Cost Estimates for AMI

Smart grid attributes comprising of advanced metering infrastructure, peak load management and power quality management shall be implemented in DLF City sub division in full scale for all the consumers. In addition the activity of real time monitoring of distribution transformer using distribution transformer monitoring units shall be implemented as specific activity.

Cost estimates for supply of equipment / systems have been prepared based upon recently awarded/quoted prices in similar works and budgetary offers from various parties related to specific domains, which include taxes & duties as well. For installation of above equipment / systems following pre-installation preparations and field activities are considered:

(i) Testing of equipment / systems at utility's facility
(ii) Field surveys
(iii) Network preparation, including right of ways and obtaining interagency permissions
(iv) Setting up of cross-dock facilities as logistical hubs for field deployment
(v) Removal of existing equipment / system
(vi) Installation of new equipment / system
(vii) Checking for performance and accuracy as part of commissioning

Cost estimates for implementation of above initiatives are described below:

1.1 AMI, PLM & PQM

As proposed earlier advanced metering infrastructure shall be installed for total 29144 consumers comprising of 9,380 Nos. single phase whole current smart meters, 18,602 Nos. three phase whole current smart meters, 9,44 Nos. three phase CT operated smart meters, 218 no. 11 KV CT operated Smart meter and 01 no. 66 KV CT operated

Smart meter along with associated communication and IT infrastructure. Cost for associated systems has been considered separately in specific activities. Estimated cost of balance system is discussed below:

1.1.1 Field Equipment Cost

Field equipment costs include the costs for the different types of Smart Meters having embedded two-way communication systems. All self-contained meters other than CT operated meters will also have an internal switch for remote connect / disconnect applications.

The AMI communications network hardware and installation involves the physical roll-out of the communications infrastructure (collection points, wide area network (WAN) hardware) in the field and within DLF City Sub Division facilities (head-end communications equipment). Network communication implementation includes field survey, installation of communication equipment and testing of communication equipment. The cost of AMI communication network also include the cost of additional infrastructure required to ensure an acceptable and viable communication system which is inclusive of devices like DCU, Signal enhancers etc. We have considered one data concentrator unit for fifty (50) smart meters. Actual installation may vary according to field conditions like line of sight, geography of the location etc

During implementation of advanced metering infrastructure, old meters shall be uninstalled and they shall be having some salvage value and useful remaining life. Uninstalled meters can be utilized in any other area of DHBVN.

Table 1-1 shows the cost estimate for field equipment for advanced metering infrastructure.

Table 1-1: Cost estimate for field equipment for AMI

Sl. No	Item Description	Unit	Quantity	Unit Price (in Rs.)	Estimated Cost (in Rs. Lac)
1	Single phase whole current Smart Meter	Nos.	9,380	5,400	501.55
2	Three Phase whole current Smart Meter	Nos.	18602	10,300	1,883.15
3	Three phase CT operated Smart Meter	Nos.	944	13,300	141.51
4	11 KV CT operated Smart Meter	Nos.	218	25000(L/S)	54.50
5	66 KV CT operated Smart Meter	Nos.	1	50000(L/S)	0.50
6	Data Concentrator Units	Nos.	550	84,100	462.55
				Sub Total (In Rs.Lac)	**3043.76**
7	AMI meter Installation @ 12%	Lot	1		365.25
				Total for AMI Hardware (in Rs.)	3409.01
					Rs.34.09 Cr

In addition to above capital cost there would be recurring charges for GPRS connection of DCUs @ approx. Rs. 600/- per annum per SIM card.

1.1.2 IT Systems for AMI, PLM and PQM

Key components of IT systems proposed for AMI & PLM are:

- Meter Data Acquisition System (MDAS) to communicate with the AMI network and to capture meter data and send control commands to the meter. MDAS shall also transfer data to a Meter Data Management System (MDMS) where meter data is validated against acceptance rules to ensure data quality. Estimations are done for missing data and corrections are made to some data elements.
- Data Storage systems are considered for data repository
- Data will need to be shared by several systems, and it requires an integration platform to allow sharing of the information between various enterprise systems

(e.g. providing data for various applications such as billing, customer service, GIS mapping and customer analytics).

- For peak load management suitable application software shall be installed in control centre, which would be integrated with AMI system for reducing peak load in the area.
- For power quality management suitable application software shall be installed in control centre, which would be integrated with active power filters along with AMI system for maintaining adequate power quality in the area.
- Cyber Security system of the AMI network, including planning and implementation of security architecture to protect customer and operational data, is also required.

Table 1-**2** shows the cost estimate for IT system for AMI, PLM & PQM.

Table 1-2: Cost estimate of IT system for AMI, PLM & PQM

Sl. No	Item Description	Unit	Qty.	Unit Price (in Rs.)	Estimated Cost (in Rs. Lac)
A	**Application Software**				
A.1	Meter Data Acquisition Software (MDAS)	Lot	1	5252000	52.52
A.2	Meter data management (MDM) capable of processing raw data, building of desired analytics like giving demand response signal, taking control / programming actions based on preset logic, interface with billing software being used by utility (29000 Nos. of consumers and scalable upto 100% expansion)	Lot	1	6660000	66.60

Sl. No	Item Description	Unit	Qty.	Unit Price (in Rs.)	Estimated Cost (in Rs. Lac)
A.3	Peak Load Management Module (29000 Nos. of consumers and scalable upto 100% expansion)	Lot	1	4728000	47.28
	Sub Total (A) for Application Software				**166.40**
B	**Data Archiving Software**				
B.1	Data Archiving and SAN management software	Lot	1	2710000	27.10
	Sub Total (B) for Data Archiving Software				**27.10**
C	**Network Management Software**				
C.1	Centralized network management software along with patch management & identity management	Lot	1	1342000	13.42
C.2	Antivirus software for all machines in control centre	Lot	1	252859	2.53
	Sub Total (C) for network Management Software				**15.95**
D	**Hardware for application**				
D.1	Application Server suitable for MDAS, MDM, PLM and PQM along with operating system	Set	2	1697412	33.94
D.2	Application server with minimum 4 GB RAM for development, quality and testing	Set	1	936410	9.36
D.3	Web Server for access	Set	2	5155268	103.10
	Sub Total (D) for Hardware for Application				**146.40**
E	**Hardware for storage**				

Sl. No	Item Description	Unit	Qty.	Unit Price (in Rs.)	Estimated Cost (in Rs. Lac)
E.1	SAN based storage for storing Smart Meter data (29000 nos.), data from MDM, PLM for 2 years with 100% expansion capacity	No.	1	2026381	20.26
E.2	Data Archiving Server	Nos.	2	653964	13.08
	Sub Total (E) for Hardware for Storage				**33.34**
F	**Hardware for network Management**				
F.1	Network Management server with patch & identity management	Set	1	801001	8.01
F.2	Centralized management console with single monitor	Set	1	1089576	10.89
	Sub Total (F) for Hardware for Network Management				**18.90**
G	**Workstation Consoles**				
G.1	Workstation consoles with dual 24" monitor along with Operating System & license	Nos.	2	256927	5.14
	Sub Total (G) for workstation consoles				**5.14**
H	**Network Hardware**				
H.1	Firewall with Network-based intrusion prevention system (NIPS) Minimum 8 Ethernet ports (1 Gbps) and 4 Fiber Optics Ports	Nos.	2	450000	9
H.2	Router with Minimum 8 Ethernet ports (1 Gbps) and 4 Fiber Optic Ports	Nos.	2	250000	5
H.3	LAN Switch (24 port 1000 / 100 /10 Mbps, layer 3 switching, 8 Ethernet ports (1 Gbps))	Set	2	25000	5

Sl. No	Item Description	Unit	Qty.	Unit Price (in Rs.)	Estimated Cost (in Rs. Lac)
H.4	Fibre Channel SAN switch	Nos.	1	1000000	10
	Sub Total (H) for Network Hardware				**29**
I	**Printers**				
I.1	Color laser printer	No.	1	273515	2.73
I.2	Black and White laser printer with Multifunction devices	No.	2	170000	3.4
	Sub Total (I) for Printers				**6.13**
J	**Furniture**				
J.1	Table for Workstation	Nos.	5	17000	0.85
J.2	Table for Printers	Nos.	3	10000	0.30
J.3	Swivel Chairs	Nos.	10	5800	0.58
	Sub Total (J) for Furniture				**1.73**
K	**Integration of Existing IT Infrastructure**				
K.1	Integration of existing IT infrastructure developed under R-APDRP with Smart Grid. Eg:- Consumer mapping, Asset Mapping, GIS, Billing system, Customer Care Service etc.	Set	1	15000000	150
	Sub Total (K) for Integration				**150**
	Total for IT Hardware / Software (A+B+C+D+E+F+G+H+I+J+K)				**600.09**
L	Installation, Commissioning and Misc. Contingencies @ 12 %	LS			72.01
Total cost of Supply & Installation of IT system					**672.1 i.e. Rs. 6.72 Cr.**

1.1.3 Distribution Transformer Monitoring Units (DTMU)

Installation of 550 Nos. of Distribution Transformer Monitoring Units shall be done for real time monitoring of health of distribution transformer to prevent complete failure of transformer and hence increased reliability and availability for consumers.

The cost estimates of field equipment for PQM and DTMU are given in table below.

Table 1-3: Cost estimate of field equipment for PQM and DTMU

Sl. No.	Particulars	Unit	Quantity	Unit Price (in Rs.)	Estimated Cost (in Rs. Lac)
1	Active power filter	Nos.	10	1250000	125
2	Distribution Transformer Monitoring Units	Nos.	550	100000	550
Sub-total for field equipment for PQM and DTMU					**675**
3	Installation, Commissioning and Misc. Contingencies @ 12 %	LS			81
Total for Supply & Installation of field equipment for PQM and DTMU					**756 i.e.**
					Rs. 7.56 Cr.

In addition to above capital cost there would be recurring charges for GPRS connection of above equipment @ approx. Rs. 600/- per annum per SIM card.

1.1.4 Consumer Education and Awareness

The success of smart grid program is dependent on the facility offered by utility to communicate with customers, with a specific focus on educating them on the safety and capabilities of the AMI system so that direct benefits of customers are maximized. For this broad public education and specific customer education on the positive impacts of smart grid technology, implementation success stories and/or specific details on participation in Demand Response/ Demand Side Management programs shall be done. As a fair estimate we have considered a lump sum amount of Rs. 10,00,000/- (Rupees Ten Lac) for Consumer Awareness Campaign / Education for Smart Grid.

1.2 Consultancy Services

For successful implementation of the Smart Grid project, various management and engineering activities viz. preparation of technical specifications, technical evaluation of bids, discussions with various parties, witnessing tests at various stages, supervision of field activities, implementation of quality assurance plan, project progress review, preparation of training modules etc. are required.

In accordance with MoP guidelines 5% consultancy and project management charges have been considered in cost estimate. Summary of estimated cost for Smart Grid initiatives is shown in **Table 1-4**.

Table 1-4: Summary of estimated cost for smart grid initiatives

S. No.	Item Particular	Estimated Cost in Rs. Cr.
1.	Field Equipment for AMI & PLM	34.09
2.	IT System and Integration for AMI & PLM	6.72
3.	Field Equipment for PQM & DTMU	7.56
4.	Consumer Education and Awareness	0.10
Total (In Rs. Cr.)		**48.47**
