



Detailed Project Report (DPR)

For

Capex Plan- FY 2021-22

Submitted By

TP North Odisha Distribution Ltd



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Glossary		Glossary	
AB SWITCH	Air Break Switch	MBC	Metering Billing and Collection
AC	Alternating Current	MCC	Master Control Centre
ADMS	Advanced Distribution Management System	MCCB	Moulded Case Circuit breaker
AMC	Annual Maintenance Contract	MM	Material Management
AMI	Automatic Meter Infrastructure	MMG	Meter Management Group
AMR	Automated Meter Reading	MPG	Maintenance Planning Group
APS	Area Power System	MPLS	Multi-Protocol Label Switching
AT&C	Aggregate Technical and Commercial	MRT	Meter Reading & Testing
BA	Business Associate	MS	Microsoft
BCC	Backup Control Centre	MTTR	Mean Time to Repair
BO	Business Output	MU	Million Unit
BPL	Below Poverty Limit	MV	Medium Voltage
BW	Business Warehouse	MVA	Mega Volt Ampere
CAIDI	Customer Average Interruption Duration Index	MW	Mega Watt
CAPA	Corrective Action and Preventive Action	NABL	National Accreditation Board for Testing and Calibration Laboratories
CAPEX	Capital Expenditure	NCC	No Current Complaint
CC	Control Centre	NESCO	North Eastern Electricity supply Company of Odisha Ltd.
CIS	Customer Information System	O&M	Operation & Maintenance
Ckt.KM	Circuit Kilo meters	ODSSP	Odisha Distribution System Strengthening Project
COTS	Commercial of the shelf	OEM	Original Equipment Manufacturer
COVID	Corona Virus Disease	OERC	Odisha Electricity Regulatory Commission
CPSCC	Central Power System Control Centre	OFC	Optic Fibre Cable
CRM	Customer Relationship Management	O/H	Over head
CSR	Corporate Social Responsibility	OMS	Outage Management System
CT	Current Transformer	OPEX	Operational Expenditure
CWIP	Current Work In Progress	OPGW	Optical Ground Wire

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CYMDIST	Distribution System Analysis Package of CYME	OPTCL	Odisha Power Transmission Corporation Limited
DC	Direct Current	OS	Operating System
DCP	Data Collection Point	OT	Operational Technology
DD	Drop Down	PBMC	Performance Based Maintenance Contracts
DMS	Distribution Management System	PC	Personal Computer
DPR	Detailed Project Report	PGCIL	Power Grid Corporation of India Limited
DSS	Distribution Sub-Station	PoC	Proofing of Concept
DT	Distribution Transformer	LV	Low Voltage
EHT	Extra High Tension	PP	Production Planning
ELCB	Earth Leakage Circuit Breaker	PSC	Power System Control
EPC	Engineering Procurement and Construction	PT	Potential Transformer
ERP	Enterprise Resource Planning	PTR	Power Transformer
FCC	Fuse Call Centre	PTW	Permit To Work
FPI	Fault Passage Indicator	RoW	Right of Way
FY	Financial Year	R&R	Reward & Recognition
GIGO	Garbage in, garbage out	RCA	Root Cause Analysis
GIS	Geographical Information System	RMU	Ring Main Unit
GoI	Government of India	SAIDI	System Average Interruption Duration Index
GoO	Government of Odisha	SAIFI	System Average Interruption Frequency Index
GRIDCO	Grid Corporation of Odisha	SAP	System Application and Products
GSAS	Grid Station Automation System	SBM	Spot Billing Module
GSS	Grid Sub Station	SCADA	Supervisory Control and Data Acquisition
HMC	Hub Maintenance Crew	SD	Sales and Distribution
HT	High Tension	SDO	Sub Divisional Officer
HTCT	High Tension Current Transformer	SHG	Self help Group
HVAC	Heating, Ventilation and Air Conditioning	SITC	Supply Installation Testing and Commissioning
HVDS	High Voltage Distribution System	SLA	Service Level Agreement
IEC	International Electro technical Commission	SLDC	State Load Dispatch Centre

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IED	Intelligent Electronic Devices	SLMC	System Line Maintenance Crew
IEMS	Input Energy Monitoring System	SMC	Substation Maintenance Crew
IMS	Integrated Management System	SMS	Short Message Service
IPDS	Integrated Power development scheme	SOP	Standard Operating Procedure
ISU	Industry Specific Solution Utility	SSL	Secure Sockets Layer
IT	Information Technology	STS	Sub Transmission System
ITIA	IT Implementation Agency	STS	Sub transmission system
JE	Junior Engineer	T&D	Training & Development
KM	Kilo meter	TBEM	TATA Business Excellence Model
KV	Kilo Volt	TCOC	TATA Code of Conduct
KVA	Kilo Volt Ampere	TPCODL	TP Central Odisha Distribution Limited
LDMS	Local Data Monitoring System	TPWODL	Tata Power western Odisha Ltd.
LT	Low Tension	U/G	Under Ground
LTCT	Low Tension Current Transformer	UPS	Uninterrupted Power Supply

1. Introduction:

Tata Power North Odisha Distribution Limited (TPNODL) incorporated as a joint venture of The Tata Power Company (51%) and Odisha Government (49%) on the Public-Private Partnership (PPP) model. TPNODL took over the license to distribute electricity in the northern part of Odisha, which was earlier served by erstwhile NESCO, through a competitive bidding process. The business of TPNODL utility shall be governed by the provisions of license issued by Hon'ble Odisha Electricity Regulatory Commission (OERC) for distribution and retail supply of electricity in North Odisha. OERC regulates the working of the entire power sector of Odisha state, including determination of tariff chargeable to end consumers and establishing performance norms (mainly related to Loss reduction, Safety, Reliability of power supply and Consumer service delivery). The core business activities of TPNODL are summarized as follows:

1. Operation and maintenance of distribution network
2. Expansion of distribution network
3. Restoration of power after interruptions
4. Electricity supply and after sales services
5. Connection of new customers to the distribution network
6. Meter reading, billing, and revenue collection
7. Customer complaint resolution
8. General customer care including provision of information on services
9. Customer sensitization on energy efficiency, energy losses and safety

2. Our Business Area:

TPNODL license area is spread over a geography of 27857 Sq.Km and serve the registered consumer base of 1.9 million. TPNODL procures power from GRIDCO which is a state owned company, engaged in the business of purchase of electricity in bulk from various generators located inside Odisha and the state share of power from Central generators for supply in all power distribution utilities, including TPNODL. It receives electrical power at a sub transmission voltage of 33KV from **Odisha Power Transmission Company Limited's (OPTCL) 220/132/33 kV Grid Substations** and then distributes the power at 33KV / 11KV / 440V / 230V depending on the demand of the consumers. For effective operations, license area is divided in 5 circles which is further sub divided in 16 Divisions, 50 Sub-division & 159 sections which manages the commercial and O&M activities in order to serve its consumer. The detail of the same is as tabulated below

Sr. No.	Circle	Division	Sub-div
1	Balasore	BED, Balasore	Supply No-I
			Supply No-II
		BTED, Basta	Basta
			Jamsuli
		JED, Jaleswar	Jaleswar S/D
			Bhograi S/D
		CED, Balasore	RE-I
			RE-II
			Nilagiri
			Soro
			Bahanaga
			Markona
SED, Soro	Khaira		
	No.I Bhadrak		
	No.II Bhadrak		
	Basudevpur		
	Dhamra		
	Tihidi		
2	Bhadrak	BNED, Bhadrak	Bhadrak Rural
			Dhamnagar
			Asurali S/D
			Baripada
3	Baripada	BPED, Baripada	Rural S/D, Baripada
			Betnoti
			Kuliana
			Moroda

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		UED, Udala	Khunta
			Udala
		RED, Rairangpur	Rairangpur-I
			Rairangpur-II
			Karanja
			Joshipur
4	Jajpur Road	JRED, Jajpur Road	Panikoili
			Jajpur Road
			Duburi
		JTED, Jajpur Town	No.I Jajpur Town
			Dasharathpur
			Binjharpur
		KUED, Kuakhia	Bari
			Dharamasala
			Kuakhia
5	Keonjhar	KED, Keonjhar	No.I Keonjhar
			No.II Keonjhar
			Turumunga
		JOED, Joda	Joda
			Champua
			Barbil
		AED, Anandapur	Anandapur
			Ghatagaon
			Bidyadharpur

3. Existing Supply System:

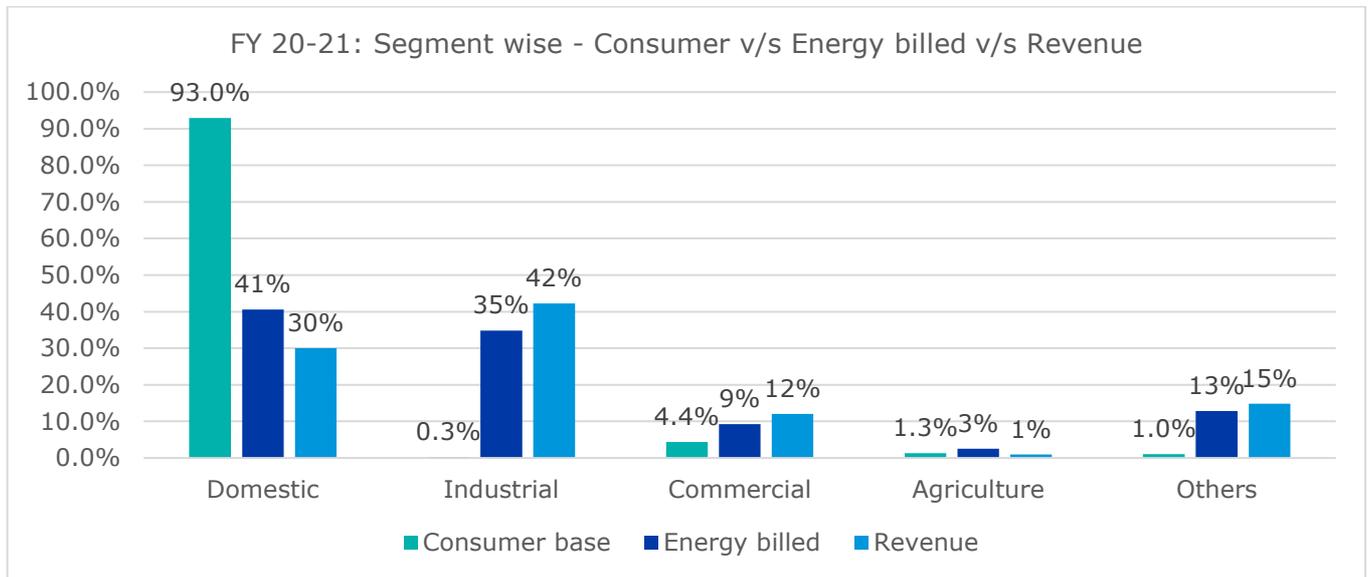
TPNODL receives electrical power at 33kV level from 26 numbers of Grid Sub stations (GSS) out of which 3 nos. TS are rated at 220/33kV, and 23 nos. at 132/33kV located within and in the vicinity of TPNODL operational area. TPNODL distributes the power at 33kV / 11kV / 415V / 230V depending on the demand of the consumers.

At present, there are 91 numbers of 33 kV feeders with a combined circuit length of approximately 2788 Ckt.KMs supplying power to 215 numbers of 33/11kV Primary Substations. The 33kV supply is stepped down to 11kV level through 484 numbers of 33/11kV power transformers with an installed capacity of 2191 MVA at these primary substations. Nearly 720 numbers of 11 kV feeders emanates from the 33/11 kV primary substations having cumulative length of approximately 36865 Ckt.KMs and supply power to HT consumers connected at 11 kV level and LT customers connected to 11/0.415 kV & 11/0.230 kV distribution substations. 69646 numbers of distribution transformers are installed in all five circles with an installed capacity of 2457 MVA. The length of the LT network is approximately 66262 Ckt.KMs. These LT feeders supply power to three phase and single-phase consumers. The information is summarized in the table below.

Name of Circle	Balasore	Bhadrak	Jajpur Road	Keonjhar	Baripada	TPNODL Total
No. of Consumers	524783	294588	314604	315515	531892	1981382
NO. OF GSS	6	3	5	6	6	26
TOTAL NO. OF 33 KV FEEDER	26	7	18	22	18	91
NO. OF 33/11KV SUB STATION	58	33	34	40	50	215
NO OF POWER TRANSFORMER	125	71	77	89	122	484
Transformation Capacity 33/11(MVA)	560.4	350.6	364.35	428.6	487.5	2191.45
NO. OF 11 KV FEEDER	189	110	100	138	183	720
NO. OF DTR	20003	11809	13165	11312	13357	69646
Transformation Capacity 33/0.415 kV, 11/.415/0.230 kV (MVA)	784	408	491	349	423	2457
33KV LINE IN KM	630	361	394	607	795	2788
11KV LINE IN KM	8841	4997	5156	7141	10729	36865
LT LINE WITH BARE CONDUCTOR IN KM	7545	1961	5070	3458	4179	22215
LT LINE WITH AB CABLE IN KM	7685	5742	5100	6558	18959	44047
TOTAL LT LINE IN KM	15231	7704	10171	10016	23139	66262

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The graph below represents the share of customer base, their energy consumption and contribution in revenue based on FY 20-21 data.



4. Key Challenges:

The brief inspection of the network reveals that the network in TPNODL is in very poor state and seriously lacks compliance with respect to the statutory guidelines. While this affects the system reliability due to frequent breakdowns, it may pose threat to safety of employees, public at large and animals.

4.1. 33 kV Lines/Feeders

33kV feeders connect a Primary substation (PSS) to the Grid substation (GSS) and supply primary substations and some 33/0.415 kV distribution transformers. These feeders are the main source of supply and reliability to the PSS. We have the following observations on 33 kV feeders.

1. Most of the feeders have long length and radially connected. The long overhead feeders are prone to faults. It is always difficult to inspect the feeder after occurrence of a fault leading to high equipment downtime and SAIDI.
2. At many of the locations these lines are installed on damaged, bent, and tilted poles which is unsafe for the asset as well as the public. Further these lines are observed with undersized & worn out bare conductor, having extremely long spans, multiple and poorly executed joints, and compromised safety clearances.
3. Most of the locations of feeders do not have guard wire beneath conductors, even in urban areas, for safety of public against conductor snapping and subsequent accidents.
4. We observed encroachment on RoW i.e. houses / structures constructed below 33 kV, 11kV and LV overhead feeders at many locations both in urban and rural areas.
5. At many locations two feeders running on single pole structure.
6. It is also observed that no intermediate H pole is used in 33 kV feeders for mechanical strength and for conductor jointing. These H poles are essential to avoid cascading effect of failure of a pole.
7. The installation of majority of poles is not as per standards.

Below table shows tripping data of 33 KV feeders.

Category of Feeder	In FY - 18-19		In FY -19-20		In FY -20-21	
	No. of tripping	Duration of tripping	No. of tripping	Duration of tripping	No. of tripping	Duration of tripping
	No.	Min	No.	Min	No.	Min
ALL 33 kV Incoming Feeders	5260	838	5968	872	3359	614

4.2. 33/11 kV Primary Substations (PSS)

Primary substations transform 33 kV voltage to 11kV level. There are one or more 33 kV feeders supplying power to the PSS. 33 kV voltage is stepped down to 11kV through power transformers of various capacity viz. 1.0 MVA 1.6 MVA, 2 MVA, 3.15 MVA, 5 MVA,7.5 MVA 8 MVA, 10 MVA and 12.5 MVA. At many 33/11 kV primary substations, the Power Transformers are not appropriately maintained. The silica gel, in most of the power transformers, is moisturized which can lead to breakdown of the power transformers. The silica gel can be replaced at very small cost and can avoid breakdown of the most costly equipment of the power distribution network. The connections in the outdoor yard, between bus bar and equipment, are done with poor jointing methods, leading to hotspots which may add to the technical losses. The technical loss due to poor jointing can be reduced significantly by using latest wedge connectors.

The analysis shows that some of the existing 33/11kV sub-stations are already overloaded or approaching the overload limit. It is anticipated that some of the sub-stations may be overloaded in next 2 to 3 years with the consumer growth of around 5% per annum. There is an obvious reliability concern for substations with only one power transformer in service at some substations. Below is the trend of Power Transformer (PTR) for past 3 years.

Below table shows Failure of Power Transformers.

Particulars	FY 18-19	FY 19-20	FY 20-21
Failure of Power Transformers (PTR)	15	23	19

Boundary walls for most of the substations are in damaged condition and there is no fencing between the substation premises and 33kV outdoor switchyard. This makes the PSS highly unsafe as there are chances of entry of unauthorized persons and animals into the live switchyard which may result in accidents.

Earthing system is most important for safety & protection of men and equipment. The existing earthing system is in very bad condition and ineffective.

Many circuit breakers and CTs are lying bypassed since long for want of spares. This is another major threat for protection of the equipment. The failure of the substation equipment can result in substantial revenue loss due to breakdown of the equipment.

Automobile batteries and underrated battery chargers are used at many substations due to non-availability of standard equipment in stores. This makes the basic protection system ineffective and there are chances of major damage to substation capital intensive equipment if the defects are not addressed urgently.

Some of the pictures depicting the network condition and violation of statutory compliance posing safety threat to Public, Employees and animals are captured and presented in Annexure - 1

4.3. 11 kV Lines /Feeders

11kV feeders connect a Primary substation (PSS) to the distribution transformers and TPNODL have many long overhead feeders and some of these are more than 100 Ckt.KM length. We have identified following observations on the 11 kV feeders.

1. Most of the feeders are radially connected have longer length compared to the standard engineering practices. Some of the feeders are more than 100 Ckt. km long. The long overhead feeders are prone to faults. It is always difficult to inspect the feeder after occurrence of a fault leading to high equipment downtime and SAIDI.
2. At many of the locations these lines are installed on damaged, bent, and tilted poles which is unsafe for the asset as well as the public. Further these lines are observed with undersized & worn out bare conductor, having extremely long spans, multiple and poorly executed joints, and compromised safety clearances.
3. Most of the locations of feeders do not have guard wire beneath conductors, even in urban areas for safety of public against conductor snapping and subsequent accidents.
4. We observed encroachment on RoW i.e. houses / structures constructed below the overhead feeders at many locations both in urban and rural areas.
5. It is also observed that no intermediate H pole is used in 11 kV feeders for mechanical strength and for conductor jointing. These H poles are essential to avoid cascading effect of failure of a pole.
6. The installation of majority of poles is not appropriate to the standards.

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Below table shows tripping data of 11 KV feeders.

Category of Feeder	In FY - 18-19		In FY -19-20		In FY -20-21	
	No. of tripping	Duration of tripping	No. of tripping	Duration of tripping	No. of tripping	Duration of tripping
	No.	Min	No.	Min	No.	Min
ALL 11 kV outgoing Feeders	350582	88397	466528	95962	247894	45448

4.4. Distribution Substations (DSS)

TPNODL has three types of distribution substations according to voltage levels i.e. 33/0.415 kV, 11/0.415 kV and 11/0.230 kV. The substations are either plinth mounted, or pole mounted. DD fuse is the primary protection equipment for the distribution transformer in a DSS which protects the DT, the costliest equipment of the DSS, in case of faults. It is noticed that AB switch and DD fuse are bypassed in some of the 11/0.415 kV Distribution Substations (DSS), thus compromising the life of the equipment beside network reliability. Following is the trend of Distribution Transformer (DTR) failure for past 3 years.

Below table shows Failure of Distribution Transformers.

Particulars	FY 18-19	FY 19-20	FY 20-21
Failure of Distribution Transformers (DTR)	2347	2416	2312

4.5. LT network

LT feeders emanate from DT secondary side and serve the electrical energy to the end customers. There is no effective LT feeder protection system in place on the secondary side of most of the DSS. In place of LT Fuse box/MCCB box; aluminum wire is used as fuses on the secondary side of the distribution substations at almost all substations. These fuse units are installed at very low height without any fencing of the DSS. The rating of the aluminum wires, used as fuses is not appropriate to the rating of the DT, and thus compromising the life of the distribution transformer, in case of fault in the LT network. This is a potential safety threat to public at large and animals

4.6. Earthing

Earthing of the electrical installation is very important for safety of the men, animal, and equipment. Earthing system is in very bad condition in almost all feeders, Primary and

distribution substations. All the above deficiencies make the distribution substations highly unsafe and unreliable. There are chances of serious accidents and fatalities if not addressed on urgent basis.

4.7. Metering System

On commercial front, Energy Meter installed at consumer premises is a mix of electro-mechanical meters, consumer owned meters and electronic meters etc. These meters are connected to TPNODL system through PVC insulated service cable supported by GI wire which also serves as earth point to the consumer installation. Many of the meters are faulty which add to the non-technical losses as the energy consumption is not recorded and therefore bills are not raised as per the actual consumption. Further many of the meters are not provided with seals which creates a potential source for theft of the electrical energy.

One of the major reason for low Billing Efficiency is leakages in meter reading process clubbed with inaccurate or no recording of reading in meter due to faulty/no meter in approximately 3.85 lakh (2.79 lakh – Defective + 1.06 lakh No Meter) customers and 0.24 Lakh Mechanical meters in the network.

In FY 20 – 21, against the total input energy of 4941 MU, billed energy was 3921 MU resulting into billing efficiency of around 79%. Out of this 3921 MU billed energy, approximately, 41% of the energy billed in a particular year is supplied to Domestic Consumers. Commercial and Industrial Consumers contribute to 9% and 35% of the total billed units, respectively. Balance 15% energy is billed to others like Railways/Public Street Lighting/Public Water Work/Irrigation and Agriculture etc. In terms of Revenues, Domestic Consumers contribute to around 30%, Commercial 12%, Industrial 42% and others 16% respectively.

TPNODL is also planning to review the meter seals to avoid chances of meter tampering or any other type of undesired activity by consumer resulting into loss of revenue to TPNODL. TPNODL is planning to use insulated Polycarbonate meter box, armored service cable and proper meter seals on meter boxes and terminal covers to eliminate chances of theft of electricity.

4.8. IT Issues

Current IT landscape is using multiple Decentralized Legacy Billing system for single phase and three phase and Decentralized TALLY system for Accounts payable, Receivable, Asset

Accounting. This software is very basic and most of processes and its activities are managed manually outside the system. Also, system is not upgradable due to outdated technology. There is only one Oracle database using Oracle 8 version, which is not supported by OEM anymore. Many of the mission critical application like call center applications, Cash Collection application, SBM applications are managed by multiple agencies which have a lot of integration issues resulting in data inconsistencies across various systems. Legacy AMR system currently installed is not communicating.

4.9. Housekeeping in working place

The level of hygiene and sanitation at the workplaces and different offices is poor. Office buildings, in general, are very old which need strengthening through major civil works. Infrastructure of the offices need revamping and major civil works are to be addressed for ensuring conducive work environment for Employees and consumers visiting the offices. Substantial investment is required to address the above stated challenges and to safeguard the assets, public & animals from the accident and ensuring statutory compliant network.

Besides TPNODL is also planning to improve the office infrastructure through revamping and other civil interventions. These activities are urgently needed to provide conducive work environment to TPNODL employees and all consumers visiting TPNODL offices. Many of the office buildings are very old and need urgent strengthening to avoid mishap. Call Centre and Customer care Centers needs to be established / developed further to provide better connectivity to all category of consumers with TPNODL and provide them a unique service experience.

5. Issues of Network Infrastructure:

5.1. Unsafe Horizontal and Vertical Clearance

Any responsible Power distribution utility is bound to comply all statutory compliance. Any non-compliance to the statutory guidelines attracts penalties apart from damage to brand image. TPNODL has taken over the assets of erstwhile NESCO on “as is where is” basis. In erstwhile NESCO area, there was lack of compliance to statutory guidelines at many locations. For example, the height of the lowest conductor in many MV feeders from the ground is not meeting the safe clearances as mentioned in the Regulation 58 of CEA regulations (Measures relating to Safety and Electric Supply – 2010). In many cases the span length varies from 60-120 mtrs., which further worsens the problem. More span length causes high sag and results in low clearance from ground level.

In TPNODL licensed area, there are many locations which are not complying with the statutory guidelines and hence require huge funds and efforts to make the network safe. At some places vertical clearances of the lines have reduced, due to re-construction of the roads, to the dangerous level causing violation of statutory guidelines. TPNODL proposes to take up refurbishment/life enhancement work for lines to rectify all such defects. Since the volume of such locations are high, huge investment spread across many years would be required to rectify all the deficiencies.

5.2. Damaged Poles / Conductors / Stay / boundary Walls.

The network is in very poor state due to vast geography, widespread network, and absence of preventive maintenance practices. Major elements of the weak network comprise damaged poles, worn out conductors, damaged stay wires and ineffective earthing. At some locations, poles or support structure are damaged, rusted or tilted. Major factors causing damage to the poles includes structural deterioration of poles, flood, cyclone, heavy vegetation etc. Tilting of poles has resulted in increase in conductor sag and if replacement / refurbishment of the tilted or broken pole is not undertaken on priority, mechanical strength of the line will reduce and may result into falling of line during high speed winds / storms. Falling of line can cause fatal accident. It is also a major concern for ensuring reliable power supply to the consumers as restoration may take many days depending upon the location and severity of damage to the line. To prevent tilting of any pole from its normal position due to abnormal wind pressure, installation of Stay wire is required. At many places stay/guy

insulators are either missing or damaged, which may cause major safety concern not only for the safety of Public but animal also in case of leakage current. Especially animal use the stay wire for rubbing their skin and if the stay wire is live, the animals are likely to get electrocuted.

Moreover, there are other reasons, which have resulted into depletion of existing network such as use of undersized conductor in overhead feeders, poor condition of the conductor, multiple joints in a single span in many sections, poor binding wire joints etc. witnessed in the sections causing hot spot and may result into jumper parting. At some locations, stay wire are also damaged resulting into weaker mechanical support to the poles. Under the refurbishment/life enhancement activity TPNODL has planned to replace damaged poles, replacement of worn out conductor, re-sag the conductor, install mid-span pole, introduce stay-wire at start, end and at every H-pole with at least two stay together with two-anchor rod in same pit. This will strengthen the line and will reduce the effect of the bad weather conditions and at the same time will help to reduce accident due electrocution caused by leakage current.

5.3. No or poor Earthing of the Poles & Structure

In an electrical installation, earthing system plays important role for proper working of the power distribution system, and protection of human beings against electric shock. Metal frame of all power distribution equipment are connected with the general mass of the earth which is always at zero potential. It's worth mentioning that the general mass of the earth don't have any resistance. As per Central Electricity Authority Regulations (Measures relating to Safety and Electric Supply,2010) rule 41, there is provision of earthing, neutral wire in a 3-phase, 4-wire system and the additional third wire in a 2- phase, 3-wire system.

The grounding system must have minimum of two or more distinct earth pits (electrodes) to ensure effective grounding. Further, according to rule 42, installation with connected load of above 5 kW, and voltage exceeding 250 V shall have a suitable earth leakage protective device to isolate the load in case of earth fault or leakage in the circuit. In case the earthing of any power equipment or network becomes weak or defective due to corroded connections or damaged connection, clearance of fault may take more time and putting stress on the equipment connected in the network. During the site visits, it is observed that at most of the places proper earthing was not evident and at some of the 33/11kV primary substation, DSS

and poles earthing is not adequate. Further the condition of earthing in old installations is observed to be extremely bad due to exhaustion of earthing electrodes/spikes and connections. This situation is dangerous for the stability of power system and there are chances of electric shock to the human beings and animals if corrective actions are not taken urgently. Therefore, there is urgent need to strengthen the earthing system to ensure safety of man and material. TPNODL proposes to strengthen the earthing system by introducing fresh earthing in both DSS and PSS as part of refurbishment activity. This will enhance life not only of equipment but shall also help in proper functioning of protection relays.

5.4. Absence of Cradle/Guard wire in Overhead feeders crossing the road

Guarding is an arrangement provided in overhead MV/HV/LV feeders, by which a live conductor, when accidentally gets broken, is prevented to encounter public or animals and vehicles moving beneath the road. By having cradle guards in place, immediately after a live conductor breaks, it first touches the cradle guard, which is connected to earth, thus completing the electrical circuits necessary for the operation of the protection relays installed at substations. This in-turn trips the circuit breaker and danger to any living object is averted.

At present, most of the network is overhead and there is no provision of guard or cradle wire installed beneath the overhead conductors. This poses serious safety threat to the public since the network is in very poor condition and possibility of conductor snapping cannot be ruled out. In such scenario, cradle guard will help in avoiding accidents caused by snapping of conductors of overhead MV feeders. TPNODL proposes to put in place the cradle wire/guard wire on all road crossings and vulnerable public locations as part of the refurbishment activity of lines.

5.5. Poor condition / Absence of fencing at most of the Distribution Substations & 33/11kV Primary Substations (Structures)

Absence of boundary walls and fencing around the Primary Substation and Distribution Substations has exposed the live power distribution equipment to the human beings and animals, who are not aware of the consequences of coming in direct contact or in the arching zone of high voltage equipment. Our site visits indicate that most of the 33/11kV Primary

Substations and 11/0.415kV Distribution Substations either have broken boundary fence or there is no boundary fence, specifically in rural areas.

It is also observed that there is no fence between the substation premises and live 33kV switchyard in almost all 33/11kV Primary Substations. There are high chances of entry of unauthorized persons or animals in high voltage switchyards. There are information's regarding electrocution of human beings and animal's at substations in the past. TPNODL proposes to put up fencing/build boundary wall under the DSS and PSS Refurbishment job.

5.6. Failure of lightning arrestors

The area of the TPNODL is prone to thunderstorm. Lightning during the thunderstorm is frequent in the area. Presently lightning arrestors are installed on 33 KV & 11 KV lines at PSS end. There are long lines emanating from PSS & no downstream lightning arrestors are installed. When power line is struck by lightning or is exposed to the intense electromagnetic fields, very high voltage generates in the line. This results in failure of the insulators in the line. Also, since downstream lightning arrestors are not available, this results in failure of downstream Distribution Transformers. Sometime this high voltage may be dangerous to the human life also. The damage can be minimize by using the lightening arrester in the lines.

5.7. Temporary work for restoration of supply post cyclones

Site visits in the coastal areas and interactions with the technical team revealed that the overhead network is hit hard by various cyclone and a result major portion of the network got collapsed. Due to scarce manpower, and in order to restore the power supply to affected areas, the quality of workmanship was compromised and major focus shifted from doing the work right to fix the issues without following the best construction practices. Many parts of the network even today are temporary. Efforts and investment are needed to make the temporary systems permanent at the earliest as the temporary installations are unreliable and unsafe for operations. Although the funds are provided for rectifying the issues developed due to temporary restoration however TPNODL proposes to correct the network adequately under 33 kV & 11 kV Line Refurbishment activity to improve reliability, system improvement & mitigate unsafe situation.

5.8. Non-availability of safety equipment & PPEs.

Personal protective equipment, or PPE, protects its user against any physical harm or hazards that the workplace environment may present. It is important because it exists as a preventative measure for industries that are known to be more hazardous, like manufacturing, mining, and Electricity Distribution. It is important that PPEs and safety equipment provided to staff to carryout construction and maintenance activities should meet safety regulations and guidelines. Availability of appropriate specifications and type of PPE's for different activities ensures safety of workforce against injuries, incidents, and accidents. Reduction in injuries, incidents and accidents helps to improve the productivity.

Any power distribution utility is bound to comply with all statutory requirements. Non-compliance results in enforcement action, penalties, harassment, and loss of brand image. The network in TPNODL is highly non-compliant to statutory guidelines, as a result of which huge number of accidents takes place every year. We as a responsible organization have to ensure that network is complaint to the statutory guidelines/requirements so that safety of employees, public at large and animals can be ensured.

To meet above stated objective and ensure safe and reliable network, it is proposed to carry out refurbishment (Life Enhancement) activities to extend the useful life of the assets. All expenditure involved in refurbishment of Substations and Feeders shall be covered under Capital Expenditure.

Benefits of Proposal:

Refurbishment of substations and feeders will benefit TPNODL through

- Improvement of voltage profile.
- Reduction in number of outages.
- Increase in vertical clearances.
- Reduction in equipment downtime.
- Reduction in unserved energy.
- Enhanced reliability of power supply.
- Reduction in number of accidents.

6. Network Analysis- Statutory Guidelines:

In TPNODL, each division has different characteristics and thus have different challenges. However, some common challenges which were witnessed during our limited site visits, appears to be unsafe network from safety point of view to our employees, public and animals. Objective of site visit was to understand the issues, reasons and area where improvement can be made. The following issues were observed and the same needs urgent attention to make the network safe, reliable and statutory compliant:

- ❖ Unsafe horizontal / vertical clearances in 33 kV and 11kV feeders. **(Regulation 58)**
- ❖ Damaged Conductor / Poles / Stay wire / Boundary walls.
- ❖ No or poor earthing of the Poles & Structure. **(Regulation 41 & 72)**
- ❖ Absence of cradle wire in overhead MV feeders. **(Regulation 70)**
- ❖ Damaged / Missing fence at most of the Distribution Transformers Substations & 33/11kV Primary Substations (Structures) resulting into easy accessibility for Public and animals.
- ❖ Non-availability of Safety Equipment & PPEs.

Regulations mentioned in the bracket are the applicable regulation of CEA (Measures relating to Safety and Electric Supply – 2010). Details are in Annexure 2

From the analysis of last ten years accident data, it is observed that most of the accident happened either due to deficiency in the network infrastructure or easy accessibility of the live parts to the Public and Animals. Even to operate network, necessary PPEs are also not available in sufficient quantity. Some of the PPEs were never procured by the erstwhile NESCO. Table below shows Year wise details of Fatal / Non-fatal Electrical accidents occurred under NESCO's operational area during Financial Year 2011-2021.

Sl no	Financial Year	Human			Animal			Total
		Fatal	Non-fatal	Total	Fatal	Non-fatal	Total	
1	2010-11	13	13	26	5	0	5	31
2	2011-12	14	6	20	8	0	8	28
3	2012-13	9	9	18	7	0	7	25
4	2013-14	14	8	22	6	0	6	28
5	2014-15	12	7	19	7	4	11	30
6	2015-16	21	42	63	13	0	13	76
7	2016-17	24	28	52	24	0	24	76
8	2017-18	33	41	74	16	0	16	90
9	2018-19	31	20	51	40	1	41	92

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10	2019-20	34	34	68	12	0	12	80
11	2020-21	35	5	40	11	0	11	51

It is pertinent to mention here that the number of fatal accidents are more than the number of non-fatal accident, for both Human and Animals. **Further, almost 55% of fatal accident involved humans, which is very serious.**

Below figure shows the detailed analysis of Humans accident.

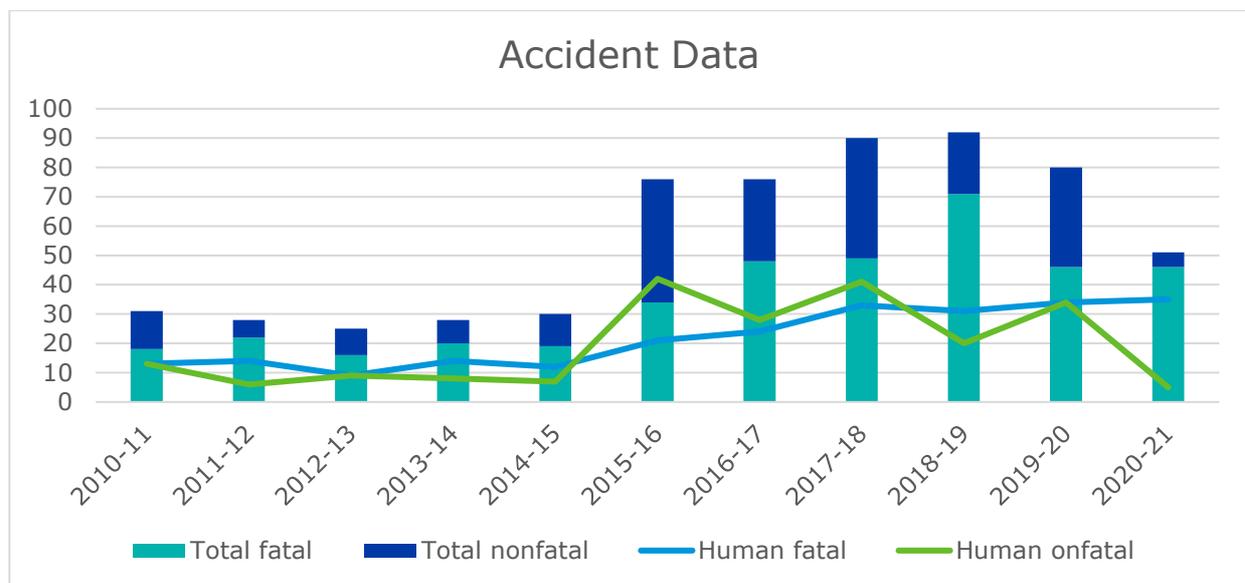


Table below shows the Fatal and non-fatal accident happened during the last 3 Years at different voltage level.

Voltage Level	FY 18-19				FY 19-20				FY 20-21			
	Fatal		Non-Fatal		Fatal		Non-Fatal		Fatal		Non-Fatal	
	Human	Animal	Human	Animal	Human	Animal	Human	Animal	Human	Animal	Human	Animal
33KV	1	0	3	0	1	0	0	0	2	1	2	0
11KV	18	23	17	0	14	9	25	0	16	6	3	0
LV	12	17	0	1	19	3	9	0	17	4	0	0
Total	31	40	20	1	34	12	34	0	35	11	5	0

From the above table, it is observed that majority of the fatal and non-fatal accident occurred in 11kV & LV network and thus focused approach must be followed on these segments to make the network safe & secure. As a responsible distribution utility, we need to curtail it

further. Hence potentially unsafe locations need to be addressed in time so as to ensure safe network for employees, Public and Animals.

Apart from high number of Accidents, other major problem is DT failure and extremely high number of interruptions at 11 kV and 33 kV level due to bad network condition. This affects the supply system very badly. The interruption at 11 kV feeders is too high by any utility standard.

7. Proposed CAPEX Plan for FY 21 -22:

As explained earlier, TPNODL has identified several challenges related to Safety, 33kV/11kV/0.415kV/0.230 kV network, Metering infrastructure, Customer Services and Technology usage. These challenges are planned to be addressed through a systematic investment plan by TPNODL. The proposed CAPEX plan represents a justified and efficient level of total capital investment estimated by TPNODL to meet the service obligation, improving safety, reliability of network, level of service standards.

In order to improve the reliability and reduce the losses, major interventions like Network reinforcement, Technology adoption is proposed in this plan so that equipment failure / tripping can be reduced and reliability, billing & collection efficiency can be improved. The network demands urgent refurbishment like re-conductoring of feeders, optimization of feeder length, dedicated feeders for industrial/ commercial customers, replacement of damaged / tilted poles, provision of intermediate poles, replacement of joints, enhancing system protection, replacement of sick equipment and network augmentation to improve the reliability of power supply.

Introduction of advanced technologies and analytics will be prime focus area for improving the accuracy of the meter reading, curtail tampering of the meters and providing better and effective customer services. Further Business process re-engineering is required to improve the customer services. Technology adoption is also required to provide quality customer services, manage revenue cycle processes for reduction of AT&C losses and efficiently manage to deliver reliable and quality supply in safe manner to its consumer by meeting various standards of operation.

During the initial phase, capital investments are proposed under the following broad cost centers that shall be aligned with multiple initiatives and schemes so as to reduce AT&C losses, improve system reliability and augment the network to support continuous load growth. Further, a need is also felt to improve the existing facilities and infrastructure to provide a better consumer experience and a modern, rich, and conducive work environment to all employees for better performance.

With this objective of ensuring reliable power supply and ensuring best customer services to the end consumers, TPNODL has come up with a capital investment plan under the

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major heads. These heads are detailed in subsequent sections along with fund requirement and activities to be performed.

- 1) Statutory Compliance/Safety
- 2) Loss Reduction
- 3) Reliability Improvement
- 4) Load Growth
- 5) Technology & Civil Infrastructure

TPNODL proposes Capital Expenditure of INR 275.4 Crores. for FY 21-22 to carry out various activities under 5 major categories.

S. No.	Major Category	Activity	DPR Cost TPNODL(In Crores.)**	Annexure
1	Statutory & Safety	Safety & Testing equipments	8.51	Annexure 3
		Cradle guard at major road crossings	2.46	Annexure 4
		Fencing of Distribution substations	9.8	Annexure 5
		Boundary wall for Primary substations	6.84	Annexure 6
		Establishment of Meter Testing Lab	2.2	Annexure 7
		Total (1)	29.81	
2	Loss Reduction	Equipment for Meter data downloading	0.28	Annexure 8
		AMR enabled equipment	1.37	Annexure 9
		Conversion of LT Bare conductor to AB Cable	13.56	Annexure 10
		Field Testing equipment - Metering and enforcement	1.76	Annexure 11
		Total (2)	16.97	
3	Reliability	33 KV Network refurbishment & AB switch	22.96	Annexure 12
		Refurbishment of 33KV/11KV Primary Substation (PSS)	17.5	Annexure 13
		11 KV Network refurbishment & AB switch	26.13	Annexure 14
		Refurbishment of 11KV/0.415 KV Distribution Substation (DSS)	8.99	Annexure 15
		Installation of LV protection at DSS	6.74	Annexure 16
		Installation of Auto reclosure / Sectionalizers ,RMUs, &FPIs	6.77	Annexure 17
		Trolley Mounted Pad Substations	2.34	Annexure 18
		Underground cable Fault Locating Van and oil filtration machine	3	Annexure 19
		Testing equipment for PSS	6.48	Annexure 20

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		Earthing of Power Transformers and Distribution Transformers	0.91	<i>Annexure 21</i>
		33KV & 11 KV Lightning Arrestor	1.69	<i>Annexure 22</i>
		Total (3)	103.51	
4	Load Growth	Augmentation from 5 MVA to 8 MVA Power Transformer	8.96	<i>Annexure 23</i>
		Augmentation from 200/250 to 315 KVA Distribution Transformer	5.19	<i>Annexure 24</i>
		Augmentation 63/25 to 100 KVA Distribution Transformer	4.11	<i>Annexure 25</i>
		Addition of 11 kV Overhead Line	1.68	<i>Annexure 26</i>
		Addition of 33 kV Overhead Line	2.06	<i>Annexure 27</i>
		Total	22	
5	Technology & Civil Infrastructure	Data Center (DC) Development Cost	5.39	<i>Annexure 28</i>
		IT Infrastructure Hardware Cost	5.31	<i>Annexure 29</i>
		End user Devices i.e. Laptop, desktop, Printer, scanner	16.34	<i>Annexure 30</i>
		Software Licenses	15	<i>Annexure 31</i>
		Communication Network Infrastructure at DC and office locations	4.98	<i>Annexure 32</i>
		Mini SCADA Implementation (20 nos ODSSP & 10 nos Old PSS)	2.55	<i>Annexure 33</i>
		GIS Implementation for One Division	7.91	<i>Annexure 34</i>
		Smart Metering Infrastructure (HES & MDM on 4G/ NBIOT Communication)	10.5	<i>Annexure 35</i>
		Call Center Implementation (System & Infrastructure)	5	<i>Annexure 36</i>
		Civil Infrastructure (Office Buildings, Meter Test Lab, Customer Care center, Records Rooms, Power System Control)	17.3	<i>Annexure 37</i>
		Establishment of DT workshop	3.6	<i>Annexure 37</i>
		High mast light in the Center store	0.75	<i>Annexure 37</i>
		Assets for Offices	5.23	<i>Annexure 37</i>
Building shed for material storage with racking system	3.25	<i>Annexure 37</i>		
		Total (5)	103.11	
Grand Total (1+2+3+4+5)			275.4	

** Hard cost

For each of the above cost centers, the investment has been further detailed below:

7.1 Statutory & safety

7.1.1 Safety PPEs & Equipment:

It is proposed to implement Tata Safety & Health Management System (TSHMS) at TPNODL to prevent work-related injuries & ill-health to the workers and to provide a safe & healthy workplace to the employees.

The implementation of TSHMS will also help in improving the safety of all stakeholders (consumers, Business Associate employees & public).

Personal protective equipment, or PPE protects its user against any physical harm or hazards that the workplace environment may present. It is important because it exists as a preventative measure for industries that are known to be more hazardous, like manufacturing, mining, and Electricity Distribution. It is important that PPEs and safety equipment provided to staff to carryout construction and maintenance activities should meet safety regulations and guidelines. Availability of correct type and size of PPE's for different activities ensures safety of workforce against injuries, incidents, and accidents. Reduction in injuries, incidents and accidents helps to improve the productivity.

Any power distribution utility is bound to comply with all statutory requirements. Non-compliance results in enforcement action, penalties, harassment, and loss of brand image. In view of above, below mentioned PPE need to be procured for Metering Team for carrying out activities in safe manner.

Tree Trimming

State of Odisha being a coastal state leads to growth of heavy vegetation. Tree branches usually grow fast and come in close proximity with our electrical lines, which may cause transient faults and harm to general public and stray animals. To prevent this, we carry out patrolling as a part of our feeder maintenance activities and schedule branch cutting activities for parts of the tree which enters beyond the given electrical clearance limits. To carry out smooth and faster tree cutting, we have proposed for tree pruning machines.

Expenses for procurement of Personal Protective Equipment (PPEs):

PPEs will be required to be provided to the workforce for the safe execution of work. PPE such as Safety Shoes, Safety Helmet with induction tester, Full body safety harness, safety hand gloves, and reflective jacket will be provided to each employee.

Expenses for procurement of Safety Equipment:

- a) **Aerial Tower Wagon:** It is proposed to bring the technological interventions in the safety to reduce the risk of fall from height while carrying out the work on the poles of trimming the trees. It is proposed to procure two nos. Aerial Tower Wagon to carry out the height work.
- b) **Neon Tester & Discharge Rod:** It is proposed to provide the set of neon tester & discharge rod with each fuse call center & sections so that the linemen can easily carry it at the working site to carry out the testing & discharging of the high voltage lines.
- c) **FRP ladders:** FRP ladders will be required to be given to each fuse call center, substations & section offices to carry out the maintenance work on the poles. Fiber glass ladders of 9 meters & 12 meters will be provided to access the height so that workmen will not require to climb without following safety norms.
- d) **Fire extinguisher:** A fire extinguisher is an active fire protection device used to extinguish or control small fires, often in emergency situations. We required these to install in the different offices of the TPNODL to quench the fire.
- e) **DISCHARGE ROD FOR 11-33-66KV :** It is required to discharge the line during the maintenance / breakdown to discharge dead system having limited fault levels and also to discharge the static & induced charges in the dead system or equipment, particularly in transmission lines, cables, transformers, reactors, large bus bar systems, switch-gears etc.
- f) **GROUNDING SET FOR O/H LINE PORTABLE:** Portable Earthing and short-circuiting equipment is temporarily installed on isolated power circuits to provide a controlled path for short-circuit current.

g) **Non-Contact Electric Voltage Power Detector/Sensor:** A non-contact voltage tester is the safest way to make sure the power is off without touching any wires. The tester will light up and/or make noise when it comes close to a hot (live) wire, even one that's covered in plastic insulation. It is required to test the line whether it is charged or dead for the safety of the workman.

h) **Water Hydrant System against Major fire protection** - Fire breakout is a major risk for stores leading to loss of public assets & property. There had been occurrences of fire incidence in past where high value material had been destroyed in Store. Accordingly, there is need for establishment of Water Hydrant System for safety & avoid any eventuality of fire in and around.

The objective of this report is to design a Fire Fighting system that shall provide:

- Life safety of occupants.
- Property protection.
- Compliance with all relevant statutory requirements.
- Minimum disruption during emergency to the store function and power distribution system.
- Necessity of project is for fire risk mitigation plan.

Benefits of the Project:

- Personal protective equipment and Safety and Testing Tools protects its user against any physical harm or hazards that the workplace environment may present.
- It is important because it exists as a preventative measure for industries that are known to be more hazardous, like manufacturing, mining and Electricity.
- An employee will be aware on which equipment is required of which tasks, and what it is meant to protect will help employee use of PPE that are provided to employee by the employer, which is the best way to ensure no or less injury or illness.
- Use of PPE also increases the quality of your workday and reduce the Man-hour lost due to any kind of injuries or illness

7.1.2 Cradle Guard at major road crossings

Cradle guards are provided in overhead MV/HV/LV feeders, by which a live conductor, when accidentally gets broken, is prevented to encounter public or animals and vehicles. By having cradle guards in place, immediately after a live conductor breaks, it first touches the cradle guard thus completing the electrical circuits necessary for the operation of the protection relays installed at substations. This in-turn trips the circuit breaker and danger to any living object is averted. At present, most of the network is overhead and there is no provision of guard or cradle wire installed beneath the overhead conductors. This poses serious safety threat to the public and possibility of conductor parting cannot be ruled out. In such a scenario, cradle guard will help in avoiding accidents caused by snapping of conductors of overhead MV feeders. TPNODL proposes to put in place the cradle wire/guard wire.

7.1.3 Installation / Construction of Plinth fencing for DSS and Boundary wall for PSS:

Distribution Substation are located at various locations catering the power supply requirement to the consumers. Since these are installed at various scattered locations along the Road, public places, near the commercial areas etc. During the survey, it is observed that boundary walls or fencing are either damaged or do not exist thus posing a safety threat to stray animals and public at large.

At many of the places it was found that the condition of the Fencing of DSS and Boundary wall for PSS is in a very bad condition. Ensuring safety of People & equipment is very much needed for safe operation. Hence it is proposed for Construction of fencing for DSS and Boundary wall of PSS, wherever required.

Distribution Substation (DSS) comprises of various equipment which perform specific task to ensure delivery of power supply at appropriate voltage to the end consumers. Main components are 11 kV Switching device, 11 kV Protection, Transformer, LV Protection, Earthing, fencing and O/G LV feeders. The most expensive equipment in the DSS is the Transformer and its life depends upon healthy condition of all other components be it LV Protection, HV Protection, Earthing or fencing. Thus, fencing is one of the most important part which ensures overall first-hand protection of the transformer. Therefore, installation

of fencing and boundary wall to safeguard the DSS and PSS equipment and to maintain safety clearances is one of the major needs.

It will benefit by improving the safety of people and the equipment DSS failure will be reduced, hence power cuts will decrease.

Safety of public and stray animals

In this proposal, TPNODL intends to carry out new fencings in phase manner. In this year around 1000 numbers of locations are being proposed for carrying out Fencing of DSS & 2593 meters of Boundary wall at PSS.

Detailed cost estimates for Boundary Wall & Fencing are attached in annexure No.4.

Circle wise Requirement of Fencing of DSS:

Circle Name	No of Divisions	Total no of 3 phase DT >100 KVA	1 st year no of DSS Fencing to be considered in FY21-22(Nos.)	Unit Cost for each DSS Fencing (in Crore)	Total Cost for DSS Fencing (in Crore)
Balasore	5	3157	200	.0098	1.96
Bhadrak	2	1185	200		1.96
Baripada	3	1051	200		1.96
Jajpur	3	1726	200		1.96
Keonjhar	3	850	200		1.96
Total	16	7969	1000		9.8

Circle wise Requirement of Boundary wall for PSS:

Circle Name	No of Divisions	Total Boundary wall required (in mtrs)	Total quantity considered in FY21-22 (in meters)	Unit Cost for per meter Boundary wall for PSS (in Crore)	Total Cost for PSS Boundary wall (in Crore)
Balasore	5	9120	954	0.0026	2.51
Bhadrak	2	4155	70		0.18
Baripada	3	2385	250		0.66
Jajpur	3	3811	768		2.02
Keonjhar	3	2441	551		1.45
Total	16	21912	2593		6.84

7.1.4 Establishment of Meter Testing Lab:

As per the clause no. 102 (d) of OERC Supply code 2019 “The licensee/supplier shall set up appropriate number of accredited testing laboratories or utilize the services of other accredited testing laboratories. The licensee/supplier shall take immediate action to get the accreditations of their existing meter testing laboratories from NABL, if not already done”

Presently there is no meter testing laboratory facility at TPNODL. New meter testing labs are to be developed in TPNODL at 2 locations (Balasore & Jajpur) to cater to meter testing requirements.

Meter testing group is responsible for performing the following testing activities on day to day basis:

1. Sample meters are to be tested in NABL accredited lab prior to installation, to ensure high quality of the meters.
2. As per Requirement of Statutory testing, meters installed at Grids, HT & LT customers’ needs to be tested in pre-defined time, based on voltage level, on which meter is serving. Officials have to undertake testing of these meters at site as per IS 15707, with calibrated standard meters, specific for defined voltage levels. In order to perform these testing, sufficient equipment are not available with TPNODL.
3. Consumer complaints regarding fast / slow meters after meter installation / during life cycle of meters need to be addressed by testing meters at site as per IS 15707. In order to perform these testing, sufficient equipment are not available with TPNODL.

There is requirement of new meter testing bench and details of CAPEX required is mentioned below.

These labs will ensure the statutory requirement of meter testing across TPNODL.

Material	Qty. (No.)
SINGLE PHASE 20 POSITION BENCH	2
THREE PHASE 20 POSITION BENCH	2
SINGLE PHASE/ THREE PHASE PHANTOM LOAD TEST BENCH	2

7.1.5 CAPEX requirement for Statutory & Safety:

Since the geography is vast and huge investment is required to make the network fully compliant to safety and statutory standards, and since this huge investment is not possible in a single year, TPNODL shall address network deficiencies at critical locations. Table below suggest the activities to be performed along with funds required under Statutory and Safety Head.

S. No.	Major Category	Activity	DPR Cost TPNODL(In Crores.)	Annexure
1	Statutory & Safety	Safety & Testing equipments	8.51	<i>Annexure 3</i>
		Cradle guard at major road crossings	2.46	<i>Annexure 4</i>
		Fencing of Distribution substations	9.8	<i>Annexure 5</i>
		Boundary wall for Primary substations	6.84	<i>Annexure 6</i>
		Establishment of Meter Testing Lab	2.2	<i>Annexure 7</i>
		Total (1)	29.81	

7.2 Loss Reduction:

During limited site inspections, energy meters were not found at consumer's premises which were energized under Saubhagya scheme, an initiative of Gol. Further, at number of places where energy meters are installed and available at site, the same are not functioning properly. The above issues are resulting into reduction in billing efficiency, high AT&C losses, increased provisional billing, defective bills, and increased consumer complaints leading to customer dissatisfaction. Errors in bills leads to non-payment of bills and thus hampers the collection efficiency. It is required to test meters on-site to detect any abnormality/theft thereby reducing AT&C losses. The Electronics meters have capacity for recording data in its memory. This meter data is required to be analysed for detecting any metering abnormality.

Therefore, in this head, following activities are planned for execution:

- Data collection & analysis for detecting problematic meters.
- Energy Monitoring System (AMR)

- LT bare to ABC Conversion
- On-site testing of meters to detect any metering abnormalities/theft.

7.2.1 CMRI for Meter data downloading - Metering and enforcement

At present in TPNODL there is no practice of collecting data from the meters installed at site. It is proposed to procure CMRI's for data collection & analysis. This will help in identification of any problematic meters & take corrective action. The cost estimate is mentioned in annexure 6.

Description	Qty
CMRI for Meter data downloading	82

7.2.2 GSM Modem for AMR Communication

The proposed AMR will offer multiple benefits to the DISCOM as well as consumers. It is proposed to install 2500 nos for consumers having load above 20 KW. This will improve revenue cycle of the DISCOM. TPNODL will be able to control the billing and collection for these consumers effectively. Less billing disputes as 100% correct bills issued on actual meter readings. The cost estimate is mentioned in annexure 6.

Description	Qty.
	(No.)
GSM MODEM for AMR Communication	2500

7.2.3 LT Bare Line to AB cable conversion:

In TPNODL, LT network plays important role of the Power supply distribution system and spread across TPNODL licensed area for power distribution. The bare overhead used is more prone to transient fault due to tree branch touching or any foreign particle fall on the line. Due to this, consumer's experiences frequent fault however, this can be reduced by structured maintenance. Moreover, Bare conductor is easier to maintain and faster to restore during any fault but at the same time, it requires more clearances. These bare conductor lines are more subject to electricity theft through direct hooking and thus

causing revenue leakage in the system. LT AB cables exist in the system and constitute approx. 66 % of the total LT network across TPNODL.

To improve the safety factor, minimize the safety accident risk, reduce the chances of fault & strengthen existing 415V network, it is suggested for replacement of overhead bare conductors with new aerial bundled cables. This in turn will help in providing reliable power supply for all consumers & stakeholders.

Moreover, during the survey, it is observed that LT bare conductors are more prone to hooking, resulting in direct theft of the electricity. To avoid direct hooking, it is proposed to convert LT OH bare conductor into LT AB cable. This will help in eliminating the direct theft and thus protecting the revenue leakage.

The same resulted in reduced direct 'hooking' done on bare LT conductor lines thereby reducing commercial losses drastically in theft-prone areas. LT Bare Line to ABC conversion would encompass the following scope:

1. LT Bare shall be replaced with LT ABC.
2. Erection of mid span pole.
3. Earthing of every 5th Pole and poles which are installed across the road.
4. Erection of Mid span pole wherever the span length is more than 40 Mtrs to reduce the Sag.
5. Installation of Distribution Box and removing of jumbling of service line cables

Benefit to customer:

By executing the proposals as made in this head, 415V network can be strengthened and we would be able to serve our consumers in a much better way. Following benefits are envisaged from this investment:

1. Reliable Power supply to the Consumers since bare conductor will get converted into insulated cable.
2. Comparatively safer than the LT Bare conductor and eliminate the element of risk if it comes in proximity.
3. Simpler installation, as crossbars and insulators are not required.

4. Suitable for congested lanes as well.
5. Electricity theft is becoming hard as hooking would not be possible.
6. Less required maintenance and necessary inspections of lines.

7.2.4 Field Testing Equipment

As per Requirement of Statutory testing, meters installed at Grids, HT & LT customers' needs to be tested in pre-defined time, based on voltage level, on which meter is serving. Officials have to undertake testing of these meters at site as per IS 15707, with calibrated standard meters, specific for defined voltage levels. In order to perform these testing, sufficient equipments are not available with TPNODL. This will also help in identifying faulty meters at site & take required corrective action. Consumer complaints regarding fast / slow meters after meter installation / during life cycle of meters need to be addressed by testing meters at site as per IS 15707. In order to perform these testing, sufficient equipments are not available with TPNODL.

Requirement of testing equipment for LT & HT meters at site is given below:

Testing equipment	Qty. (No.)
LT meter 3 phase meter- testing equipment (onsite testing)	12
HT meter- testing equipment (onsite testing)	16
HT-CTPT testing equipment	6
12 V Battery (for AC power supply to CT-PT error testing equipment at site)	5
Portable Calibrated load box	35
Single phase meter testing equipment (onsite testing)	60
TRMS Value Measuring Clamp on Meter With high Accuracy and High Insulation Class	60
CMRI with Bluetooth, Memory 500 MB	82
IR+PI Value Measurement in Step of 500V to 5kV (Megger)	65

7.2.5 CAPEX requirement for AT&C Loss Reduction

S. No.	Major Category	Activity	DPR Cost TPNODL(In Crores.)	Annexure
2	Loss Reduction	Equipment for Meter data downloading	0.28	Annexure 8
		Equipment for AMR enabled equipment	1.37	Annexure 9
		Conversion of LT Bare conductor to AB Cable	13.56	Annexure 10
		Field Testing equipment - Metering and enforcement	1.76	Annexure 11
		Total (2)	16.97	

7.3 Network Reliability

TPNODL have many long overhead feeders. The present power distribution network is in bad condition resulting into frequent tripping's and as a result consumer are not getting reliable and quality power supply. There are total 215 numbers of 33/11kV Primary Substations.

Table below shows tripping occurred in 1st six months of FY 20-21 and in FY 19-20 and FY 18-19. From the below table there is increasing trend in the Tripping. The number of tripping's are extremely high when compared to best in class utilities.

Category of Feeder	In FY - 18-19		In FY -19-20		In FY -20-21	
	No. of tripping	Duration of tripping	No. of tripping	Duration of tripping	No. of tripping	Duration of tripping
	No.	Min	No.	Min	No.	Min
ALL 33 kV Incoming Feeders	5260	838	5968	872	3359	614
ALL 11 kV outgoing Feeders	350582	88397	466528	95962	247894	45448

TPNODL intends to implement the following actions to improve the reliability of power supply

- Identification and replacement of faulty / sick equipment causing frequent tripping.
- Introduction of technology to ensure faster restoration of supply in case of any tripping.

Most faults that occur on overhead lines are transient faults caused by lightning and tree branches touching the live line conductor. The transient fault caused by lightning results in damage to insulators if lightning arresters are not provided or not working. Transient faults caused by tree branches interfering with line conductor are removed immediately by operation of a protection relay.

Regular inspection of feeders followed by tree trimming regularly helps to minimize transient faults and in most cases trial recloser are found to be successful in feeder with higher transient fault. However, each time the feeders are tripped due to transient fault, all customers connected to the feeder experience outage. Utilities at times finds it difficult to identify the exact reason of the fault. In a long distribution feeder with many unprotected branches, it becomes difficult to identify the faulty and healthy sections of the feeder. TPNODL intends to use auto reclosers, sectionalizers, and fault passage indicators to improve the reliability of overhead feeders. Apart from installing the above stated equipment, it is also planned to introduce AB switches at 33kV & 11kV long feeders so as to sectionalize at the appropriate location for any planned / unplanned shutdown thereby reducing the no. of affected consumers.

As discussed earlier, most of the LT feeders emanating from 11/0.415/0.230kV distribution substations don't have protection and control as a result, fault in any one LT circuit is likely to affect the supply of all customers connected on the same DT. Same is true with maintenance outages. To overcome this situation, TPNODL is planning to provide circuit breakers on LT feeders for control and protection of the feeder. Various initiatives proposed to improve the reliability of power supply in 11kV and downstream network are given below

1. 33 kV & 11 kV Network refurbishment to ensure Horizontal / Vertical clearances and as per Load flow distribution planning done by GRIDCO.
2. Primary Substation (PSS) Distribution Substation (DSS) Refurbishment.
3. Installation of Auto Reclosure & Sectionalizers in important and critical feeders.
4. Installation of Communicable overhead FPIs for faster identification of faults.
5. Installation of LV protection at Distribution substation to arrest the LT faults at LT level itself instead escalating to the 11kV feeder level.
6. Replacement of Battery & Battery Charger to strengthen the DC protection system in

33/11kV Grid Substations.

7. Installation of AB switches at 33kV & 11kV lengthy feeders for improving Reliability during planned / unplanned outages.
8. Proposal for Trolley mounted pad substations.
9. Installation of Lightning arrestors.

7.3.1 33 kV & 11 kV Network Refurbishment:

33kV or 11kV feeders are important asset for a distribution utility which connects various substations and provide power to end consumers. TPNODL has 2788 Ckt.KMs of 33kV and 36865 Ckt.KMs of 11kV feeders under its operational area. Besides, 66262 Ckt.KMs of LT feeders provides power to the end customers.

Proper upkeep of the feeders is important for ensuring safety and reliability of power supply. During site visits, it was observed that most of the 33kV / 11kV / LV lines are in very poor condition and pose safety threat to the human beings and animals. Most of the feeders have binding wire / multiple joints. As a result, there are chances of snapping of conductors and subsequent electrocution of human beings or animals since cradle guards are not provided. Due to scarcity of staff and materials, there is no structured maintenance program. Tree branches / creepers are interfering with live conductor at many locations. Huge number of tripping's are reported on 33 and 11kV feeders in previous years. With poor condition of network and absence of maintenance program, it is difficult for utility to ensure delivery of reliable and quality power supply to the end users. During site visits, it has been observed that conductor of different sizes is used in different phases which restricts the circuit capacity limiting to the lowest size of the conductor used in the circuit. Moreover, over sagged wires in 33kV or 11kV feeders are posing major threat to the lives of human beings and animals. At some places, due to re-construction/ widening of roads, vertical clearances of the feeders have reduced to the dangerous level. This is not only causing violation of statutory guidelines but also enhancing chances of fatal accidents.

There are few lines in TPNODL area which are crossing the river. During heavy rains, the rivers get flooded. The riverbed height increases & comes close to sag of 11 KV & 33 KV lines. The clearance between the lines & water reduces. Even at some places the lines got submerged in water. As a result, the supply to the customers get affected. To overcome this

issue height of the line is required to be raised by installing the towers at both the ends of river crossing.

To ensure safety of equipment and human beings / animals, refurbishment of 33kV, 11kV and LV lines is urgently required in phase manner starting from critical area where movement of public / animals is high. Refurbishment job would encompass following scope.

1. Straightening of tilted poles.
2. Replacement of damaged poles, insulators, and accessories.
3. Earthing of every 5th Pole and poles which are installed across the road.
4. Erection of Mid span pole wherever the span length is more than 50 Mtrs to reduce the Sag.
5. Restringing of conductor to increase the vertical clearance by reducing the sag.
6. Replacement of the conductor in the sections having multiple joints.
7. Installation of cradle guard wire in the feeder crossing the roads. While installing the cradle guard wire, pole across the road shall be converted into double pole structure to increase the height and provide mechanical support to the section. All conductor in the section crossing the road shall be replaced if found to have even single joint.
8. Replacement of weak Jumpers and connections.
9. Replacement of binding wire joints with wedge connector to remove hotspots.
10. Installation of Danger boards, Anti climbing devices, stay sets etc. to ensure safety & statutory compliance.

7.3.2 Refurbishment of Primary Substations (PSS)

The Power distribution network & its equipment health is a critical factor for ensuring reliable & quality power supply to the end consumers. Although field teams are committed to upkeep the equipment by doing preventive maintenance, but still some of the equipment gets faulty and may result into pre-mature failure due to frequent tripping.

Pre-mature failure of the equipment results into long duration outage as it becomes difficult to restore the power supply if it happens during odd hours or if spare equipment

is not available in the inventory. Hence, to ensure highest reliability, all equipment needs to operate properly at all the time.

To strengthen the existing network, it is suggested to replace the sick equipment in the existing network. Further, this replacement will help in utilization of the resource to the optimum level, managing the load in case of any exigency and mitigate the issue of overloading etc.

Budget is proposed for Sick equipment replacement to improve reliability of Power supply. Also, this will ensure better operation & control of the network & faster restoration of supply in case of interruptions.

1. Replacement of the sick equipment (VCB, CT/PT,CRP,Isolator,etc) in PSS.
2. Replacement / provision of AB switches.
3. Provision of new / additional earthing as per site requirement.
4. Carry out civil works as per site requirement.
5. Replacement of damaged support structure at PSS. This includes MS / GI structure, channels etc. Dismantling of existing structure and erection of new structure at same location has been considered in scope of the work.
6. Replacement of Battery and Charger.
7. Replacement of all undersize bus bars with standard size to remove hotspot.
8. Carry out civil works as per site requirement.
9. Detailed technical inspection and testing of the equipment.

Battery & Battery Charger:

During the field visits, it has been observed that some of the Battery and Battery charges are not operational and needs immediate replacement. Replacement of Battery & Battery Charger is essential to strengthen the DC protection system in 33/11kV Grid Substations to improve reliability. Installation of Battery & Battery charges have been proposed to strengthen the DC system in the 33/11kV Grid Substations. In this year, 50 sets of Battery & Battery chargers are proposed to be replaced.

7.3.3 Refurbishment of Distribution Substation (DSS):

Distribution Substation (DSS) comprises of various equipment which perform specific task to ensure delivery of power supply at appropriate voltage to the end consumers. Main

components are 11 kV Switching device, 11 kV Protection, Distribution Transformer, LV Protection, Earthing, fencing and O/G LV feeders. The most expensive equipment in the DSS is Distribution Transformer and its life depends upon healthy condition of all other components be it LV Protection, HV Protection, Earthing or fencing. The age of Distribution Transformer can be enhanced by ensuring healthiness of all other components. Generally, in power distribution utility, most of the transformers are either approaching or have outlived their operational life. TPNODL, however, is of opinion that replacement of power distribution equipment merely on the basis of ageing is not advisable and other factors such as health of the assets & their associated components, loading conditions, and other operational criticalities also needs to be considered. The above exercise is necessary as replacement of equipment is capital intensive and has direct impact on tariff.

In our preliminary site visits, it is observed that existing DSS are in shabby condition with damaged or ill-maintained HT & LT protection equipment. All connections at pole mounted or plinth mounted substations are in very bad condition which not only cause high technical loss but also give rise to undue interruptions. The Aluminum lug / sockets used in DTs and other equipment in the substations are observed to be of inadequate size and proper crimping of lugs with the help of crimping tools found missing at almost all places. This is resulting into generation of hotspots and failure of connections.

At all location, fuse cut-out arrangement found with oversize fuse wire. Most of the fuse cut-outs are installed at a lower height accessible to public and animals thus creating safety hazard. Analysis of distribution transformer's failure data for the last few years also suggest that effective HV & LV protection might have reduced the transformer failure. For example, if there is no effective protection on LV side and any fault occur on the load side, the fault current will pass through the transformer for a longer duration till such time the fault is isolated by upstream network. Since the magnitude of the fault current is high, it is likely to produce mechanical and thermal stresses in the transformer causing pre-mature failure of the transformer.

During the survey, it is observed that boundary walls and fencing are either damaged or do not exists thus poses safety threat to stray animal and public at large. At many of the places it was found that the condition of the Fencing of DSS was in a very bad condition.

Ensuring safety of People & equipment is very much needed for safe operation. Hence it is proposed for Construction of fencing for DSS wherever required. Refurbishment/Life Enhancement of DSS helps in addressing the above-mentioned issues, improve the reliability of power system and above all ensures safety. TPNODL proposes for activities under Refurbishment of Distribution Substation:

- Detailed technical inspection and testing of the equipment.
- Replacement of damaged support structure at DSS. This includes MS / GI structure, channels etc. Dismantling of existing structure and erection of new structure at same location has been considered in scope of the work.
- Installation of palm connectors at HT and LT side of Distribution Transformers and ensuring that all connections are through palm connectors.
- Replacement of all undersize conductors with standard size to remove hotspot.
- Replacement / provision of AB switch, DD Fuse units, LT ACB or MCCB (depending on Transformer ratings) and all associated cables / conductors.
- Provision of new / additional earthing in all DSS as per site requirement.
- Installation of fencing to safeguard the DSS equipment and to maintain safety clearances.
- Installation of danger boards, anti-climbing devices, stay-sets etc. to ensure safety & statutory compliance.
- Carry out civil works as per site requirement.

7.3.4 Installation of Auto reclosure / Sectionalizers, FPI, RMU AB switches:

Auto-reclosures are very efficient in minimizing outages from transient faults on overhead feeders. When installed along with Sectionalizers, they can isolate the faulty sections of the feeder while re-energizing the rest of the feeders. In case of very long circuits, the sectionalizers can also be connected in series.

TPNODL currently has many very long overhead feeders. Moreover, it is observed that multiple 11kV feeders are controlled through single 11kV breaker or AB switch in some primary substation. Fault in any 11kV feeder or maintenance activity in 11kV breaker at primary substation affects the supply of consumers connected on all 11kV feeders

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controlled from that breaker. To improve reliability of power supply at such substations, installation of auto-recloser, sectionalizers and Ring Main Units (RMU) is being proposed in phase manner. In first year, a total of 10 numbers of autoreclosers and 30 numbers of sectionaliser have been proposed for installation.

TPNODL is also planning to install 10 numbers of RMUs to improve reliability. AB switches are proposed at lengthy 33kV & 11kV Feeders to have provision of isolation of section during any planned / unplanned outages. This will help in improving the reliability since currently entire feeder is forced tripped for such outages.

Installation of overhead Fault Passage Indicators (O/H FPIs) is proposed for faster identification and restoration of faults on long 11kV feeders with multiple sections. In first year, 30 sets of communicable FPIs are proposed for installation on pilot basis.

S.No.	Description	UOM	Quantity Considered in 1st Phase (Nos.)	Amount in Crore
1	Supply and Installation of Auto-reclosers	EA	10	1.34
2	Supply and Installation of Sectionalisers	EA	30	3.91
3	Supply and Installation of FPIs	SET	30	0.2
4	Supply and Installation of 4 Way RMUs	EA	10	1.32
5	Installation of AB Switch on 33KV Feeders	EA	58	1.84
6	Installation of AB Switch on 11KV Feeders	EA	190	5.31
	Total			13.92

Circle	Auto-recloser	Sectionalizer	FPI	RMU	33 kV AB Switches	11 kV AB Switches
Balasore	2	6	6	2	12	65
Baripada	2	6	6	2	10	46
Bhadrak	2	6	6	2	12	25
Jajpur	2	6	6	2	10	32
Keonjhar	2	6	6	2	14	22
Total	10	30	30	10	58	190

Benefits

FPI - Benefits

1. Easy fault identification.
2. Easy to install, even on live network.
3. Detects both short circuit and low current earth faults.
4. Indicates both permanent and transient faults.
5. Highly visible red flashlight.
6. Reduction in supply restoration time by 1-2 hrs.
7. Reduction in unserved Energy
8. Enhancing customer satisfaction

Auto-Recloser and Sectionalizer-Benefits

Continuity of power supply for the consumers resulting in less complaints from citizens.

1. Reduce the time of power supply disconnection in cases of transient faults.
2. Reduce the unsold energy due to faults.
3. Reduce the cost of manpower operating in managing disconnected lines.
4. Maximum utilization of the network components.
5. Event Log and Remote control.
6. Reduce cost of fault finding.

RMU- Benefits:

1. The major advantage of Ring Main Units is the safety they provide to the operators. Like the operation of switching devices with interlocking system requires less knowledge and effort.
2. Working with IEDs allows remote operation. SCADA implementation is easy with smart Ring main units.
3. The space occupied by RMUs is less as they are Gas Insulated Switchgear.
4. The time taken for installation and commissioning of RMUs is very less. RMUs require less maintenance.
5. Beautification in the network

AB Switch - Benefits:

1. The major advantage of installing AB switches in 33kV and 11kV feeders is that field engineers would have flexibility to isolate the section locally instead of switching off entire feeder.
2. In case of any tripping, maintenance engineer can isolate the faulty section and restore the supply of remaining consumers thereby improving the reliability.

7.3.5. Installation of LV protection at DSS

During site visit it was observed that there are no LT Protection at DT secondary side, so any fault occurred during in LT shifts to 11kV System due to which 11kV feeders trips most of the time. The Tripping on 11kV feeders has impact of SAIFI and SAIDI and more and more consumers are being affected by the fault, which in turn reduces the reliability of the system.

To reduce the effect of LT fault on 11kV System, it is recommended to install the MCCB on Pole Mounting substation for 100 kVA and 250 KVA Distribution Substations and ACB on 500 KVA Substations.

S.No.	Description	UOM	LT Protection requirement in DSS (Nos.)	Quantity Considered in 1st Phase (Nos.)	Amount (in Crores)
1	Supply and Installation of MCCB-100 KVA	EA	6966	447	1.96
2	Supply and Installation of MCCB-250 KVA	EA	498	180	2.08
3	Supply and Installation of ACB-500 KVA	EA	159	72	2.70
Total			7623	699	6.74

7.3.6. Proposal for Trolley Mounted Pad Substation and Package Distribution Substations:

In case of Refurbishment of a DSS or Distribution Transformer failure, about 10-12 hrs. are required to complete the total job of DSS refurbishment or change of DT for which the supply remains off for whole durations leads to customer dissatisfaction and loss of revenue.

Mobile trolley mounted Pad substations can rapidly restore electrical service. Compact and easy mobility for emergency Service, forced outage repairs, temporary service restoration and regularly scheduled maintenance. Mobile substations are designed to withstand the road travel requirements and maximum stability and protection for safe movement over uneven pavement. Supply interruption for this considerable amount of time leads to customer dissatisfaction apart from loss of MUs that would have been consumed. Inclusion of some Trolley mounted Pad substations will lead to Flexible and faster temporary restoration. Total time for restoration is equal to that required to move the trolley at the location and to connect the HT and LT jumpers

In this proposal, TPNODL intends to procure 10 Nos. 500 kVA new trolley mounted Pad Substations on priority basis.

In this scheme, TPNODL proposes use of trolley mounted Pad substations to make the process of immediate power restoration at the time of natural calamities like storms and cyclones more flexible.

1. This will reduce the restoration time, apart from lowering the requirement of man-hours.
2. Faster power restoration at time of DT failure
3. Public Safety
4. Lesser Road Congestion

7.3.7. CAPEX requirement for Network Reliability:

S. No.	Major Category	Activity	DPR Cost TPNO DL(In Crores.)	Annexure
3	Reliability	33 KV Network refurbishment & AB switch	22.96	Annexure 12
		Refurbishment of 33KV/11KV Primary Substation (PSS)	17.5	Annexure 13
		11 KV Network refurbishment & AB switch	26.13	Annexure 14
		Refurbishment of 11KV/0.415 KV Dsitribution Substation (DSS)	8.99	Annexure 15
		Installation of LV protection at DSS	6.74	Annexure 16
		Installation of Auto reclosure / Sectionalizers ,RMUs, &FPis	6.77	Annexure 17
		Trolley Mounted Pad Substations	2.34	Annexure 18
		Underground cable Fault Locating Van and oil filtration machine	3	Annexure 19
		Testing equipment for PSS	6.48	Annexure 20
		Earthing of Power Transformers and Distribution Transformers	0.91	Annexure 21
		33KV & 11 KV Lightning Arrestor	1.69	
		Total (3)		103.51

7.4 Load Growth

Every year DISCOM have to release applied new connection. To meet this consumer growth, both network infrastructure needs to be extended, strengthened, or augmented and new energy meters to be installed to release the new connection. Some of the connections can be released from the existing network and some may require augmentation/addition/extension before release of new connection.

The following tables represent the data for consumer base in FY 19-20 & FY 20-21.

	Mar-20	Mar-21	Consumer Growth
Consumer Base	1906556	2009292	5%

Also, with the increase in consumer base there is load on DTR. Few DTR's get overloaded & get burnt. Below table shows the details of Burnt transformers in previous year.

Circle	PTR burnt		DTR Burnt	
	No.	Capacity (MVA)	No.	Capacity (MVA)
Balasore	5	17.6	766	35.98
Bhadrak	5	22.45	310	17.98
Baripada	0	0	476	18.15
Jajpur road	4	21.15	342	16.60
Keonjhar	2	13	326	12.37
Total	16	74.2	2220	101.10

Hence for carrying out network extension/ augmentation/addition, we propose expenditure under this head to consider load growth, network extension / augmentation / addition is expected to be carried out to cater the new demand.

Benefit to customer: Better the availability of materials, faster will be process of providing new connection hence more will be the customer satisfaction.

7.4.1. Augmentation of 33kV& 11Kv line, Power Transformers & DT

Augmentation of 11kV new line:

During site survey it is observed that most of 33/11kV Primary Sub-Stations are having single incoming 33kV source. With failure of single existing 33kV source entire 33/11kV PSS gets shutdown thereby causing shutdown to all the downstream 11kV & LT network consumers.

It is also observed that HT consumers on 33kV and 11kV are being fed through tapping point instead of a dedicated feeder. There are multiple HT consumers source also mixed with incoming source of 33/11kV PSS. In case of technical fault at one of the HT consumers leads to tripping of incoming source and another connected HT consumer.

To overcome this issue, it is proposed to study to establish link line from alternative available source.

At present 11kV feeders are radial and do not have ring connectivity with another 11kV feeder as per N-1 philosophy. It is proposed to study ring connectivity between nearest 11kV feeder in the vicinity and adjacent PSS 11kV feeders like Hospitals, town, commercial and key government establishments.

Addition/ Augmentation of Power Transformers

To cater the increasing load demand, PTR augmentation is required to avoid any overloading and N-1 fail situations. Also, to ensure reliable power supply to our consumers, PTRs has to be kept at optimum loading so as to avoid any mechanical stress on the transformers due to overloading.

To avoid any overloading issues especially in urban areas where the load growth is high, it is required to augment some of the power transformers in city area which are over loaded /may get overloaded considering load growth for the next two years. It will give benefit to consumers as follows:

1. Reliable power supply by ensuring N-1 reliability at PTR level.
2. Reduce over-burdening of existing PTRs thereby reducing power cuts.

Augmentation of Distribution Transformer

To cater the increasing load demand, DT augmentation is required to avoid overloading of transformer leading to transformer failure and power interruptions. Also, to ensure reliable power supply to our consumers, Distribution Transformers need to be kept at optimum loading to avoid any mechanical stress on the transformers due to overloading.

When a distribution transformer loading exceeds 80% of the rated capacity of the transformer, then it is “overloaded”.

To avoid these overloading issues especially in urban areas where the load growth is high, it is required to augment the capacity of the Distribution transformers to mitigate the overloading issue. It will provide benefit to consumers as follows:

1. Reliable power supply by reducing chances of fault in network, thereby reducing power interruptions
2. Reduce over-burdening of existing Distribution transformers thereby reducing power cuts.

In case of overloading of the Distribution Transformer, it not only hampers the power supply to the consumers but also may cause pre-mature failure of DT due to operating for long hours on overload condition. Thus, to abide by the safe loading limits, augmentation of distribution transformers are proposed for locations, where loading is exceeding the rated value.

In this proposal, TPNODL intends to carry out Distribution Transformer's augmentation for those DTs which are identified as overloaded at various locations. 50 nos. of Transformers are proposed for Augmentation of 200/250 kVA to 315 kVA DTs and 60 nos of DTs proposed for augmentation from 63/25 kVA to 100 kVA at different locations.

In this proposal, TPNODL intends to carry out PTR augmentation for those PTRs which are identified as overloaded at various locations. Total 9 nos PTR are proposed for Augmentation from 5 MVA to 8 MVA at different locations.

7.4.2 CAPEX Summary for Network Load Growth

S. No.	Major Category	Activity	DPR Cost TPNODL(In Crores.)	Annexure
4	Load Growth	Augmentation from 5 MVA to 8 MVA Power Transformer	8.96	Annexure 23
		Augmentation from 200/250 to 315 KVA Distribution Transformer	5.19	Annexure 24
		Augmentation 63/25 to 100 KVA Distribution Transformer	4.11	Annexure 25
		Addition of 11 kV Overhead Line	1.68	Annexure 26
		Addition of 33 kV Overhead Line	2.06	Annexure 27
		Total	22	

7.5 Technology & Civil Infrastructure

7.5.1 Proposed Technology Transformation

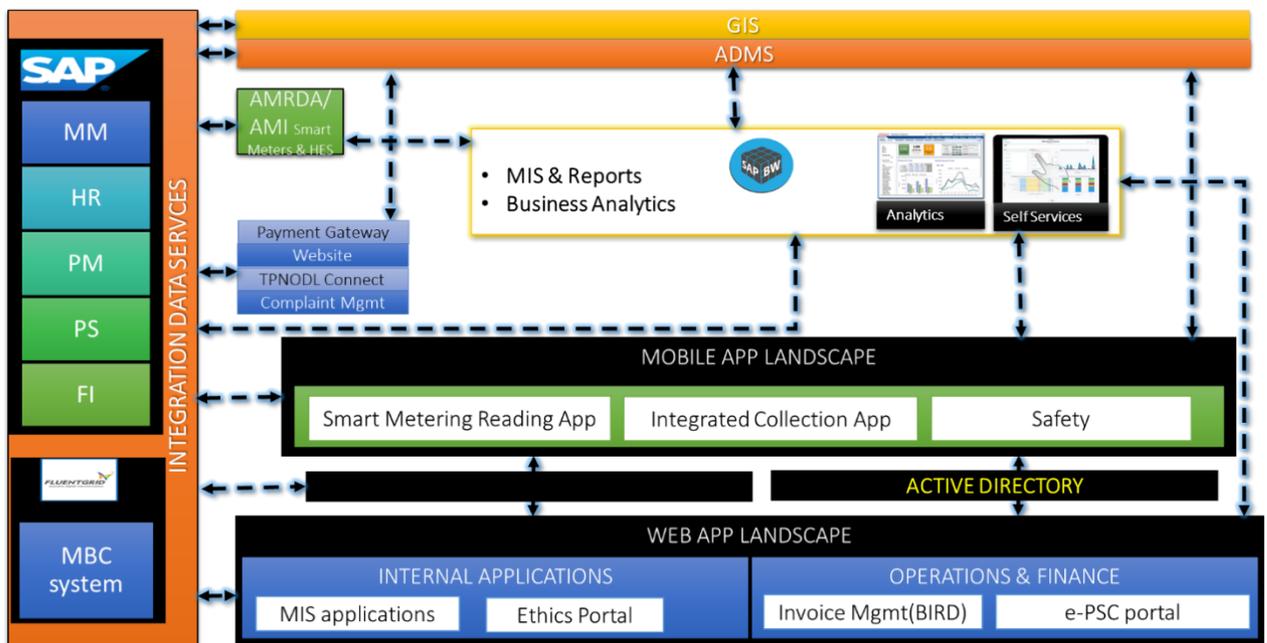
Information technology (IT) Landscape

Operational efficiencies when matched with Technological applications, results into great face change for a utility. As far as technology is concerned erstwhile NESCO had not done investment in technology till start of MBC & ERP implementation Govt. funded IPDS schemes but could not managed to roll out resulting into defeating the very purpose of the scheme. There is no investment done on Operational technologies like SCADA/DMS/OMS, GIS etc

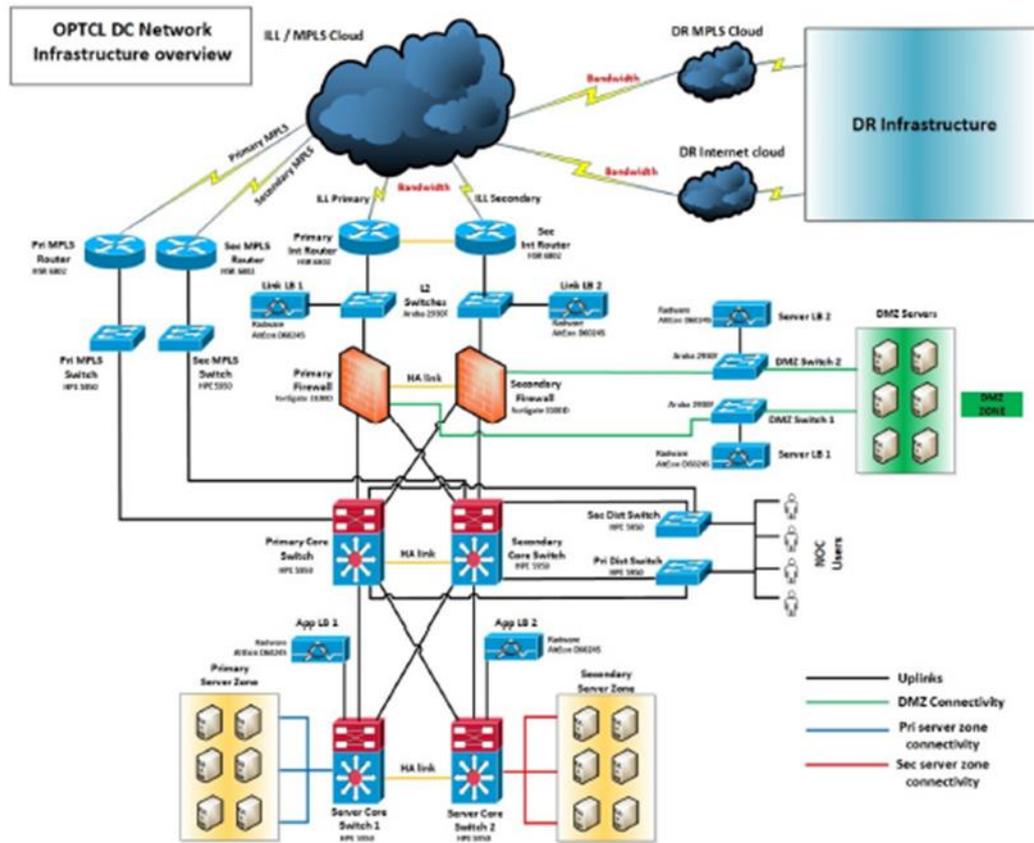
Key technological interventions like Fluent Grid's MBC (Meter Reading, billing, and collection), ERP on SAP platform (Procure to pay module. Plant Maintenance, HR Module etc.), GIS, and SCADA are planned to be implemented in phased manner.

Similarly, other interventions like Smart metering, Analytics, Smartphone based spot billing are being considered to unleash full potential of technology and reap the consequent benefits. TPNODL is also planning on establishing reliable communication network that will act as a backbone for other technological initiatives. This will help in improving the process efficiency and ensure better services to our end users.

IPDS scheme Fluent Grid is implementing Customer Care Solution, Meter, Billing & Collection, New Connection and other Commercial Process, Energy Audit, MIS, Various ERP Modules. Apart from this, TPNODL is planning to rollout Smart Metering MDM and HES system for consumers above 5 KW along with various mobility landscape. IT-OT landscape shall be proposed as follows.



IT-OT Connectivity Design



Key considerations for IT Landscape Transformation

1. Development of back end IT Infrastructure for Smart Metering

Smart Meters and metering system are the technology that is currently available in the market and is a preferred solution to adopt for consumer metering. Gol has also given mandate to replace all 25 Crores meters by smart meters in next 3 years.

In line with the national mission and as a pilot project, TPNODL intends to roll out Smart Meter (SM) project under Advance Metering Infrastructure (AMI).

The proposed Smart Metering AMI will offer multiple benefits to the DISCOM as well as consumers.

The benefits are as follows:

1. TPNODL will be able to control the entire billing and collection very effectively

2. Less billing disputes as 100% correct bills issued on actual meter readings
3. The revenue cycle can be managed much better by spreading the meter reading dates

Description	Activity	DPR Cost (In Crores.)
Smart Metering (AMI)	Installation of Smart Meters IT infrastructure, software like HES & MDM for 1 Lakh consumers (Phase-1)	10.5

2. Augmentation of IPDS Software licenses pan TPNODL

Fluent Grid is a COTS solution with suitable for enterprise wide operation. As per existing scenario, around 14 Lakh consumer licenses and 340 ERP User licenses are already available under IPDS. Additional consumer (8 lakh) and initially SAP ERP 500 user licenses would be procured to enable PAN area implementation of Fluent Grid CIS/MBC and SAP ERP.

An integrated contact centre for entire TPNODL area shall be dealt through the Aspect Contact Centre Solution (under IPDS implementation). This solution shall be scaled up to 50-seater call centre against current provisioning of 5 seater call center. The Core IT applications would include the following business critical modules / functionalities:

a. MBC and CIS

- New Connection
- Connection Management
- Disconnection & Reconnection
- Customer Move Out
- Metering and Material Process – Issue, Installation, Replacement, Removal and Reconciliation
- Billing – Scheduled, Unscheduled, Assessment, complaint handling
- Collection
- SMRD – Smart Meter Reading Devices - Mobile App for Meter Reading, Bill Distribution & follow up. This application is part of IPDS project and would be implemented by Fluent Grid.
- Customer Relationship Management
- Centralized Call Centre

- Energy Audit
- Customer Web Self Service

b. SAP ERP

- Material Management
- Finance and Controlling
- Plant Maintenance
- Human Capital Management
- Web Self Service
- Automation of approval hierarchy process which is not part of finance & Controlling. This is required for system generated approval for faster action. So, TPNODL would like to implement through purchase of Adobe/ documentum licenses to implement this.

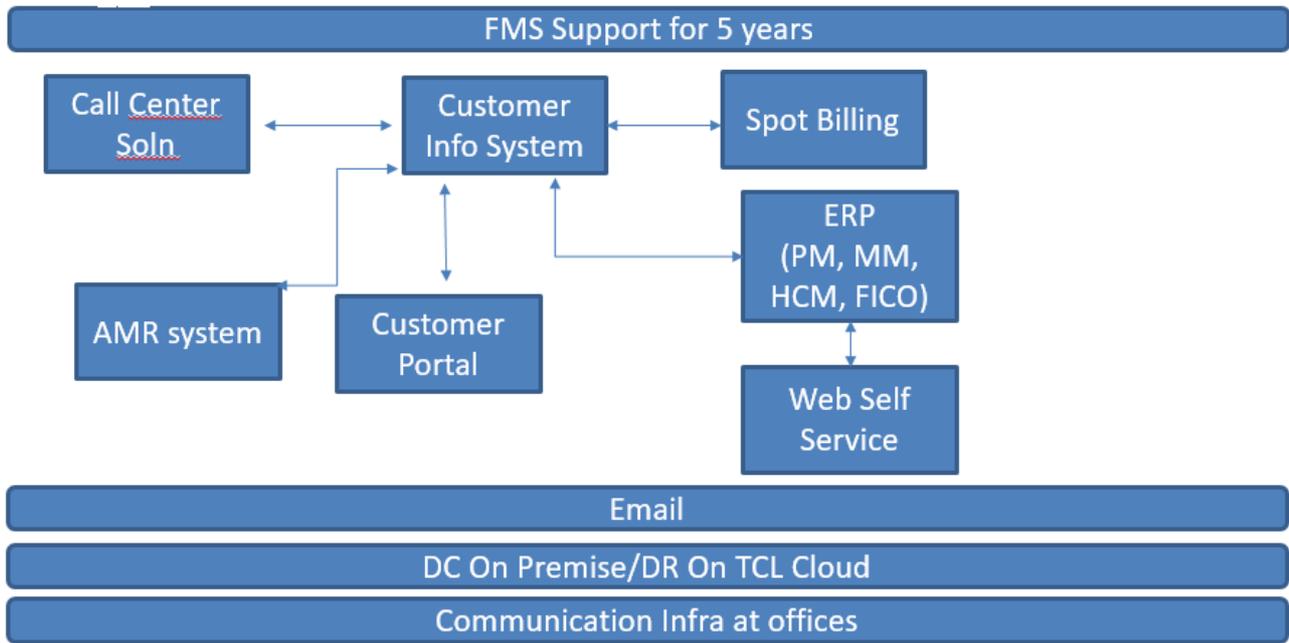
c. Business Intelligence – SAP BW & BO

- Data Warehousing
- Management Information System
- Dashboards

d. Mobility and additional digital platform

- TPNODL connect
- Invoice Management

IPDS Software Landscape



As current IPDS system is only planned for IPDS towns, following matrix lists the additional requirement of licenses for rolling it out across TPNODL

Sl. No.	Application	Total Licenses for TPSODL, TPWODL, TPNODL	TPNODL	
			Allotment for TPNODL	Delta Requirement
1	CIS (MBC) Application (Consumers)	4000000	1400000	800000
2	SAP Full use ERP Application users	1072	366	500
3	SAP Self-service users (employees)	868	280	1000
4	SAP – Payroll users	8500	3500	0
5	MS Exchange Email	1145	410	500
6	MS Active Directory	1145	410	1200

3. Non-SAP or Bespoke Applications & Mobile Apps

Following In-House Applications are planned to be implemented at TPNODL

- a. **Payment Gateway** – A centralized proprietary payment gateway is planned to be established which would seamlessly integrate with all collection touch points like website, mobile app, counters, partner agencies, mobile wallets into a single repository where verification and validation of payments would be done and would be posted to the billing system
- b. **Website** - Content management System with dynamic website would be placed with integrations to payment gateway and other key systems
- c. **TPNODL Connect** – Mobile app which would run on all devices and with ease of use features and enablement's for customer satisfaction
- d. **Suraksha Portal & Behaviour based Safety app** – As safety is a key aspect and needs to be woven in the company culture, best practices followed at Tata Power DDL will be implemented
- e. **BIRD (Invoice Management)** – Bill Inward Recipient Desk is an application for submission, approval and processing of vendors invoices online, check status of the invoice and track the same
- f. **e-PSC Application** - Platform to capture and evaluate reliability indices and a backbone to power system control team
- g. **Complaint management system & Anubhav Portal** which is end to end feedback capture and CAPA closure with information dissemination to all stakeholders is planned to be implemented to bring transparency and effective response to customer needs
- h. **Mobile Apps**
 - i. **SMRD** – Smart Meter Reading Devices - Mobile App for Meter Reading, Bill Distribution & follow up. Integration with SAP and Real time Reading uploading to SAP for Billing, OCR based meter reading to be in place
 - ii. **TPNODL Connect** - Bill Payment , Employee Verification ,Outage Information ,My Account enabled with Billing ,Consumption & Payment History ,Register & track Complaints ,Smart Meter Data ,Offer & Schemes ,Report Safety issues , Apply New Connection, Streetlight Complaints & Energy Conservation Tips
 - iii. **Collection Mobile app** will be integrated with the Payment Gateway application and billing system for up-to-date information

Capital expenditure of INR 15 Crores is proposed for implementing IPDS licensing in terms of buying additional licenses and procuring additional hardware to cater to entire TPNODL area consumers and load growth is as below

S. No.	Description	FY22
3	DC software & Licenses (ERP, MBC,DB, OS etc.)	15
	Total	15

4. IT Infrastructure (H/W & Field office infra for augmentation of IPDS application licenses)

a. Proposed IT/OT Infrastructure

Current Data Center developed under IPDS scheme by OPTCL is combined data center for TPNODL, TPSODL and TPWODL and only includes IPDS town's consumers which are approximately 60% of total consumer coverage. Also many other Smart Grid applications like SCADA, GIS, Meter Data Management/Head End System for Smart Metering, Mobility platform and other consumer facing applications are yet to be implemented along with many niche applications like mobile app for consumers, collection agencies and other web portal for safety management, Permit to Work, Outage Management etc. Current Data Center developed by OPTCL is requires scaling up to include non IPDS consumers and implementation of other Smart Grid Applications. Hence, we have proposed our new/extension of Data Center Setup in FY 22 for hosting additional Smart Grid applications like SCADA, GIS, Smart Metering, and various bespoke applications. As Technology transformation would also require huge focus on reliability of IT systems, having DR for TPNODL, is also planned in Year FY23 & FY24.

Along with this, TPNODL is also focused on digitization till section level as well as substations. Accordingly, new laptops, additional desktops and mobile devices are planned to be made available to each person in TPNODL and mobile devices for people engaged in field work.

Description	FY22
	Amt. (INR Crores.)
Data Center Cost	5.39

Frontend devices (Laptops, desktops, printers/scanners)	16.34
DC Hardware equipment Cost	5.31
Total	27.04

b. Communication Network Infra

While existing TPNODL connectivity is serving through internet bandwidth that too till subdivision level. There are lot of inconsistencies at subdivision and especially at sections level where employees are connecting through mobile hot spots. While connectivity is provisioned till section level under IPDS, we have found that bandwidth asked in IPDS is far less than requirement and also there needs to be a different approach for sustainable connectivity solution at subdivision and section level. Accordingly TPNODL is planning to have IP-MPLS connectivity at major locations i.e. Data Center, Head Office, Central Store, Circle Offices and Division offices. Also Co-locations offices like circle, division, subdivision, section, customer care, cash collection on same/nearby locations will be connected to single link to optimise bandwidth cost. Also, TPNODL has planned to connect nearby and major locations with optical fiber to increase reliability of network and optimise bandwidth cost. For bandwidth at Subdivision and Section Level, TPSODL will currently provide good local internet connectivity till we try other sustainable solution like microwave RF etc. Bandwidth provisioned for different locations are as follows:

Category	Link Type	Bandwidth ~ upgradable (MBPS)
Data Centre	MPLS	100 ~ 150 ~ 200
Data Centre	Internet/RF	100 ~ 150 ~ 200
TPNODL's Head Office	MPLS	50 ~ 100
Customer Call Centre	MPLS	20 ~ 40
TPNODL's Circle Office	MPLS	10 ~ 50
TPNODL's Division Office	MPLS	20 ~ 30
TPNODL's Collocated Sub Division/Section Offices	MPLS	6 ~ 10
Subdivisions & Sections	Internet	Good Internet bandwidth till permanent sustainable solution is explored.
Substations (except colocations/optical fibre connected locations)	MPLS	MPLS data Sims bandwidth till permanent sustainable solution is explored

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Expenditure in Network Infrastructure: While in IPDS scheme, there is a provision to connect most of the office through Network Infrastructure, additional expenditure is planned to ensure network reliability till last mile.

Description	FY22
Network Infra	4.98

5. Operational Technology Landscape-SCADA Implementation

Currently there are total 215 numbers of 33/11 kV substations in TPNODL areas out of which 99 no. of substations are developed/being developed under ODSSP scheme and at present 64 ODSSP are taken into service.

Name of Circle	BALASORE	BHADRAK	JAJPUR ROAD	KEONJHAR	BARIPADA	Total
Total Substations	58	33	34	40	50	215
ODSSP S/Stns (64 taken in service out of 99)	23	14	18	27	17	99

While Non ODSSP/Old Substations would take some time for modernization/revamping for making it SCADA ready, substations under ODSSP (being SCADA ready) can be very quickly integrated to centralized Control Center. These substations are equipped with capabilities of being remotely managed with help of communicable devices viz. relays, IED, RTUs, etc. These new substations shall bring in higher levels of operational efficiency and system performance. TPNODL area is prone to frequent disaster situations such as cyclone, etc. and these substations shall not only help in managing the load efficiently but also reduce system downtime. Further, to harness the remote management capabilities of these substations it is must that these substations are integrated to Supervisory Control and Data Acquisition (SCADA) System. Through this system, all these substations shall be connected to a centralized control centre for the purpose remote monitoring, control & operations.

As a Phase wise approach, it is considered that in FY22 20 nos. ODSSP substations & 10 nos old PSS would be connected to SCADA.

However, it is very pertinent to mention that SCADA is very effective for load management and effective and efficient operational execution. Over the period of time to convert old PSS into SCADA enabled PSS, it is required to scale up SCADA infrastructure at Power System Control level and Data center equipment level with DR enablement along with proven SCADA software. Also, installing the devices/ new equipment in field to make them SCADA compatible is also must. Overall. This system requires investment which will be justified by the operational excellence in power management and efficient restoration. In FY22, we have kept limited Capex to make the data compatibility with ODSSP substations.

Description	FY22
Mini SCADA	2.55 Cr.

6. GIS Implementation:

TPNODL is also planning to implement GIS system to have better asset management and its topology which will further facilitate to implement OT technologies by integrating with GIS. System once implemented will strengthen various other business processes viz. energy audit process, technical feasibility, dues verification, network planning. GIS will be backbone for Electrical linear and nonlinear asset repository as well as its connectivity topology. Being a large geography, GIS will be implemented in two parts:

- 1) GIS Software & its integration
- 2) GIS Data Creation PAN TPNODL.

In FY 21-22, it is proposed to implement the GIS software and its implementation with limited IT infrastructure and user’s licenses which will be subsequently added with data for all divisions with scalability of infrastructure and user’s licenses. CAPEX proposed for implementation of GIS in FY 21-22 is

Description	FY22
GIS Implementation	7.91 Cr.

Benefits of Proposed IT Landscape

Following are the key benefits of the Proposed Solution:

- Adoption of very strong integrated application landscape for enterprise wide implementation
- Ensure secured services to customers to safe guard the confidentiality, integrity and availability of IT systems
- Integrated processes with strong access control
- Drive the culture of safety and ethics among the workforce and all stakeholders
- Ensure customer delight and effective solutions for addressing needs
- Stringent data integrity to avoid any revenue leakage
- Increased Billing and collection efficiency
- Enhanced user experience with extensive standard features & functionalities
- Standardized process workflow across organization
- Centralized data base for synchronized data.
- Enhanced integration and automation capabilities with Non-SAP applications
- Using SAP standard capabilities combined with customer presentment platforms for a delightful customer experience

7. Customer services:

Customer Touch Points:

To improve the customer experience, customer touch points need to be augmented for providing ease of connectivity and single touch point at offices. Accordingly, following initiatives are proposed:

Establishing 50 seat Call Centre:

Call Centre is a convenient mode for providing service on 24X7 basis thereby customer is not required to go through the hardship of visiting the office. This demands the overhauling of existing infrastructure of call centre to improve the Call Centre connectivity. Keeping in mind to provide ease in customer experience, a unified Call Centre (one no. for TPNODL/franchise customers) is imperative to be made operational.

Considering the customer base of 19 Lakh consumers and providing service at call is the preferred mode of service in utility sector, initially, infrastructure of existing 4 seats call centre is proposed to enhance to 50 seats Call Centre at Balasore. To encourage the customer to connect with unified Call Centre, its number will be advertised through Bill, Website and other medium for enhancing the call inflow.

Initially, Call Centre will have 15-20 agents per eight-hour shift (*average 50 agents per day*). With the gradual increase in customer calls at unified call centre, number of agents will be enhanced to 50 agents in a shift to ensure connectivity at all time. It is pertinent to mentioned here that, similar experience happened whereby different industries like Telecom, Travel, and E-Commerce etc. are serving their consumers satisfactory by service delivery through Call Centre for most of customer's requirements.

It has been experienced that with the passage of time, call centre will become preferred mode of communication. Thus, increase call inflow is expected thereby it is imperative to have 2nd Call Centre location at some other location (*after reviewing the call inflow*) in next financial year for catering the increased call inflow. Further, it will also serve the purpose of Business Continuity during disaster situation at Balasore or vice-versa.

To establish the one of the state of art call center, it is required to commission call center telephony equipment for inbound and outbound, interfaced with multiple option to connect and further integration with business system to auto response and feedback from consumers

CAPEX proposed for implementation of call center in FY 21-22 is

Description	FY22
Call center Implementation	5 Cr.

7.5.2. Civil Infrastructure

TPNODL currently have offices in all the five circles, divisions, subdivisions & section office. Some of them are owned and others are on rented property. Currently the Offices in Balasore City, Circle Office Balasore are accommodating office and associated services staff.

The challenges exist in TPNODL using current buildings and infrastructure is to accommodate more employees and providing a hygienic, well ventilated and spacious working environment with minimum expenditure. It may also be noted that no annual repairs or refurbishment in all office buildings have been made in recent years, hence, immediate rehabilitation of the said buildings is required.

Existing Infrastructure

TPNODL currently have offices in all the five circles, divisions, subdivisions & section office. Some of them are owned and others are on rented property. Currently the Offices in Balasore City, Circle Office Balasore are accommodating office and associated services staff.

Corporate Office at Balasore,

The office space is currently crowded and haphazardly planned for seating arrangements, moreover, most of the circulation area has been occupied with files, documents etc. In view of more people joining the office it will be difficult to accommodate the extra manpower in the same arrangement.

Circle Office at Balasore

The existing building is a single-story building and needs upgradation and repairs. Currently building accommodates Circle Head and Division Head (BED) and their supporting staff. Most of the space is utilized for record keeping / storage of Cupboards etc. The roof of building is having leakage and damaged at many places and needs rehabilitation. Water leakage & seepage is observed from roof, walls and floors. The existing building requires urgent replacement of rehabilitation of existing structure to enhance its structural strength and internal modification to accommodate seating space for 60 employees. It is also required to make existing washrooms functional along with new washrooms and dining space to cater the increased strength of Staff.

Old Store Office at Balasore

The existing building is single story building, located at Balia - Balasore. This building remained underutilized and require urgent rehabilitation of walls and roof. This office after rehabilitation and renovation can create space of 21 employees. It is also required to make existing washrooms functional along with new washrooms and dining space to cater the increased strength of Staff.

The Store at Jajpur

Roofs of existing sheds at Jajpur store are badly damaged and beyond repairs due to cyclone effect. Also, due to zero maintenance of the sheds, these sheds needs rehabilitation including replacement of doors and windows. To increase the utility of badly damaged roofs of sheds and make them serviceable. Currently, they are lying abandoned & can be used for indoor material and the height of compound wall shall be increased by providing two layers of concertina coil to prevent entry of miscreants

Civil work proposed:

Renovation of various office buildings

Office building including the corporate office & all field offices upto the section level which are in dilapidated conditions will be completely renovated to increase their usable life. Further the existing furniture which are in poor condition will be replaced by modern workstations, cabins, etc.

Remodelling & Creation of Additional Workspaces in various office buildings.

The office buildings upto Division offices need to be remodelled to create additional space for accommodating the new recruits, provisions for conference rooms, canteens, visitors lounge, etc.

Record rooms

Record rooms of Structural Steel and covered with Precoated Sheets will be set at each circle with "State of the Art" provision of storage, protection, fire proofing, mass scanning, bar coding of all records & files for easy access to employees.

OPCENEX (Operation Center of Excellence)

It is proposed to create an centralized Operation center and PSC in newly constructed Sub Station at Vivekanand Marg near Kalimandir at Balasore. This substation is constructed under IPDS Scheme and can accommodate 25 Employees and a Centralized PSCC.

Civil Work for Meter Test Bench

In order to create updated Meter Testing Bay new building is to be constructed admeasuring about 160 sq.m. at convenient location at Balasore & Jajpur along with refurbishment of area with all basic amenities required for setting up the Meter testing laboratory. This will have all modern testing benches and equipment's along with storage facility in covered storage shed.

Civil Infrastructure for Call Center & Customer Care Centers

50-seater, 24 x 7 call center to be set at Balasore to cater all consumer calls related to No-current complaints, billing complaints, new Service connections, requests & queries. Customer care centers would be set up at each division to cater to walk-in consumers to register No-current complaints, billing complaints, new Service connections, requests & queries. These centers would also provision for bill collection

Security System of Stores: - High Mast lighting System

High mast lighting are commonly used to illuminate large areas from a very high mounting height for storage, It is an efficient lighting solution & most preferred way of illumination because it can achieve a high space to height ratio. As stores & scrap stores are vulnerable to theft it is important to have optimum illumination to safeguard the materials kept in the premise. Balasore Store has a very big area of 70000 sqr mtr and Jajpur Store has an area of 60000 sqr mtrs. Also, from operational point of view appropriate & efficient lighting arrangement is required to support loading, unloading & movement of materials inside the premises. Accordingly, the requirement of High Mast Lighting System is given below.

- i. Balasore Store part-1- 05 Nos.

- ii. Balasore Store Part -2 – 05 Nos.
- iii. Jajpur Store – 05 Nos.

Boundary Wall & Fencing

There is no boundary wall at four store locations. The boundary wall at the Balasore Store has no Concertina wire thereby allowing easy access inside store. All the stores will be provided with 3 meter height boundary wall with 600 mm concertina wiring protection.

Storage of E-waste and Hazardous Scrap Material

As per the guidelines of the NGT, the disposal of E-Waste and Hazardous Scrap like used Oil, Computer accessories etc has to be as per the OHSAS guidelines for occupational health and safety management system.

Civil Upgradation of DT workshop:

TPNODL has its own Distribution Transformer Workshop at Balasore which is very old and ill maintained. Hence it is proposed to renovate the DT workshop for its better utilization and expenditure of an amount of 1 crore is proposed.

7.5.3. Administration

In TPNODL, the office space is currently crowded and haphazardly planned for seating arrangements, moreover, most of the circulation area has been occupied with files, documents etc. Some of offices are owned and others are on rented property.

The challenges exist in TPNODL using current buildings and infrastructure is to accommodate more employees and providing a hygienic, well ventilated, and spacious working environment to them.

To provide best in class services to consumers, earn consumer delight, and improve satisfaction among other stakeholders and maintaining a clean & safe working environment, following infrastructures are required at above stated workplace.

- ❖ **Office air conditioning systems** are required to provide a comfortable working environment to bring and control Energy Efficiency, Humidity, Air Quality, and Reduction in Noise & Keeping Business Critical Equipment at the Right Temperature.
- ❖ **Water cooler & Purifiers** are required for proper hydration employees and to ensure

good health and improve overall efficiency. An employee should drink at least eight glasses of water a day to be properly hydrated as Water increases the amount of blood flow and oxygen to the brain and other body parts which in turn increases brain activity and attentiveness

- ❖ **Ergonomic office chairs** for sitting long periods with ease. This naturally helps employees work more efficiently and productively. Another benefit is reduction in healthcare expenses related to poor posture from unsuitable office chairs.
- ❖ **Photocopier machines** to offer a fast and easy way of getting single or multiple copies of documents & Improves Functionality of businesses.
- ❖ **Vehicles** to provide carpool facility to the company staff as well as car facility to the sr. management team.
- ❖ **File cabinets** are basic requirements to keep office space organized and tip top. It helps store important papers, documents, photographs, magazines, and training materials in one single place for easy and immediate access besides offering secure storage, it offers instant access to files of thousands of customers and employees.
- ❖ **Canteen facilities** are the necessity of satisfying employees with a better range of foods and healthy options.

To ensure safe, hygienic, well ventilated, and spacious working environment for employees as well as consumers, a capital expenditure is proposed, break up of which is mentioned in annexure 16.

7.5.4. CAPEX Summary for Technology and Civil Infrastructure

S. No.	Major Category	Activity	DPR Cost TPNODL(In Crores.)	Annexure
5	Technology & Civil Infrastructure	Data Center (DC) Development Cost	5.39	<i>Annexure 28</i>
		IT Infrastructure Hardware Cost	5.31	<i>Annexure 29</i>
		End user Devices i.e. Laptop, desktop, Printer, scanner	16.34	<i>Annexure 30</i>
		Software Licenses	15	<i>Annexure 31</i>
		Communication Network Infrastructure at DC and office locations	4.98	<i>Annexure 32</i>
		Mini SCADA Implementation (20 nos ODSSP & 10 nos Old PSS)	2.55	<i>Annexure 33</i>
		GIS Implementation for One Division	7.91	<i>Annexure 34</i>

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	Smart Metering Infrastructure (HES & MDM on 4G/ NBIOT Communication)	10.5	<i>Annexure 35</i>
	Call Center Implementation (System & Infrastructure)	5	<i>Annexure 36</i>
	Civil Infrastructure (Office Buildings, Meter Test Lab, Customer Care center, Records Rooms, Power System Control)	17.3	<i>Annexure 37</i>
	Establishment of DT workshop	3.6	<i>Annexure 37</i>
	High mast light in the Center store	0.75	<i>Annexure 37</i>
	Assets for Offices	5.23	<i>Annexure 37</i>
	Building shed for material storage with racking system	3.25	<i>Annexure 37</i>
	Total (5)	103.11	

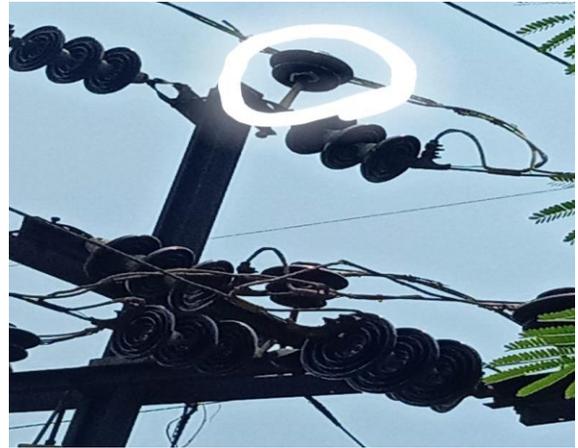
Benefits of Proposal:

S.No	CAPEX Description	Objective
1	Civil Infrastructure	To rehabilitate & renovation of office premises, customer care center, cash collection centers etc. to create additional seating space with modular furniture for employees.
2	Civil Work for Meter Test Bench	To construct the space for meter testing bay along with refurbishment of area with all basic amenities required for setting up the Meter testing laboratory including storage shed.
3	Call Center, PSCC & Data Center Infrastructure	To rehabilitate the space for accommodating three bays for Call Center, IT Hub and PSCC along with refurbishment of area with all basic amenities required for setting up the above three bays
4	Store Shed	To increase the utility of badly damaged roofs of sheds and make them serviceable, Currently, they are lying abandoned & can be used for indoor material. Increase the height of compound wall by providing two layers of concertina coil to prevent entry of miscreants.
5	Administration	It will provide comfortable working environment, healthy eating & refreshments for employees and stakeholders and
		Helps to store important papers, documents, photographs, magazines and training materials in one single place. Vehicles will provide car pool facility to the company staff And water cooler is required for proper hydration employees

8. Annexures

8.1 Annexure1 Sample Photographs related to depilated network & civil infrastructure







8.2 Annexure 2 CEA regulations

CEA regulations (Measures relating to Safety and Electric Supply – 2010)

41. Connection with earth-

The following conditions shall apply to the connection with earth of systems at voltage normally exceeding 125 V but not exceeding 650 V, namely: -

(i) neutral conductor of a 3-phase, 4-wire system and the middle conductor of a 2-phase, 3-wire system shall be earthed by not less than two separate and distinct connections with a minimum of two different earth electrodes or such large number as may be necessary to bring the earth resistance to a satisfactory value both at the generating station and at the sub-station.

(iii) neutral conductor shall also be earthed at one or more points along the distribution system or service line in addition to any connection with earth which may be at the consumer's premises.

58 (1) No conductor of an overhead line, including service lines, erected across a street shall at any part thereof be at a height of less than—

- For lines of voltage not exceeding 650 volts—5.8 metres
- For lines of voltage exceeding 650 volts but not exceeding 33 kV-6.1 metres

58 (2) No conductor of an overhead line, including service lines, erected along any street shall at any part thereof be at a height less than—

- For lines of voltage not exceeding 650 volts—5.5 metres
- For lines of voltage exceeding 650 volts but not exceeding 33 kV—5.8 meters

58 (3) No conductor of an overhead line, including service lines, erected elsewhere than along or across any street shall be at a height less than—

- For lines of voltage up to and including 11000 volts, if bare----4.6 meters.
- For lines of voltage up to & including 11,000 volts, if insulated—4.0 meters.
- For lines of voltage exceeding 11,000 volts—but not exceeding 33 kV----5.2 meters.

60. Maximum interval between supports-

All conductors shall be attached to supports at intervals not exceeding the safe limits based on the ultimate tensile strength of the conductor and the factor of safety specified under regulations 57. Provided that in the case of overhead lines carrying conductors of voltage not exceeding 650 V when erected in, over, along or across any street, the interval shall not, without the consent in writing of the Electrical Inspector, exceed 65 meters.

69. Lines crossing or approaching each other and lines crossing- Street and road.

ii) Guarding shall be provided where lines of voltage not exceeding 33 kV cross a road or street.

(iii) Where an overhead line crosses or is in proximity to another overhead line, guarding arrangements shall be provided so to guard against the possibility of their coming into contact with each other.

69. Guarding-

(1) Where guarding is required under these regulations the following shall be observed namely:

- a) Every guard-wire shall be connected with earth at each point at which its electrical continuity is broken.
- b) Every guard-wire shall have an actual breaking strength of not less than 635 kg and if made of iron or steel, shall be galvanized.
- c) Every guard-Wire or cross-connected systems of guard-wires shall have sufficient current-carrying capacity to ensure them rendering dead, without risk of fusing of the guard-wire or wires, till the contact of any live wire has been removed.

72. Earthing-

1. All metal supports and all reinforced and pre-stressed cement Concrete supports of overhead lines and metallic fittings attached thereto, shall be either permanently and efficiently earthed by providing a continuous earth wire and securely fastening to each pole and connecting with earth ordinarily at three points in every km with the spacing between the points being as neatly equidistant as possible or each support and the metallic fitting attached thereto shall be efficiently earthed.
2. Metallic bearer wire used for supporting insulated wire of overhead service lines of

voltage not exceeding 650 V shall be efficiently earthed or insulated.

3. Each stay-wire shall be similarly earthed unless insulator has been placed in it at a height not less than 3.0 metres from the ground.

Statutory guidelines (CEA – Technical Standards for Construction of Electrical Plants and Electric Lines,2010) in respect of Lines and its associated Poles and Towers, Span Length, Erection of Poles, and Stay.

95. Supports (Poles and Towers)-

1. The supports shall be poles or narrow based lattice towers with fully galvanized structure as per site requirement.
2. Poles may be used for 33 kV, 22 kV, 11 kV and LT lines (lines below 500 V) as per requirement. The poles shall be pre-cast concrete (PCC) pole, pre-stressed cement concrete (PSCC) pole, steel joist, rail pole or steel tubular pole as required, provided PCC and PSCC poles shall not be used at cut-points and as end poles.
3. Poles shall conform to relevant IS as the case may be.
4. Concrete poles shall be preferred in plain areas.
5. In hilly areas appropriate snow or ice loading shall be considered for design of poles and towers.
6. For locations involving long spans or higher clearances on account of crossing of power or communication lines or a railway line, specially designed poles/lattice towers may be used.
7. For angles of deviation of more than 10-degree, double pole structure shall be used.
8. The height of the pole above the ground level, length of pole below ground and working load shall be decided taking into consideration wind zone, terrain, topography, and the statutory clearances required to be maintained and these shall conform to relevant IS.

96. Line Span-

1. Line span shall be decided taking into consideration topography, wind pressure, type of support, conductor configuration and ultimate tensile strength of conductor.
2. The span shall be within the range specified by IS.
3. Uniform span shall be maintained as far as possible between consecutive pole structures.
4. While constructing a line, if a road crossing occurs at mid span, then a pole shall be placed on one side of the road so as to avoid mid span at the road crossing.
5. While crossing another power line, the lower voltage line shall be underneath. The lower line shall normally not cross at mid span of the upper line.
6. While placing poles on high ground, shorter poles can be used while maintaining proper ground clearance at the middle of the span.
7. Poles shall normally not be placed along the edges, cuts, or embankments of creeks and streams.
8. At all the places where the new line crosses over roads or another existing line, adequately earthed guard wire mesh below the line shall be provided to avoid the conductor of the new line falling over the areas below, in case of any break. In cases where the line passes below an existing line, the guard wire mesh shall be provided above the new line under construction.

97. Erection of Poles-

Erection of poles shall be carried out in accordance with the provisions of relevant IS.

98. Factor of Safety-

The supports shall be suitable for the wind loads as per relevant IS. The minimum factor of safety for supports shall be as per Central Electricity Authority (Measures Relating to Safety and Electricity Supply), Regulations as and when these are notified by the Authority.

100. Stay Arrangements-

1. To prevent tilting of a pole from its normal position due to abnormal wind pressure and deviation of alignment, the pole shall be kept in position by stays. The stays shall

be provided at:

- a. Angle locations.
 - b. Dead end locations.
 - c. Tee off points.
 - d. Steep gradient locations.
 - e. cut- point.
 - f. Along the straight run at minimum two locations in 1 km.
2. Galvanized iron stay wires and stay rods of adequate size shall be used. The individual wire used to form "stranded stay-wire" shall have a minimum tensile strength complying with relevant IS. For double pole structure, four stays along the line, two in each direction and two stays along the bisection of the angle of deviation or as required depending on the angle of deviation shall be provided.
 3. When two or more stays are provided on the same pole, each stay shall be grouted entirely separate from the other.
 4. The angle between the pole and stay wire shall be about 45 degrees and in no case it shall be less than 30 degrees. -
 5. Stays shall be anchored by either providing base plates, angle iron or rail.
 6. Stay wires shall be connected to the pole with a Porcelain Guy Strain Insulator. The standard Guy Strain insulators shall be as per relevant IS. The Porcelain insulator shall be inserted in the stay wire at a height of minimum 3 m vertically above the ground level. The strain insulators shall be free from defects, thoroughly vitrified and smoothly glazed.
 7. Wooden insulators shall not be used for stay/guy wire.

99.Earthing of Poles-

1. All metallic supports shall be permanently and effectively earthed. The Earthing arrangement shall conform to relevant IS.
2. Metal cross arms and insulator pins for PCC and PSCC poles shall be bonded together and normally earthed at every pole for 33 kV or 22 kV or 11 kV lines and at every 5th pole for lines below 500 volts.
3. The support on each side of a road crossing, railway crossing or river crossing shall

be earthed.

4. Normally coil Earthing shall be provided except for locations involving railways, telegraph line, power line crossings and special structures where pipe/rod type Earthing shall be provided. Whenever the electric lines pass close to a well or a permanently moist place, an earth should be provided in the well or the marshy place and connected to the electric line pole.
5. All steel poles on which switches, transformers, fuses etc. are mounted shall be earthed.
6. All poles above 650 volts, irrespective of inhabited areas, shall be earthed. For poles below 650 V guarding with continuous earth-wire shall be provided invariably, connected to earth at three equidistant points in one km.

101. Protective Guard-

Guard wire shall be used where an overhead line crosses or is in proximity to any telecommunication line or any other overhead line and in populated localities. Every guard wire shall be connected to earth wherever its electrical continuity is broken. The minimum factor of safety for stay wires, guard and bearer wires shall not be less than 2.5 based on ultimate strength of the wire.

71. Fencing and Approach Arrangement-

Fencing shall be provided around the sub- station. A metalled approach road to transport the equipment should be provided leading from the main road.

77. Transformer Mounting Structure-

1. The transformer shall be mounted on a single pole, H pole structure or on a plinth depending upon site requirements, size and weight of the transformer.
2. Direct single pole mounting shall be used for transformers up to 25 kVA only.
3. The transformers of more than 25 kVA and up to 250 kVA can be mounted on H pole structure or on plinth. Transformers above 250 kVA shall be mounted on plinth only.
4. The structures shall be provided with anti-climbing devices and danger

board.

5. The plinth shall be higher than the surroundings. The plinth foundation shall be of concrete.
6. Plinth mounted distribution sub-stations shall be adequately protected by fencing so as to prevent access to the equipment by unauthorized persons, animals and shall be provided with standard danger boards. The enclosure shall permit free circulation of air on all sides.

8.3 Annexure 3: Cost Estimate for Safety & Testing Equipment

S No.	Item Description	Quantity	Unit	TPNODL / CDB Rates INCL GST	Total Amount
1	FIRE EXTINGUISHER DCP 25KG CAP.	150	EA	14,318	2,147,718.00
2	FIRE EXTINGUISHER DCP 50KG CAP.	150	EA	22,500	3,375,000.00
3	FIRE EXTINGUISHER ABC TYPE 10 KG	700	EA	7,100	4,970,000.00
4	FIRE EXTINGUISHER ABC 4 KG CAPACITY.	1,166	EA	3,180	3,707,880.00
5	FIRE EXTINGUISHER ABC 6 KG CAPACITY.	1,500	EA	4,100	6,150,000.00
6	FIRE EXTINGUISHER CO2 CAP 4.5KG	1,500	EA	5,381	8,071,200.00
7	FIRE EXTINGUISHER MECH FOAM 9 LTR	318	EA	4,201	1,335,981.60
8	FIRE EXTINGUISHER MECH FOAM 50 LTR	15	EA	15,046	225,695.25
9	FIRE EXTINGUISHER DCP 50KG CAP.	17	EA	22,500	382,500.00
10	FIRE EXTINGUISHER ABC TYPE 9 KG	15	EA	3,027	45,405.00
11	FIRE EXTINGUISHER MECH FOAM 9 LTR	8	EA	10,650	85,200.00
12	FIRE EXTINGUISHER water mist type	3	EA	263,435	790,305.00
13	LADDER FIBRE GLASS 3 FOLD 9 MTR HEIGHT	300	EA	11,887	3,566,037.00
14	LADDER FIBRE GLASS FOLDING 12 MTR HEIGHT	170	EA	15,849	2,694,338.50
15	DISCHARGE ROD FOR 11-33-66KV	600	EA	11,240	6,744,000.00
16	NEON TESTER 11KV – 33KV – 66KV	600	EA	16,355	9,813,000.00
17	GROUNDING SET FOR O/H LINE PORTABLE	6	EA	38,645	231,870.00
18	Non Contact Electric Voltage Power Detector/Sensor	300	EA	2,549	764,700.00
19	Fire fighting system foam and water at store	1		30000000	30000000
Total safety		7,519	0	30,471,963	85,100,830
Total safety (In cr.)					8.5

8.4 Annexure 4 Cost Estimate for Cradle guard at major road crossings

a. Cost Estimate of cradle guard for 33KV line:

Sl No	Description of Materials	Unit	Quantity	Rate in Rs. FY2019-20	Amount in Rs.
1	Guarding cross arm of 100x50x6mm MS Channel 2.76mtr long 2Nos @9.2Kg/mtr	Kg	18282	65	1188346
2	Back clamp for guarding cross arm	No	720	150	108000
3	HT Stay set Complete	Set	720	1050	756000
4	7/8 SWG GI Stay Wire (0.729Kg/mtr)	Kg	7200	75	540000
5	HT Stay clamp (1.9Kg/pair)	pair	720	125	90000
6	HT Stay Insulator	No	720	50	36000
7	Cement concreting for stay anchor plate with C.C. 1:3:6 by using 4cm size hard granite metal = 0.45Mtrx0.45Mtrx1.5Mtr= 0.3Cum	LS	720	1270	914400
8	MS Nuts, Bolts & washers	Kg	720	78	56160
9	40mm dia GI pipe earthing device 3.0mtr long	No	720	1050	756000
10	Materials for Massionary work for Earth Pit, Charcoal, Salt etc including construction of earthing chamber (Size: 2"x2") and RCC slab cover	LS	720	1600	1152000
11	Eye hook	No	1440	60	86400
12	No. 6 GI wire ((2x72.1mtr) Guard wire+ (2x10mtr long earth wire)) (0.146Kg/mtr)	Kg	8630	75	647276
13	No. 8 GI wire (37x3.05mtr long) cross lacing (0.103Kg/mtr)	Kg	4184	75	313836
	Total A				6644418
	Stock, storage and Insurance @ 3% of A				199333
	Sub Total B				6843750
	T &P @ 2% of B				136875
	Contingency @ 3% of B				205313
	Transportation @ 7.5% of B				513281
	Erection Charges @ 10% of B				684375
	Sub total C				8383594
	6% supervision charge/over head charge				503016
	Gross Total (Without GST)				8886610
	OR Say				8886610
	GST @				1599590
	CESS 1%				88866
	Gross (Inc. GST)-				10575066
				Total(In Crores)	1.06

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b. Estimate of Cradle guard for 11 KV line:

SI No	Description of Materials	Unit	Quantity	Unit Rate in Rs.	Amount in Rs.
1	Guarding cross arm of 100x50x6mm MS Channel 2.21mtr long 2Nos @9.2Kg/mtr	Kg	20,739	65	13,48,012
2	Back clamp for guarding cross arm	No	1,020	80	81,600
3	HT Stay set Complete	Set	1,020	1050	10,71,000
4	7/10 SWG GI Stay Wire (0.455Kg/mtr)	Kg	7,140	75	5,35,500
5	HT Stay clamp	pair	1,020	125	1,27,500
6	HT Stay Insulator	No	1,020	50	51,000
13	Cement concreting for stay anchor plate with C.C. 1:3:6 by using 4cm size hard granite metal= 0.45Mtrx0.45Mtrx1.5Mtr= 0.3Cum	No	1,020	1270	12,95,400
7	MS Nuts, Bolts & washers	Kg	1,020	71	72,420
8	40mm dia GI pipe earthing device 3.0mtr long	No	1,020	1050	10,71,000
9	Materials for Massionary work for Earth Pit, Charcoal, Salt etc including construction of earthing chamber (Size: 2"x2") and RCC slab cover	LS	1,020	1600	16,32,000
	150X 150mm RS joist (11 Mtr long)(30.6 ky Per meter)(Each 336.6kg)	Kg		65	-
10	Eye hook	No	4,080	60	2,44,800
11	No. 6 GI wire ((2x72.1mtr) Guard wire+ (2x10mtr long earth wire)) (0.146Kg/mtr)	Kg	12,226	75	9,16,975
12	No. 8 GI wire (37x2.55mtr long) cross lacing (0.103Kg/mtr)	Kg	4,956	75	3,71,715
	Total A				88,18,922
	Stock, storage and Insurance @ 3% of A				2,64,568
	Sub Total B				90,83,490
	T &P @ 2% of B				1,81,670
	Contingency @ 3% of B				2,72,505
	Transportation @ 7.5% of B				6,81,262
	Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)				9,08,349
	Sub total C				1,11,27,275
	6% supervision charge/over head charge				6,67,636
	Gross Total				1,17,94,911
	OR Say				1,17,94,911
	GST @				21,23,084

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	CESS 1%				1,17,949
	Gross (Inc. GST)-				1,40,35,944
	Total(In Crores)				1.40

8.5 Annexure 5 Cost Estimate for Fencing of DSS

Cost Estimate of Unit cost for Fencing for DSS:

S.NO.	Brief Item Description	Quantity	Unit	Rate	Amount
1	Excavation in all types of ordinary soils / hard murrum including all necessary permissions, depositing / stacking of all materials, removal of vegetation, backfilling with excavated earth in layers, well watered, compacted, transporting of surplus excavated material for backfilling or stacking or spreading or removal of surplus excavated earth within a basic lead of 100 mtrs as directed for a depth from 0.0 to 1.5 mtrs	408	M3	250	102000
2	Providing and laying 225 or 300 mm thick dry rubble soling with approved quality stones including filling gaps with small chips ramming with hand rammer etc. complete.	157	M3	2000	314000
3	Supplying, Providing and laying in position plain cement concrete of grade M15 machine mixed, vibrated and placed to correct line and level in levelling course/fill under or around foundations pits, slabs on grade, sumps, soak pits, etc. at any depth with 30 mm down graded coarse aggregates including curing, compacting, de-watering wherever necessary, providing marine plywood shuttering, form work, steel scaffolding wherever required etc. complete. (Min cement content 300 Kg/m3)	51	M3	6000	306000
4	Supplying, Providing and laying in position plain cement concrete of grade M15 machine mixed, vibrated and placed to correct line and level in bedblocks/ concrete blocks, coping, etc. at any depth with 30 mm down graded coarse aggregates including curing, compacting, de-watering wherever necessary, providing marine plywood shuttering, form work, steel	82	M3	6500	533000

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S.NO.	Brief Item Description	Quantity	Unit	Rate	Amount
	scaffolding wherever required etc. complete. (Min cement content 300 Kg/m3)				
5	Providing all material and constructing brick masonry 230 mm. thick and above in cement mortar (1:5) using approved quality class 50 conforming to IS:3102 table moulded bricks, including leaving inserts / pockets, steel scaffolding, curing, raking joints, etc.	196		6000	1176000
6	Providing and plastering external surfaces of concrete and brick work such as walls, columns, beams, coping etc. with cement mortar 1:4 mix finish smooth with 1:1 proportion cement & slaked lime neeru / instant neeru, including providing and erecting steel scaffolding, hacking concrete surface, providing bands, grooves drip moulds, curing, etc - 12 mm thk	1326	M2	350	464100
7	Providing steel and supplying all material, fabricating and erecting structural steel work at all heights including steel scaffolding for roof trusses, purlins, beams, columns, posts for gates, chequered plate flooring, treads, risers, stringers, bracings, runners etc. at all heights including welding and gas cutting, drilling of holes etc. complete as per the approved drawing or as directed. Contractor shall use his own welding set, gas cutting set, gas, electrodes, drill machine and other accessories, required for carrying out the entire work. The rate shall include supply and fixing of MS bolts, and nuts, and washers and applying one coat of Shalimar or any other approved make red oxide (primer) paint to all the exposed surfaces of steel including applying synthetic enamel paint of approved make over one coat of primer.. Structural steel section shall be of primary manufacturer and confirm to IS2062 requirements	24.65	MT	89890	2215788.5

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S.NO.	Brief Item Description	Quantity	Unit	Rate	Amount
8	Providing and fixing reinforced barbed wire tape (RBT) (2.6mm) thick single wire along the boundary wall / fencing on angle iron post with all necessary fitting such as welding of nuts, bolts, clips, split pins, steel scaffolding, TSP & labour etc.complete.	5100	M	30	153000
9	Providing all the materials including binding wires, cleaning, bending, cutting, hoisting, placing in position, lapping and binding with 16 SWG annealed soft iron wire or tack welding reinforcement steel for all types of RCC / Precast work irrespective of locations & levels all as per drawings including handling and transporting from site stores, steel scaffolding complete as directed by using High yield strength deformed bars conforming to IS 1786 - HYSD Bars	2.785	MT	75000	208875
10	Providing cartage service and transporting, excavated soil, debris, bricks, concrete, scrapwood including loading and unloading and disposing off to dumping sites approved by statutory bodies outside premises including submission of relevant documents, as applicable outside the station premises . (Note. Payable measurement shall be dismantelled qty. (Voids to be deducted as applicable whenever heap / truck measurements are taken))	325	M3	450	146250
11	Providing , stretching and fixing Galvanised Iron chain link fencing 2" square and of gauge 10 (bare metal thickness) on angle posts with heavy duty GI split pins etc. in position complete as directed at all Heights including steel scaffolding.	4250	M2	400	1700000
12	Stretching and fixing chain link fencing 2" square and of gauge 10 (bare metal thickness) on angle posts with heavy duty GI split pins etc. in position complete as directed at all Heights including steel scaffolding. (Only Chain link shall be supplied by the Owner).	4250	M2	200	850000

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S.NO.	Brief Item Description	Quantity	Unit	Rate	Amount
13	Providing, Fabricating and erecting MS gates consisting of MS hollow rectangular or square box sections with 6mm to 8mm thk. MS joining plates, including welding of sections as per design approved by the Owner. Fabricating the framework with necessary hinges, locking arrangement including applying synthetic enamel paint of approved make over one coat of primer. Contractor shall use his own welding set, gas cutting set, gas, electrodes and other accessories, steel scaffolding required to complete the entire job. All hollow box steel section shall be of primary manufacturer and confirm to IS 4923 requirements	6.8	MT	89890	611252
				Total	8780265.5
			Add GST		
			Add GST	18%	1580447.79
			Grand Total including taxes		10360713.29
	Cost for Total RM			1700	10360713.29
	Cost Per RM of fencing				6094.53
	Cost for 1 unit of 4 x4				97512.59
	Say for One Uint			Rs. Cr	0.0098 Cr

Circle wise Requirement of Fencing of DSS:

Circle Name	No of Divisions	Total Fencing required on priority based (in Nos.)	1 st year no of DSS Fencing to be considered in FY21-22(Nos.)	Unit Cost for each DSS Fencing(in Crore)	Total Cost for DSS Fencing(in Crore)
Balasore	5	3157	200	.0098	1.96
Bhadrak	2	1185	200		1.96
Baripada	3	1051	200		1.96
Jajpur	3	1726	200		1.96
Keonjhar	3	850	200		1.96
Total	16	7969	1000		

8.6 Annexure 6 Cost Estimate for Boundary wall of PSS

Sno	Item Description	Unit	Qty	Rate in Rs	Amount in Rs
1	Excavation	Cum	9507.667	250	2376917
2	PCCM-10	Cum	518.6	6000	3111600
3	RCC Raft M-20	Cum	1728.667	8000	13829333
4	Rcc Column M-20	Cum	345.7333	9000	3111600
5	RCC For Beam M-20	Cum	432.1667	9000	3889500
6	Brick Masonary 1:5	Cum	1642.233	6000	9853400
7	External Plaster in CM 1:4	Sqm	17286.67	350	6050333
8	Strl Steel	MT	17.28667	89000	1538513
9	Barb wire	Rm	23337	30	700110
10	Concertina Coil	Rm	2593	400	1037200
11	Reinf Steel	MT	129.65	75000	9723750
12	Painting with Cement based paint	Sqm	17286.67	160	2765867
	Total Amount				57988123
			Add GST	18%	10437862.2
	Gross amount including GST				68425986
	Gross amount for boundary wall				68425986
	Gross amount (in CR)				6.84

Circle wise Requirement of Boundary wall for PSS:

Circle Name	No of Divisions	Total Boundary wall required (in mtrs)	Total quantity considered in FY21-22 (in meters)	Unit Cost for per meter Boundary wall for PSS (in Crore)	Total Cost for PSS Boundary wall(in Crore)
Balasore	5	9120	954	.0026	2.51
Bhadrak	2	4155	70		0.18
Baripada	3	2385	250		0.66
Jajpur	3	3811	768		2.02
Keonjhar	3	2441	551		1.45
Total	16	21912	2593		6.84

8.7 Annexure 7 Cost Estimate for DPR for Establishment of Meter Testing Lab

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Material	Estimated unit cost (Rs.)	Estimated unit cost (Rs.) With GST 18%	Qty. (No.)	Cost (Rs.)
SINGLE PHASE 20 POSITION BENCH	26,00,000	30,68,000	2	61,36,000
THREE PHASE 20 POSITION BENCH	39,00,000	46,02,000	2	92,04,000
Personal computer for meter test bench	59,750	70,505	4	2,82,020
Printer for meter test bench computer	10,000	11,800	4	47,200
SINGLE PHASE/ THREE PHASE PHANTOM LOAD TEST BENCH	2,08,000	2,45,440	2	7,36,320
Civil & Admin charges			Lump sum	55,94,500
Total				2,20,00,040
Total in Rs. Crores				2.20

8.8. Annexure 8 Cost Estimate for Equipment for Meter data downloading

SL NO	Testing Equipment Required	Qty	Estimated Unit rate with GST	Approximate Costing(Budgetary)
1	CMRI for Meter data downloading	82	35,000.00	28,70,000.00
TOTAL in Rs Crs				0.28

8.9. Annexure 9 Cost Estimate for AMR enabled equipments

SL NO	Testing Equipment Required	Qty	Estimated Unit rate with GST	Approximate Costing(Budgetary)
1	GSM MODEM for AMR Communication	2500	5,500.00	1,37,50,000
TOTAL in Rs Crs				1.37

8.10. Annexure 10 Cost Estimate for Conversion of LT Bare conductor to AB Cable

S No.	Item Description	Quantity	Unit	Unit Rate (In Rs)	Amount (in Rs)
1	3x50+1x25+1x16mm ² AB cable	220000	M	140	30,800,000.00
2	300Kg PSC pole 9Mtr long	1540	EA	3,000.00	4,620,000.00
3	Board Danger 440V size 8x10 inch	1540	EA	80	123,200.00
4	ANTICLIMBING DEVICE	1540	EA	150	231,000.00
5	Two Line X arm GI for 9Mtr PCC Pole	1540	EA	242	372,680.00
6	ANCHOR LT ABC CABLE 3X120 TO 150 SQMM	3520	EA	65	228,800.00
7	Suspension Clamp with EYE hook for ABC	6160	EA	340	2,094,400.00
8	Eye Hook for AB cable	9680	EA	60	580,800.00
9	Plate Base RCC Size 450x450x50mm	1540	EA	60	92,400.00
10	7/10 SWG G I stay wire (10Kg. / Set)	35200	KG	75	2,640,000.00
11	40mm dia GI pipe earthing device 3 mtr. Long	2200	EA	1,050	2,310,000.00
12	Pipe HDPE Size 25MM	6600	M	18	118,800.00
13	Lug AL 70 SQMM for 7/8 SWG WIRE/EARTHING	8800	EA	17	149,600.00
14	METAL DISTRIBUTION BOX	1100	EA	1,009	1,110,252.00
15	Dist. Box for housing 5 No. 10Amps MCCB including accessories for fixing with pole suitable for AB XLPE Cable	1100	EA	1,838	2,021,800.00
16	Cap cable end for ABC Cables	14080	EA	19	267,520.00
17	IPC KZ 4X150	17600	EA	80	1,408,000.00
18	IPC EP 95 LT ABC 16-95 & 5-10 SQMM ST.LT	13200	EA	40	522,630.51
19	WIRE GI 8 SWG	915.2	KG	52	47,590.40
20	IPC KZ 2x150 LTABC 50-150 & 6-35(50) sqmm	52800	EA	64	3,379,200.00
21	STEEL STRAP SIZE 20 MMX50 M LONG	176	ROL	1,250	220,000.00
22	BUCKLES FOR STEEL STRAP (1 EA = 100 NOS)	176	EA	580	102,012.88
23	CABLE 1.1KV AL 4CX25 SQMM ARM	6600	M	120	792,000.00
24	GLAND FOR CABLE 4X25 SQ.MM	22000	EA	48	1,052,644.07
25	LUG AL CRIMPING 25 SQMM XLPE SINGLE HOLE	8800	EA	3	30,650.85
26	FLAT GI SIZE 50X6 MM	52800	KG	75	3,960,000.00
27	FLAT GI Size 25x6 MM	34320	KG	75	2,574,000.00
28	FRP CROSS ARM 1070MM 415V		EA	317	-
29	ISA-50*50*6 GI Angel (4.6KG/M)	46200	KG	114	5,276,979.66
30	ISM-75*40 GI Channel (7.24KG/M)	46200	KG	114	5,276,979.66
31	BOLT & NUT GI 12MMX50MM HEX	2640	KG	82	216,480.00
32	BOLT & NUT GI 16MMX75M HEX	5280	KG	82	432,960.00
33	WASHER GI SIZE 12MM DIA	880	KG	114	100,513.90
34	4Cx16 mm ² LT PVC Cable	22000	Mtr	100	2,200,000.00

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35	2Cx6 mm ² LT PVC Cable	44000	Mtr	30	1,320,000.00
36	4Cx10 mm ² LT PVC Cable	22000	Mtr	115	2,530,000.00
37	Dismantling of 55Sqmm conductor & Transport to Store	220	KM	1000	220,000.00
38	Dismantling of PSC pole with Transport to Store	660	EA	1000	660,000.00
39	MISC expenses for Dismantling	220	LS	1000	220,000.00
40	LT Stay set Complete	1100	Set	520	572,000.00
41	7/12 SWG Stay Wire	11000	K.g.	75	825,000.00
42	LT Stay clamp (1.4 K.g./ Pair)	1100	pair	110	121,000.00
43	LT Stay Insulator	1100	No.	35	38,500.00
44	Fixing and concreting of stay set with 0.5Cum cement concrete foundation 1:3:6 size (900mmx600mmx900mm) using 40mm BHG metal with all labour and material except stay set, stay wire, stay insulator.	1100	No.	2455.46	2,701,006.00
45	WASHER GI SIZE 16MM DIA	1320	KG	114	150,770.85
46	TIE PLASTIC BLACK SIZE 7.6 MM X 380 MM	8800	EA	3	28,160.00
47	TIE PLASTIC BLACK SIZE 7.6 MM X 150MM	4400	EA	2	9,856.00
48	Tie Plastic size 9mmx265mm	23760	EA	4	95,040.00
Subtotal Material(A)					84,845,227
Stock, Storage and Insurance@3% of A					2545356.80
Sub- Total-B					87390583.57
T & P Charges @ 2% of B					1747811.67
Contingency @ 3% of B					2621717.51
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					9214918.36
Transportation Charges@7.5% of B					6554293.77
Sub-Total C					107529324.88
Over Head Charges (Including Supervision charges) @6% of C					6451759.49
Total D					113981084.37
Gross Cost					113981084.37
OR Say					113981084.00
GST @ 18%					20516595.12
CESS 1%					1139810.84
Gross Cost (Inc. GST)					135637489.96
Total(In Crores)					13.56

8.11. Annexure 11 Cost Estimate for Field Testing equipment - Metering and enforcement

SL NO	Testing Equipment Required	Qty	Estimated Unit rate with GST in Rs	Approximate Costing(Budgetary)
1	Portable CT-PT Error Testor	6	11,50,000	69,00,000
2	HT Accucheck (HT meter Testing Equipment)	16	2,00,000	32,00,000

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3	LT Accucheck (LT 3Phase meter Testing Equipment)	12	1,50,000	18,00,000
4	12V Battery (for AC power supply to CT-PT Error Tester at Field)	5	10,000	50,000
5	Single phase Accucuckeck (For 1phse meter testing at field)	60	43,000	25,80,000
6	LT Clamp on meter	60	4,500	2,70,000
7	Insulation tester (Meggar)	65	35,000	22,75,000
8	Portable calibrated Load Box	35	15,000	5,25,000
TOTAL in Rs				17600000
Total in Rs Crs				1.76

8.12. Annexure 12 Cost Estimate for 33 KV Network refurbishment & AB switch

a. Cost Estimate for 33 kV Network refurbishment

S. No.	Description	UOM	Qty	Amount in Crores.
1	33kV Line Refurbishment-148 sq.mm AAAC	Ckt Km	58	5.67
2	33kV Line Refurbishment-232 sq.mm AAAC	Ckt Km	114	15.45

Cost Estimate for 33kV Overhead Line Refurbishment with 148 sq.mm AAAC

S No.	Item Description	Quantity	Unit	Unit Rate (In Rs.)	Amount (INR)
1	148mm ² All Aluminium Alloy Conductor. AAAC	179220	M	82	1,46,96,040
2	150X 150mm RS joist (13 Mtr long)(34.6 ky Per meter)(Each 415.2kg)	168571	KG	65	1,09,57,128
3	BOLT & NUT GI 16MMX75M HEX	870	KG	82	71,340
4	BOLT & NUT GI 16MMX200MM HEX	174	KG	82	14,268
5	50x50x6 mm M.S Angle (4.50Kg. / Mtr)	11600	KG	65	7,54,000
6	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	5800	KG	65	3,77,000
7	100x50x6 mm MS Channel (9.2Kg. / Mtr)	8120	KG	65	5,27,800
8	50x6 mm G I flat	6264	KG	75	4,69,800
9	25x6 mm G I flat	1856	KG	75	1,39,200
10	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	232	EA	1,050	2,43,600
11	PIPE HDPE SIZE 25 MM	696	M	31	21,576
12	LUG AL 70 SQMM FOR 7/8 SWG WIRE/EARTHING	928	EA	17	15,776
13	WASHER MS SIZE 16MM DIA	116	KG	95	10,991
14	BOARD DANGER 33KV SIZE 8X10 INCH	928	EA	80	74,240

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15	ANTICLIMBING DEVICE FOR TOWER (BRACKET)	928	EA	430	3,99,111
16	INSULATOR STAY (GUY/EGG) 11KV	928	EA	50	46,400
17	PLATE BASE RCC SIZE 450X450X50MM	1334	EA	110	1,46,740
18	ANCHOR ROD SIZE 20MMX2100MM	928	EA	77	71,456
19	TENSION SCREW GI SIZE 750X20MM	928	EA	342	3,17,376
20	Disc insulator (B&S) 120KN Polymer	696	EA	1,440	10,02,240
21	33KV H W fitting(B&S)90KN, 3Bolt	351	EA	351	1,23,201
22	V-Cross arm 33 KV 22 KG	696	EA	1,580	10,99,680
23	7/10 SWG G I stay wire (10Kg. / Set)	11600	KG	75	8,70,000
24	Back Clamp for V cross arm(33KV) 1.7 kg each 950*8 Flat)	696	EA	150	1,04,400
25	WIRE GI 4 SWG	34800	KG	52	18,09,600
26	COVER MVLC - 38 FOR GOAT COND	348	M	550	1,91,400
27	Materials for Massionary work for Earth Pit,Charcoal, Salt etc including construction of earthing chamber (Size: 2"x2") and RCC slab cover	232	LS	1600.00	3,71,200
28	33KV pin insulator polymer	2436	EA	480	11,69,280
Subtotal Material(A)					3,60,94,843
Stock, Storage and Insurance@3% of A					1082845.30
Sub- Total-B					37177688.57
T & P Charges @ 2% of B					743553.77
Contingency @ 3% of B					1115330.66
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					3153476.76
Transportation Charges@7.5% of B					2788326.64
Sub-Total C					44978376.41
Over Head Charges (Including Supervision charges) @6% of C					2698702.58
Total D					47677078.99
Gross Cost					47677078.99
OR Say					47677079.00
GST @18%					8581874.22
CESS 1%					476770.79
Gross Cost (Inc. GST)33 kV OH Line-148 sqmm					56735724.01
Total(In Crores)					5.67

Cost Estimate for 33kV Overhead Line Refurbishment with 232 sq.mm AAAC

S No.	Item Description	Quantity	Unit	Unit Rate in Rs.	Amount (INR)
1	232 sqmm All Alloy Aluminum Conductor AAAC	353805	M	156.50	5,53,70,483
2	150X 150mm RS joist (13 Mtr long)(34.6 ky Per meter)(Each 415.2kg)	332783	KG	65	2,16,30,882

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3	BOLT & NUT GI 16MMX75M HEX	1718	KG	82	1,40,835
4	BOLT & NUT GI 16MMX200MM HEX	344	KG	82	28,167
5	50x50x6 mm M.S Angle (4.50Kg. / Mtr)	17175	KG	65	11,16,375
6	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	6641	KG	65	4,31,665
7	100x50x6 mm MS Channel (9.2Kg. / Mtr)	16488	KG	65	10,71,720
8	50x6 mm G I flat	12366	KG	75	9,27,450
9	25x6 mm G I flat	3664	KG	75	2,74,800
10	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	458	EA	1,050	4,80,900
11	PIPE HDPE SIZE 25 MM	1374	M	31	42,594
12	LUG AL 70 SQMM FOR 7/8 SWG WIRE/EARTHING	1832	EA	17	31,144
13	WASHER MS SIZE 16MM DIA	344	KG	95	32,548
14	BOARD DANGER 33KV SIZE 8X10 INCH	1832	EA	80	1,46,560
15	ANTICLIMBING DEVICE FOR TOWER (BRACKET)	1832	EA	430	7,87,760
16	INSULATOR STAY (GUY/EGG) 11KV	1832	EA	50	91,600
17	PLATE BASE RCC SIZE 450X450X50MM	2634	EA	110	2,89,685
18	ANCHOR ROD SIZE 20MMX2100MM	1832	EA	77	1,41,064
19	TENSION SCREW GI SIZE 750X20MM	1832	EA	342	6,26,544
20	Disc insulator (B&S) 120KN Polymer	1374	EA	1,440	19,78,560
21	33KV H W fitting(B&S)90KN, 3Bolt	1374	EA	351	4,82,274
22	V-Cross arm 33 KV 22 KG	1374	EA	1,580	21,70,920
23	7/10 SWG G I stay wire (10Kg. / Set)	22900	KG	75	17,17,500
24	Back Clamp for V cross arm(33KV) 1.7 kg each 950*8 Flat)	1374	EA	150	2,06,100
25	WIRE GI 4 SWG	57250	KG	75	42,93,750
26	COVER MVLC - 38 FOR GOAT COND	687	M	550	3,77,850
27	Materials for Massionary work for Earth Pit,Charcoal, Salt etc including construction of earthing chamber (Size: 2"x2") and RCC slab cover	458	LS	1600.00	7,32,800
28	33KV pin insulator polymer	4809	EA	480	23,08,320
	Subtotal Material(A)				9,79,30,850
	Stock, Storage and Insurance@3% of A				2937925.49
	Sub- Total-B				100868775.07
	T & P Charges @ 2% of B				2017375.50
	Contingency @ 3% of B				3026063.25
	Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @ 10% over other materials (B)				8972887.08
	Transportation Charges@7.5% of B				7565158.13
	Sub-Total C				122450259.03
	Over Head Charges (Including Supervision charges) @6% of C				7347015.54
	Total D				129797274.57

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	Gross Cost		129797274.57
	OR Say		129797275.00
	GST @18%		23363509.5
	CESS 1%	-	1297972.75
	Gross Cost (Inc. GST)		154458757.25
	Total(In Crores)		15.45

b. Cost Estimate for 33 kV AB Switch

S No.	Item Description	Quantity	Unit	Unit Rate (In Rs.)	Amount (INR)
1	232 sqmm All Alloy Aluminum Conductor AAAC	1740	M	156.50	272310
2	150x150mm RS joist (12Mtr long) (34.6 Kg per meter) (Each 367.2Kg)	42595	KG	65	2768688
3	AB Switch(33KV,400A,3Pole,50Hz)	58	ST	19070	1106060
4	40mm dia GI pipe earthing device 3 mtr. Long	58	EA	1050	60900
5	PIPE HDPE SIZE 25 MM	174	M	32	5525
6	LUG AL 70 SQMM FOR 7/8 SWG WIRE/EARTHING	232	EA	17	3944
7	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	4060	KG	65	263900
8	100x50x6 mm MS Channel (9.2Kg. / Mtr)	4060	KG	65	263900
9	7/10 SWG G I stay wire (10Kg. / Set)	1160	KG	75.00	87000
10	25x6 mm G I flat	522	KG	75.00	39150
11	50x6 mm G I flat	1283	KG	75.00	96199
12	50x50x6 mm M.S Angle (4.50Kg. / Mtr)	2900	KG	65.00	188500
13	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	3190	KG	65.00	207350
14	Disc insulator (B&S) 120KN Polymer	696	EA	1,440.00	1002240
15	33KV post insulator(2X24KV Post insulator Stack)	348	EA	1,580.00	549840
16	33KV H W fitting(B&S)90KN, 4Bolt	348	EA	500.00	174000
17	P.G. CLAMP FOR 232 MM2 AAC CONDUCTOR	348	EA	1150	400200
18	BOARD DANGER 33KV SIZE 8X10 INCH	116	EA	80	9280
19	PLATE BASE RCC SIZE 450X450X75MM	116	EA	219	25461
20	ANTICLIMBING DEVICE FOR TOWER (BRACKET)	116	EA	430	49889
21	BOLT & NUT GI 12MMX50MM HEX	116	KG	82.00	9512
22	BOLT & NUT GI 16MMX100MM HEX	116	KG	82.00	9512
23	BOLT & NUT GI 16MMX150MM HEX	116	KG	82.00	9512
24	BOLT & NUT GI 16MMX50MM HEX	298	KG	82.00	24403
25	WASHER MS SIZE 16MM DIA	218	KG	95	20609
26	WASHER MS SIZE 12MM DIA	29	KG	95	2748
27	Materials for Massionary work for Earth Pit,Charcoal, Salt etc including construction of earthing chamber (Size: 2"x2") and RCC slab cover	58	LS	1600.00	92,800
28	Civil works for Pole Foundation	58	L/S	12712	737288
29	FRP Fencing	178988	M2	18	3185380
	Subtotal Material(A)				1,16,66,100

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	Stock, Storage and Insurance@3% of A	349982.99
	Sub- Total-B	12016082.74
	T & P Charges @ 2% of B	240321.65
	Contingency @ 3% of B	360482.48
	Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)	1059020.84
	Transportation Charges@7.5% of B	901206.21
	Sub-Total C	14577113.92
	Over Head Charges (Including Supervision charges) @6% of C	874626.84
	Total D	15451740.76
	Gross Cost	15451740.76
	OR Say	15451741.00
	GST @	2781313.38
	CESS 1%	-
	Gross Cost (Inc. GST)-ABS 33 KV	18387571.79
	Total(In Crores)	1.84

8.13. Annexure 13 Cost Estimate for Refurbishment of 33KV/11KV Primary Substation (PSS)

Cost estimate for Sick Equipment replacement (VCB, CT/PT, CRP, Isolator, AB switches, Battery bank & Charger) in PSS:

Sr no	Item Description	Quantity	Unit	Unit Rate (In Cr.)	Amount (INR)
1	33KV VCB -800A	32	EA	3,00,000.00	96,00,000.00
2	33KV CT- 800-400-200/1-1-1	96	EA	46,000.00	44,16,000.00
3	33KV PT	27	EA	40,000.00	10,80,000.00
4	33KV Control Relay Panel For Transformer	30	EA	4,50,000.00	1,35,00,000.00
5	33KV Control Relay Panel For IC/OG	16	EA	3,00,000.00	48,00,000.00
6	11KV VCB - 1200A	32	EA	2,50,000.00	80,00,000.00
7	11KV CT- 300-600/1-1, 400-800-1200/1-1	96	EA	30,000.00	28,80,000.00
8	11KV PT	16	EA	30,000.00	4,80,000.00
9	11KV Control relay panel	32	EA	2,50,000.00	80,00,000.00
10	11kv switchboard with control VCB,CT & control Panel	15	EA	5,98,802.00	89,82,030.00
11	33kv Isolator (800A)	25	EA	1,20,000.00	30,00,000.00
12	AB Switch(33KV,400A,3Pole,50Hz)	25	ST	19070	4,76,750.00
13	AB Switch(11KV, 400A,3Pole,50Hz)	48	ST	11,850.00	5,68,800.00
14	240 sqmm ACSR	4000	mtr.	156.50	6,26,000.00
15	16 C 2.5 mm sq Cu Control Cable, un armoured	7000	mtr.	403.00	28,21,000.00
16	10 C 2.5 mm sq Cu Control Cable, un armoured	7000	mtr.	330.00	23,10,000.00
17	2C 2.5mm sq Cu Control Cable, un armoured	7000	mtr.	68.00	4,76,000.00

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18	11 KV 800 Amp Isolator without earth switch with PI (polymer)	0	Set	43,240.00	0.00
19	24 V, 100 AH, maintenance free VRLA Battery (Set. 4 Nos of 12V Battery)	40	EA	28,820.00	11,52,800.00
20	24V, 100A Float cum Boost Charger (Float/Boost current as per above VRLA Battery)	40	EA	3,29,220	1,31,68,800.00
21	48 V, 100 AH, maintenance free VRLA Battery (Set. 4 Nos of 12V Battery)	5	EA	57,650.00	2,88,250.00
22	48V, 100A Float cum Boost Charger (Float/Boost current as per above VRLA Battery)	5	EA	1,44,120.00	7,20,600.00
23	Control Cable 2Cx 50 Sq mm	1000	mtr.	684	6,84,000.00
24	RTU , ethernet switches with Panel	10	EA	24,58,364	2,45,83,640.30
25	30kV, 10kA, Metal Oxide, Class-3, Surge Arrester	192	EA	11,538	22,15,296.00
26	9kV, 5kA, Metal Oxide, Surge Arrester (Distribution Class)	192	EA	1,202	2,30,760.96
27	33 kV Porcelain Pin Insulator including GI pin	192	EA	480	92,160.00
28	33 KV Polymer Disc Insulator 120 KN	192	EA	1,440	2,76,480.00
29	11 kV Porcelain Pin Insulator including GI Pin	192	EA	200	38,400.00
30	11 KV Porcelain Disc Insulator 120 KN	192	EA	1,440	2,76,480.00
31	40mm Nominal bore GI pipe (medium gauge) earthing device with 3mtr long	200	No	1050.00	2,10,000.00
32	25X6mm GI Flat (@ 1.2Kg/mtr)	3840	Kg	75.00	2,88,000.00
33	Materials for Massionary work for Earth Pit,Charcoal, Salt etc including construction of earthing chamber (Size: 2"x2") and RCC slab cover	256	No	1600.00	4,09,600.00
34	Design, Engineering, Supply of all materials and labour for construction of RCC foundation (1:2:4)as per approved drawing for 33KV VCB with CT as per applicable TS and drawing.	1	LS	15000	15000.00
35	Sundries (Clamp, connector, danger board, Insulation tape etc)	64	LS	2000.00	1,28,000.00
	Subtotal Material(A)				11,67,94,847.26
	Stock, Storage and Insurance@3% of A				3503845.42
	Sub- Total-B				120298692.68
	T & P Charges @ 2% of B				2405973.85
	Contingency @ 3% of B				3608960.78
	Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)				10660894.72
	Transportation Charges@7.5% of B				9022401.95
	Sub-Total C				145996923.98
	Over Head Charges (Including Supervision charges) @6% of C				8759815.44
	Total D				154756739.42
	Gross Cost				154756739.42
	OR Say				154756739.00

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	GST @18%	27856213.02
	CESS 1%	15,47,567.39
	Gross Cost (Inc. GST)	184160519.41
	Total(In Crores)	18.42

Cost Estimate for DSS refurbishment:

S.No.	Description	UOM	Qty	Amount in Crores.
1	DSS Refurbishment of 500 kVA	EA	42	2.51
2	DSS Refurbishment of 250 kVA	EA	139	4.73
3	DSS Refurbishment of 100 kVA	EA	61	1.76
Total			242	8.99

8.14. Annexure 14 Cost Estimate for 11 KV Network refurbishment & AB switch

a. 11 kV Network refurbishment

S. No.	Description	UOM	Qty	Amount in Crores.
1	11 kV Line Refurbishment-100 sq.mm AAAC	Ckt Km	164	20.82

Cost Estimate for 11kV Overhead Line Refurbishment with 100 sq.mm AAAC

S No.	Item Description	Quantity	Unit	Unit Rate (in Rs)	Amount (INR)
1	100 sqmm All Alloy Aluminum Conductor AAAC	669330	M	55	36813150
2	150X 150mm RS joist (11 Mtr long)(30.6 ky Per meter)(Each 336.6kg)	1195603	KG	65	77714208
3	BOLT & NUT GI 16MMX75M HEX	7912	KG	82	648791
4	BOLT & NUT GI 16MMX200MM HEX	1669	KG	82	136894
5	50x50x6 mm M.S Angle (4.50Kg. / Mtr)	70208	KG	65	4563488
6	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	32190	KG	65	2092350
7	100x50x6 mm MS Channel (9.2Kg. / Mtr)	79920	KG	65	5194800
8	50x6 mm G I flat	53280	KG	75	3996000
9	25x6 mm G I flat	16428	KG	75	1232100
10	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	1110	EA	1050	1165500
11	PIPE HDPE SIZE 25 MM	3330	M	31	103230

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12	LUG AL 70 SQMM FOR 7/8 SWG WIRE/EARTHING	4440	EA	17	75480
13	WASHER MS SIZE 16MM DIA	1292	KG	95	122426
14	BOARD DANGER 11KV SIZE 8X10 INCH	6660	EA	80	532800
15	ANTICLIMBING DEVICE FOR 11 M PCC POLE	6660	EA	219	1458540
16	INSULATOR STAY (GUY/EGG) 11KV	8880	EA	50	444000
17	PLATE BASE RCC SIZE 450X450X75MM	15540	EA	110	1709400
18	ANCHOR ROD SIZE 20MMX2100MM	8880	EA	77	683760
19	TENSION SCREW GI SIZE 750X20MM	8880	EA	342	3036960
20	Disc Insulator(B&S) 70KN Polymer	6660	EA	1150	7659000
21	HW FITTING(B&S) 70KN 3 BOLT	6660	EA	350	2331000
22	11 KV V cross arm 10.2 Kg each	4440	EA	810	3596400
23	7/10 SWG G I stay wire (10Kg. / Set)	86580	KG	75	6493500
24	Back Clamp for V cross arm(11KV)	4440	EA	80	355200
25	WIRE GI 4 SWG	118770	KG	52	6176040
26	SLEEV BLACK POLYOLEFIN -16MM	19980	M	10	203186
27	MONKEY SCARE- ONE LAYER	3330	EA	64	211653
28	BIRD GUARD SPIKE (FLEXIBLE POLYCORBONAT)	6660	EA	38	253080
29	SILICON RUBBER SPACER 11 KV	8880	EA	395	3507600
30	GUARD POLIPRO FOR OVERHEAD COND.	6660	M	295	1967974
31	Materials for Massionary work for Earth Pit,Charcoal, Salt etc including construction of earthing chamber (Size: 2"x2") and RCC slab cover	1110	LS	1600.00	17,76,000
32	11KV pin insulator polymer	19980	EA	200	3996000
Subtotal Material(A)					18,02,50,509
Stock, Storage and Insurance@3% of A					54,07,515
Sub- Total-B					18,56,58,024
T & P Charges @ 2% of B					37,13,160
Contingency @ 3% of B					55,69,741
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					1,45,63,521
Transportation Charges@7.5% of B					1,39,24,352
Sub-Total C					22,34,28,798
Over Head Charges (Including Supervision charges) @6% of C					1,34,05,728
Total D					23,68,34,526
Gross Cost					23,68,34,526
OR Say					23,68,34,526
GST @18%					4,26,30,215
CESS 1%					- 23,68,345
Gross Cost (Inc. GST)-11 kV OH Line-100 sqmm					28,18,33,086
Total(In Crores)					28.18

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b. 11 kV AB Switch

Cost Estimate for 11 KV Switch

S No.	Item Description	Quantity	Unit	Unit Rate (In Rs.)	Ammount (INR)
1	125 sqmm All Alloy Aluminum Conductor AAAC	5700	M	76.80	437760
2	150X 150mm RS joist (11 Mtr long)(30.6 ky Per meter)(Each 336.6kg)	127908	EA	65.00	8314020
3	AB Switch(11KV, 400A,3Pole,50Hz)	190	ST	11,850.00	2251500
4	40mm dia GI pipe earthing device 3 mtr. Long	190	EA	1,050.00	199500
5	PIPE HDPE SIZE 25 MM	570	M	31.75	18098
6	LUG AL 70 SQMM FOR 7/8 SWG WIRE/EARTHING	760	EA	17.00	12920
7	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	11528	KG	65.00	749289
8	100x50x6 mm MS Channel (9.2Kg. / Mtr)	11868	KG	65.00	771430
9	7/10 SWG G I stay wire (10Kg. / Set)	3800	KG	75.00	285000
10	25x6 mm G I flat	1710	KG	75.00	128250
11	50x6 mm G I flat	4202	KG	75.00	315136
12	50x50x6 mm M.S Angle (4.50Kg. / Mtr)	7768	KG	75.00	582608
13	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	9096	KG	75.00	682176
14	Disc insulator (B&S) 120KN Polymer	2280	EA	1,440.00	3283200
15	33KV H W fitting(B&S)90KN, 4Bolt	1140	EA	500.00	570000
16	P.G. CLAMP FOR 100 MM2 AAC CONDUCTOR	1140	EA	1,150.00	1311000
17	BOARD DANGER 11KV SIZE 8X10 INCH	380	EA	80.00	30400
18	PLATE BASE RCC SIZE 450X450X75MM	380	EA	219.49	83406
19	ANTICLIMBING DEVICE FOR 11 M PCC POLE	380	EA	205.00	77900
20	BOLT & NUT GI 12MMX50MM HEX	264	KG	82.00	21675
21	BOLT & NUT GI 16MMX100MM HEX	248	KG	82.00	20332
22	BOLT & NUT GI 16MMX150MM HEX	1277	KG	82.00	104744
23	BOLT & NUT GI 16MMX50MM HEX	975	KG	82.00	79941
24	WASHER MS SIZE 16MM DIA	713	KG	94.75	67512
25	WASHER MS SIZE 12MM DIA	95	KG	94.75	9002
26	Civil Foundation	190	L/S	12,711.86	2415254
27	Materials for Massionary work for Earth Pit,Charcoal, Salt etc including construction of earthing chamber (Size: 2"x2") and RCC slab cover	190	LS	1,600.00	3,04,000
28	FRP Fencing	586340	M2	18.00	10554120
Subtotal Material(A)					3,36,80,174
Stock, Storage and Insurance@3% of A					1010405.22
Sub- Total-B					34690579.34
T & P Charges @ 2% of B					693811.59
Contingency @ 3% of B					1040717.38
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					3040885.90
Transportation Charges@7.5% of B					2601793.45

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	Sub-Total C		42067787.66
	Over Head Charges (Including Supervision charges) @6% of C		2524067.26
	Total D		44591854.92
	Gross Cost		44591854.92
	OR Say		44591855.00
	GST @		8026533.9
	CESS 1%	-	445918.55
	Gross Cost (Inc. GST)-ABS 11 KV		53064307.45
	Total(In Crores)		5.31

8.15. Annexure 15 Cost Estimate for Refurbishment of 11KV/0.415 KV Distribution Substation (DSS)

a. Cost Estimate for 500 kVA Distribution Substations Refurbishment

S No.	Item Description	Quantity	Unit	Unit Rate (in Rs)	Amount (INR)
1	500 KVA,11/0.4KV(Cu) Transformer	0	EA	5,80,000.00	-
2	ACB LT 400A	84	EA	39,919	33,53,196
3	BOARD DANGER 11KV SIZE 8X10 INCH	84	EA	80	6,720
4	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	294	EA	1,050	3,08,700
5	LUG AL CRIMPING 95 SQMM XLPE SINGLE HOLE	1008	EA	20	20,160
6	FUSE ELEMENT FOR 11KV DD FUSE 30AMP PINK	126	EA	52	6,552
7	7/10 SWG G I stay wire (10Kg. / Set)	3150	KG	75	2,36,250
8	CABLE 1.1KV AL 1X630 SQMM UNAR XLPE	2688	M	395	10,62,079
9	LUG AL CRIMPING 630 SQMM XLPE ONE HOLE	672	EA	115	77,280
10	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	7140	KG	65	4,64,100
11	50x50x6 mm M.S Angle (4.50Kg. / Mtr)	2940	KG	65	1,91,100
12	50x6 mm G I flat	1260	KG	75	94,500
13	BOLT & NUT GI 16MMX75M HEX	420	KG	82	34,440
14	BOLT & NUT GI 12MMX75MM HEX	210	KG	82	17,220
15	BOLT & NUT GI 16MMX200MM HEX	210	KG	82	17,220
16	WASHER GI SIZE 12MM DIA	21	KG	82	1,722
17	WASHER GI SIZE 16MM DIA	21	KG	82	1,722
18	TEMPLETE FOR TRANSFORMER MAINT.RECORD	42	EA	68	2,835
19	CONNECTOR PALM LT BRASS 1000A 630KVA TRF	168	EA	1,144	1,92,203
20	150X 150mm RS joist (11 Mtr long)(30.6 ky Per meter)(Each 336.6kg)	28274	KG	65	18,37,836
21	11 KV V cross arm 10.2 Kg each	84	EA	810	68,040
22	Back Clamp for V cross arm(11KV)	84	EA	80	6,720
23	11KV pin insulator polymer	252	EA	200	50,400

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24	AB Switch(11KV,200A,3Pole,50Hz)	42	EA	7,380.00	3,09,960
25	Lightening Arrester(9KV,5KA)	126	EA	980	1,23,480
26	ANTICLIMBING DEVICE FOR 11 M PCC POLE	84	EA	219	18,396
27	FUSE UNIT DD 11KV 200A 1P SIL.RUBBER W/B	126	EA	1,356	1,70,838
28	CONDUCTOR ACSR RABBIT PVC 61.70 SQMM	966	M	67	64,722
29	BIRD CAP FOR 9KV 5KA SURGE ARRESTER	126	EA	237	29,862
30	TAPE HT SCOTCH 23 25MMX9.1M 66KV	38	ROL	214.20	8,187
31	ANTI TRACKING SILICON TAPE SCOTCH 70 3M	15	EA	1,550.75	23,447
32	VINYL TAPE SCOTCH 35 YELLOW-BLUE-RED	168	EA	213.23	35,822
33	ALNOX 3M (HOT SPOT REDUCING PASTE)	3	EA	3,779.96	11,113
34	3M SCOTCH 1625 SPRAY	17	EA	338.98	5,695
35	3M SCOTCH FILL PUTTY	42	EA	593.22	24,915
36	RODENT CAPACITIVE SCREEN GUARD FOR- DT	126	EA	94.50	11,907
37	BIRD GUARD SPIKE (FLEXIBLE POLYCORBONAT)	84	EA	38.00	3,192
38	SLEEV BLACK POLYOLEFIN	84	M	38.94	3,271
39	PLATE BASE RCC SIZE 450X450X75MM	84	EA	110	9,240
40	CONNECTOR MINI WEDGE 25 SQMM TO DOG	126	EA	183	23,077
41	BUS BAR COPPER HDT SIZE 75X10MM	42	M	1,857	77,992
42	PIPE HDPE SIZE 25 MM	504	M	31	15,624
43	CABLE 1.1KV AL 4CX300 SQMM XLPE ARM	1260	M	1,011	12,73,860
44	JT. KIT O/D 1.1KV XLPE 4X300 SQ.MM HS	168	EA	1,247.78	2,09,627
45	PIPE G.I.100MM DIA HEAVY CLASS PLAIN END	252	M	773	1,94,702
46	25x6 mm G I flat	420	KG	75	31,500
47	BOLT & NUT GI 12MMX50MM HEX	42	KG	82	3,444
48	Materials for Massionary work for Earth Pit,Charcoal, Salt etc including construction of earthing chamber (Size: 2"x2") and RCC slab cover	294	LS	1600.00	4,70,400
49	FRP Fencing	1764	Sq. M	2,615	46,13,308
Subtotal Material					15818578
Stock, Storage and Insurance@3% of A					474557.33
Sub- Total-B					16293134.96
T & P Charges @ 2% of B					325862.70
Contingency @ 3% of B					488794.05
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					1534664.94
Transportation Charges@7.5% of B					1221985.12
Sub-Total C					19864441.77
Over Head Charges (Including Supervision charges) @6% of C					1191866.51
Total D					21056308.28
Gross Cost					21056308.28
OR Say					21056308.00
GST @18%					3790135.44
CESS 1%					-
Gross Cost (Inc. GST)-					25057006.52
Total(In Crores)					2.51

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b. Cost Estimate for 250 kVA Distribution Substations Refurbishment

S No.	Item Description	Quantity	Unit	Unit Rate (in Rs)	Amount (INR)
1	250 KVA,11/0.4KV (AL) Transformer	-	EA	2,68,450	-
2	LT Distribution Box for 250 KVA S/S.	139.00	EA	48,000	66,72,000
3	7/10 SWG G I stay wire (10Kg. / Set)	278.00	EA	75	20,850
4	Back Clamp for V cross arm(11KV)	278.00	EA	80	22,240
5	11KV pin insulator polymer	834	EA	200	1,66,800
6	AB Switch(11KV,200A,3Pole,50Hz)	139	EA	15,100	20,98,900
7	Lightening Arrester(9KV,5KA)	417	EA	980	4,08,660
8	FUSE UNIT DD 11KV 200A 1P SIL.RUBBER W/B	417	EA	1,356	5,65,392
9	FUSE ELEMENT FOR 11KV DD FUSE 20A WHITE	417	EA	49	20,433
10	CONDUCTOR ACSR RABBIT PVC 61.70 SQMM	3,197	M	67	2,14,199
11	CABLE 1.1KV AL 4CX300 SQMM XLPE ARM	1,112	M	1,011	11,24,232
12	GLAND FOR ARM CABLE 4X300 SQ.MM	278	EA	603	1,67,634
13	ISMC-125*65 GI Channel (13.3KG/M)	12,258	KG	114	14,00,160
14	ISMC-100*50 GI Channel (9.76KG/M)	8,282	KG	114	9,45,929
15	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	13,857	KG	65	9,00,699
16	50x50x6 mm M.S Angle (4.50Kg. / Mtr)	10,500	KG	65	6,82,504
17	50x6 mm G I flat	7,078	KG	75	5,30,841
18	25x6 mm G I flat	2,341	KG	75	1,75,557
19	BOLT & NUT GI 12MMX50MM HEX	841	KG	82	68,958
20	WASHER GI SIZE 16MM DIA	632	KG	82	51,861
21	WASHER GI SIZE 12MM DIA	270	KG	82	22,112
22	LUG AL CRIMPING 95 SQMM XLPE SINGLE HOLE	1,390	EA	20	27,800
23	LUG AL 70 SQMM FOR 7/8 SWG WIRE/EARTHING	7,506	EA	17	1,27,602
24	LUG AL CRIMPING 300 SQMM XLPE ONE HOLE	1,112	EA	52	57,824
25	BIRD CAP FOR 9KV 5KA SURGE ARRESTER	417	EA	237	98,829
26	TEMPLETE FOR TRANSFORMER MAINT.RECORD	139	EA	68	9,383
27	TAPE HT SCOTCH 23 25MMX9.1M 66KV	126	ROL	214.20	27,095
28	ANTI TRACKING SILICON TAPE SCOTCH 70 3M	50	EA	1,550.75	77,600
29	VINYL TAPE SCOTCH 35 YELLOW-BLUE-RED	556	EA	213.23	1,18,555
30	ALNOX 3M (HOT SPOT REDUCING PASTE)	10	EA	3,779.96	36,779
31	3M SCOTCH 1625 SPRAY	56	EA	338.98	18,847
32	3M SCOTCH FILL PUTTY	139	EA	593.22	82,458
33	RODENT CAPACITIVE SCREEN GUARD FOR- DT	417	EA	94.50	39,407

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34	BIRD GUARD SPIKE (FLEXIBLE POLYCORBONAT)	278	EA	38.00	10,564
35	SLEEV BLACK POLYOLEFIN	278	M	38.94	10,826
36	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	695	EA	1,050	7,29,750
37	PIPE HDPE SIZE 25 MM	3,197	M	31	99,107
38	7/10 SWG G I stay wire (10Kg. / Set)	10,105	KG	75	7,57,898
39	CONNECTOR MINI WEDGE 25 SQMM TO DOG	417	EA	183	76,375
40	Materials for Massionary work for Earth Pit,Charcoal, Salt etc including construction of earthing chamber (Size: 2"x2") and RCC slab cover	695	LS	1600.00	11,12,000
41	FRP Fencing	3,892	Sq.M	2,615	1,01,78,569
Subtotal Material(A)					2,99,57,227
Stock, Storage and Insurance@3% of A					898716.80
Sub- Total-B					30855943.61
T & P Charges @ 2% of B					617118.87
Contingency @ 3% of B					925678.31
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					3085594.36
Transportation Charges@7.5% of B					2314195.77
Sub-Total C					37798530.93
Over Head Charges (Including Supervision charges) @6% of C					2267911.86
Total D					40066442.79
Gross Cost					40066442.79
OR Say					40066443.00
GST @18%					7211959.74
CESS 1%					-
Gross Cost (Inc. GST)-Refurbishment-250kVA					47278459.74
Total(In Crores)					4.73

c. Cost Estimate for 100 kVA Distribution Substations Refurbishment:

S No.	Item Description	Quantity	Unit	Unit Rate (in Rs)	Amount (INR)
1	500 KVA,11/0.4KV(Cu) Transformer	0	EA	5,80,000.00	-
2	ACB LT 400A	84	EA	39,919	33,53,196
3	BOARD DANGER 11KV SIZE 8X10 INCH	84	EA	80	6,720
4	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	294	EA	1,050	3,08,700
5	LUG AL CRIMPING 95 SQMM XLPE SINGLE HOLE	1008	EA	20	20,160

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6	FUSE ELEMENT FOR 11KV DD FUSE 30AMP PINK	126	EA	52	6,552
7	7/10 SWG G I stay wire (10Kg. / Set)	3150	KG	75	2,36,250
8	CABLE 1.1KV AL 1X630 SQMM UNAR XLPE	2688	M	395	10,62,079
9	LUG AL CRIMPING 630 SQMM XLPE ONE HOLE	672	EA	115	77,280
10	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	7140	KG	65	4,64,100
11	50x50x6 mm M.S Angle (4.50Kg. / Mtr)	2940	KG	65	1,91,100
12	50x6 mm G I flat	1260	KG	75	94,500
13	BOLT & NUT GI 16MMX75M HEX	420	KG	82	34,440
14	BOLT & NUT GI 12MMX75MM HEX	210	KG	82	17,220
15	BOLT & NUT GI 16MMX200MM HEX	210	KG	82	17,220
16	WASHER GI SIZE 12MM DIA	21	KG	82	1,722
17	WASHER GI SIZE 16MM DIA	21	KG	82	1,722
18	TEMPLETE FOR TRANSFORMER MAINT.RECORD	42	EA	68	2,835
19	CONNECTOR PALM LT BRASS 1000A 630KVA TRF	168	EA	1,144	1,92,203
20	150X 150mm RS joist (11 Mtr long)(30.6 ky Per meter)(Each 336.6kg)	28274	KG	65	18,37,836
21	11 KV V cross arm 10.2 Kg each	84	EA	810	68,040
22	Back Clamp for V cross arm(11KV)	84	EA	80	6,720
23	11KV pin insulator polymer	252	EA	200	50,400
24	AB Switch(11KV,200A,3Pole,50Hz)	42	EA	7,380.00	3,09,960
25	Lightening Arrester(9KV,5KA)	126	EA	980	1,23,480
26	ANTICLIMBING DEVICE FOR 11 M PCC POLE	84	EA	219	18,396
27	FUSE UNIT DD 11KV 200A 1P SIL.RUBBER W/B	126	EA	1,356	1,70,838
28	CONDUCTOR ACSR RABBIT PVC 61.70 SQMM	966	M	67	64,722
29	BIRD CAP FOR 9KV 5KA SURGE ARRESTER	126	EA	237	29,862
30	TAPE HT SCOTCH 23 25MMX9.1M 66KV	38	ROL	214.20	8,187
31	ANTI TRACKING SILICON TAPE SCOTCH 70 3M	15	EA	1,550.75	23,447
32	VINYL TAPE SCOTCH 35 YELLOW-BLUE-RED	168	EA	213.23	35,822
33	ALNOX 3M (HOT SPOT REDUCING PASTE)	3	EA	3,779.96	11,113
34	3M SCOTCH 1625 SPRAY	17	EA	338.98	5,695
35	3M SCOTCH FILL PUTTY	42	EA	593.22	24,915
36	RODENT CAPACITIVE SCREEN GUARD FOR-DT	126	EA	94.50	11,907
37	BIRD GUARD SPIKE (FLEXIBLE POLYCORBONAT)	84	EA	38.00	3,192
38	SLEEV BLACK POLYOLEFIN	84	M	38.94	3,271
39	PLATE BASE RCC SIZE 450X450X75MM	84	EA	110	9,240
40	CONNECTOR MINI WEDGE 25 SQMM TO DOG	126	EA	183	23,077
41	BUS BAR COPPER HDT SIZE 75X10MM	42	M	1,857	77,992
42	PIPE HDPE SIZE 25 MM	504	M	31	15,624

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43	CABLE 1.1KV AL 4CX300 SQMM XLPE ARM	1260	M	1,011	12,73,860
44	JT. KIT O/D 1.1KV XLPE 4X300 SQ.MM HS	168	EA	1,247.78	2,09,627
45	PIPE G.I.100MM DIA HEAVY CLASS PLAIN END	252	M	773	1,94,702
46	25x6 mm G I flat	420	KG	75	31,500
47	BOLT & NUT GI 12MMX50MM HEX	42	KG	82	3,444
48	Materials for Massionary work for Earth Pit,Charcoal, Salt etc including construction of earthing chamber (Size: 2"x2") and RCC slab cover	294	LS	1600.00	4,70,400
49	FRP Fencing	1764	Sq. M	2,615	46,13,308
Subtotal Material					15818578
Stock, Storage and Insurance@3% of A					474557.33
Sub- Total-B					16293134.96
T & P Charges @ 2% of B					325862.70
Contingency @ 3% of B					488794.05
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					1534664.94
Transportation Charges@7.5% of B					1221985.12
Sub-Total C					19864441.77
Over Head Charges (Including Supervision charges) @6% of C					1191866.51
Total D					21056308.28
Gross Cost					21056308.28
OR Say					21056308.00
GST @18%					3790135.44
CESS 1%					-
Gross Cost (Inc. GST)-					25057006.52
Total(In Crores)					2.51

8.16. Annexure 16 Cost Estimate Installation of LV protection at DSS

Cost Estimate for LT protection at DSS

S.No	Description	UOM	Qty	Amount
				in Rs. Crores
1	Supply and Installation of MCCB-100 KVA	EA	447	2.70
2	Supply and Installation of MCCB-250 KVA	EA	180	2.08
3	Supply and Installation of ACB-500 KVA	EA	72	1.96
Total			699	6.74

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a. Cost Estimate for Supply and Installation of MCCB for 100 kVA DT

S No.	Item Description	Quantity	Unit	Unit Rate (in Rs)	Amount (INR)
1	LT Distribution Box for 100 KVA S/S.	447	EA	24,419	1,09,15,293
2	CABLE 1.1KV AL 4CX150 SQMM ARM	6,705	M	280	18,77,400
3	GLAND FOR ARM CABLE 4X150 SQ.MM	1,788	EA	280	5,00,640
4	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	21,903	KG	65	14,23,695
5	50x6 mm G I flat	4,470	KG	75	3,35,250
6	25x6 mm G I flat	2,235	KG	75	1,67,625
7	BOLT & NUT GI 12MMX50MM HEX	447	KG	82	36,654
8	BOLT & NUT GI 16MMX75M HEX	447	KG	82	36,654
9	WASHER GI SIZE 16MM DIA	112	KG	114	12,740
10	WASHER GI SIZE 12MM DIA	112	KG	114	12,740
11	LUG AL 70 SQMM FOR 7/8 SWG WIRE/EARTHING	894	EA	17	15,198
12	LUG AL CRIMPING 150 SQMM XLPE ONE HOLE	7,152	EA	13	92,976
13	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	447	EA	1,050	4,69,350
14	PIPE HDPE SIZE 25 MM	1,341	M	31	41,571
15	Materials for Massionary work for Earth Pit,Charcoal, Salt etc including construction of earthing chamber (Size: 2"x2") and RCC slab cover	447	LS	1600.00	7,15,200
16	7/10 SWG G I stay wire (10Kg. / Set)	4,470	KG	75	3,35,250
Subtotal Material					1,69,88,235
Stock, Storage and Insurance@3% of A					509647.05
Sub- Total-B					17497882.05
T & P Charges @ 2% of B					349957.64
Contingency @ 3% of B					524936.46
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					1749788.21
Transportation Charges@7.5% of B					1312341.15
Sub-Total C					21434905.51
Over Head Charges (Including Supervision charges) @6% of C					1286094.33
Total D					22720999.84
Gross Cost					22720999.84
OR Say					22721000.00
GST @					4089780
CESS 1%					-
Gross Cost (Inc. GST)-MCCB 250 KVA					27037990.00
Total(In Crores)					2.70

b. Cost Estimate for Supply and Installation of MCCB for 250 kVA DT

S No.	Item Description	Quantity	Unit	Unit Rate (In Rs.)	Amount (INR)
1	LT Distribution Box for 250 KVA S/S.	180	EA	48,000.00	86,40,000.00
2	CABLE 1.1KV AL 4CX300 SQMM XLPE ARM	2,700	M	1,011	27,29,700.00
3	GLAND FOR ARM CABLE 4X150 SQ.MM	720	EA	280	2,01,600.00
4	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	8,820	KG	65	5,73,300.00
5	50x6 mm G I flat	1,800	KG	75	1,35,000.00
6	25x6 mm G I flat	900	KG	75	67,500.00
7	BOLT & NUT GI 12MMX50MM HEX	180	KG	82	14,760.00
8	BOLT & NUT GI 16MMX75MM HEX	180	KG	82	14,760.00
9	WASHER GI SIZE 16MM DIA	45	KG	114	5,139.92
10	WASHER GI SIZE 12MM DIA	45	KG	114	5,139.92
11	LUG AL 70 SQMM FOR 7/8 SWG WIRE/EARTHING	360	EA	17	6,120.00
12	LUG AL CRIMPING 150 SQMM XLPE ONE HOLE	2,880	EA	13	37,098.31
13	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	180	EA	1,050	1,89,000.00
14	PIPE HDPE SIZE 25 MM	540	M	31	16,740.00
15	Materials for Massionary work for Earth Pit,Charcoal, Salt etc including construction of earthing chamber (Size: 2"x2") and RCC slab cover	180	LS	1,600	2,88,000.00
16	7/10 SWG G I stay wire (10Kg. / Set)	1,800	KG	75	1,35,000.00
Subtotal Material(A)					1,30,58,858
Stock, Storage and Insurance@3% of A					391765.74
Sub- Total-B					13450623.88
T & P Charges @ 2% of B					269012.48
Contingency @ 3% of B					403518.72
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					1345062.39
Transportation Charges@7.5% of B					1008796.79
Sub-Total C					16477014.25
Over Head Charges (Including Supervision charges) @6% of C					988620.86
Total D					17465635.11
Gross Cost					17465635.11
OR Say					17465635.00
GST @					3143814.3
CESS 1%					-
Gross (Inc. GST)-MCCB 250 KVA					20784105.65
Total(In Crores)					2.08

c. Cost Estimate for Supply and Installation of ACB for 500 kVA DT:

S No.	Item Description	Quantity	Unit	Unit Rate (In Rs.)	Amount (INR)
1	ACB LT 400 A	144	EA	39,919	57,48,336.00
2	CABLE 1.1KV AL 1X630 SQMM UNAR XLPE	3,240	M	466	15,10,617.60
3	LUG AL CRIMPING 630 SQMM XLPE ONE HOLE	864	EA	136	1,17,244.80
4	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	3,528	KG	65	2,29,320.00
5	50x6 mm G I flat	720	KG	75	54,000.00
6	25x6 mm G I flat	360	KG	75	27,000.00
7	BOLT & NUT GI 12MMX50MM HEX	72	KG	82	5,904.00
8	BOLT & NUT GI 16MMX75M HEX	72	KG	82	5,904.00
9	WASHER GI SIZE 16MM DIA	18	KG	114	2,055.97
10	WASHER GI SIZE 12MM DIA	18	KG	114	2,055.97
11	LUG AL 70 SQMM FOR 7/8 SWG WIRE/EARTHING	144	EA	17	2,448.00
12	LUG AL CRIMPING 150 SQMM XLPE ONE HOLE	1,152	EA	13	14,839.32
13	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	72	EA	1,050	75,600.00
14	11 Mtr long 330 kg PSC Pole(including transportation cost upto store)	144	EA	7,000.00	10,08,000.00
15	PIPE G.I.100MM DIA HEAVY CLASS PLAIN END	432	M	772.63	3,33,774.92
16	CABLE 1.1KV AL 4CX300 SQMM XLPE ARM	2,880	M	1,011.00	29,11,680.00
17	PIPE HDPE SIZE 25 MM	216	M	31	6,696.00
18	Materials for Massionary work for Earth Pit,Charcoal, Salt etc including construction of earthing chamber (Size: 2"x2") and RCC slab cover	72	LS	1600.00	1,15,200
19	7/10 SWG G I stay wire (10Kg. / Set)	720	KG	75	54,000.00
Subtotal Material(A)					1,22,24,677
Stock, Storage and Insurance@3% of A					366740.30
Sub- Total-B					12591416.87
T & P Charges @ 2% of B					251828.34
Contingency @ 3% of B					377742.51
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					1362965.69
Transportation Charges@7.5% of B					944356.27
Sub-Total C					15528309.68
Over Head Charges (Including Supervision charges) @6% of C					931698.58
Total D					16460008.26
Gross Cost					16460008.00
OR Say					16460008.00
GST @					2962801.44
CESS 1%					-
Gross (Inc. GST)-					19587409.52
Total(In Crores)					1.96

8.17. Annexure 17 DPR for Auto-Recloser, Sectionalizer, FPI & RMU and AB switches at 33kV & 11kV Feeders

a. Cost Estimate for Supply and Installation of 11kV Auto-Recloser

S No.	Item Description	Quantity	Unit	Unit Rate (In Rs.)	Amount (INR)
1	Auto reclosure	10	ST	7,73,431.00	77,34,310
2	Lightening Arrester(9KV,5KA)	60	EA	980	58,800
3	BOLT & NUT GI 12MMX50MM HEX	10	KG	82	820
4	BOLT & NUT GI 16MMX75M HEX	30	KG	82	2,460
5	50x6 mm G I flat	100	KG	75	7,500
6	25x6 mm G I flat	150	KG	75	11,250
7	150X 150mm RS joist (11 Mtr long)(30.6 ky Per meter)(Each 336.6kg)	6,732	EA	65	4,37,580
8	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	250	KG	65	16,250
9	100x50x6 mm MS Channel (9.2Kg. / Mtr)	150	KG	65	9,750
10	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	20	EA	1,050	21,000
11	7/10 SWG G I stay wire (10Kg. / Set)	600	KG	75	45,000
12	LUG AL CRIMPING 95 SQMM XLPE SINGLE HOLE	80	EA	20	1,600
13	BIRD CAP FOR 9KV 5KA SURGE ARRESTER	60	EA	237	14,237
14	125 sqmm All Alloy Aluminum Conductor AAAC	150	M	-	-
15	ANTICLIMBING DEVICE FOR 11 M PCC POLE	20	EA	219	4,380
16	BOARD DANGER 11KV SIZE 8X10 INCH	20	EA	80	1,600
17	PLATE BASE RCC SIZE 450X450X75MM	60	EA	110	6,600
18	INSULATOR STAY (GUY/EGG) 11KV	40	EA	50	2,000
19	ANCHOR ROD SIZE 20MMX2100MM	40	EA	77	3,080

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20	TENSION SCREW GI SIZE 750X20MM	40	EA	342	13,680
21	BRACKET/STAY COLLAR FOR 11 M PCC POLES	40	EA	195	7,819
22	PIPE HDPE SIZE 25 MM	60	M	31	1,860
23	Materials for Massionary work for Earth Pit,Charcoal, Salt etc including construction of earthing chamber (Size: 2"x2") and RCC slab cover	20	LS	1600.00	32,000
24	11KV pin insulator polymer	60	EA	200	12,000
Subtotal Material(A)					84,45,576
Stock, Storage and Insurance@3% of A					2,53,367
Sub- Total-B					86,98,943
T & P Charges @ 2% of B					1,73,979
Contingency @ 3% of B					2,60,968
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					8,47,359
Transportation Charges@7.5% of B					6,52,421
Sub-Total C					1,06,33,670
Over Head Charges (Including Supervision charges) @6% of C					6,38,020
Total D					1,12,71,690
Gross Cost					1,12,71,690
OR Say					1,12,71,690
GST @					20,28,904
CESS 1%					1,12,717
Gross Auto Reclosure Cost (Inc. GST)					1,34,13,311
Total(In Crores)					1.34

b. Cost Estimate for Supply and Installation of 11kV Sectionalizer

S No.	Item Description	Quantity	Unit	Unit Rate (In Rs.)	Amount (INR)
1	SECTIONALISER 11KV 3PH POLE MOUNTED	30	EA	7,73,431.00	2,32,02,930
2	Lightening Arrester(9KV,5KA)	180	EA	980	1,76,400
3	BOLT & NUT GI 12MMX50MM HEX	30	KG	82	2,460
4	BOLT & NUT GI 16MMX75M HEX	90	KG	82	7,380
5	50x6 mm G I flat	300	KG	75	22,500
6	25x6 mm G I flat	450	KG	75	33,750
7	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	750	KG	65	48,750

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8	100x50x6 mm MS Channel (9.2Kg. / Mtr)	450	KG	65	29,250
9	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	60	EA	1,050	63,000
10	7/10 SWG G I stay wire (10Kg. / Set)	1800	KG	75	1,35,000
11	LUG AL CRIMPING 95 SQMM XLPE SINGLE HOLE	240	EA	20	4,800
12	BIRD CAP FOR 9KV 5KA SURGE ARRESTER	180	EA	237	42,712
13	125 sqmm All Alloy Aluminum Conductor AAAC	450	M	-	-
14	ANTICLIMBING DEVICE FOR 11 M PCC POLE	60	EA	219	13,140
15	BOARD DANGER 11KV SIZE 8X10 INCH	60	EA	80	4,800
16	PIPE HDPE SIZE 25 MM	180	M	31	5,492
17	150X 150mm RS joist (11 Mtr long)(30.6 ky Per meter)(Each 336.6kg)	10098	KG	65	6,56,370
18	PLATE BASE RCC SIZE 450X450X75MM	30	EA	110	3,300
19	Materials for Massionary work for Earth Pit,Charcoal, Salt etc including construction of earthing chamber (Size: 2"x2") and RCC slab cover	60	LS	1600.00	96,000
20	11KV pin insulator polymer	180	EA	200.00	36,000
Subtotal Material(A)					2,45,84,033
Stock, Storage and Insurance@3% of A					737521
Sub- Total-B					25321554
T & P Charges @ 2% of B					506431
Contingency @ 3% of B					759647
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					2498352
Transportation Charges@7.5% of B					1899117
Sub-Total C					30985101
Over Head Charges (Including Supervision charges) @6% of C					1859106
Total D					32844207
Gross Cost					32844207
OR Say					32844207
GST @					5911957
CESS 1%					328442
Gross Cost (Inc. GST)-Sectionaliser					39084606
Total(In Crores)					3.91

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c. Cost Estimate for Supply and Installation of Overhead Communicable FPI:

S No.	Item Description	Quantity	Unit	Unit Rate (In Rs.)	Amount (INR)
1	Non-communicable FPI	90	EA	9,328	8,39,520
2	cost to make in Communicable	90	EA	4,664	4,19,760
Subtotal Material(A)					12,59,280
Stock, Storage and Insurance@3% of A					37778.40
Sub- Total-B					1297058.40
T & P Charges @ 2% of B					25941.17
Contingency @ 3% of B					38911.75
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					129705.84
Transportation Charges@7.5% of B					97279.38
Sub-Total C					1588896.54
Over Head Charges (Including Supervision charges) @6% of C					95333.79
Total D					1684230.33
Gross FPI Cost					1684230.33
OR Say					1684230.00
GST @					303161.4
CESS 1%					16842.3
Gross (Inc. GST)-FPI Cost					2004233.70
Total(In Crores)					0.20

d. Cost Estimate for Supply and Installation of 4 Way RMU

S No.	Item Description	Quantity	Unit	Unit Rate (In Rs.)	Amount (INR)
1	RMU 11KV 4 WAY 2X630 BKR O/D	10	EA	4,16,127	41,61,270
2	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	500	KG	75	37,500
3	50x6 mm G I flat	600	KG	75	45,000
4	25x6 mm G I flat	100	KG	75	7,500
5	BOARD DANGER 11KV SIZE 8X10 INCH	50	EA	131	6,550
6	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	40	EA	1,050	42,000
7	BOLT & NUT GI 16MMX75M HEX	20	KG	78	1,560
8	BOLT & NUT GI 12MMX50MM HEX	20	KG	78	1,560
9	WASHER GI SIZE 16MM DIA	5	KG	114	571
10	WASHER GI SIZE 12MM DIA	5	KG	114	571
11	CABLE 11KV AL 3CX400 SQMM XLPE ARM	800	M	1,468	11,74,400
12	Heat shrinkable jointing kit for 3C x 400 mm ² 33 KV XLPE Cable(outdoor type)	40	EA	33,255.00	13,30,200
13	Heat shrinkable jointing kit for 3C x 400mm ² 33 KV XLPE Cable(indoor type)	40	EA	20,503.00	8,20,120
14	PIPE G.I.100MM DIA HEAVY CLASS PLAIN END	120	M	773	92,715

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15	PIPE HDPE SIZE 25 MM	60	M	31	1,833
16	LUG AL CRIMPING 95 SQMM XLPE SINGLE HOLE	40	EA	8	312
17	7/10 SWG G I stay wire (10Kg. / Set)	200	KG	75	15,000
18	125 sqmm All Alloy Aluminum Conductor AAAC	60	M	76.87	4,612
19	Materials for Massionary work for Earth Pit,Charcoal, Salt etc including construction of earthing chamber (Size: 2"x2") and RCC slab cover	40	LS	1600.00	64,000
20	FRP Fencing (3x2.4x2.0)	200	Sq. M	2,615	5,23,051
21	RMU Plinth	10	EA	15,917	1,59,167
Subtotal Material(A)					84,89,492
Stock, Storage and Insurance@3% of A					254685
Sub- Total-B					8744177
T & P Charges @ 2% of B					174884
Contingency @ 3% of B					262325
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					660112
Transportation Charges@7.5% of B					655813
Sub-Total C					10497311
Over Head Charges (Including Supervision charges) @6% of C					629839
Total D					11127150
Gross 4 Way RMU Cost					11127150
OR Say					11127150
GST @					2002887
CESS 1%					111272
Gross Cost (Inc. GST)-4W RMU 11 KV					13241309
Total(In Crores)					1.32

8.18. Annexure 18 Cost Estimate for Trolley Mounted Pad substations

Item Description	Unit Cost (in Crores)	Quantity	Total Cost (In Crores)
PAD MOUNTED SUBSTATION 500 KVA DT, WITH 2 NUMBER ACB	0.234	10	2.34

SI No	Description of Materials	Unit	Quantity	Unit Rate in Rs.	Amount in Rs.
1	Trolley for Mounting TRF	EA	10	200000	2000000
2	500 KVA.11/0.4 KV (Cu)Transformer with tap changer, BIS Energy level-II	EA	10	580000	5800000
3	ACB LT 400A	EA	20	39919	798380
4	BOARD DANGER 11KV SIZE 8X10 INCH	EA	20	94.4	1888
5	LUG AL CRIMPING 55 SQMM XLPE SINGLE HOLE	EA	30	12	360

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6	CABLE 1.1KV AL 1X630 SQMM UNAR XLPE	M	400	466.24	186496
7	LUG AL CRIMPING 630 SQMM XLPE ONE HOLE	EA	320	135.7	43424
8	CONNECTOR PALM LT BRASS - TRF	EA	40	1144.0678	45762.71186
9	ISMC-75*40 GI Channel (7.24KG/M)	KG	1700	121.1	205870
10	ISA-50*50*6 GI Angel (4.6KG/M)	KG	700	121.1	84770
11	FLAT GI SIZE 50X6MM	KG	300	88.5	26550
12	BOLT & NUT GI 16MMX75M HEX	KG	100	82	8200
13	BOLT & NUT GI 12MMX75MM HEX	KG	50	82	4100
14	BOLT & NUT GI 16MMX200MM HEX	KG	50	82	4100
15	WASHER GI SIZE 12MM DIA	KG	5	82	410
16	WASHER GI SIZE 16MM DIA	KG	5	82	410
17	TEMPLETE FOR TRANSFORMER MAINT.RECORD	EA	10	79.65	796.5
18	CONNECTOR PALM LT BRASS 1000A 630KVA TRF	EA	40	1349.92	53996.8
19	55 SQ MM 11kV insulated conductor	M	3000	150	450000
20	3x120+1x70+1x16mm2 AB cable,	KM	10.3	432370	4453411
21	Aluminum Socket-120Sqmm	No	80	22	1760
22	BOLT & NUT GI 12MMX50MM HEX	KG	10	96.76	967.6
23	3Cx 150 mm ² 11KV XLPE Cable (Armoured), A2XFY	Mtr	500	735	367500
24	Heat shrinkable jointing kit for 3Cx150mm ² 11 KV XLPE Cable(outdoor type)	Mtr	20	11756	235120
	Total A				14,774,273
	Stock, storage and Insurance @ 3% of A				443,228
	Sub Total B				15,217,501
	T &P @ 2% of B				304,350
	Contingency @ 3% of B				456,525
	Transportation @ 7.5% of B				1,141,313
	Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)				1,418,750
	Sub total C				18,538,438
	6% supervision charge/over head charge				1,112,306
	Gross Total				19,650,745
	OR Say				19,650,745
	GST @ 18%				3,537,134
	CESS 1%				196,507
	Gross (Inc. GST)-				23,384,387
	Total(In Crores)				2.34

8.19 Annexure 19 Cost Estimate for Underground cable Fault Locating Van and oil filtration machine

Sr no	Description	Quantity	Unit Rate	Amount	Amount in Crs
1	FLC Van	1	26500000	26500000	2.65
2	Oil filtration Machine	5	700000	3500000	0.35
TOTAL Rs Crs					3

8.20 Annexure 20 Cost Estimate of Testing equipment for PSS

S No.	Item Description	Unit	Quantity	Unit Rate	Total Amount(INR)
				In Rs.	
1	INSULATION TESTER DIGITAL 0-5KV	EA	5	1,70,557	852785
2	INSULATION TESTER DIGITAL 500V-1000V	EA	10	4,350	43500
3	OIL TEST SET 100KV MOTORIZED	EA	12	52,746	632952
4	EARTH TESTER DIGITAL	EA	72	8,467	609624
5	CONTACT RESISTANCE METER (CRM 100B)	EA	5	3,50,000	1750000
6	SINGLE PHASE VARIAC	EA	5	35,000	175000
7	THREE PHASE VARIAC	EA	5	51,000	255000
8	DIGITAL LOW RESISTANCE OHMMETER TRM104	EA	5	1,39,700	698500
9	TAN DELTA & CAPACITANCE MEASUREMENT KIT	EA	5	26,00,000	13000000
10	TRANSFORMER RATIO METER TRM-200	EA	5	4,96,485	2482425
11	SECONDARY CURRENT INJECTION WITH TIMER	EA	5	2,00,000	1000000
12	CB TIMER KIT	EA	5	1,53,250	766250
13	TOOLS BATTERY MAINTENANCE	EA	5	1,37,280	686400
14	DISCHARGE ROD FOR 11-33-66KV	EA	16	21,240	339840

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15	TOOL KIT HD COMPLETE WITH CANVAS BAG	EA	16	20,000	320000
16	DRILLING MACHINE	EA	72	5,000	360000
17	CT ANALYZER MODEL CTERP-2000	EA	6	3,00,000	1800000
18	NEON TESTER 11KV - 33KV - 66KV	EA	72	20,355	1465560
19	CLAMP ON EARTH RESISTANCE TESTER	EA	10	2,500	25000
20	TRANSF.WINDING RESISTANCE METER TRM 103	EA	6	3,83,500	2301000
21	CAPACITANCE & TAN DELTA SET CTS-500	EA	5	1,17,500	587500
22	PRIMARY INJECTION TEST SET 0-600A	EA	6	80,000	480000
23	OIL PUMP HAND OPERATED	EA	10	1,699	16990
24	INFRARED THERMO - SCANNING CAMERA	EA	4	7,10,000	2840000
25	ULTRASONIC INSPECTION KIT	EA	3	12,00,000	3600000
26	PORTABLE TR OIL AND GAS DGA INSTRUMENT	EA	2	29,24,000	5848000
27	RELAY TEST SET (DUAL SOURCE THREE PHASE INJECTION KI)	EA	1	20,00,000	2000000
28	METER EARTH RESIS DIGITAL 0-10/1000 OHMS	EA	72	22,951	1652472
29	HI-POT TEST SET AC 0-40 KV AC 50 mA.	EA	16	57,200	915200
30	COIL EARTH LEAKAGE 1300T 11KV ECE OCB	EA	6	1,272	7632
31	DIGITAL MULTIMETER METER	EA	50	5,000	250000
32	TOWER WAGON -(AREIAL TYPE)	EA	2	25,00,000	5000000
34	GROUNDING SET FOR O/H LINE PORTABLE	EA	6	38,645	231870
35	Oil sample collection bottle for DGA	EA	16	5,000	80000

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36	Power Tools - Battery Operated for tightening and loosening of the nut/bolts	EA	5	3,000	15000
37	Power Tools battery operated for Drilling purpose	EA	5	3,000	15000
Total (with GST)					62662130
Total In Crores					6.27

8.21 Annexure 21 Cost Estimate for Earthing of PTR, DTR & Lines

S No.	Item Description	Quantity	Unit	Unit Rate (In Rs.)	Amount (INR)
1	7/10 SWG G I stay wire, Grade -2	28000	KG	75	21,00,000
2	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	1400	No	1050	14,70,000
3	FLAT GI SIZE 25X6 MM	12600	KG	121	15,24,600
4	Hexagonal Bolts with Nuts(GI)	2100	KG	82	1,72,200
6	PIPE HDPE SIZE 20 MM	8400	Mtr	37.78	3,17,352
7	Aluminium Cable Sockets 95 mm ²	5600	EA	20	1,12,000
Subtotal Material(A)					56,96,152
Stock, Storage and Insurance@3% of A					170884.56
Sub- Total-B					5867036.56
T & P Charges @ 2% of B					117340.73
Contingency @ 3% of B					176011.10
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					586703.66
Transportation Charges@7.5% of B					440027.74
Sub-Total C					7187119.79
Over Head Charges (Including Supervision charges) @6% of C					431227.19
Total D					7618346.98
Gross Cost of earthing					7618346.98
OR Say					7618347.00
GST @					1371302.46
CESS 1%					76183.47
Gross Cost (Inc. GST)					9065832.93
Total(In Crores)					0.91

8.22 Annexure 22 Cost Estimate for 33KV & 11 KV Lightning Arrestor

S No.	Item Description	Quantity	Unit	Unit Rate (In Rs.)	Amount (INR)
1	Lightning Arrester(9KV,10KA) Station Class	1200.00	EA	1000.00	1200000.00
2	Lightning Arrester(30KV,10KA) (Station Class,class-2)	600.00	EA	10350.00	6210000.00
3	75x40x6 mm M.S Channel	8700.00	KG	65.00	565500.00
4	GI Flat 50x6mm	1440.00	KG	75.00	108000.00
5	7/10 SWG G I stay wire, Grade -2	12000.00	KG	75.00	900000.00
6	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	600.00	No	1050.00	630000.00
7	FLAT GI SIZE 25X6 MM	5400	KG	121	6,53,400
8	Hexagonal Bolts with Nuts(GI)	1800	KG	82	1,47,600
9	PIPE HDPE SIZE 20 MM	3600	Mtr	37.78	1,36,008
10	Aluminium Cable Sockets 95 mm ²	2400	EA	20	48,000
Subtotal Material(A)					1,05,98,508
Stock, Storage and Insurance@3% of A					317955.24
Sub- Total-B					10916463.24
T & P Charges @ 2% of B					218329.26
Contingency @ 3% of B					327493.90
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					1091646.32
Transportation Charges@7.5% of B					818734.74
Sub-Total C					13372667.46
Over Head Charges (Including Supervision charges) @6% of C					802360.05
Total D					14175027.51
Gross Cost of earthing					14175027.51
OR Say					14175028.00
GST @					2551505.04
CESS 1%					-
Gross Cost (Inc. GST)					16868283.32
Total(In Crores)					1.69

8.23 Annexure 23 Cost Estimate for Augmentation from 5 MVA to 8 MVA Power Transformer

S.No.	Description	UOM	Qty	Amount
				in Crores
1	Augmentation to 8 MVA Power Transformer	EA	9	8.96
Total				8.96

Sl. No.	Item-Description	Unit	Qty.	Unit Rate in Rs.	Total Price
1	Part-A				
2	Earthing and Grounding as per applicable TS				
b	GI flat 90X6 mm size under ground for mat	MT	9.00	75000.00	675000
c	GI flat 50X6 mm size for riser	MT	2.70	75000	202500
d	GI flat 25X6 mm size for riser	MT	2.70	75000	202500
e	8 swg GI wire	MT	0.45	75000	33750
3	Busbar, droppers, jumpers and interconnections with all outdoor equipment using 232 sq.mm AAA Conductor , all associated conductor, insulator, hardwares,clamps, 8 SWG wire etc as per applicable TS		0.00		
a	33 KV & 11 KV Bus bar with 232 sq.mm AAA Conductor	km	1.80	186230.83	335215
b	Equipment jumpering with 232 sq.mm AAA Conductor	km	1.80	186230.83	335215
c	3 Bolted(3 pair M-16 U bolts to be used) 33 Kv H/W fitting with 4 nos Insulator (70KN) String Suitable for 232 sq.mm AAA Conductor	Set	81.00	2952.00	239112
d	12 bolted (M-12)"T" clamp, 232 sq.mm AAAC run & 230 mm drop	No	27.00	1000	27000
e	3 Bolted (M- 16) PG Clamp suitable for 232 sq.mm AAA Conductor	No	108.00	384	41472
5	33Kv Isolator without earth switch	Set	9.00	67500	607500
7	33Kv O/D VCB with CT & In-Door Control Relay Panel (Excluding Foundation) for transformer	Set	9.00	590000.00	5310000
A			0.00		
9	33/11 KV, 8 MVA 33/11 KV (Cu) Power Transformers with OLTC (Excluding Foundation)	No	9.00	5700000.00	51300000
10	33Kv Post Insulator	No	27.00	1580.00	42660
16	TOTAL OF SUPPLY		0.00		59351925
17	Dismantling of existing transformer	EA	9.00	200000	1800000
18	Testing	LS	9.00	200000	1800000
A	GRAND TOTAL(29+30+31)				62951925
B	Stock & Storage @ 3% of A				1888558
C	Sub - Total (A+B)				64840483
	T & P Charges @ 2% of C				1296810
	Contingency @ 3% of C				1945214
	Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)				3568633

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E	Sub - Total			71651140
F	Other Overheads including supervision charges @ 6% of E			4299068
G	Total estimated Capital Cost (E+F)			75950209
H	GST 18% of G			13671038
J	Total Cost			89621246
	Total(In Crores)			8.96

8.24 Annexure 24 Cost Estimate for Augmentation from 200/250 to 315 KVA Distribution Transformer

S.No.	Description	UOM	Qty	Amount
				in Crores
1	Augmentation from 200/250 to 315 KVA Distribution Transformer	EA	50	5.19

S No.	Item Description	Quantity	Unit	Unit Rate (In Rs.)	Amount (INR)
1	315 KVA,11/0.4KV (Cu) Transformer	50.00	EA	4,44,910.00	2,22,45,500
2	LT Distribution Box for 315 KVA S/S.	50	EA	71,112.00	35,55,600
3	11 KV V cross arm 10.2 Kg each	100	EA	810	81,000
4	Back Clamp for V cross arm(11KV)	100	EA	80	8,000
5	11KV pin insulator polymer	300	EA	200	60,000
6	AB Switch(11KV,200A,3Pole,50Hz)	50	EA	7,380	3,69,000
7	Lightening Arrester(9KV,5KA)	150	EA	980	1,47,000
8	FUSE UNIT DD 11KV 200A 1P SIL.RUBBER W/B	150	EA	1,356	2,03,378
9	FUSE ELEMENT FOR 11KV DD FUSE 20A WHITE	150	EA	49	7,350
10	CONDUCTOR ACSR RABBIT PVC 61.70 SQMM	1,150	M	67	77,050
11	CABLE 1.1KV AL 4CX300 SQMM XLPE ARM	400	M	1,011.00	4,04,400
12	GLAND FOR ARM CABLE 4X150 SQ.MM	100	EA	280	28,000
13	ISMC-125*65 GI Channel (13.3KG/M)	4,410	KG	114	5,03,655
14	ISMC-100*50 GI Channel (9.76KG/M)	2,979	KG	114	3,40,262
15	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	4,985	KG	65	3,23,993
16	50x50x6 mm M.S Angle (4.50Kg. / Mtr)	3,777	KG	65	2,45,505
17	50x6 mm G I flat	2,546	KG	75	1,90,950
18	25x6 mm G I flat	842	KG	75	63,150
19	BOLT & NUT GI 12MMX50MM HEX	303	KG	82	24,805
20	WASHER GI SIZE 16MM DIA	228	KG	82	18,655
21	WASHER GI SIZE 12MM DIA	97	KG	82	7,954
22	LUG AL CRIMPING 95 SQMM XLPE SINGLE HOLE	500	EA	20	10,000
23	LUG AL 70 SQMM FOR 7/8 SWG WIRE/EARTHING	2,700	EA	17	45,900

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24	LUG AL CRIMPING 150 SQMM XLPE ONE HOLE	400	EA	13	5,153
25	BIRD CAP FOR 9KV 5KA SURGE ARRESTER	150	EA	237	35,550
26	TEMPLETE FOR TRANSFORMER MAINT.RECORD	50	EA	68	3,375
27	TAPE HT SCOTCH 23 25MMX9.1M 66KV	46	ROL	214.20	9,746
28	ANTI TRACKING SILICON TAPE SCOTCH 70 3M	18	EA	1,550.75	27,914
29	VINYL TAPE SCOTCH 35 YELLOW-BLUE-RED	200	EA	213.23	42,646
30	ALNOX 3M (HOT SPOT REDUCING PASTE)	4	EA	3,779.96	13,230
31	3M SCOTCH 1625 SPRAY	20	EA	338.98	6,780
32	3M SCOTCH FILL PUTTY	50	EA	593.22	29,661
33	RODENT CAPACITIVE SCREEN GUARD FOR-DT	150	EA	94.50	14,175
34	BIRD GUARD SPIKE (FLEXIBLE POLYCORBONAT)	100	EA	38.00	3,800
35	SLEEV BLACK POLYOLEFIN	100	M	38.94	3,894
36	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	250	EA	1,050	2,62,500
37	PIPE HDPE SIZE 25 MM	1,150	M	31	35,650
38	7/10 SWG G I stay wire (10Kg. / Set)	3,635	KG	75	2,72,625
39	Materials for Massionary work for Earth Pit,Charcoal, Salt etc including construction of earthing chamber (Size: 2"x2") and RCC slab cover	250	LS	1,600	4,00,000
40	CONNECTOR MINI WEDGE 25 SQMM TO DOG	150	EA	183	27,473
41	FRP Fencing	1,400	Sq. M	2,615	36,61,356
Subtotal Material(A)					3,38,16,633
Stock, Storage and Insurance@3% of A					1014499.00
Sub- Total-B					34831132.41
T & P Charges @ 2% of B					696622.65
Contingency @ 3% of B					1044933.97
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					23,37,469.99
Transportation Charges@7.5% of B					2612334.93
Sub-Total C					41522493.95
Over Head Charges (Including Supervision charges) @6% of C					2491349.64
Total D					44013843.59
Gross Sectionaliser Cost					44013843.59
OR Say					44013844.00
GST @18%					7922491.92
CESS 1%					440138.44
Gross Cost (Inc. GST)-					51936335.92
Total(In Crores)					5.19

8.25 Annexure 25 Cost Estimate for Augmentation 63/25 to 100 KVA Distribution Transformer

S.No.	Description	UOM	Qty	Amount
				in Crores
1	Augmentation from 63 to 100 KVA Distribution Transformer	EA	60	4.11

S No.	Item Description	Quantity	Unit	Unit Rate	Amount (INR)
1	100 KVA,33/0.4KV(Cu) Transformer	60.00	EA	2,72,000	1,63,20,000
2	LT Distribution Box for 100 KVA S/S.	60	EA	24,419.00	14,65,140
3	11 KV V cross arm 10.2 Kg each	120	EA	810	97,200
4	Back Clamp for V cross arm(11KV)	120	EA	80	9,600
5	11KV pin insulator polymer	360	EA	200	72,000
6	AB Switch(11KV,200A,3Pole,50Hz)	60	EA	7,380	4,42,800
7	Lightening Arrester(9KV,5KA)	180	EA	980	1,76,400
8	FUSE UNIT DD 11KV 200A 1P SIL.RUBBER W/B	180	EA	1,356	2,44,054
9	FUSE ELEMENT FOR 11KV DD FUSE 20A WHITE	180	EA	49	8,820
10	CONDUCTOR ACSR RABBIT PVC 61.70 SQMM	1,380	M	67	92,460
11	CABLE 1.1KV AL 4CX150 SQMM ARM	480	M	539	2,58,789
12	GLAND FOR ARM CABLE 4X150 SQ.MM	120	EA	280	33,600
13	ISMC-125*65 GI Channel (13.3KG/M)	5,291	KG	114	6,04,386
14	ISMC-100*50 GI Channel (9.76KG/M)	3,575	KG	114	4,08,315
15	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	5,981	KG	65	3,88,791
16	50x50x6 mm M.S Angle (4.50Kg. / Mtr)	4,532	KG	65	2,94,606
17	50x6 mm G I flat	3,055	KG	75	2,29,140
18	25x6 mm G I flat	1,010	KG	75	75,780
19	BOLT & NUT GI 12MMX50MM HEX	363	KG	82	29,766
20	WASHER GI SIZE 16MM DIA	273	KG	82	22,386
21	WASHER GI SIZE 12MM DIA	116	KG	82	9,545
22	LUG AL CRIMPING 95 SQMM XLPE SINGLE HOLE	600	EA	20	12,000
23	LUG AL 70 SQMM FOR 7/8 SWG WIRE/EARTHING	3,240	EA	17	55,080
24	LUG AL CRIMPING 150 SQMM XLPE ONE HOLE	480	EA	13	6,183
25	BIRD CAP FOR 9KV 5KA SURGE ARRESTER	180	EA	237	42,660
26	TEMPLETE FOR TRANSFORMER MAINT.RECORD	60	EA	68	4,050
27	TAPE HT SCOTCH 23 25MMX9.1M 66KV	55	ROL	214.20	11,696
28	ANTI TRACKING SILICON TAPE SCOTCH 70 3M	22	EA	1,550.75	33,496

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29	VINYL TAPE SCOTCH 35 YELLOW-BLUE-RED	240	EA	213.23	51,175
30	ALNOX 3M (HOT SPOT REDUCING PASTE)	4	EA	3,779.96	15,876
31	3M SCOTCH 1625 SPRAY	24	EA	338.98	8,136
32	3M SCOTCH FILL PUTTY	60	EA	593.22	35,593
33	RODENT CAPACITIVE SCREEN GUARD FOR-DT	180	EA	94.50	17,010
34	BIRD GUARD SPIKE (FLEXIBLE POLYCORBONAT)	120	EA	38.00	4,560
35	SLEEV BLACK POLYOLEFIN	120	M	38.94	4,673
36	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	300	EA	1,050	3,15,000
37	PIPE HDPE SIZE 25 MM	1,380	M	31	42,780
38	7/10 SWG G I stay wire (10Kg. / Set)	4,362	KG	75	3,27,150
39	CONNECTOR MINI WEDGE 25 SQMM TO DOG	180	EA	183	32,967
40	FRP Fencing	1,680	Sq-M	2,615	43,93,627
Subtotal Material(A)					2,66,97,289
Stock, Storage and Insurance@3% of A					800918.68
Sub- Total-B					27498207.93
T & P Charges @ 2% of B					549964.16
Contingency @ 3% of B					824946.24
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					19,09,340.79
Transportation Charges@7.5% of B					2062365.59
Sub-Total C					32844824.71
Over Head Charges (Including Supervision charges) @6% of C					1970689.48
Total D					34815514.19
Gross Sectionaliser Cost					34815514.19
OR Say					34815514.00
GST @ 18%					6266792.52
Gross Cost (Inc. GST)-Refurbishment					41082306.52
Gross Cost (Inc. GST)-Refurbishment in Rs Crs					4.11

8.26 Annexure 26 Cost Estimate for Addition of 11 kV Overhead Line

S.No.	Description	UOM	Qty	Amount
				in Crores
1	New 11 kV Overhead bare Line	CKT.KM	10	1.68

S No.	Item Description	Quantity	Unit	Unit Rate (in Rs)	Amount (INR)
1	125 sqmm All Alloy Aluminum Conductor AAAC	30150	M	76.87	23,17,630.50

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2	150X 150mm RS joist (11 Mtr long)(30.6 ky Per meter)(Each 336.6kg)	84150	EA	65.00	54,69,750.00
3	Hexagonal Bolts with Nuts(GI)	356	KG	82.00	29,224.80
4	Hexagonal Bolts with Nuts(GI)	75	KG	82.00	6,166.40
5	50x50x6 mm M.S Angle (4.50Kg. / Mtr)	3163	KG	65.00	2,05,562.50
	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	1450	KG	65.00	94,250.00
6	100x50x6 mm MS Channel (9.2Kg. / Mtr)	3600	KG	65.00	2,34,000.00
7	50x6 mm G I flat	2400	KG	75.00	1,80,000.00
8	25x6 mm G I flat	740	KG	75.00	55,500.00
9	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	50	EA	1050.00	52,500.00
10	PIPE HDPE SIZE 25 MM	150	M	31.00	4,650.00
11	LUG AL 70 SQMM FOR 7/8 SWG WIRE/EARTHING	200	EA	17.00	3,400.00
12	WASHER MS SIZE 16MM DIA	58	KG	94.75	5,514.70
13	Danger Plate	300	EA	80.00	24,000.00
14	ANTICLIMBING DEVICE FOR 11 M PCC POLE	300	EA	219.00	65,700.00
15	HT STAY INSULATOR TYPE-C	400	EA	50.00	20,000.00
16	PLATE BASE RCC SIZE 450X450X50MM	700	EA	110.00	77,000.00
17	ANCHOR ROD SIZE 20MMX2100MM	400	EA	77.00	30,800.00
18	TENSION SCREW GI SIZE 750X20MM	400	EA	342.00	1,36,800.00
19	Disc Insulator(B&S) 70KN Polymer	300	EA	1,150.00	3,45,000.00
20	11KV H W fitting(B&S)70KN	300	EA	350.00	1,05,000.00
21	11 KV V cross arm 10.2 Kg each	200	EA	810.00	1,62,000.00
22	7/10 SWG G I stay wire (10Kg. / Set)	4000	KG	75.00	3,00,000.00
23	Back Clamp for V cross arm(11KV)	200	EA	80.00	16,000.00
24	WIRE GI 4 SWG	5376	KG	52.00	2,79,552.00
25	SLEEV BLACK POLYOLEFIN -16MM	900	M	10.17	9,152.54
26	MONKEY SCARE- ONE LAYER	150	EA	63.56	9,533.90
27	BIRD GUARD SPIKE (FLEXIBLE POLYCORBONAT)	300	EA	38.00	11,400.00
28	SILICON RUBBER SPACER 11 KV	400	EA	395.00	1,58,000.00
29	GUARD POLIPRO FOR OVERHEAD COND.	300	M	295.49	88,647.46
30	Materials for Massionary work for Earth Pit,Charcoal, Salt etc including construction of earthing chamber (Size: 2"x2") and RCC slab cover	50	LS	1600.00	80,000
31	11KV pin insulator polymer	900	EA	200.00	1,80,000.00
	Subtotal Material(A)				1,07,56,734.79
	Stock, Storage and Insurance@3% of A				322702.04
	Sub- Total-B				11079436.83
	T & P Charges @ 2% of B				221588.74
	Contingency @ 3% of B				332383.11
	Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)				826251.56
	Transportation Charges@7.5% of B				830957.76

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	Sub-Total C		13290618.00
	Over Head Charges (Including Supervision charges) @6% of C		797437.08
	Total D		14088055.08
	Gross Cost		14088055.08
	OR Say		14088055.00
	GST @18%		2535849.9
	CESS 1%	-	140880.55
	Gross Cost (Inc. GST)-11 KV New CKT.		16764785.45
	Total(In Crores)		1.68

8.27 Annexure 27 Cost Estimate for Addition of 11 kV Overhead Line

S.No.	Description	UOM	Qty	Amount
				in Crores
1	New 33 kV Overhead bare Line	CKT.KM	10	2.06

S No.	Item Description	Quantity	Unit	Unit Rate	Amount (INR)
1	232 sqmm All Alloy Aluminum Conductor AAAC	31000	M	156.50	48,51,500
2	150X 150mm RS joist (13 Mtr long)(34.6 ky Per meter)(Each 415.2kg)	103800	KG	65	67,47,000
3	BOLT & NUT GI 16MMX75M HEX	150	KG	82	12,300
4	BOLT & NUT GI 16MMX200MM HEX	50	KG	82	4,100
5	50x50x6 mm M.S Angle (4.50Kg. / Mtr)	1500	KG	65	97,500
6	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	580	KG	65	37,700
7	100x50x6 mm MS Channel (9.2Kg. / Mtr)	1440	KG	65	93,600
8	50x6 mm G I flat	1080	KG	75	81,000
9	25x6 mm G I flat	320	KG	75	24,000
10	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	100	EA	1,050	1,05,000
11	PIPE HDPE SIZE 25 MM	300	M	31	9,300
12	LUG AL 70 SQMM FOR 7/8 SWG WIRE/EARTHING	400	EA	17	6,800
13	WASHER MS SIZE 16MM DIA	30	KG	95	2,843
14	BOARD DANGER 33KV SIZE 8X10 INCH	150	EA	80	12,000
15	ANTICLIMBING DEVICE FOR TOWER (BRACKET)	150	EA	430	64,500
16	INSULATOR STAY (GUY/EGG) 11KV	160	EA	50	8,000
17	PLATE BASE RCC SIZE 450X450X50MM	310	EA	110	34,100
18	ANCHOR ROD SIZE 20MMX2100MM	160	EA	77	12,320
19	TENSION SCREW GI SIZE 750X20MM	160	EA	342	54,720

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20	Disc insulator (B&S) 120KN Polymer	120	EA	1,440	1,72,800
21	33KV H W fitting(B&S)90KN, 3Bolt	120	EA	351	42,120
22	V-Cross arm 33 KV 22 KG	120	EA	1,580	1,89,600
23	7/10 SWG G I stay wire (10Kg. / Set)	2000	KG	75	1,50,000
24	Back Clamp for V cross arm(33KV) 1.7 kg each 950*8 Flat)	120	EA	150	18,000
25	WIRE GI 4 SWG	5376	KG	52	2,79,552
26	COVER MVLC - 38 FOR GOAT COND	60	M	550	33,000
27	33KV pin insulator polymer	420	EA	480	2,01,600
Subtotal Material(A)					1,33,44,955
Stock, Storage and Insurance@3% of A					400348.64
Sub- Total-B					13745303.27
T & P Charges @ 2% of B					274906.07
Contingency @ 3% of B					412359.10
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					1027059.83
Transportation Charges@7.5% of B					1030897.75
Sub-Total C					16490526.01
Over Head Charges (Including Supervision charges) @6% of C					989431.56
Total D					17479957.57
Gross Cost					17479957.57
OR Say					17479958.00
GST @18%					3146392.44
Gross Cost (Inc. GST) 33 kV OH Line-232 sqmm					20626350.44
Total Rs Crs					2.06

8.28 Annexure 28 Cost Estimate for Data Center (DC) Development

S. No.	Description	Unit cost (INR)	Qty	Amt.
1	IT Server Racks	86375	10	0.09
2	Precision AC's	1230000	2	0.25
3	Water Leakage system	214	1500	0.03
4	Cold Containment in Data Centre	495000	2	0.10
5	Fire safety system (FM 200)	3200	1000	0.32
6	Building Management System	5000000	1	0.50
7	Generator 100-200 KVA	2500000	1	0.25
8	Fire Proof Storage	500000	1	0.05
9	Data cabling and Electrical cabling	5000000	1	0.50
10	Data centre UPS with UPS panel	8062500	1	0.81
	Civil Cost for Data Center Creation	Lumsum		2.50
Total				5.39

8.29 Annexure 29 Cost Estimate for IT Infrastructure Hardware

S. No.	Description	Unit cost (INR inclusive of Tax)	Proposed by FG Scope	Qty Required	Total Amount
1	Anti virus Server	1448853	1	1	0.14
2	AD Server	1448853	1	1	0.14
3	Web Server	1448853	1	1	0.14
4	Mail server	1448853	1	1	0.14
5	SAN Storage	9232214		1	0.92
6	SAN Switch	3220975		1	0.32
7	SAN Cabling	135700		1	0.01
8	Switch -Layer-II	150000	2	1	0.02
9	LDAP Server	1448853		1	0.14
10	Backup Server	1448853		1	0.14
11	Core Switch	2191538		1	0.22
12	Tape Library for Back up	8000000		1	0.80
13	Router Installation for Internet Gateway	2038532	1	1	0.20
14	Cabling Connectors and required Hardware	271400		1	0.03
15	LAN including Accessories	327376		1	0.03
16	Fiber Optical Cable, Connectors, Patch Cord etc.	868242		1	0.09
17	Additional Hardware other Application	1200000		15	1.80
				Total	5.31

8.30 Annexure 30 Cost Estimate for End user Devices i.e. Laptop, desktop, Printer, scanner

S.No	Description	Unit cost (INR)	Existing in Use	Existing in Store	FG Scope (C)	Total (A+B+C)	FY22	
			(A)	(B)			Qty	Amt.
			Qty	Qty	Qty	Qty	Qty	
1	Workstation PC with windows OS & UPS & MS Office	72000	0	0	293	293	300	2.16
2	Laptop with windows OS & MS Office	82000					900	7.38
3	Anti Virus	1200			293	293	1693	0.20
4	MS Office of existing Laptop/Desktop	22000	0	0	0	0	200	0.44
5	Core Cal Licenses	30000					1200	3.6
6	Ipad	50000					50	0.25
7	Printer(Laser Jet B/W)	20000			44	44	200	0.4
8	Scanner / Copier (Laser Jet - Color)	30000	0	0	0	0	20	0.06
9	Bar code reader	5000			360	360	200	0.1

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	Mobile Phone for Mobile apps	25000					700	1.75
	Total							16.34

8.31 Annexure 31 Cost Estimate for Software Licenses

S. No.	Description	Existing in Use (A)	FG Scope (B)	Total (A+B)	Unit cost (INR, inclusive of Tax)	Qty	Amt. (In Rs Cr.)
1	MBC software including Energy audit, New connection / disconnection, MIS		1400000	1400000	27	600000	1.62
2	DB License MBC		2	2	8449584	0	0.00
3	Server OS MBC		5	5	676459	4	0.27
4	ERP full user licensed		340	340	40710	500	2.04
5	Self service		280	280	20355	1000	2.04
6	Payroll users		3500	3500	11534.5	700	0.81
7	ERP Data base		2	2	1485915	1	0.15
8	Server OS ERP		9	9	777927.39	6	0.47
9	Access Management software			0	15000000	0	0.00
10	System Security			0	1357000	0	0.00
11	EMS /NMSsolution			0	17914586	0	0.00
12	Mailing solution			0	178356	0	0.00
13	AD software			0	67850	1	0.01
14	SPAM filter			0	67850	1	0.01
15	IDS/IPS/Firewall			0	10000000	1	1.00
16	Development of Web portal		1	1	6106500	1	0.61
17	MBC Implementation- Additional Licenses		1	1	71704667	0	0.00
18	ERP Implementation		1	1	90652320	1	1.00
19	Share Point Portal		0	0	2500000	1	0.25
20	MS SQL Licenses for other application			0	1500000	4	0.60
21	Oracle Licenses Enterprise				2500000	4	1.00
	Oracle Patition Licenses				700000	4	0.28
21	Other Technologies Implementation			0	30000000	1	3.00
					Total		15.14

8.32 Annexure 32 Cost Estimate for Communication Network Infrastructure at DC and office locations

S. No.	Description	Unit cost (INR inclusive of Tax)	Qty	Amt.
1	Lease line - Private APN and IP/MPLS equipment at critical location 30-50 Mbps	800000	25	2
	Microwave link as N-1 of communication network	500000	25	1.25
3	LAN Cables at location	300000	25	0.75
4	30 kVA UPS at location for Desktop	200000	25	0.5
6	WIFI Access points	45000	100	0.45
7	Wifi Controller	300000	1	0.03
	Total			4.98

8.33 Annexure 33 Cost Estimate for Mini SCADA Implementation (20 nos ODSSP & 10 nos Old PSS)

S. No.	Description	Unit cost (INR inclusive of Tax)	Qty	Amt.
1	SCADA Software and allied licenses for 20 nos ODSSP	200000	20	0.40
2	Implementation Cost	70000000	0.2	1.40
3	PSS Control Room equipment including screen, desktop, switches	10000000	0.75	0.75
	Total			2.55

8.34 Annexure 34 Cost Estimate for GIS Implementation for One Division

S. No.	Description	Unit cost (INR)	Qty	Amt.
1	GIS Infrastructure like server, switch, storage etc.	18000000	0.75	1.35
2	GIS software	45000000	0.75	3.38
3	Implementation Cost	45000000	0.6	2.70
4	Data Capturing for one division (33/11 KV/LT, consumer mapping, Pole Numbering) - 300 sqkm			
5	Base map	1900	300	0.06
6	33 KV /11 KV SS survey	5000	10	0.01
7	33 KV /11/LT network Circuit length	1800	400	0.07
8	Consumer	35	100000	0.35
	Total			7.91

8.35 Annexure 35 Cost Estimate for Smart Metering Infrastructure (HES & MDM on 4G/ NBIOT Communication)

S. No.	Description	Unit cost (INR inclusive of Tax)	Qty	Amt.
1	Smart Metering Infrastructure for HES & MDM up to 3 Lacs meter	50000000	0.4	2.00
2	HES Software Licenses 1 Lac meter	30000000	0.5	1.50
3	Implementation Cost of HES	30000000	0.6	1.80
	MDM Licenses & Revenue protection up to 1 Lac meter	30000000	0.6	1.80
4	Implementation Cost of MDM & Revenue protection, developed by TPDDL	40000000	0.6	2.40
	Miscellaneous	20000000	0.5	1.00
		Total		10.50

8.36 Annexure 36 Cost Estimate for Call Center Implementation (System & Infrastructure)

S. No.	Description	Unit cost (INR)	Qty	Amt.
1	Call Center Software for IVR, CTI & Telephony, Call recordinging	20000000	0.75	1.50
2	Call center infra like desktop, IP phone, Headphone - 50 seater	10000000	0.75	0.75
3	Implementation and integration Cost	25000000	0.75	1.88
4	Civil Cost for Call Center Building	10000000	0.75	0.75
		Total		5.00

8.37 Annexure 37 Cost Estimate for Civil Works, Store & Administration

Security System of Stores:

The requirement of High Mast Lighting System:

a. Cost Estimate of High Mast at Stores:

Store Name	Requirement	Estimate Cost
		(in Cr.)
Balasore Store Part 1	High Mast	0.25
Balasore Store Part 2	High Mast	0.25
Jajpur Stores	High Mast	0.25
Total		0.75

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b. Cost Estimate of Racks at Balasore Stores:

Work description	Unit	Rate	Qty	Amount
Building cost of shed	Sq M	12000	1500	18000000
racking system	L/S			5000000
				23000000
Amount in Cr.				2.3

c. Cost Estimate of Upgrading DT Workshop:

S. No	Description	Purpose of Equipment	Price	Details
1	Civil Construction	Establishment of DT workshop	25000000	
2	Admin Expences	Furnitures, LED Screen, Projector etc	2500000	Including all furniture, Water cooler, RO, tables, benches
3	IT & Electrical Expences	Power Cable, Meter, Building Lighting, Wiring, LAN Connection	600000	Including optical fibre connection
4	EOT	For transformer movement withinn workshop	1680000	5MT Span-20M, Height-5M
5	Oil Filter Machine	For Oile Filtration	600000	1200 LPH
6	Electrical Oven (2 Nos.)	For DT Moisture Removal	2400000	Size- 7'X8'X8'; 25KW (10Lakh each)
7	Rewinding Machines	For Transformer winding	228000	LT 4 HP motor, HT 1 HP motor
8	Various testing equipments	BDV, Turns Ratio, Megger, Hivoltage Setup, Winding Resistance Meter, Loss Measurement (Watt Meter), DVDF Test Set Up etc.	2425200	Refer Second Sheet
9	Pallet Lift/Fork Lift	For DT & Spare movement	60000	One pallet of 5 ton
10	Miscellaneous Tools	Various Small tools for Repairing Activities	60000	Wrenches, screw drivers, bolt cutter. Automatic tools extra like pneumatic gun
11	Safety equipment 50000, Air compressor 100000	For DT maintenance	468000	Air compressor 5 HP
Grand Total			36021200	
		TOTAL in Rs Crs	3.60	

Total Cost estimate for Store & DT workshop:

S.no	Item Description	Total Budget
		(In Crores)
1	High Mast arrangement	0.75

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2	Fire Extinguishers	0.15
3	Store boundary wall with concertina wire	2.3
4	Storage of E-waste and Hazardous Scrap Material	0.8
5	Upgradation of DT workshop	3.6
Total		7.60

d. Cost Estimate for Civil Infrastructure (Office Buildings, Meter Test Lab, Customer Care Center, Records Rooms, PSC):

Sr no	Particulars	Estimated Cost (Rs Lakhs)	Add GST	Total Inc GST
1	Infrastructure for Customer Care, Payment Centre and Section Offices	154.48	27.80	182.28
2	Construction and Upgradation of office infrastructure,	463.69	83.46	547.15
3	Construction of Connecting roads	45.3	8.15	53.45
4	Record room	128.4	23.11	151.51
5	Upgradation of Storage space	51.4	9.25	60.65
6	Creating of storage platform	64.93	11.69	76.61
7	Civil Work for Meter Test Bench	254.24	45.76	300.00
8	Civil work for Call centre &PSCC	304.24	54.76	359.00
Total in Rs Lacs				1730.68
Amount in Rs Cr.				17.31

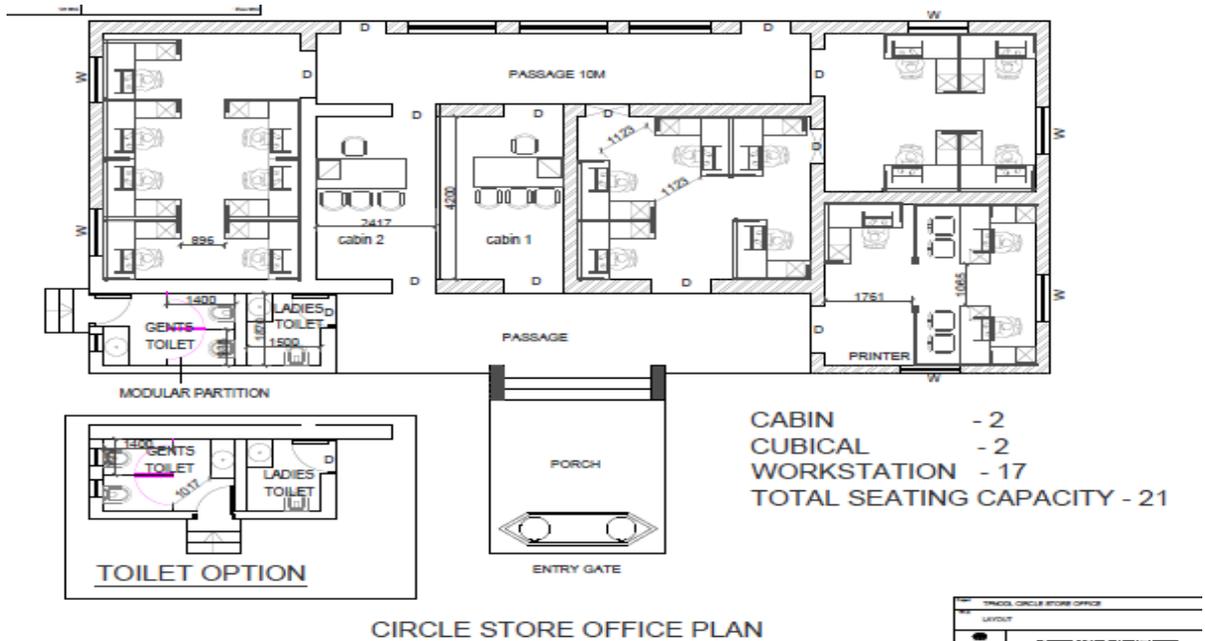
e. Cost Estimate for Administration:

S. No.	Major Category	Qty	Unit Price in Rs	Total Cost
1	Aicconditioners	200	40000	8000000
2	Chairs/Executive chairs/Visitors Chairs	1500	10000	15000000
3	Tables	50	30000	1500000
4	Other furnitue & frixture	Various	4000000	333333
5	Water Cooler	150	45000.00	6750000
6	Water Dispencer	100	10000.00	1000000
7	RO / Aquaguard	150	18000.00	2700000
8	Photocopy Machine	15	100000.00	1500000
9	Projector and displey screen	15	37000.00	555000
10	Sanitizer M/c	42	10000.00	420000
11	Biometric M/c	223	20000.00	4460000
12	Fan ceiling / Wall mounted / Pedestal Fan/ Exhaust Fan	120	2000.00	240000
13	Refrigerator	21	22000.00	462000
14	Induction Plate	30	3000.00	90000
15	Electric Kettle	200	1200.00	240000
16	White Board	72	6000.00	432000
17	Notice / Pin up Board	72	3000.00	216000
18	Emergency Light	80	1300.00	104000

Detailed Project Report Capex Plan FY 21-22

19	TV	25	35000.00	875000
20	EPBAX System	72	30000.00	2160000
21	Mislanious capex	Lumpsum	2000000.00	2000000
22	Boom barrier in stores gate	4	400000.00	1600000
23	Metal dedector	6	80000.00	480000
24	Walky talky handsets	30	40000.00	1200000
Total Rs				52317333
Total in Rs Crs				5.23

Proposed OPCENEX (Operations Centre for Excellence and PSCC)



PRAYER:

Pursuant to the direction of Hon'ble Commission vide suo motu proceeding in case no 9/2021 on dated 25.03.2021, para 39, TPNODL is supposed to file the Capital investment plan as per the vesting order.

In compliance to above, I am submitting herewith CAPEX plan to a tune of 275.4 Cr on behalf of TPNODL which may kindly be approved.

Dated:

Chief Executive Officer

TPNODL