National Smart Grid Mission
Ministry of Power
Government of India

MODEL DETAIL PROJECT REPORT (DPR)

FOR

SMART GRID PROJECTS UNDER NSGM

NATIONAL SMART GRID MISSION (NSGM)

State

Utility

Project Area

Detailed Project Report for Smart Grid Project

Ref. No.

Submitted to

National Smart Grid Mission
Ministry of Power
Government of India

Date of Submission

List of Annexures

1	SLPMU/DRC Approval
2	Project implementation plan post sanction alongwith PERT chart etc.
3	IT architecture diagram
4	Regulatory plan/proposal/sanction for investment/real time pricing mechanism etc.
5	SG project team details alongwith contact Nos/emails
6	Plan for funding utility share of project

Note: Relevant documents to be attached by the utility

General Guidelines

1	Utility has to create an Smart Grid Cell comprising of team of IT/AMI/SCADA/DMS /Renewable experts having relevant qualifications, experience and background in the field of system integration and Smart Metering and Smart Grid implementation. This team shall be involved from concept to commissioning of the system and shall also be the Nodal Department/Group from the Utility for all issues related to implementation of the project
2	Utility to undertake necessary Business Process Reengineering initiatives including as suggested by SGIA for proper implementation of the programme and to make the business processes Smart Grid worthy
3	Utility has to ensure timely availability of infrastructure facilities that are essential for implementation of Smart Grid Functionalities and are not in the scope of SMART Grid Implementing Agency's (SGIA) viz. Smart Grid Control Center Civil Works etc.
4	Utilities to follow the CEA / BIS / NSGM standard guidelines for the Smart Grid Infrastructure. Any deviation shall require the due approval from the NSGM
5	There shall be one Smart Grid Control Center in a Utility. In case Utility proposes to setup more than one Smart Grid Control Center it has to justify its case
6	The cost estimates should not include any departmental overhead expenses. All such expenditures should be borne by the utility
7	Utility will ensure ring-fencing of the proposed Project Area (Town) through metering of all import/export metering points and segregation of agriculture feeders within 16 weeks of the sanction of DPR
8	Utility shall provide all possible support to MoP/ Nodal Agency (NSGM) and their representatives for successful implementation of the projects
9	Scope variation on account of increase of consumer base during the currency of contract or any other reason would be to Utility's account and the contract will include the clause for qty variation. Incremental quantities to be borne by the utility and any incremental quantity between date of sanction and award should be informed to NSGM with justification
10	If SCADA/DMS exists in the Project Area, Utility shall ensure availability of necessary interface/implementation profile for integration of SCADA/DMS with new system. Also, Utility shall define the extent of integration required at the time of NIT. Utility shall ensure that all necessary protocols and other details are provided to SGIA as per requirement. Utility needs to submit the SCADA/DMS Project Completion Certificate with this DPR
11	Projects with consumer base of less than 2 lakhs are to be implemented within 18 months and projects which are having consumer base between 2 to 10 lakhs are to be implemented in 24 months. Utility to submit a detailed project plan with the DPR. Start date will be from the date of approval of DPR from the NSGM
12	In case the selected project area is not covered under R-APDRP (Part-A) Scheme for SCADA/DMS or IT Baseline Infrastructure, then same infrastructure can be proposed in this DPR so as to have baseline system in place with Smart Grid Functionalities
13	Utility shall collect all necessary protocols as well as points of integration APIs in new system from SGIA which may be passed on to SCADA /DMS implementation agency in future for integrating the same with the proposed system
14	Implementation of project shall be in accordance with the NSGM Guidelines

Smart Grid - Introduction and Objective

Electricity plays vital role in both day to day life of people and the economic development of a nation. To ensure sustainable supply of electricity and energy security, the efficient management of the electricity distribution network through use of intelligent devices which can monitor and control power flows in real time, has become necessary. In order to bring efficiency and sustainability in the electricity distribution sector, introduction of Smart Grid technologies is envisaged under the recently launched National Smart Grid Mission (NSGM) by Ministry of Power (MoP), Government of India (GoI).

Global energy scenario is witnessing key changes in terms of shift of focus towards green energy and sustainable growth and Smart Grid is getting evolved by integrating end-to-end, advanced communications infrastructure and information systems into the electric power system. Objective of Smart Grid is to use advancements of information and communication technology to make the power grid more efficient, reliable, secure and resilient while minimizing costly investments in new centralized generation capacity. One of the main points about Smart Grid is an increased level of observation and control of a complex power system to facilitate distributed and renewable energy generation. This can only be achieved by an increased level of information sharing between the individual components and sub-systems of the power system.

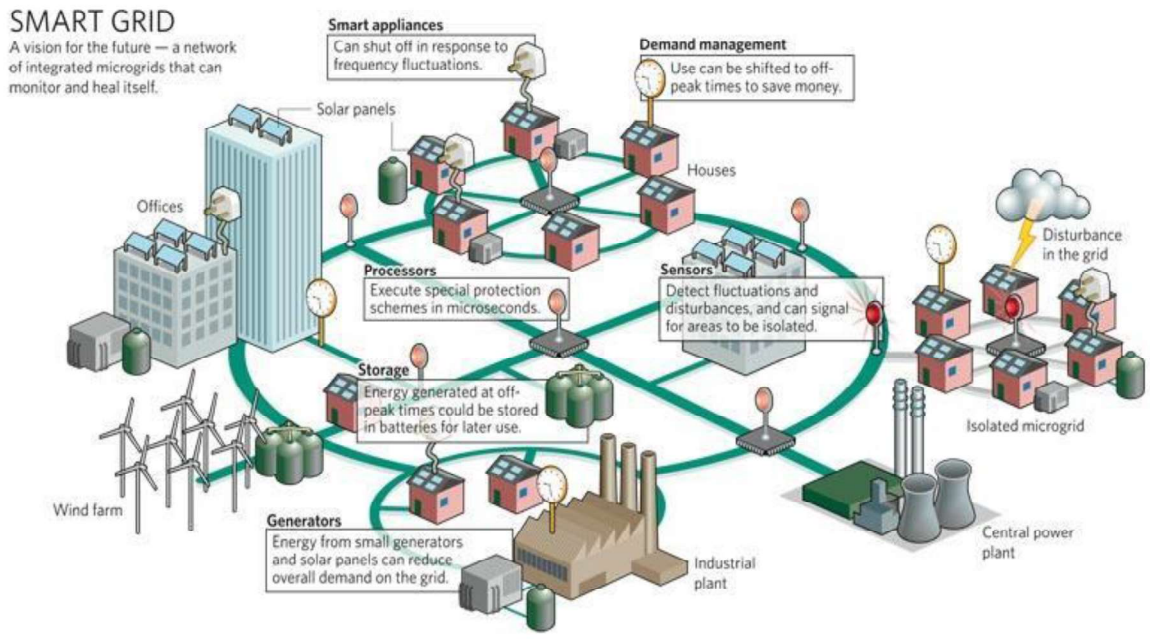
The Smart Grid is integrating the electrical and information, communication technologies in the complete power system value chain enabling every point for generation and every point as controllable consumption. “Smart Grid” with reference to distribution system is the next generation system that delivers electricity to consumers using two way digital technologies to enable efficient management of consumers’ end use of electricity as well as efficient use of the grid to identify and correct supply-demand imbalances instantaneously. It also detects faults in a “self–healing” process that improves service quality, enhances reliability and reduces costs. The “Smart Grid” encompasses a broad set of applications, including software, hardware and intelligent technologies including communication that enable utilities to integrate, interface with intelligently control & automation innovations.

In a Smart Grid, all the various nodes are interconnected to share data as and where needed. It provides choices to each and every customer for deciding the timing and amount of power consumption based upon the price of power at a particular instant, apart from providing choices to the consumer and motivating them to participate in the operation of the grid, ensuring energy efficiency and accommodating all renewable generation and storage options. The Smart Grid technologies help in maximizing system uptime, while also helping the utility to restore power supply more quickly to the customers in the event of an outage.

The overall objective of the Smart Grid project is to ensure 24x7 stable supply of electricity to all customers in the selected project area, reduce AT&C losses and equipment failure rate; and increase the billing and collection efficiency through various smart grid functionalities envisaged in the project.

Smart Grid technologies like SCADA/DMS, Distribution Automation, Advanced Metering Infrastructure (AMI), GIS, Street Light Automation System and Peak Load Management (PLM) etc. would provide granular insight and control for individual customers and improve the power quality. That insight coupled with continuous process realignment helps improve performance of distribution system, enhance power supply reliability and quality as well as customer satisfaction.

Smart Grid initiative focuses on reducing the collection loss and reduces the cost of power to the utility through peak load management and higher energy savings. Above mentioned initiatives shall bring down technical as well as non-technical losses in the system.



The main objectives of the proposed smart grid project are to leverage of the Smart Grid technologies which would improve the performance of the distribution system of Project Areas as well as empower customers to participate in energy management process and to achieve improvement in energy efficiency. The main objectives are:

1. AT&C Loss Reduction
2. Provide 24x7 reliable power to all customers
3. Make Project Area free from DG sets
4. Reduce the equipment failure rate
5. Improve the restoration time in case of power failure
6. Defferred Capex - Optimization of asset utilization and operating efficiency of the electric power system
7. Improve billing and collection efficiency
8. Increased customer satisfaction – educate and engage them for better tomorrow
9. Facilitating Distributed Generation Integration - Roof Top solar
10. Enabling integration of EVs and their Charging infrastructure
11. Integration of Street Light Automation system

Utility Declaration

1	The proposed DPR includes only new works and excludes other works under implementation	
2	The cost estimates do not include any departmental overhead expenses	
3	Detailed information regarding protocols, type, make, memory map etc. of system meters, which will be needed to integrate energy accounting/ auditing solutions, shall be made available to the System Integrator within four weeks of award of contract.	
4	If SCADA/DMS exists in the Project Area, Utility shall ensure availability of necessary interface points for integration of SCADA/DMS with new system. Also, Utility shall define the extent of integration required at the time of NIT	
5	Utility will ensure ring-fencing of the proposed Project Area through metering of all import/export metering points within 16 weeks of the sanction of DPR	
6	Following items have been excluded from the scope of the DPR. Utility /SGIA shall arrange the same from their own resources: - Land, data centre & customer care centre & various server rooms and other civil & structural works including earthing infrastructures such as air conditioning system - External & internal electrification & lighting - Fire fighting system - Any mobile equipment such as crane, truck, jeep, filter m/c etc. - Any T&P, testing equipments etc. - Office furniture, computer and software for use in office except for the computers required for business process software - Any contract for IT / outsourcing of services of revenue expenditure type where there is no capital addition - Communication equipments such as mobile phone, telephone etc. other than those specified in SRS - Manpower for managing collection centres, data centre & customer care centres	
7	Smart Grid Cell/Group has been formed at utility level, which shall be involved from concept to commissioning of the system and co-ordinate from the Utility side for all issues related to implementation of the project	
8	The details of the authorised signatory & Nodal officer are given below	
9	Approved by:	
10	Designation	
11	Signature of Nodal Officer for Smart Grid project	

Complete Utility Profile

Basic Information

Sl. No.	Particulars	Unit	Value
1	Name of the Utility	Name	
2	Date of Incorporation	Date	
3	Head/Corporate Office	Address	
4	Area of Coverage	Sq. Kms.	
5	Total Population (as per 2011 census)	Nos.	
6	Nodal Officer Details	Name	
		Desig.	
		Mobile	
		E-mail	
		Phone	
7	No. of Level-1 Offices (Zones)	Nos.	
8	No. of Level-2 Offices (Circles)	Nos.	
9	No. of Level-3 Offices (Divisions)	Nos.	
10	No. of Level-4 Offices (Sub-Divisions)	Nos.	

Asset Information

Sl. No.	Particulars	Unit	Value
1	Total Number of EHV S/s Feeding Utility	Nos.	
2	Total Number of Power Transformers	Nos.	
3	Total Capacity of Power Transformers	MW	
4	Total Number of 66/33 kV Feeders	Nos.	
5	Total Length of 66/33 kV Feeders (Overhead)	Kms.	
6	Total Length of 66/33 kV Feeders (Underground)	Kms.	
7	Total Number 11 kV Feeders	Nos.	
8	Total Length of 11 kV Feeders (Overhead)	Kms.	
9	Total Length of 11 kV Feeders (Underground)	Kms.	
10	Total Length of LT Lines (Overhead)	Kms.	
11	Total Length of LT Lines (Underground)	Kms.	
12	Total Number of Distribution Transformers	Nos.	
13	Total Capacity of Distribution Transformers	MVA	

Key Performance Indicators (Commercial+Operations)

Sl. No.	Particulars	Unit	FY 2016-17	FY 2017-18
1	Total Consumers	Nos.		
2	Annual Input Energy	MU		
3	Annual Energy Billed	MU		
4	Total Revenue Billed	₹ Cr.		
5	Total Revenue Realized	₹ Cr.		
6	Billing Efficiency	%		
7	Collection Efficiency	%		
8	AT&C Losses	%		
9	Average Billing Rate	₹ / kWh		
10	Annual Consumer Base Growth	%		
11	Peak Demand	MW		
12	DT Failure Rate	%		
13	HT / LT ratio	Nos.		
14	Provisional Billing	%		
15	Defective Meter	%		

Smart Grid Project Area Profile

Basic Information of Project Area

Sl. No.	Particulars	Unit	Value
1	Name of the Project Area	Name	
2	Area of Coverage	Sq. Kms.	
3	Is Project Area Shortlisted Smart City	Yes/No	
4	Is Project Area an R-APDRP (Part-A) IT Town	Yes/No	
5	Is Project Area an R-APDRP (Part-A) SCADA / DMS Town	Yes/No	
6	Total Population (as per 2011 Census)	Nos.	
7	Project Area Nodal Officer Details	Name	
		Desig.	
		Mobile	
		E-Mail	
		Phone	
8	Name of Zone of Project Area	Name	
9	Name of Circle of Project Area	Name	
10	No. of Division Offices in Project Area	Nos.	
11	No. of Sub Division Offices in Project Area	Nos.	

Asset Information of Project Area

Sl. No.	Particulars	Unit	Value
1	Total No. of Sub-stations feeding Project Area	Nos.	
2	Total Number of Power Transformers	Nos.	
3	Total Capacity of Power Transformers	MW	
4	Total Number of 66/33 kV Feeders	Nos.	
5	Total Length of 66/33 kV Feeders (Overhead)	Kms.	
6	Total Length of 66/33 kV Feeders (Underground)	Kms.	
7	Total Number 11 kV Feeders	Nos.	
8	Total Length of 11 kV Feeders (Overhead)	Kms.	
9	Total Length of 11 kV Feeders (Underground)	Kms.	
10	Total Length of LT Lines (Overhead)	Kms.	
11	Total Length of LT Lines (Underground)	Kms.	
12	Total Number of Distribution Transformers	Nos.	
13	Total Capacity of Distribution Transformers	MVA	

Key Performance Indicators (Commercial+Operations) of Project Area

Sl. No.	Particulars	Unit	FY 2016-17	FY 2017-18
1	Total Consumers	Nos.		
2	Annual Input Energy	MU		
3	Annual Energy Billed	MU		
4	Total Revenue Billed	₹ Cr.		
5	Total Revenue Realized	₹ Cr.		
6	Billing Efficiency	%		
7	Collection Efficiency	%		
8	AT&C Losses	%		
9	Technical Losses	%		
10	Commercial Losses	%		
11	Average Billing Rate	₹ / kWh		
12	Annual Consumer Base Growth	%		

13	Peak Demand	MW		
14	DT Failure Rate	%		
15	HT / LT ratio	Nos.		
16	Provisional Billing	%		
17	Defective Meter	%		

Consumer Mix in Project Area

Sl. No.	Particulars	No. of Metering Points	Consumption Annually (MU)	% of Overall Consumption
1	Domestic Consumers			
2	Commercial Consumers			
3	Industrial Consumers			
4	Street Lighting			
5	Agriculture Consumers			
6	Others/HT Consumers			
7	Sub-Total			

Metering Type in Project Area

Sl. No.	Particulars	No. of Metering Points	Consumption Annually (MU)	% of Overall Consumption
1	Single Phase Meters			
2	Three Phase Meters			
3	LT CT Meters			
4	HT Meters			
5	DT Meters			
6	Feeder Meters			
7	Sub-Total			

Investment under Various Central Government Schemes in Project Area

Sl. No.	Particulars	Approved Cost (₹ Cr.)	Amount Spent (₹ Cr.)	Balance (₹ Cr.)
1	R-APDRP (Part-A) for IT			
2	R-APDRP (Part-A) for SCADA / DMS			
3	National Electricity Funds			
4	IPDS			
5	DDUGGY			
6	Sub-Total			

Technology Stack									
Utility and Project Area Existing Technology Stack									
Sl. No.	**Particulars**	**Utility Wise Status**				**Project Area Status**			
		Present	**Scheme**	**Product**	**Status**	**Present**	**Scheme**	**Product**	**Status**
1	Centralized Call Center	Yes / No				Yes / No			
2	New Connection	Yes / No				Yes / No			
3	Disconnection and Dismantling	Yes / No				Yes / No			
4	Metering	Yes / No				Yes / No			
5	Billing	Yes / No				Yes / No			
6	Collection	Yes / No				Yes / No			
7	Asset Management	Yes / No				Yes / No			
8	Maintenance Management	Yes / No				Yes / No			
9	Geographical Information System	Yes / No				Yes / No			
10	Network Analysis Tool	Yes / No				Yes / No			
11	DGPS based Consumer Indexing	Yes / No				Yes / No			
12	DGPS based Asset Mapping	Yes / No				Yes / No			
13	Energy Audit	Yes / No				Yes / No			
14	Meter Data Aquistion System (MDAS / AMR)	Yes / No				Yes / No			
15	Web Self Service	Yes / No				Yes / No			
16	Data Center Establishment	Yes / No				Yes / No			
17	Disaster Recovery Center Establishment	Yes / No				Yes / No			
18	SCADA / DMS	Yes / No				Yes / No			
19	Outage Management System	Yes / No				Yes / No			
20	Advanced Metering Infrastructure	Yes / No				Yes / No			
21	Power Procurement Management	Yes / No				Yes / No			
22	ERP - Finance	Yes / No				Yes / No			
23	ERP - HR	Yes / No				Yes / No			
24	ERP - Inventory Management	Yes / No				Yes / No			
25	Business - Intelligence / Analytics	Yes / No				Yes / No			

Proposed Smart Grid Functionalities for the Project Area			
Sl. No.	**Module**	**Proposed**	**Remarks**
1	Advanced Metering Infrastructure with PQM, PLM and BI	Yes / No	
2	SCADA / DMS	Yes / No	
3	Outage Management System	Yes / No	
4	Geographical Information System	Yes / No	
5	Renewable Generation	Yes / No	
6	Energy Storage	Yes / No	
7	Street Light Automation	Yes / No	
8	Electric Vehicle Charging Station	Yes / No	
9	Transformer Monitoring Unit	Yes / No	
10	Integration with Existing Systems	Yes / No	

Project Cost Summary

Overall Project Cost (₹)

Sl. No.	Smart Grid Functionality	IT HW	IT SW	Field HW	Network	Spares	PMC	FMS Year 1	FMS Year 2-5	Total
1	Smart Grid Control Center									
2	Advanced Metering Infrastructure									
3	Supervisory Control & Data Acquisition									
4	Geographical Information System									
5	Outage Management System									
6	DT Monitoring Units									
7	Electric Vehicle Charging Station									
8	Solar Power Plants									
9	Street Light Automation									
Total Project Cost										

Project Fund Sourcing

Sl. No.	Particulars	Total
1	Total Project Cost	
2	NSGM Funding (Max 30% of Project Cost Excluding Network Backhaul & FMS for 2-5 Years) As Per Approval of EC	
3	Utility Share	

Note: The data in this sheet are autofilled based on inputs in sheets of SGCC, AMI, SCADA, GIS and Others. Please verify the data for any discrepancies

Description of Important Server Types		
Sl. No.	**Server Type**	**Description**
1	Testing, Development and Quality	For Testing, Development and Quality Purpose
2	Access Contol Servers	For authentication, accounting, and authorization services to network devices
3	Anti Virus Servers/ Unified Threat	For Anti-Virus / Cyber Secrutiy Application
4	DNS Servers	For Domain Naming Service
5	LDAP Servers	LDAP (Lightweight Directory Access Protocol) is used to store credentials in a network security system and retrieve it with your password and decrypted key giving access to the services
6	WEB Proxy Servers/ Web Servers with Load Balancing	It acts as a gateway between a local network and a larger-scale network such as the Internet
7	EMS/NMS Server with Network Operation Console	Service to host software for managing the Data Center Hardware, System Software and Organization Network
8	SAN Storage System/ External RAID Mass Storage device	For storing the Discom data in a centralized location for all applications
9	Backup Server	Server responsible for backing up and restoring files, folders, databases and hard drives on a network
10	Database Servers for HES & MDM	Server to host Database of Head End System and Meter Data Management Software
11	Application Servers for HES	For hosting Head End Software, which will get data from the Field DCU/ Repeaters/Gateways
12	Application Servers for PQM	For hosting Power Quality Management Application
13	Application Servers for PLM	For hosting Peak Load Management Application
14	Application Servers for MDM	For hosting Meter Data Management Application
15	Application Servers for BI	For hosting Business Inteligence Application
16	SCADA Server	For SCADA Application
17	ADMS Server	For Advanced Distribution Management System Application
18	ISR Server	Information Storage & Retrieval (ISR) System
19	NMS Server	For hosting SCADA Network Management System (NMS) Application
20	DTS Server	Dispatcher Training Simulator (DTS)
21	Development Server	For Development and Testing Purpose
22	Communication Servers	For SCADA Network Communication Application

Cost Estimate - Smart Grid Control Center					
IT Hardware					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	Testing, Development and Quality Servers	Nos.			
2	Access Contol Servers	Nos.			
3	Anti Virus Servers/ Unified Threat Management	Nos.			
4	DNS Servers	Nos.			
5	LDAP Servers	Nos.			
6	Web Proxy Servers with Load Balancing	Nos.			
7	EMS/NMS Server with Operation Console	Nos.			
8	SAN / External RAID Mass Storage Device	Nos.			
9	Backup Server	Nos.			
10	Tape Library / External DAT Drive	Nos.			
11	IDF / MDF Wall Mount Racks	Nos.			
12	IDF / MDF Floor Mount Racks	Nos.			
13	Core Switch	Nos.			
14	Access Switch	Nos.			
15	Distribution Switch	Nos.			
16	Layer II Switch (48 ports)	Nos.			
17	Layer II Switches (24 ports)	Nos.			
18	Router for MPLS/ VPN Network	Nos.			
19	Router for Internet Gateway	Nos.			
20	Application Load Balancer	Nos.			
21	Critical Load UPS	Nos.			
22	Service Load UPS	Nos.			
23	Workstation (w/ UPS, Table, Chair, OS, Office)	Nos.			
24	Routers	Nos.			
25	Network LaserJet (B/W) Printer	Nos.			
26	A4 Size Inkjet / Bubble Jet printer	Nos.			
27	A3 Size Inkjet / All in One Color Laser Jet Printer	Nos.			
28	GPS Time Synchronization System	Nos.			
29	Work Station with Dual TFT Monitors	Nos.			
30	Additional Item 1	Nos.			
Sub-Total for IT Hardware					
IT Software					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	EMS / NMS System	Nos.			
2	Antivirus Software/UTM application	Nos.			
3	Database Software	Nos.			
4	Operation Systems	Nos.			
5	Additional Item 1	Nos.			
Sub-Total for IT Software					
Network Backhaul					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	Primary MPLS - VPN Connectivity	Per Year			
2	Secondary MPLS - VPN Connectivity	Per Year			
3	Primary Internet bandwidth	Per Year			
4	Secondary Internet Bandwidth	Per Year			
5	Additional Item 1	Per Year			
Sub-Total for Network Backhaul					

Spares					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	Spares for IT Hardware	-	5%		
Sub-Total for IT Hardware Spares					
Services					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	PMC (incl. Installation, Testing, Commissioning, Data Migration and Training Cost)	LS	15%		
2	Facility Management Services (Y1)	Per Year	7%		
3	Facility Management Services (Y2-Y5)	Per Year	7%		
Sub-Total for Services					
Total for Smart Grid Control Center					

Cost Estimate - Advanced Metering Infrastructure					
IT Hardware					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	Database Servers for HES & MDM	Nos.			
2	Application Servers for HES	Nos.			
3	Application Servers for PQM	Nos.			
4	Application Servers for PLM	Nos.			
5	Application Servers for MDM	Nos.			
6	Application Servers for BI	Nos.			
7	Additional Item 1	Nos.			
Sub-Total for IT Hardware					
IT Software					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	AMI - Head End System	Nos.			
2	AMI - MDMS/Updation of Existing MDMS	Nos.			
3	AMI - Business Analytics	Nos.			
4	AMI-PQM and PLM Softwares	Nos.			
5	Additional Item 1	Nos.			
Sub-Total for IT Software					
Field Hardware					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	Single Phase Smart Meters (Consumer)	Nos.			
2	Three Phase Smart Meters (Consumers)	Nos.			
3	Three Phase LT CT Smart Meters (Consumers)	Nos.			
4	Three Phase HT Smart Meters (Consumers)	Nos.			
5	Three Phase LT CT Smart Meters (DTs)	Nos.			
6	Three Phase HT Smart Meters (Feeders)	Nos.			
7	Data Concentrator Unit / Field Routers	Nos.			
8	Additional Item 1	Nos.			
Sub-Total for Field Hardware					
Network Backhaul					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	Communication Between DCU and HES	Per Year			
2	Additional Item 1	Per Year			
Sub-Total for Network Backhaul					
Spares					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	Spares for IT Hardware	-	5%		
2	Spares for Field Hardware	-	5%		
Sub-Total for Hardware Spares					
Services					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	PMC (incl. Installation, Testing, Commissioning, Data Migration and Training Cost)	LS	15%		
2	Facility Management Services (Y1)	Per Year	7%		
3	Facility Management Services (Y2-Y5)	Per Year	7%		
Sub-Total for Services					
Total for AMI					

Cost Estimate - Supervisory Control And Data Acquisition					
IT Hardware					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	SCADA Server	Nos.			
2	ADMS Server	Nos.			
3	FEP Server with Interface Switches	Nos.			
4	ISR Server	Nos.			
5	NMS Server	Nos.			
6	DTS Server	Nos.			
7	Development Server	Nos.			
8	Communication Servers	Nos.			
9	LED Based Video Projection System with 2x3 Module Configuration with Each Module at Least 70" Diagonal with Common Projector	Nos.			
10	Workstation with Dual TFT Monitors	Nos.			
11	Developmental Console with One TFT	Nos.			
12	DTS/Workstation Console with Dual TFTs	Nos.			
13	Remote VDUs with One TFT Monitors	Nos.			
14	Router for SCADA/DMS Interface with IT system	Nos.			
15	Router at Remote VDU	Nos.			
16	Web Server with Load Balancing	Nos.			
17	Additional Item 1	Nos.			
18	Additional Item 2	Nos.			
Sub-Total for IT Hardware					
IT Software					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	SCADA Software	Nos.			
2	ADMS Software	Nos.			
3	ISR Software	Nos.			
4	DTS Software	Nos.			
5	ICCP Software	Nos.			
6	Development Software	Nos.			
7	Network Management Software	Nos.			
8	GIS Adaptor/Engine for Importing Data from GIS System under IT System	Nos.			
9	Master Station cum RTU Simulator & Protocol Analyser Software Tool	Nos.			
10	RTU DB Config. & Maint. Software Tool	Nos.			
11	LDMS Software	Nos.			
12	FRTU DB Config. & Maint. Software Tool	Nos.			
13	Master Station cum FRTU Simulator & Protocol Analyser Software Tool	Nos.			
14	Additional Item 1	Nos.			
Sub-Total for IT Software					
Field Hardware					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	RTU Base Equipment with Accessories	Nos.			
2	FRTU Base Equipment with Accessories	Nos.			
3	Replacement of 11 KV VCB/OCB at Grid S/s	Nos.			
4	Replacement of 66/33 KV OCB/VCB	Nos.			

5	Replacelemt of Existing C&RP Electro-mechanical Relay with with IEC 61850 BCPU	Nos.			
6	Replacement of Electromechanical Relay with IEC 61850 BCPU at 66/11 and 33/11 KV S/s	Nos.			
7	Switch compliant to 61850	Nos.			
8	Transformer Monitoring Unit (TMU) on IEC 61850	Nos.			
9	Installation of 4 Way RMUs at Various 11 KV S/s for Controlling and Monitoring of 11 KV n/w	Nos.			
10	Installation of 3 Way RMUs at Various 11 KV S/s for Controlling and Monitoring of 11 KV n/w	Nos.			
11	5 Way RMU	Nos.			
12	6 Way RMU	Nos.			
13	Multifunction Transducers	Nos.			
14	Weather Transducer - Wind Speed	Nos.			
15	Weather Transducer - Wind Direction	Nos.			
16	Weather Transducer - Rainfall	Nos.			
17	Weather Transducer - Humidity	Nos.			
18	Weather Transducer - Temperature	Nos.			
19	DC Transducer for Station Analog Parameters	Nos.			
20	Router	Nos.			
21	Single TFT PC for LDMS	Nos.			
22	Heavy Duty Relays for CB Trip/Close	Nos.			
23	Additional Item 1	Nos.			
Sub-Total for Field Hardware					
Network Backhaul					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	Network Connectivity Charges for 10 mbps MPLS Broadband Links for SLDC, IT DC, SCADA DR, Control Center to MPLS Cloud	Per Year			
2	Network Connectivity Charges for Control Center MPLS Broadband Link	Per Year			
3	Network Connectivity Charges for 3G	Per Year			
4	3G/4G Modem	Nos.			
Sub-Total for Network Backhaul					
Spares					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	Spares for IT Hardware	-	5%		
2	Spares for Field Hardware	-	5%		
Sub-Total for Hardware Spares					
Services					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	PMC (incl. Installation, Testing, Commissioning, Data Migration and Training Cost)	LS	15%		
2	Facility Management Services (Y1)	Per Year	7%		
3	Facility Management Services (Y2-Y5)	Per Year	7%		
Sub-Total for Services					

Total for AMI	

Cost Estimate - Geographical Information System					
Hardware					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	GIS Database Server	Nos.			
2	GIS Application Server	Nos.			
3	Additional Item 1	Nos.			
Sub-Total for Hardware					
Software					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	GIS Application	Nos.			
2	Additional Item 1	Nos.			
Sub-Total for Software					
Field Services					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	Procurement of Satellite Imagery and Creation of Base Map of Project Area	Nos.			
2	Technical Audit of Substations	Nos.			
3	Technical Audit of Distribution Transformers	Nos.			
4	Locating Co-ordinates (Latitude-Longitude) using DGPS, Collection/Updation of Attribute Database of Following Electrical Network Assets Through Field Survey and Codification & Indexing with Their Upstream Source of Supply:				
4.1	66/33, 66/11, 33/11 kV substations	Nos.			
4.2	HT (33, 11 kV) Overhead Lines / Underground Cables Alongwith Associated Line Equipments such as RMUs, DTs, Capacitors etc.	Nos.			
4.3	LT Overhead Lines and Underground Cables Alongwith Associated Equipment such as Poles, Feeder Pillar Boxes etc.	Nos.			
5	Collection/Updation of Consumer Attribute Database Through Door-to-Door Field Survey and Codification & Indexing Consumers with Respective Upstream Source of Supply	Nos.			
6	Preparation of Digitized Electrical Network on Base Map in Pre-defined Scale with Features & Attributes of Assets and Consumers Collected Through DGPS / Door-to-Door Survey	Nos.			
Sub-Total for Field Services					
Services					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	PMC (incl. Installation, Testing, Commissioning, Data Migration and Training Cost)	LS	15%		
2	Facility Management Services (Y1)	Per Year	7%		
3	Facility Management Services (Y2-Y5)	Per Year	7%		
Sub-Total for Services					

Total for GIS	

Cost Estimate - Outage Management System, DT Monitoring Units, EV Charging Station, Solar Power Plants, Street Light Automation					
Outage Management System					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	Database Server for OMS	Nos.			
2	Application Servers for OMS	Nos.			
3	Communicable FPIs	Nos.			
4	Outage Management System Application	Nos.			
5	Project Management and Consultancy Services	LS	15%		
6	Facility Management Services (Y1)	Per Year	7%		
7	Facility Management Services (Y2-Y5)	Per Year	7%		
Total for OMS					
DT Monitoring Units (250 kVA and Above)					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	Distribution Transformer Monitoring Units	Nos.			
2	Project Management and Consultancy Services	LS	15%		
3	Facility Management Services (Y1)	Per Year	7%		
4	Facility Management Services (Y2-Y5)	Per Year	7%		
Total for DT Monitoring Units					
EV Charging Stations					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	EV Charging Stations (Fast Charger)	Nos.			
2	Payment Terminals	Nos.			
3	Web Solution for Monitoring Charging Systems	Nos.			
4	Network Backhaul for Data Connectivity	Per Year			
5	Project Management and Consultancy Services	LS	15%		
6	Facility Management Services (Y1)	Per Year	7%		
7	Facility Management Services (Y2-Y5)	Per Year	7%		
Total for EV Charging Stations					
Solar Power Plants					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	Power Plants (1 MW) Estb. with accessories	Nos.			
2	Power Plants (5 MW) Estb. with Accessories	Nos.			
3	Power Plants (10 MW) Estb. with Accessories	Nos.			
4	Smart Meters with Net Metering Provision	Nos.			
5	Project Management and Consultancy Services	LS	15%		
6	Facility Management Services (Y1)	Per Year	7%		
7	Facility Management Services (Y2-Y5)	Per Year	7%		
Total for Solar Power Plants					
Street Light Automation					
Sl. No.	**Partiuclars**	**Unit**	**Rate**	**Qty**	**Amount**
1	CCMS Server	Nos.			
2	CCMS Application	Nos.			
3	CCMS Mobile Application	Nos.			
4	CCMS Switches	Nos.			
5	LED Lights (16 Watts) with Accessories	Nos.			
6	LED Lights (30 Watts) with Accessories	Nos.			
7	LED Lights (40 Watts) with Accessories	Nos.			
8	LED Lights (60 Watts) with Accessories	Nos.			

9	LED Lights (120 Watts) with Accessories	Nos.			
10	LED Lights (240 Watts) with Accessories	Nos.			
11	Replacement of Damaged Poles	Nos.			
12	Network Backhaul for Data Connectivity	Per Year			
13	Project Management and Consultancy Services	LS	15%		
14	Facility Management Services (Y1)	Per Year	7%		
15	Facility Management Services (Y2-Y5)	Per Year	7%		
Total for Street Light Automation					

Total for Other Functionalities	

Key Performance Indicators					
Sl. No.	**Smart Grid Attributes**	**Key Performance Indicators**	**Present Value**	**Target Value**	**Support Docs**
1	Advanced Metering Infrastructure	Reduction in AT&C Loss %			
2		Manual Connection/Disconnection for Defaulter Consumers			
3		Reduction in Number of Meter Readers / Meter Reading Cost			
4	Peak Load Management	Increase in Ratio of Energy Consumption to Peak Load (MU/MW)			
5		Reduction in Short Term / Peak Power Purchase Cost			
6		Load Factor of DTs			
7	Power Quality Management	THD (Current)			
8		Average Power Factor			
9		DT Voltage Not in Permissible Limit in a Month			
10	Outage Management	Maintenance Practice			
11		Reduction in DT Failure Rate			
12		SAIDI/SAIFI/CAIDI/CAIFI Improvements			
13	Street Light Automation	System Uptime			
14		Reduction in Energy Consumption			

Cost Benefit Analysis Base Assumptions			
Expected Demand Growth			
Sl. No.	**Partiuclars**	**Unit**	**Value**
1	Growth in Meters (For The First Three Years)	%	
2	Growth in Meters (From The Fourth Year)	%	
3	Growth in Energy Consumption / Meter	%	
4	Expenses Escalation	% / Year	
5	Escalation in Energy Cost	% / Year	
6	Average Cost of Meter Reading (Monthly)	₹ / Meter	
7	R&M Expenses (For Existing Infrastructure)	₹ Cr.	
8	Employee Expenses (For Existing Infrastructure)	₹ Cr.	
Power Purchase Costs			
Sl. No.	**Partiuclars**	**Unit**	**Value**
1	Average Procurement Rate of Power	₹ / kWh	
2	Short Term Procurement of Power	₹ / kWh	
Existing Infrastructure			
Sl. No.	**Partiuclars**	**Unit**	**Value**
1	GFA	₹ Cr.	
2	Plant and Machinery	₹ Cr.	
3	Lines, Cables and Network	₹ Cr.	
4	Others	₹ Cr.	
5	Less: Total Capitalized Expenses	₹ Cr.	
6	Net GFA	₹ Cr.	
7	Net GFA	₹ / Meter	
AMI Impact			
Sl. No.	**Partiuclars**	**Unit**	**Value**
1	Reduction of Metering	%	
2	Improvement in Employee Productivity (Rest of the Organization)	%	
3	Reduction of DT and Line Failures	%	
4	Average Receivables Days Reduced to	Days	
5	Asset Throughput Improvement	%	
6	AT&C Loss - Current	%	
7	AT&C Loss - Target	%	
8	Reduction of Peak Load (Assumption)	%	
9	Peak Hour Consumption / Average Hourly Consumption	Times	
10	Peak Hours (in a Day)	Hours	
11	Average Receivables Days (Current)	Days	
Capital Structure (Financing)			
Sl. No.	**Partiuclars**	**Unit**	**Value**
1	Debt as a % of Total Capital Cost	%	
2	Equity as a % of Total Capital Cost	%	
3	Cost of Debt	%	
4	Tenure of Debt	Years	
5	Equity Cost	%	
6	Tax Rate	%	

Note: Tax rate to be re-calculated at the time of DPR preparation

Infrastructure Value			
Sl. No.	**Partiuclars**	**Unit**	**Value**
1	Total IT & Field HW Cost	₹ Cr.	
2	Total IT Software	₹ Cr.	
3	Total Spares	₹ Cr.	
4	Total Asset Cost	₹ Cr.	
5	PMC Charges	₹ Cr.	
6	PMC Charges as % of Asset Cost	%	
7	Facility Management Service (Y1)	₹ Cr.	
8	Facility Management Service (Y1) as % of Asset Cost	%	
9	Total Project Cost Including 5 Years FMS	₹ Cr.	
10	Years of Operation	Years	

Note: Certain cell values are auto calculated. Please verify for discrepancies

Cost Benefit Analysis Calculations

				Projection Period (Year of Operation)						
Sl. No.	Particulars	Unit	Base Yr	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
a	Number of Meters	Nos.								
b	Growth for First Two Years	%								
c	Subsequent Years Growth	%								
d	Incremental AMI Infra Cost	₹								
e	Energy Consumed per Meter per Year	kWh/Unit/Yr								
f	Annual Growth in Consumption / Meter	%								
g	Total Billed Power	Million kWh								
h	Annual Growth in Consumption	%								
i	Consumption Index	Index								
j	Total Amount Billed	₹ Cr. / Year								
k	Total Billed Power	MU / Year								
l	Expected Avg Rate of Energy (Fixed+Variable)	₹ / kWh								
m	Annual Escalation in Energy Cost	%								
n	Short Term Power Purchase Tariff	₹ / kWh								
o	Cost of Procured Power	₹ / kWh								
p	Savings Due to Avoiding Short Term Power Purchase	₹ / kWh								
q	Annual Escalation	%								
r	Meter Reading Cost Saved per Meter / Month	₹ / Meter								
s	R&M Expenses (for Existing Infrastructure)	₹ Cr.								
t	Employee Costs (for Existing Infrastructure)	₹ Cr.								

				Projection Period (Year of Operation)						
Sl. No.	**Performance Metrics**	**Unit**	**Base Yr**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**
1	T&C Losses	%								
	Total Billed Energy	MU / Year								
	Total Purchased Energy	MU / Year								
	Average Load	MW								
	Peak Load	MW								
2	Peak Load / Average Load Ratio									
	Planned Reduction in Ratio	%								
3	Power Consumed During Peak Hours	MU / Year								
	Peak Hours (in a Day)	Hours								
	Peak Hour / Average Hourly Consumption	Times								
	Planned Reduction in Ratio	%								
	Peak Power Consumed to Billed Power Ratio	%								
4	Receivable Days	Days								
5	Improved Asset Utilization (DT, Lines, etc)									
6	Metering Cost Reduction	%								
7	R&M Cost Reduction (Due to Reduction in Failure in DT and Lines)	%								
8	Increase in Employee Productivity	Times								

Cost Benefit Analysis Conclusion	
Types of Savings	**Details**
Category 1	Direct, with Managerial Oversight and Process Changes
Category 2	Those Which Will Require Some Investments in Asset Upgradation
Category 3	Productivity Related

				Projection Period (Year of Operation)						
Sl. No.	**Particulars**	**Unit**	**Base Yr**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**
Category 1 Savings										
1	Meter Reading Cost Savings	₹ Cr.								
2	Peak Load Reduction savings	₹ Cr.								
3	AT&C Loss Reduction	₹ Cr.								
4	Total Recurring Savings	₹ Cr.								
5	Recuring Savings Post Tax	₹ Cr.								
6	Float Reduction Yr to Yr Change v/s Baseline	₹ Cr.								
Total Category 1 Savings Cash Flow		**₹ Cr.**								
Category 2 Savings										
7	R&M Cost Reduction	₹ Cr.								
8	Recurring Saings Post Tax	₹ Cr.								
Total Category 2 Savings Cash Flow		**₹ Cr.**								
Category 3 Savings										
9	Saved Investments in Distribution Infra	₹ Cr.								
Total Category 3 Savings Cash Flow		**₹ Cr.**								
Additional Investments										
10	AMI, IT and Backend	₹ Cr.								
11	Upgradation / Balancing Investments	₹ Cr.								
Total Additional Investments		**₹ Cr.**								
12	New GFA	₹ Cr.								
13	Tax Savings Due to Depr. of Addl. Assets	₹ Cr.								
14	**Net Cash Flow**	**₹ Cr.**								
Internal Rate of Return (IRR)		**%**								