4   User Manuals

Following user manuals will be prepared and supplied for the system: -

  a.   User Manual for SLDC

      User manual for central site (SLDC) i.e., location where DC will be installed and where all data collection activities will be taken up, should contains all user instructions, block diagrams, user screens etc. in order to make itself self-contained complete document required for operation of complete software solution to be provided., all application software.

  b.   Training Documents

      Training document to be used during training of site personals will contain major functional details of the overall software and hardware system, its features and major instructions for understanding the overall working of the system.

c. Testing Documents

   Testing documents will be prepared and submitted as per Testing Requirements section of this specification.

7.0 Chapter 7: Planning and Procedure for Testing (FAT/SAT/STLC Software Testing Life Cycle)

All equipment, materials, and software for SAMAST System will be subject to Factory Acceptance Testing (FAT) /Site Acceptance Testing (SAT) / STLC as applicable. The purpose of Acceptance Testing is to determine compliance to this specification in every respect in regard to the delivered and installed system. Bidder needs to follow Software testing life cycle for the testing of the application.

i. Performance Bench Marks for Site Acceptance Test (Guaranteed Technical Parameters)

   a. With 2500 meters data, UI/Deviation bill will be generated within 2 hours. This time shall remain valid for additional number of meters added during project execution period.

   b. In future (In approximately 5 years), with data of 4000 meters, UI/Deviation bill will be generated within 3 hours. [Bidder has to provide dummy data for testing].

   c. State level Energy Accounting (All reports) should be completed within 1day.

   d. All other modules including scheduling (all generator scheduling, drawl schedule of Discom, open access schedule etc.) should generate the report on mouse click.

ii. Acceptance Test Plans and Procedures

The Supplier will develop and document proposed Test Procedures and Test Plans for Factory Acceptance Testing (FAT), Site Acceptance Testing (SAT), Unit testing, System Integration testing, SAT/UAT of the delivered and commissioned system and its components. Supplier will finalize the proposed FAT and SAT acceptance test plans and procedures. The final Test Procedures and Test Plans will be subject to review and approval by SLDC, OPTCL prior to testing.

The Acceptance Test Plans (ATP) will enable SLDC, OPTCL to verify the ability of the delivered and commissioned system and its components to individually and simultaneously fulfill all functional and performance requirements of the system set forth in the contract through a series of mutually agreed to structured tests.

All system documentations will be completed, reviewed and approved by SLDC, OPTCL before any testing.

The ATP will include, but not be limited to, functional tests that demonstrate compliance of the functional, performance, software, hardware, communication, interface, and operational aspects of the delivered and installed system.

iii. Factory Acceptance Test (FAT) for hardware and equipment's.

The Supplier will perform a preliminary FAT (Pre-FAT) prior to the FAT. The pre-FAT will be a complete dry run of the FAT, following the test plans and procedures. The intent is for the Supplier to detect and correct most design, integration, and database, display, and performance problems prior to the FAT. The representatives of SLDC will have the right to witness all or parts

of pre- FAT for which supplier will intimate SLDC in sufficient advance.

Test results (including documentations and certifications) for tests conducted by Supplier or third parties that are not included in the FAT test plan and procedures to be furnished to SLDC, OPTCL prior to FAT for review and evaluation.

Supplier and/or third parties conducted tests deemed inadequate will be repeated until accepted by SLDC.

Supplier's project manager will sign off each test of Pre-FAT. The completed test results will be sent to SLDC for review before their representative's travel to the Supplier facilities for the FAT. All tests will be conducted using the contract-specified databases unless SLDC authorizes the Supplier to use a test database.

The FAT will be conducted according to the FAT Test Plan and Test Procedure documents approved by SLDC, OPTCL will cover, as a minimum:

iv. Visual Inspection

To verify that the system to be delivered has all required components and is properly configured. Visual inspection will verify acceptable workmanship and that all equipment, including cables and connectors, are appropriately labelled.

v. Hardware Diagnostic Test

Individual tests of all system hardware. These tests will consist of running standard hardware diagnostic programs, plus all special diagnostic programs used by the Supplier.

vi. Communications and Interfacing Test

Verify that all interconnected system components, such as data acquisition, control, monitoring, and data management functions are operating properly when correctly connected.

vii. Software Development Tools

Verify that all required software development tools, utilities, software diagnostics, and debugging tools for the system, including the UI and database, are included in the system and are functioning correctly.

viii. Functionality verification

Verify that all system functions are working normally as set forth in the contract.

ix. Performance Testing

Verify that the system throughput, timing and response time requirements are satisfied. Tests will include verification of:

    a. Data exchange times

    b. Local and remote request response times

    c. Communication latency

    d. User Interface function response time

x. Security Testing

Verify that the system meets the software at delivery security requirements and other aspects of secure operation and system access including:

    a. Communication error detection capabilities

    b. Correct operation of system configuration, control, maintenance, and management procedures Safe system recovery with no erroneous data or control operation generation after system restarts.

    c. Protection against unauthorized access to the system and control functions

xi. Environmental Testing

Verify that:

    a. All system functions will operate correctly over the specified temperature range.

    b. The accuracy of the inputs and outputs remain valid over the specified temperature range.

The test schedule will allow sufficient time for verification and/or additional unstructured testing by the SLDC, OPTCL's representative, who will be able to schedule unstructured testing at any time, including during structured tests.

xii. Application Testing

    a. The supplier should ensure a systematic approach for testing the software application to meet the requirements and is free of defects before go live. The Software Testing Life Cycle (STLC) shall be used to ensure that the software is of high quality, reliable, and meets the needs of the end-users.

    b. The supplier shall follow all the steps of STLC such as Requirement analysis, Test Planning, Test case development, Test Environment Setup, Test Execution, Test Closure etc. The core testing team of SLDC shall review the test case development before test execution.

    c. Unit testing, integration and other setting shall be conducted by the supplier with proper documentation and ensure that the product is free from all kind defects (functional, User Interface)/bugs after which, end user (SLDC) will perform UAT at their end.

xiii. Site Acceptance Test (SAT)

The SAT will be conducted by the OWNER (End Users) with support, as required from the supplier, after the system has been installed and commissioned. The system will be subjected to a subset of the functional and performance tests. The SAT will also include any type of testing that could not be performed in the factory. SLDC's representative, as necessary, will employ

unstructured tests to verify overall system operation under field conditions. Any defects or design errors discovered during the SAT will be corrected by the Supplier. The SAT includes the commissioning test, the functional and performance test, and the cyber security audit after the installation of the delivered system.

xiv. Commissioning Test:
    a. The commissioning tests will be conducted by the supplier and include:
    b. The same visual inspection and verification as in FAT
    c. Loading of the software and starting the system. At the option of the SLDC, OPTCL all software will be recompiled from the source or distribution media.
    d. Interface of the AMR/HES and MDM System to communications facilities for all data sources and other systems that interface with the AMR/HES System.
    e. Initialization and preliminary tuning of application software as needed.

xv. Site Functional and Performance Test:
The site functional and performance test ("site test") will be comprised of a subset of the functional and performance tests conducted in FAT. The tests to be performed will be proposed by the Supplier and approved by SLDC, OPTCL. These tests will be extended as necessary to test functions simulated during the FAT, such as communications with all field devices and all other systems that interface with the DC.

xvi. Cyber Security Audit:
The cyber security audit shall be conducted by certified empaneled CERT-IN third party auditor before go-live and once in each year during AMC period.

xvii. Testing Process Flow:
    a. The SLDC will nominate a team to carry out Acceptance testing of the various solution developed by the supplier (For timely completion of the project, Testing Team nominated by SLDC will complete the testing of the software within stipulated time (not exceeding 30 days).
    b. The supplier will setup testing environment at the DC and use dedicated test servers for the same.
    c. The supplier will provide training to the Acceptance Testing team prior to the commencement of the acceptance testing of the system.
    d. The supplier should provide detailed test scripts for carrying out the acceptance test of various systems supplied.
    e. Supplier will resolve all the defects/issues identified by the SLDC's acceptance testing team during acceptance procedure.
    f. The software would be re-tested to ensure closure of identified defects/issues.
    g. Subsequently, the authorized representative nominated by the SLDC will issue an acceptance certificate which should be produced by the SP to go ahead with the final rollout of the software.

xviii. Test Approval:

The Supplier will maintain a complete computer record of all test results with variance reporting and processing procedures for approval by SLDC, OPTCL. In the event that the AMR/Complete Software System including MDM system does not successfully pass any portion of the Acceptance Testing, the Supplier will notify the SLDC, OPTCL of the specific deficiency. The Supplier will promptly correct the specified deficiency, which will then be re-tested until successful.

8.0   Chapter 8: Training and Capacity Building Requirement

i. Comprehensive training programs will be provided to enable the efficient and effective use and operation of the deployed system by users of the system, and to develop a self - sufficient hardware and software support team within SLDC, OPTCL and the registered users of SLDC, OPTCL. The bidder will prepare and provide a description of the proposed training programs with course content, and technical level of the instruction for review and approval by the SLDC, OPTCL at the beginning of the deployment, and will work with the SLDC to schedule, organize and execute the approved training programs.

Training will include, where appropriate, a combination of formal training classes, workshops, as well as continuous (informal) knowledge transfer from the Supplier's technical specialists to the personnel of SLDC and its constituents during the deployment process and after the commissioning of the AMR and Complete Software system including MDM. In-person training sessions could be offered at Supplier's location or at the SLDC, OPTCL own facilities or any other locations of choice by both parties.

Two hard copies and one soft copy of operating manual of the DC & DR Hardware and Software containing all details will be made available to SLDC, OPTCL and SLDC each.

ii. Training programs for system users

Training program for system users will include but not restricted to the following:

   a. System overview including system functionalities and features
   b. System configuration and operations-oriented training System alarms handling
   c. Local/Remote configuration procedures
   d. Engineering oriented training for development/testing
   e. Minimum classroom training for a group of system users will be 18 hours (6 hours x 3 days) in different batches. Minimum hands-on training for a team of system users will be in two parts of total 48 hours (6 hours x 8 days). The group will comprise of representatives from SLDC, OPTCL and Registered Users of SLDC etc.

iii. Training program for system hardware and software support team

The training course will be designed to give Purchaser personnel sufficient knowledge of the overall design and operation of the system so that they can correct the problems, configure the hardware, perform preventive maintenance, run diagnostic programs and communicate with contract maintenance personnel

The following subjects will be covered:

   a) System Hardware Overview: Configuration of the system hardware. Preventive maintenance techniques and diagnostic procedures for each element of the Servers & Workstation console system, e.g., Servers, processors, auxiliary memories, LANs, routers, firewall, User account login, IPS, IDS and printers.

b) System Expansion: Techniques and procedures to expand and add equipment such as memory in server, printer, communication channels, router ports, work stations and control centers.

c) System Configuration: Procedures of configuring Router ports, VLANs, Firewall Policy definitions and Interfacing web services.

d) System Maintenance: Basics of operation and maintenance of the redundant hardware configuration fail over hardware, failure of control centers configuration control panels and fail over switches. Maintenance of protective devices and power supplies.

e) Storage System: Basics of Storage Technology, understanding the various hardware storage options, configuration of storage/archiving of the Meter data, retrieval of stored meter data from the storage system and use the Historical Data for analytical studies, and report preparation etc. and also operation & maintenance of storage architecture, Maintaining backup of data from Servers and archiving and as well as retrieving of data from the remote control center in case of failure at the local storage system.

f) Operational Training: Practical training on preventive and corrective maintenance of all equipment, including use of special tools and instruments. This training will be provided on Purchaser equipment, or on similarly configured systems.

g) System Administration: An introduction to software architecture, Effect of tuning/configuration parameters of OS software, System Software, Application Software, Network software, database software, firewall, antivirus etc. on the performance of the system, Administration of Database both and RDBMS, security.

h) Operating System: Including the user aspects of the operating system, such as program loading and integrating procedures; scheduling, management, service and utility functions; and system expansion techniques and procedures.

i) System Initialization and Failover: From cold warm setup Including design, theory of operation and Practice

j) Diagnostics: Including the execution of diagnostic procedures and the Interpretation of diagnostic outputs,

k) Software Documentation: Orientation in the organization and use of system software documentation.

l) Hands-on Training: One week, with allocated computer time for trainee Performance of unstructured exercises, including system shut down, restoration and with the course instructor available for assistance as necessary.

m) System hardening and Cyber security related features of application e.g. user authentication, encryption etc.

iv. Minimum training for hardware and software support team will be in three parts of total 90 hours (6 hours x 15 days). The software support team will comprise of representatives from SLDC, OPTCL.

v. All expenditure incurred for conducting the above training program shall be borne by the supplier.

9.0   Chapter 9: Backup & Restoration

a. The Backup & Restoration of all data of SAMAST application shall be done as per the decided by the SLDC, OPTCL

b. All the applications should be able to archive data, based on user specified parameters (i.e., data range) and restore archival data for online use whenever required.

c. Backup and recovery of all the system software, application software, database, etc. as per MeitY, GoI policy (Guidelines for Government Departments for Adoption/ Procurement of Cloud Services).

d. The systems should provide features to schedule backup/ restore operations. The Solution Provider should ensure that activity such as proper Data Backup, Data Restoration, and Data Synchronization at Disaster Recovery site are tested and implemented properly as per the standard norms.

e. In case required, the systems should have the ability to run multiple backup tasks in parallel.

f. All the applications should produce individual reports for each backup/ restore activity.

g. The systems should support direct backup of data from one machine to another/ fromserver to back tapes/ CDs/ Storage Area Network etc.

h. The systems should have provision to keep data on storage media with high tolerance offailure.

i. The system should allow recovery of data in case of hardware/ software failure and data corruption. It should be able to perform recovery to a point of time, to known backup database.

j. As Disaster Management strategy, Vendor shall configure the data back-up from SLDC, site to DR site on periodic basis defined by SLDC in the detailed order. The specifications for the backup server shall be same as defined for the SLDC and only storage capacity shall be designed in such a way as to keep the data backup for a period of at-least five (5) years.