



Detailed Project Report (DPR)

For

Capex Plan- FY 2023-24

Submitted By

TP Northern Odisha Distribution Ltd

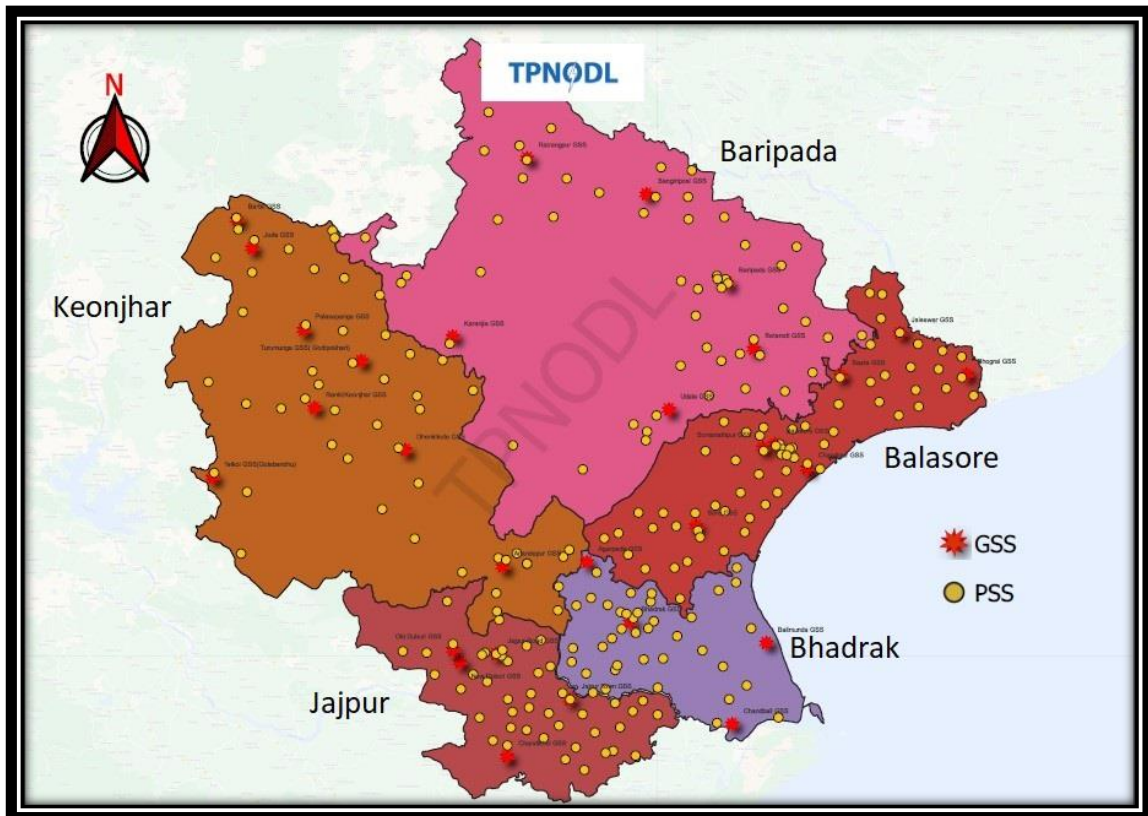


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Glossary		Glossary	
AB SWITCH	Air Break Switch	MBC	Metering Billing and Collection
AC	Alternating Current	MCC	Master Control Centre
ADMS	Advanced Distribution Management System	MCCB	Moulded Case Circuit breaker
U/G	Under Ground	MM	Material Management
AMI	Automatic Meter Infrastructure	MMG	Meter Management Group
AMR	Automated Meter Reading	MPG	Maintenance Planning Group
UPS	Uninterrupted Power Supply	MPLS	Multi-Protocol Label Switching
AT&C	Aggregate Technical and Commercial	MRT	Meter Reading & Testing
BA	Business Associate	MS	Microsoft
LTCT	Low Tension Current Transformer	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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Glossary		Glossary	
CYMEDIST	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

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Glossary		Glossary	
IEC	International Electro technical Commission	SLDC	State Load Dispatch Centre
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	LT	Low Tension

Preamble:

TPNODL started its business on 1stApril 21. In line with the vesting order, capex commitment of Rs 258.78 Cr for the first year of the operation (FY21-22), was approved by Hon'ble commission in Sep-21. All the capex works were subsequently taken up for the execution. Capex work to the tune of 123.1 Cr was completed by Mar-22. Subsequently DPR for capex commitment of Rs 326.54 Cr for second year of operation (FY-22-23) was approved by Hon'ble commission in July-22.

To speed up the various capex work under above approved DPRs. TPNODL has taken up multiple initiatives as below:

1. Engaging in-house teams for supervision of capex works execution under the Rate contracts in addition to existing project team.
2. Strengthening the project team by recruiting the 37 nos of the employee at different level.
3. Engagement of the 32 nos of BAs for execution of capex work under Rate contracts and stand alone order basis
4. Engagement of EPC contractor (SIPS) in addition of the above BAs, covering scope of 150 Cr.

As a result of the above initiative, the progress on various capex works against total approved DPRs of two years (Rs 585 cr.) as on 31st March 2023 can be seen in table mentioned below B

Capex year	Approved Amount from Hon'ble OERC	Capital Expenditure	Commitment	Capitalised amount till march 2023	Balance to capitalise
FY 21-22	258.78	230	24.31	205.41	53.37
FY 22-23	326.54	247.31	75.40	183.04	143.5
Total	585.32	477.31	99.71	388.45	196.87

Considering the load growth and various activities on network strengthening aspects TPNODL is now proposing the DPR for Capex work under third year of operation for amount in the tone of **Rs 452.8 Cr.**

This year capex is basically centred around the below mentioned four themes: -

1.1 Mitigation of Low Voltage pockets:

As a result of overloading of conductors 33 KV and 11 KV lines and installation of inadequate size of conductors in the initial trunk portion of the lines, low voltage issues are becoming critical and required to be addressed on priority. Based on the network analysis, 30 nos of schemes (146.5 KM) for conductor upgradation of 11 KV network is envisaged requiring capital expenditure of Rs 15.07 Cr. In addition to above, to mitigate the low voltage issues at the tail end of the lengthy feeders (more than 80 KM) provision of voltage regulators is also proposed under capex provision of Rs 5.01 Cr. Practice of operating On Load Tap Changer (OLTC) is being ensured wherever functional OLTCs are available on PTRs. 2 nos of 33/11kV PSS of estimated cost 18.6 Cr. Also proposed for low voltage mitigation.

1.2 Protection of Distribution Transformers:

The company has 73584 nos of Distribution Transformers (DTR) across its license area. More than 95% of these DTRs do not have LT side protection such as breaker or fuses. Further, absence of HT side AB switch, fuses and lightning arresters (LAs) is also common phenomena. It is proposed to provide the above said basic protection to all the DTRs in phase manner. Capex provision of Rs.58.85 cr. Is envisaged covering 4589 nos DTRs.

1.3 Pilferage proofing of LT Lines:

The company operates 67,117 KMs of LT network. About 34 % of this network is having bare conductors. The network with bare conductor is observed to theft prone as power conductors are easily available for the illegal tapings. In view of the same it is proposed to convert 420 KM of bare conductor to AB cable requiring capex provision of Rs. 43.35 Cr.

1.4 Reduction of Carbon Footprint:

In line with company's commitment on reducing carbon footprints, provision of Roof Top Solar plants for auxiliary consumption of the power of the offices are considered along with provision of Electric Vehicles (EVs). it is proposed to provide the battery operated 2 wheelers and 4 wheelers to our field staff. in the first year we are proposing 159 electric scooters (one for each section) and 16 nos of electric cars to perform official duty, requiring the capex provision 4.98 Cr

1. Introduction:

TP North Odisha Distribution Limited (TPNODL) was 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 is 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 (33 kV and downstream up to customer premises).
2. Restoration of power after interruptions.
3. Meter reading, billing, and revenue collection.
4. Customer complaint resolution.
5. General customer care including provision of information on services.
6. Connection of new customers to the distribution network.
7. Expansion of distribution network.

2. Our Business Area:

TPNODL license area is spread over a geography of 27857 Sq.Km having coastal line of about 150 Km serving the registered consumer base of 2.03 million. TPNODL procures power from GRIDCO which is a state-owned company. 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
		SED, Soro	Bahanaga
			Markona
			Khairi
No.I Bhadrak			
2	Bhadrak	BNED, Bhadrak	No.II Bhadrak
			Basudevpur
			Dhamra
			Tihidi
			Bhadrak Rural
		BSED, Bhadrak	Dhamnagar
			Asurali S/D

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Sr. No.	Circle	Division	Sub-div
3	Baripada	BPED, Baripada	Baripada
			Rural S/D, Baripada
			Betnoti
			Kuliana
			Moroda
		UED, Udala	Khunta
			Udala
		RED, Rairangpur	Rairangpur-I
			Rairangpur-II
			Karanjia
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
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 28 numbers of Grid Sub stations (GSS) out of which 3 nos. GSS are rated at 220/33kV and 25 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 104 numbers of 33KV feeders with a combined route length of approximately 3007 KMs supplying power to 239 numbers of 33/11KV Primary Substation (Structures). The 33KV supply is stepped down to 11KV level through 538 numbers of 33/11KV power transformers at these primary substations with an installed capacity of 2527 MVA. Nearly 816 numbers of 11KV feeders radiates from the 33/11KV primary substations having length of approximately 38,339 KMs and supply power to HT consumers connected at 11KV level and LT customers connected to 11/0.415KV distribution substation. Approximately 73,584 numbers of distribution transformers are installed in all five circles with an installed capacity of 2708 MVA. The length of the LT feeders is 67117.3 KMs approximately. These LT feeders supply power to three phase and single-phase consumers, right from large Industrial to BPL.

The information is summarized in the table below:

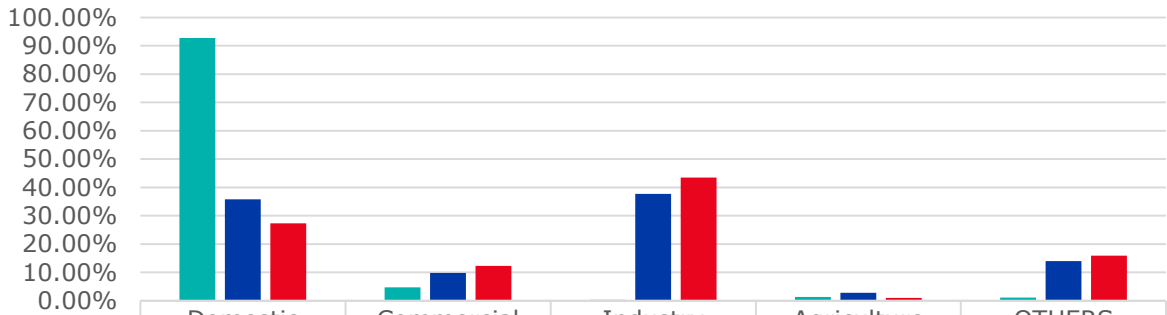
Name of Circle	Balasore	Bhadrak	Jajpur	Keonjhar	Baripada	TPNODL Total
Area in Sq km	3806	2505	2888	8240	10418	27857
No. of Consumers in lakhs	5.36	2.86	3.13	3.59	5.36	20.31
No. of GSS	7	3	5	7	6	28
Total Nos of 33 kV Feeders	27	11	18	27	21	104
Nos of 33/11 kV Sub-Station	66	35	39	47	52	239
Nos of Power Transformer	146	76	85	104	127	538
33/11kV Transformer Capacity in MVA	699.2	377.1	420.5	501.9	528.8	2527.5
Nos of 11kV Feeder	219	125	128	158	186	816
Nos of DTR	21493	12529	13681	11741	14140	73584
33/0.415 kV, 11/.415/0.230 kV Transformer Capacity in MVA	866.4	453.7	560.6	375.6	452.1	2708.3
33 kV Line in kms	631	404	441.6	667.7	862.7	3007
11 kV Line in kms	9171.9	5199.4	5282.4	7244.5	11440.9	38339.1

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Name of Circle	Balasore	Bhadrak	Jajpur	Keonjhar	Baripada	TPNODL Total
LT Line with Bare Conductor in kms	7548	1962	5551	3459.1	4179	22699.1
LT Line with Ab Cable in kms	8225.5	5832.4	4188.1	6699.0	19473.2	44418.2
Total LT Line in kms	15773.5	7794.4	9739.1	10158.1	23652.2	67117.3

The graph below represents the share of customer base, their energy consumption and contribution in revenue based on H1 data of FY22-23

Segment wise - Consumer v/s Billing MUs v/s Billing Amount



	Domestic	Commercial	Industry	Agriculture	OTHERS
Nos of Consumer	92.71%	4.69%	0.28%	1.27%	1.06%
Billing MU	35.80%	9.77%	37.73%	2.78%	13.93%
Billing Amount	27.30%	12.31%	43.46%	1.00%	15.93%

■ Nos of Consumer ■ Billing MU ■ Billing Amount

4. Key Challenges:

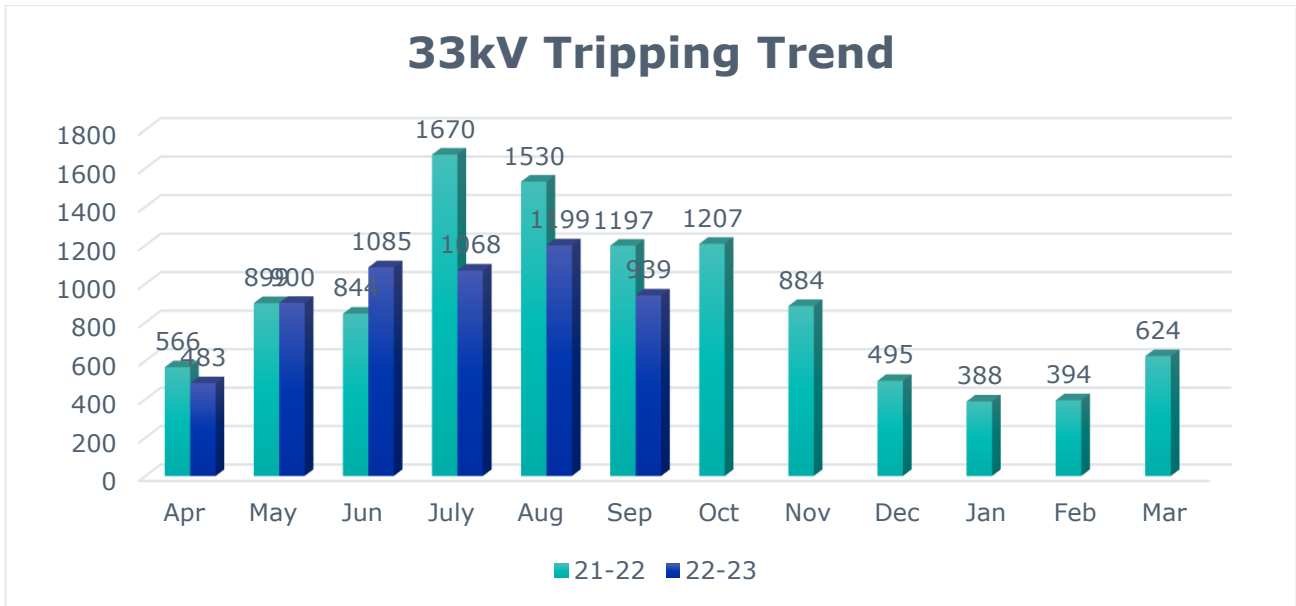
The brief inspection of the network reveals that the network in TPNODL is in very poor state and seriously lacks compliance with respect to the statutory guidelines. While this affects the system reliability due to frequent breakdowns, it may pose threat to safety of employees, public at large and animals. In the FY 21-22 & FY -22-23 many actions have been taken to improve the network condition but still lots of improvement required as requirement of the network is huge.

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 Graph shows the month wise tripping comparison data of 33 KV feeders for FY 21-22 and FY 22-23.

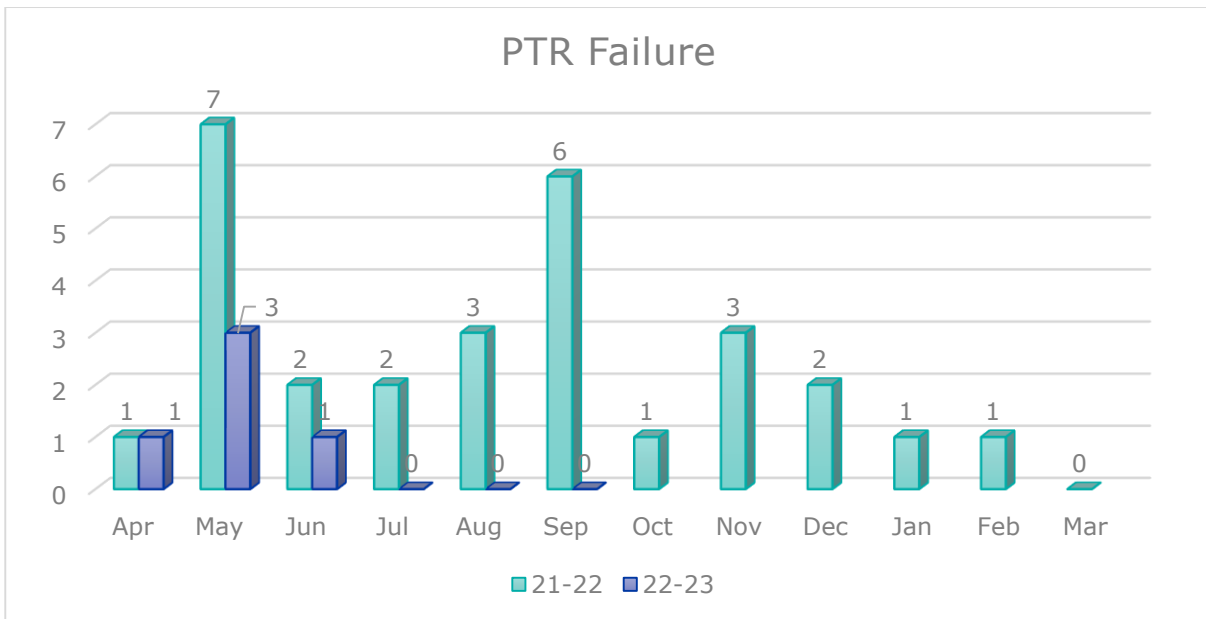


4.2. 33/11 kV Primary Substations (PSS)

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 multiple 33/11 kV primary substations, the Power Transformers are not appropriately maintained. 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 substation are already overloaded or approaching the overload limit. It is anticipated that some of the substation 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 the substations with only power transformer in service at some substations. Below is the trend of power transformer (PTR) failure for past 4 years and comparison of month wise failure of the PTR of FY21-22 and FY22-23

Particulars	FY 18-19	FY 19-20	FY 20-21	FY21-22	FY22-23(till Sept.22)
Failure of Power Transformers (PTR)	15	23	19	29	5



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.

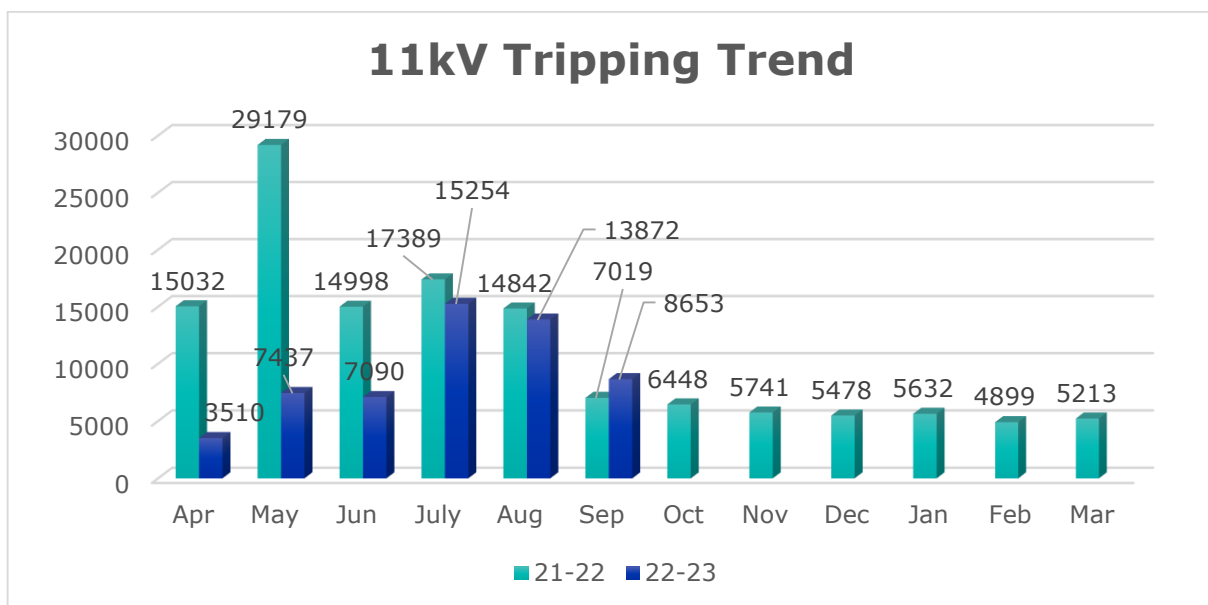
Some of the pictures depicting the network condition and violation of statutory compliance posing safety threat to Public, Employees and animals are captured and presented in Annexure - 1

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.

Below Graph shows the month wise tripping comparison data of 11 KV feeders for FY 21-22 and FY 22-23.



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	FY21-22	FY22-23 (till Sept.22)
Failure of Distribution Transformers (DTR)	2347	2416	2312	2533	2067

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; aluminium 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 aluminium 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

In an electrical installation, earthing system play 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 doesn't have any resistance.

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.

4.7. IT Issues

The journey of IT from last year has been challenging, many bespoke application and enterprise application including implementation of SAP with different module has been done. But to streamline IT system and to equip employee pan TPNODL with IT assets and secure communication with full Cyber Security many more steps need to be taken. Also we have established IT Data Centre at BBSR OPTCL Data Centre and OT Data Centre at Balasore OpCenEx building.

Since our company is growing in a rapid rate we need to have our own data storage, also planning to have our own OS/DB Licenses for GIS software.

In addition to above, these systems need to be secured completely form Virus and Cyber-attack for that we are planning to have fire wall, own optical fibre network with various other applications.

Further we are planning to implement GIS system in three Circle Bhadrak, Baripada and Keonjhar with proper consumer indexing which will help to identify and locate all consumers. Also planning to automate 75 PSS alongside with SCADA software which will help to increase the reliability of power in those areas of TPNODL

4.8. 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 Centres needs to be established / developed further to provide better connectivity to all category of consumers with TPNODL and provide them a unique service experience.

4.9. Natural Calamities

Apart from the vast geographical area, Odisha being a coastal State, it repeatedly encounters devastating storms / Cyclones. The loss due to these storms / cyclones are huge which is a major challenge for a distribution utility. The main concern related to these natural calamities are that not only it results in disruption of power supply to consumers over extended period but also it damages the power distribution infrastructure resulting into requirement of huge funds to refix the network infrastructure. A permanent solution to address the issue of virtually annual disruption of supply and repeated infusion of CAPEX to restore/replace damaged infrastructure need to be developed.

Name	Lowest Pressure(mbar)	Year	Winds(km/hr)
Odisha Cyclone	912	1999	276
Phailin	940	2013	215
Hudhud	950	2014	185
Titli	978	2018	110
Fani	932	2019	250
Amphan	920	2020	260
YAAS	970	2021	140

Source: - https://en.wikipedia.org/wiki/List_of_tropical_cyclones_that_affected_India

So, it can be seen from the history that Odisha is prone to the natural disastrous cyclones which effected erstwhile NESCO in a very bad manner and will surely a major natural challenge for TPNODL. Apart from this there are other natural challenges like

1. Saline Coastal weather which deteriorates the electrical assets
2. Different forest ranges through which rural lines are running prone to unsafe situations

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 doesn'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. 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.

5.5. 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.

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.

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.

SI 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
10	2019-20	34	34	68	12	0	12	80
11	2020-21	20	8	28	25	0	25	53
12	2021-22 (till Jan 22)	29	9	38	32	0	32	70

Detailed Project Report Capex Plan FY 23-24

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.

Below figure shows the detailed analysis of accidents.

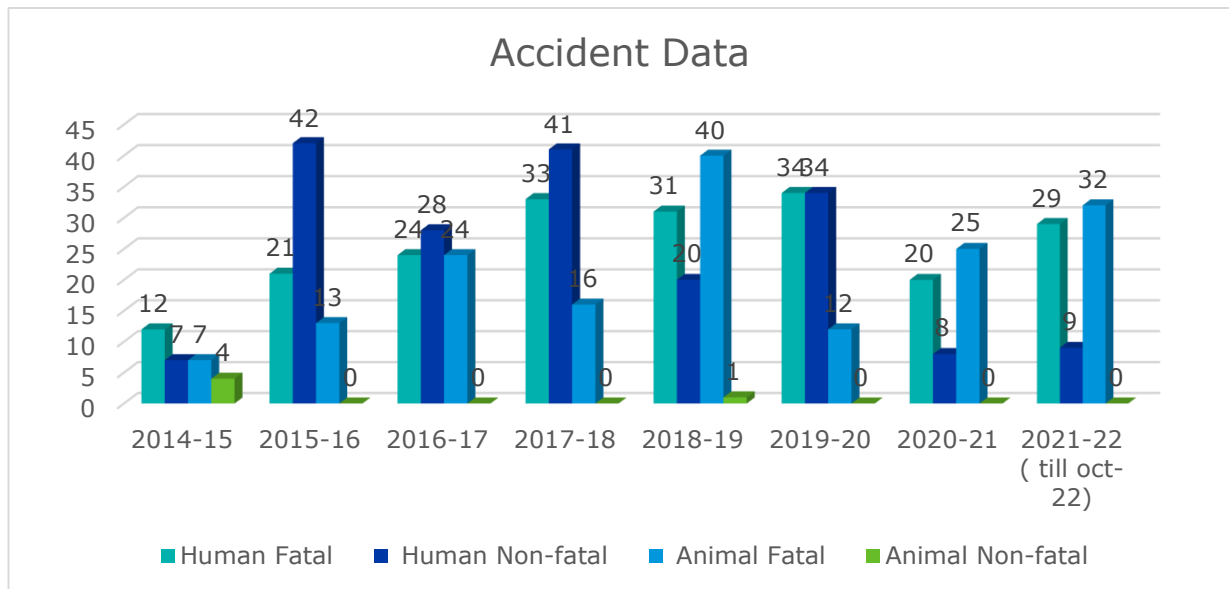


Table below shows the Fatal and non-fatal accident happened during the last 3 Years at different voltage level.

Voltage Level	FY 19-20				FY 20-21				FY 21-22 (till oct-22)			
	Fatal		Non-Fatal		Fatal		Non-Fatal		Fatal		Non-Fatal	
	Human	Animal	Human	Animal	Human	Animal	Human	Animal	Human	Animal	Human	Animal
33KV	1	0	0	0	1	0	0	0	2	0	0	0
11KV	14	9	25	0	12	6	13	0	11	7	27	0
LV	19	3	9	0	7	2	12	0	16	2	5	0
Total	34	12	34	0	20	8	25	0	29	9	32	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.

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7. Previous Year Capex Status:

7.1 Capex Status FY 21-22 as on 30th Nov-2022

S. No.	Major Category	Activity	Amount approved by Hon'ble OERC in 21-22	Capex expenditure	Commitment	Capitalised Amount on 31 Marh 2023
1	Statutory & Safety	Safety & Testing equipments	7.78	2.17	3.45	1.50
		Cradle guard at major road crossings	2.46	1.63	0.72	1.28
		Fencing of Distribution substations	9.80	5.46	0.01	5.40
		Boundary wall for Primary substations	6.24	9.35	0.53	9.34
		Establishment of Meter Testing Lab	2.17	2.35	0.12	2.34
		Total (1)	28.45	20.97	4.84	19.86
2	Loss Reduction	Equipment for Meter data downloading	0.16	0.12	0.00	0.00
		AMR enabled equipment	1.37	0.92	0.17	0.00
		Conversion of LT Bare conductor to AB Cable	13.10	13.60	0.43	12.38
		Field Testing equipment - Metering and enforcement	1.76	0.19	0.00	0.19
		Total (2)	16.39	14.83	0.60	12.57
3	Reliability	33 KV Network refurbishment & AB switch	22.96	18.07	5.67	10.79
		Refurbishment of 33KV/11KV Primary Substation (PSS)	16.29	13.74	1.63	8.05
		11 KV Network refurbishment & AB switch	26.13	20.60	1.56	15.82
		Refurbishment of 11KV/0.415 KV Dsitribution Substation (DSS)	8.90	8.10	1.72	7.89
		Installation of LV protection at DSS	6.49	6.90	0.07	6.77
		Installation of Auto reclosure / Sectionalizers ,RMUs, &FPIs	5.07	4.23	0.03	4.16
		Trolley Mounted Pad Substations	1.15	0.76	0.00	0.76

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		Underground cable Fault Locating Van and oil filtration machine	0.00	2.83	0.00	2.72
		Testing equipment for PSS	4.90	5.33	0.00	4.48
		Earthing of Power Transformers and Distribution Transformers	0.81	0.68	0.13	0.67
		33KV & 11 KV Lightning Arrestor	1.65	1.03	0.23	0.85
		Total (3)	94.35	82.26	11.02	62.95
4	Load Growth	Augmentation from 5 MVA to 8 MVA Power Transformer	8.70	8.73	0.14	8.67
		Augmentation from 200/250 to 315 KVA Distribution Transformer	5.19	6.46	0.00	6.37
		Augmentation 63/25 to 100 KVA Distribution Transformer	4.08	4.03	0.00	3.99
		Addition of 11 kV Overhead Line	1.68	0.96	0.00	0.95
		Addition of 33 kV Overhead Line	2.06	2.58	0.00	2.54
		Total	21.71	22.76	0.14	22.51
5	Technology & Civil Infrastructure	Data Center (DC) Development Cost	5.39	2.77	0.05	2.77
		IT Infrastructure Hardware Cost	5.31	7.60	0.00	7.60
		End user Devices i.e. Laptop, desktop, Printer, scanner	16.02	15.22	0.04	15.12
		Software Licenses	15.00	16.12	0.35	16.12
		Communication Network Infrastructure at DC and office locations	4.98	3.51	0.55	3.43
		Mini SCADA Implementation (20 nos ODSSP & 10 nos Old PSS)	2.55	2.33	0.21	1.36
		GIS Implementation for One Division	3.00	9.18	0.57	9.14
		Smart Metering Infrastructure (HES & MDM on 4G/ NBIOT Communication)	10.50	7.28	0.39	7.28
		Call Center Implementation (System & Infrastructure)	5.00	1.08	0.35	1.08

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	Civil Infrastructure (Office Buildings, Meter Test Lab, Customer Care center, Records Rooms, Power System Control)	17.30	19.32	1.76	19.15
	Establishment of DT workshop	3.60	0.07	0.00	0.07
	High mast light in the Center store	0.75	0.70	0.00	0.70
	Assets for Offices	5.23	3.41	1.29	3.27
	Building shed for material storage with racking system	3.25	0.61	2.15	0.45
	Total (5)	97.88	89.19	7.71	87.53
Grand Total (1+2+3+4+5)		258.78	230.00	24.31	205.41

7.2 Capex Status FY 22-23 as on 30th Nov-2022

S. No.	Major Category	Activity	Amount approved by Hon'ble OERC in 22-23	Capex expenditure	Commitment	Capitalised as on 31 March 23
1	Statutory & Safety	Fencing of Distribution substations	2.34	10.67	1.26	9.73
		Boundary wall for Primary substations	3.96	2.90	0.00	2.89
		Development of training infrastructure for safety & strengthening of LOTO system	3.05	2.99	0.49	2.43
		Total (1)	9.35	16.56	1.75	15.05
2	Loss Reduction	Installation of AMR meters at Distribution transformers.	4.5	3.86	0.57	1.11
		Conversion of LT Bare conductor to AB Cable	4.93	5.88	0.22	5.04
		Meters and metering equipment for energy audit	1.19	0.52	0.70	0.14
		Equipment for Meter data downloading	0.46	0.33	0.00	0.33
		Equipment for AMR enablement of 3 phase consumer meters	0.45	0.00	0.00	0.00
		Field Testing equipment - Metering (Portable Calibrator)	1	0.53	0.00	0.53

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		Total (2)	12.53	11.11	1.49	7.13
3	Reliability	Refurbishment of 33KV/11KV Primary Substation (PSS)	10.00	10.15	2.21	5.40
		33 KV Conductor up gradation	11.20	10.79	2.72	5.01
		11 KV Conductor up gradation	8.80	8.57	2.80	6.92
		Refurbishment of 11KV/0.415 KV Distribution Substation (DSS)	2.40	4.06	2.22	1.64
		Installation of LV protection at DSS	5.54	3.15	2.42	0.80
		Installation of Auto reclosure / Sectionalizers ,RMUs, &FPIs	10.60	9.39	1.70	5.83
		33KVand 11 Kv Voltage Regulators for voltage improvement	4.20	1.78	0.16	0.18
		LT FLC System - Vehicle Fitted (5 Nos. -- 1 for each circle) + Power Analyser for Transformer workshop (2 Nos.) +Ultrasound Scanner (5 Nos. -- 1 for each circle)	3.52	0.68	2.50	0.68
		Installation of station transformers (PPS)	2.55	0.62	0.26	0.39
		Capacitor Bank at PSS for low voltage improvement	0.88	0.12	0.00	0.00
		Earthing of Power Transformers and Distribution Transformers	0.49	0.51	1.24	0.28
		Total (3)	60.18	49.82	18.23	27.13
		4	Load Growth	Augmentation Power Transformers	4.98	6.56
Augmentation of Distribution Transformers	20.81			14.50	6.85	6.29
Addition of LT lines	13.66			8.89	3.55	4.67
Addition of 11 kV Lines (O/H and U/G)	16.98			16.65	0.94	15.59
Addition of 33 kV Overhead Lines (O/H and U/G)	10.87			7.97	2.80	2.35
Addition of New PTR and DTRs along with Associated HT/LT lines	15.58			30.59	1.34	25.52
Provision for Nua Balasore Project	10			2.30	0.39	1.43

Detailed Project Report Capex Plan FY 23-24

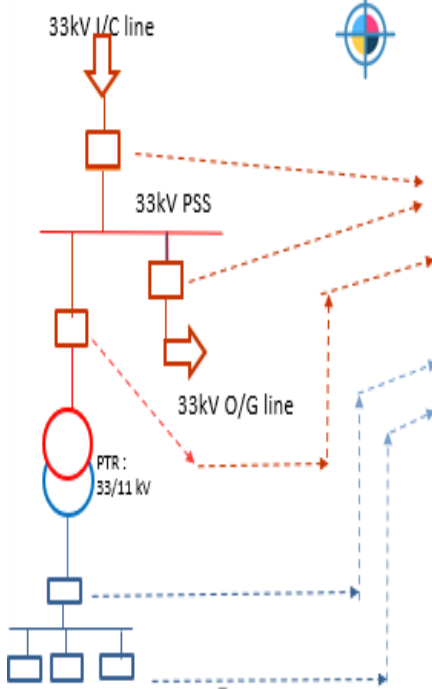
		Vehicle for the Capex related work		0.07	0.00	0.00
		Total	92.88	87.54	15.87	62.37
5	Technology & Civil Infrastructure	DC Hardware	10.33	4.22	0.14	4.22
		Software Licenses for IT Application	12.66	9.17	7.10	9.17
		End computing devices	8.96	6.10	0.00	6.10
		Cyber Security	1.2	0.00	0.00	0.00
		Automation of non ODSSP PSS	7.66	7.08	0.53	2.52
		SCADA-ADMS	9.05	10.81	4.81	10.80
		GIS Software Implementation and Land Base & Network Survey & Digitization for Balasore & Jajpur Circle	17.94	7.84	11.02	7.74
		Civil Infrastructure (Office Buildings , PSS, Stores, Approach Roads, Record room , Cafeteria Canteen , MRT office and others)	25.12	25.02	6.46	23.15
		Security cameras and heavy duty Racking system / Storage solutions for the store	0.96	0.00	0.70	0.00
		Offices Equipment	3.93	1.48	0.72	1.48
			Total (5)	97.81	71.71	31.48
6	Desater Mitigation	Conversion of 2nos PSS from AIS to GIS	20.40	0.00	0.00	0.00
		Conversion pole mounted DTR to plinth mounted (100 KVA and above)	3.52	1.80	1.73	1.18
		Height enhancement of the lines at river crossing	4.50	1.46	2.02	1.14
		Strengthening of poles in the cyclone prone area	2.40	1.05	0.46	0.60
		Trolley Mounted Pad Substations	1.17	0.00	0.00	0.00
		Overhead to Underground conversion for Major City	20.00	6.26	2.21	3.79
		Emergency Preparedness (Life boat and other emergency accessories)	1.80	0.00	0.16	0.00
			Total (6)	53.79	10.57	6.58
Grand Total (1+2+3+4+5+6)			326.54	247.31	75.40	183.57

Status of Theme:

Theme -1: Mitigation of Non functional VCBs

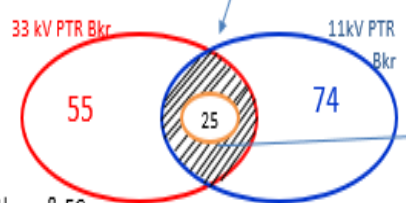
Network Protection: Plan & Status of Mitigation of Non functional VCBs

Key Focus Area: making 33 /11 kV Breakers 100 % Functional



Breaker description	Total in TPNODL System (Nos)	Nos of VCB not working/ not available	Planned in FY22/Actual	Planned in FY23/Actual	Planned in FY24
33 kV I/C, /OG Bkr	388	36/29			
33 kV PTR Bkr	513	55/22	32/8	58/71	52
Sub total 33 kV Bkrs	836	91/51=142			
11kV PTR Bkr	513	74+17=91			
11 kV OG Bkr	830	101+32(EC)=133	32/11	87/107	105
Sub total 11 kV Bkrs	1343	224			

Priority segment For Bkr replacement
 PTRs where both 33 kV as well as 11 kV Bkrs are not working



Plan	Actual
25	25

Breaker replacement program with following objectives to be achieved by 2024:

- ✓ All 33 kV Bkrs will be 100 % functional by 30th Apr-24.
- ✓ All 11 kV Bkrs will be 100 % functional by 30th Sep-24.
- ✓ VCB's added for additional PTR where single PTR were there & EC (Elephant Corridor) bay extension works.

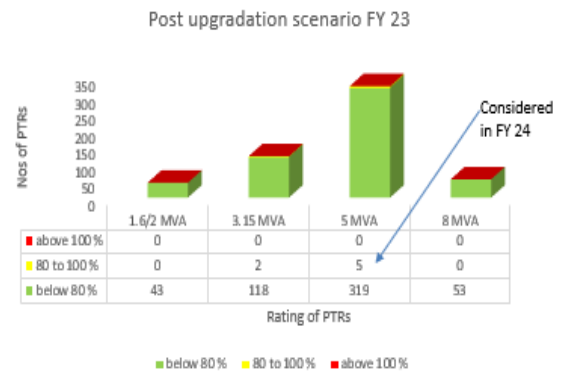
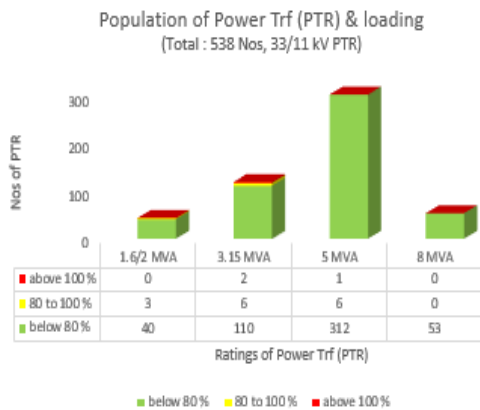
Detailed Project Report Capex Plan FY 23-24

Theme -2: Mitigation of Overloading of Power Transformers

- TPNODL has 239 Nos of PSS having 538 Nos of PTRs. PSS audit reveals 7 nos of PTRs are loaded beyond 80 % and 7 PSS having single PTR- non compliance to N-1 criteria.
- To mitigate above, TPNODL have initiated PTR upgradation program with following objectives to be achieved by 2023:
 - ✓ No 5 MVA PTR will be above 90 % of loading
 - ✓ No 3.15 MVA PTR will be above 80% of loading
 - ✓ No 1.6 MVA PTR will be above 80% loading
 - ✓ All PSS will have N-1 reliability at PTR level
- Higher capacity PTRs will be infused to augment overloaded lower capacity PTRs which will be redeployed for augmentation of further lower size PTR further.
- Spare PTRs will be kept as stand by as disaster mitigation reserve.
- PTR will be added to PSS having Single PTR

Updated status of PTR augmentation				
Capex FY	Description	Plan (no of PTR)	Actual (till Mar-23)	Remarks
FY 21-22	5MVA to 8 MVA (new)	9	9	2 return to store and 3 nos has been installed at addition for N-1
	3.15 MVA to 5 MVA (redeployment)	9	4	
	2 MVA to 3.1 MVA (redeployment)	1	0	
	1.6 MVA to 3.15 MVA (redeployment)	4	3	
FY 22-23	8 MVA to 12.5 MVA (new)	2	0	Not procured due to budget
	5MVA to 8 MVA (new)	5	5	
	3.15 MVA to 5 MVA (redeployment)	5	4	1 No. return to store due to poor/ faulty condition

Loading of 5 Nos of 5 MVA and 2 Nos 3.15 MVA will be reduced below 80% by March 23



Theme -3: Length Reduction of Long 33 kV Feeders –

Sl. No	Name of Circle	Nos of Feeders	Feeders > 50 kms	Mitigation Plan Proposed	Remarks
1	Balasore	26	1	1	1. New link line from Agarpada GSS to Kupari PSS Proposed in ODSSP-IV Scheme for mitigation of Khaira feeder. (WIP)*
2	Bhadrak	10	2	2	1. Proposal of Basudevpur feeder considered in Capex FY 22-23 from Balimunda GSS. (Line construction complete, charging subject to GSS commissioning) * 2. Chandabali GSS to Dhamra PSS Line under ODSSP - IV Scheme. (WIP)*

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Sl. No	Name of Circle	Nos of Feeders	Feeders > 50 kms	Mitigation Plan Proposed	Remarks
3	Baripada	19	3	3	<p>1. New 7.5 kms line proposal from Karanjia GSS to Saharpada PSS for Karanjia feeder taken in Capex 22-23. (WIP)*</p> <p>2. New line of 27.1 kms from Karanjia GSS to Joshipur PSS for Joshipur feeder taken. (Proposed under ODSSP-IV Scheme) *</p> <p>3. Link line from Baripada GSS to Kalabadia PSS for New Bangiriposi feeder mitigation. (WIP)*</p>
4	Jajpur	12	1	1	1. Link line Planned from New Duburi grid for Sukinda Feeder. (WIP)*
5	Keonjhar	21	3	3	<p>100% completed.</p> <p>The following 3 schemes →</p> <p>1. New Link Line from Tikira GSS (Keonjhar No-1 feeder mitigation).</p> <p>2. New line from Telkoi GSS (Judia feeder mitigation).</p> <p>3. New line for bifurcation into 29 and 46 kms feeder respectively. (Remuli Fdr mitigation)</p>
TOTAL		88	10	10	*Estimated Completion 31stMarch,23

Glimpse of the project expected at site: -



Safety Tools



PPE's for all BA Employees



Practice Yard



Safety Practice Yard



Porta cabin for Safety Training



Inside Porta Cabin



Practice Yard



DTR Boundary Wall



DTR Chainlink Fencing



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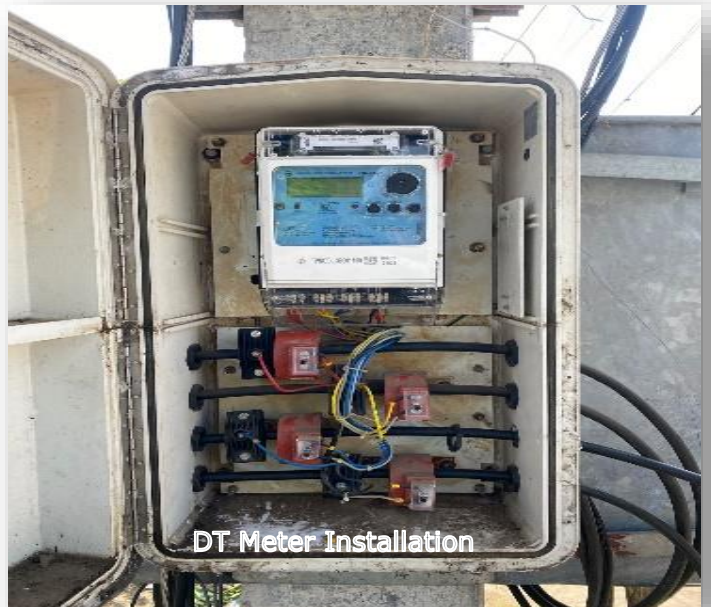
Bare to AB Conversion



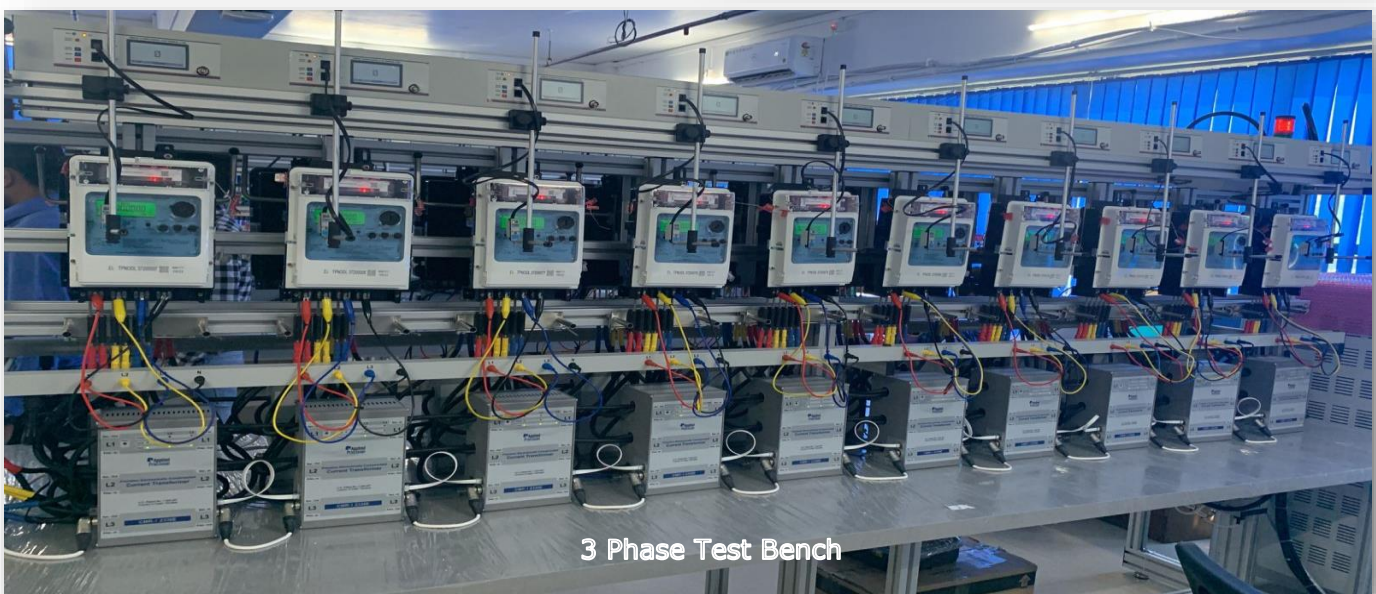
Feeder Meter Installation



Feeder Meter Installation



DT Meter Installation



3 Phase Test Bench



Meter Test Lab



33kV RMU Installation



PTR Upgradation

Detailed Project Report Capex Plan FY 23-24



Station Transformer Installation



RTU Installation



Panel Installation



PTR Upgradation



11 KV LV Protection



33 KV Line Upgradation

Detailed Project Report Capex Plan FY 23-24



11 KV RMU



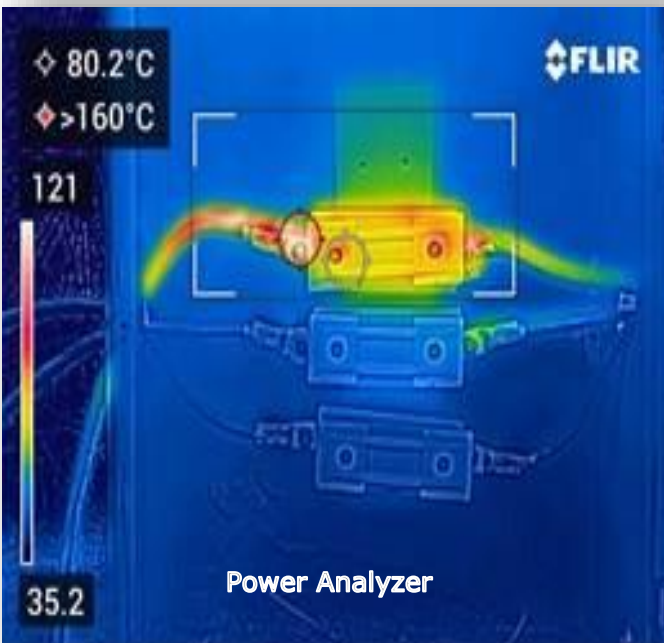
Volatage Regulator Installation



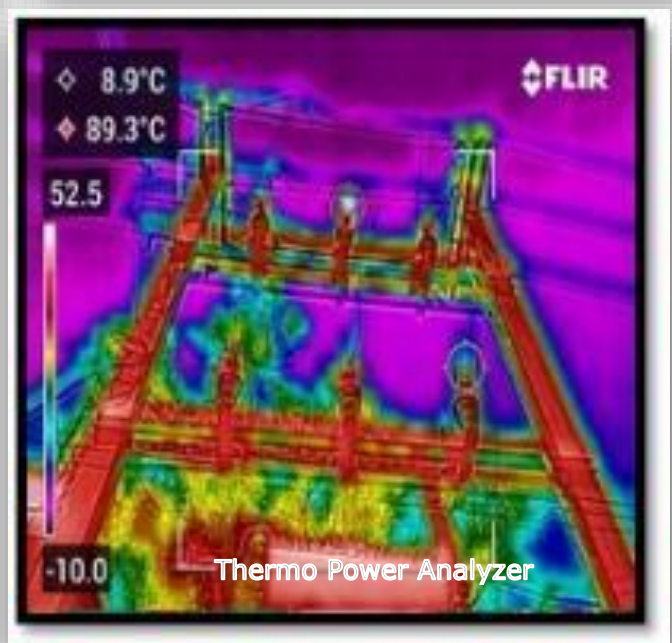
Power Control Centre



FLC Van



Power Analyzer



Thermo Power Analyzer

Division offices / Section offices / PSS



Sujanpur PSS, KUED



Ragadi PSS, JRED



Sukinda PSS, JRED



8. Proposed CAPEX Plan for FY 23-24:

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 centres 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
- 6) Reduction of carbon foot print

TPNODL proposes Capital Expenditure of INR 452.8 Crores. For FY 23-24 to carry out various activities under 6 major categories.

S. No.	Major Category	Activity	Amount in Cr.	Annexure
1	Statutory & Safety	Fencing of Distribution Substations	11.55	Annexure-3
		Boundary wall work at Primary Substations	10.73	Annexure-4
		Life enhancement of network and maintaining safe horizontal / vertical clearances	8.43	Annexure-5
		Yard Fencing with in PSS	0.98	Annexure-6
		Fire Extinguisher & Water Hydrant System for Jajpur Store	2.09	Annexure-7
		Fire wall for PTR "6Mtr*8Mtr"	1.14	Annexure-8
		Defective cable replacement	10	Annexure-9
		Shifting of O/H lines on safety ground on public request	4.34	Annexure-10
		Intrusion system for theft prevention is store	0.15	Annexure-11
Total (1)			49.41	
2	Loss Reduction	Testing equipment for Meter, Meter Reading, HT/LT Accucheck& other material.	5.91	Annexure-12
		Conversion of LT Bare conductor toAB Cable	43.35	Annexure-13
		Meters and metering equipment for energy audit	2.83	Annexure-14
		Equipment for AMR enablement of 3phase consumer meters	0.56	Annexure-15
		Field Testing equipment (PTR testing, PQ analyzer, Switch gear testing kit)	3.96	Annexure-16
Total (2)			56.61	
3	Reliability	Replacement/Addition of network component in 33/11kV Primary Substation	10.18	Annexure-17
		11 KV Conductor up gradation	15.07	Annexure-18
		Refurbishment of 11KV/0.415 KV Distribution Substation (DSS)	3.11	Annexure-19

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S. No.	Major Category	Activity	Amount in Cr.	Annexure
		Installation of LV protection at DSS	33.38	Annexure-20
		Installation of Auto reclosure /Sectionalizers, RMUs	7.52	Annexure-21
		Installation of FPIs for O/H Lines	1.86	Annexure-22
		Installation of AB Switch, HG Fuse & LA for DTRs	25.47	Annexure-23
		11 KV Voltage Regulators for voltage improvement	5.01	Annexure-24
		Installation of Station Transformers(PPS)	0.72	Annexure-25
		Procurement of spares and servicing for ODSSP & IPDS	1.45	Annexure-26
		Earthing of Transformer	14.29	Annexure-27
Total (3)			118.06	
4	Network Optimisation & Load Growth	Augmentation of Power Transformer	2.60	Annexure-28
		Augmentation of Distribution Transformer	24.57	Annexure-29
		Addition of 11 kV Lines (O/H and U/G)	24.12	Annexure-30
		Addition of 33 kV Overhead Lines(O/H and U/G)	9.80	Annexure-31
		Addition of New PTR at PSS	5.08	Annexure-32
		Addition New DTRs along with Associated HT/LT lines	17.37	Annexure-33
		New 33/11kV PSS with Associated Lines	18.60	Annexure-34
Total (4)			102.14	
5	Technology and Civil Infrastructure	Security cameras, heavy-duty Racking system / Storage solutions for Jajpur store	1.5	Annexure-35
		Civil Infrastructure (Office Buildings, PSS, Stores, Approach Roads, Record room, Cafeteria Canteen, MRT office, STS office, STS Lab and others)	29.68	Annexure-36
		Office Administration	5.75	Annexure-37
		Automation of Non-ODSSP & SCADA Interigation	12.00	Annexure-38
		Bluetooth printer, cash drop box, RRG App	0.88	Annexure-39
		Data Recovery (DR) for Hardware Equipment	16.82	Annexure-40
		Data Center (DC) for Hardware Equipment	3.50	Annexure-41
		End computing devices	0.75	Annexure-42
		Cyber Security	7.70	Annexure-43
		Communication	4.01	Annexure-44
		SCADA-ADMS, Computing devices	10.10	Annexure-45
		GIS Software Implementation and Land Base & Network Survey & Digitization for 9 Division	27.86	Annexure-46
		Software and Application	0.75	Annexure-47
Drones and its licence	0.30	Annexure-48		
Total (5)			121.60	
6	Reducing Carbon Footprint	Budget for Electric Scooter/Car	3.99	Annexure-49
		Rooftop Solar System on office building (Solar Roof top system (Corp office , circle offices , Balasore Store)	0.99	Annexure-50
Total (6)			4.98	
Grand Total = 1+2+3+4+5+6			452.80	

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The Company has completed detailed Network studies for all the 5 circles through M/s PRDC, and M/s TPDDL and Inhouse team with five-year load growth scenario. Based on the outcome of the studies, the following business imperatives have been identified to be addressed through the Capex Investments of **Rs. 452.8 Cr.** during the year FY 23-24 under 6 major categories

Note: The Grand Total cost is exclusive of capitalizable Project Employee Cost and calculated Interest during Construction (IDC).

For each of the above major categories, the investment has been further detailed below:

8.1 Statutory & safety:

8.1.1 Installation / Construction of Plinth fencing for DSS, Boundary wall for PSS & Yard Fencing with in 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 705 numbers of locations are being proposed for carrying out Fencing of DSS & 6376 meters of Boundary wall at PSS.

Detailed cost estimates for Fencing & Boundary Wall are attached in annexure No. 3 & 4.

Circle wise Requirement of Fencing of DSS:

Circle Name	No of Divisions	Total no of 3 phase DT >100 KVA	DSS Fencing to be considered in FY23-24(Nos.)	Unit Cost for each DSS Fencing (in Rs)	Total Cost for DSS Fencing (in Crore)
Balasore	5	3360	270	163775.2	4.42
Bhadrak	2	1389	120		1.97
Baripada	3	1063	120		1.97
Jajpur	3	1754	70		1.15
Keonjhar	3	858	125		2.05
Total	16	8424	705		11.55

Circle wise Requirement of Boundary wall for PSS:

Circle Name	No of Divisions	No of PSS considered for boundary wall	Total quantity considered in FY23-24 (in meters)	Unit Cost for per meter Boundary wall for PSS in Rs.	xxTotal Cost for PSS Boundary wall (in Crore)
Balasore	5	3	3044	16830	5.12
Bhadrak	2	3	634		1.07
Baripada	3	2	1034		1.74
Jajpur	3	2	634		1.07
Keonjhar	3	2	1030		1.73
Total	16	12	6376		10.73

8.1.2 Fire Extinguisher & Water Hydrant System for office at Jajpur Store:

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.

8.1.3 Fire wall for PTRs:

TPNODL has 239 nos of PSS with 538 nos power transformers of 1.0 MVA 1.6 MVA, 2 MVA, 3.15 MVA, 5 MVA, 7.5 MVA 8 MVA, 10 MVA and 12.5 MVA. As per CEA regulation and IS 1646 fire wall require to be constructed between two PTRs in the following conditions

Transformers and equipment installed outdoors, having an individual or aggregate oil content of 2,000 litres or more shall be located in a suitably fenced and locked enclosure separated on all sides by at least 6 m from any building including substation. Separating walls are necessary between transformers having an individual or aggregate oil content of 2,000 litres.

Recently EI has visited one of our PSS he has also advised to installed the fire wall between the 2 transformers where applicable.

Presently almost all the PTR are without the fire wall. So, to start with TPNODL is proposing the 30 Nos of firewall in the proposed DPR

8.1.4 Shifting of O/H lines on safety ground on public request:

TPNODL is in receipt of requests from local residents for shifting of Over Head lines from their area. It is generally observed that in such cases, residential houses have been constructed in the Right of Way (ROW) of the 33 kV Lines. As a result, the residential houses are below the OH lines or very close to the Lines creating unsafe situation. Generally, shifting of lines in such scenario can be undertaken by recovering suitable shifting charges from customer. However, there are few cases where multiple consumers, under one line have requested for shifting the same through legislative representative.

In one of such cases from Balasore area, about 15.0 km of line section of 33 kV Feeder Odangi is identified for shifting based on representation from public representative. It is proposed to install 15 km of 33 kV line through new route requiring the capex of Rs 4.34 Crs to cater to the said request for shifting the existing line.

SI No	Circle	Volatge level	Feeder name	Length in km	Ref
1	Balasore	33kV	Odnagi	15.0	Public request by area MLA

TPNODL continues to receive multiple requests from individual consumers for shifting the Lines / DTRs from vicinity of their premises and such requests will be served only after recovering the shifting charges. However, based on scale of shifting involved and general public safety at large, specific cases shall be considered under capex through approval from Honorable Commission.

8.1.5 Defective cable replacement:

During the meter replacement activity, it has been observed that the existing service line of the most of the meters are very old and having multiple joints specially in govt connections like hospitals, govt school, govt offices, etc. At many locations these joints are necked and assessable to the consumer/public, which may be the safety risk to the consumer or general public.

So, for the eliminations of the safety risk the replacement of damaged service line proposed for replacement as and when required.

8.1.6 CAPEX requirement for Statutory & Safety:

Considering the vast geography involved leading to very high requirement of investment to make the network fully compliant to safety and statutory standards, TPNODL has proposed to attend the deficiencies on priority basis based on criticality of locations. Table below indicates the activities to be performed along with funds required under Statutory and Safety Head.

S. No.	Major Category	Activity	Amount in Cr.	Annexure
1	Statutory & Safety	Fencing of Distribution Substations	11.55	Annexure-3
		Boundary wall work at Primary Substations	10.73	Annexure-4
		Life enhancement of network and maintaining safe horizontal / vertical clearances	8.43	Annexure-5
		Yard Fencing with in PSS	0.98	Annexure-6
		Fire Extinguisher & Water Hydrant System for Jajpur Store	2.09	Annexure-7
		Fire wall for PTR "6Mtr*8Mtr"	1.14	Annexure-8
		Defective cable replacement	10.00	Annexure-9
		Shifting of O/H lines on safety ground on public request	4.34	Annexure-10
		Intrusion system for theft prevention is store	0.15	Annexure-11
Total (1)			49.41	

8.2 Loss Reduction:

During site inspections, energy meters were not found at consumer's premises which were energized under Soubhagya 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:

- Testing equipment for Meter, Meter Reading, HT/LT Accucheck & other material.
- Conversion of LT Bare conductor to AB Cable.
- Meters and metering equipment for energy audit.
- Equipment for AMR enablement of 3phase consumer meters.
- Field Testing equipment (PTR testing, PQ analyser, Switch gear testing kit).

8.2.1 Testing equipment for Meter, Meter Reading, HT/LT Accucheck, Meter test bench & other material

Meter testing equipment are required to ensure the statutory guidelines of testing of meters in field and to address the meter testing against consumer request for fast/faulty meter.

As per the guideline of OERC supply code, Clause No. 111(iii) *"The licensee/supplier shall also conduct periodical inspection/testing of the meters at site as per the following schedule or earlier":*

- (a) *Single phase meters at least once every five years*
- (b) *LT three phase meters at least once every three years*
- (c) *HT/EHT meters including MDI at least once a year*

To ensure high quality in bulk supply of meters, TPNODL has estimated that meter testing lab has to be developed in Jajpur Circle. This lab will ensure the statutory requirement of meter testing in pan TPNODL.

As per the clause no. 102 (d) of OERC Supply code *"The licensee/supplier shall set up appropriate number of accredited testing laboratories or utilize the services of other accredited*

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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”.

Below mentioned testing equipment are required to be procured in addition to facilities already available.

S No.	Item Description	Unit	Quantity
1	Android Mobile for BLE Meter reading	EA	50
2	Desktop for Dumping of Meter data	EA	10.00
3	Drone	EA	5
4	HT Accucheck	EA	5.00
5	Phantom Load for site testing	EA	10
6	1 Ph Accucheck	EA	55
7	1 Ph & 3 Ph Portable Calibrator (Up to 120A, 0.05 Class)	EA	2
8	AC Magnet (0.2 T, 10 MT), DC Magnet 0.2 T & 0.27 T	EA	2
9	Control Panel for AC & DC Magnet	EA	1
10	Digital Clamp-on Meter	EA	51
11	4 Chanel Oscilloscope with Differential Voltage & Current Probe	EA	1
12	HV Tester for 1Ph & 3Ph meter with Jig	EA	1
13	Red Phase Instrument	EA	6
14	Gauss Meter	EA	1
15	20 position test bench for single phase meter	EA	2
16	20 position test bench for three phase meter	EA	1
17	Temperature and Humidity meter	EA	2.00
18	RS232 to USB converter	EA	8
19	IR Tester	EA	1
20	Variable heat control Soldering Iron	EA	2
21	Differential cost of 1 Ph smart meter vs rent	EA	34000

8.2.2 Conversion of LT Bare conductor to AB Cable.

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.

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 conductor are more prone to hooking result into 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 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 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 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.

8.2.3 Meters and metering equipment for energy audit

The energy meters installed at the exchange points i.e. all 33 kV feeders emanating from the OPTCL are metered and properly accounted. The energy accounting losses at the exchange level are reduced to acceptable level by ensuring 100% installation of utility meters for 33 kV feeders at the OPTCL also by the correction of the defective wiring. Moreover, 33 kV PSS feeder and 11 kV feeder metering revival is in progress by the replacement of the burnt, defective meters and installation of new meters at the no meter cases. Till now out of 817 Feeder 11 kV feeder meters we have replaced 228 meters and for 33 kV 78 Nos of meters installed against the 214 Nos. of 33 kV Feeders. There are more than 300 meters which are old and out of warranty period. We need to replace them with the upgraded technology meters and are communicable with the AMR. There are around more than 500 meters which are required to be installed for group metering and transformer side metering.

Following the BEE guidelines, it is mandatory to have 100% feeder metering by next financial year. Hence, the aforesaid activity is very critical for the DISCOM to comply the feeder metering status as per the BEE targeted timelines so that feeder wise energy audit can be carried out

Considering the above it is proposed to install 500 nos. meter for 33 kV & 11 kV Feeder metering so that energy audit can be carried out.

8.2.4 Equipment for AMR enablement of 3phase consumer meters

As per the mandate by the BEE, the meters should be communicable and energy audit to be carried out for each 33 kV, 11 kV, DT meters & Consumer meter. Hence to collect such bulk data and carryout the energy audit for the feeders/DT, in time bound manner

a technological intervention is required. Hence AMR solutions proposed to install on the 33kV, 11 kV, DT meters & Consumer meter. For this financial year we have procured 1,000 AMR & 1,000 SIM Card are proposed for installation. The proposed AMR will offer multiple benefits to the TPNODL as well as consumers. This will improve revenue cycle of the company. 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.

S. No	Activity	Qty	Unit
1	AMR enablement of 3 phase consumer meters	1,000	EA
2	SIM Card	1,000	EA

8.2.5 Field Testing Equipment

In any power utility, the condition monitoring and testing of electrical asset plays a vital role in health assessment of electrical equipment. This helps in identification of equipment under risk, indicates decreasing performance and upcoming failure. The monitoring plan of identified under risk critical equipment, overhauling & replacement plans shall be prepared based on outcome of condition monitoring and test results. Implementation of this plan will improve the Sub transmission network reliability and reduction in equipment failure.

Objective:

- To establish a documented approach for condition monitoring and Testing
- To provide guidelines for methodology, permissible limits and frequency for condition monitoring and testing of electrical equipment at Primary Substation (PSS)
- To establish standardised practices across all operating circles
- Improve safety by eliminating the hazards associated with equipment under risk
- To establish process for equipment replacement based on test results and condition rather than age of assets
- To reduce the risk of failure through proactive condition monitoring / assessment thus ensuring reliable operation and reduced forced outages
- To support maintenance and testing engineers to ensure better asset management.

Scope:

- a. All condition monitoring activities including testing are considered except daily / hourly station round.
- b. Following electrical equipment at Primary Substations (PSS) and 33 kV lines are considered in this document:
 - 33 kV / 11 kV Power Transformer (1.6 MVA to 12.5 MVA rating)
 - 33 kV & 11 kV Outdoor / Indoor Circuit Breaker
 - 33 kV & 11 kV Ring Main Unit (RMU)
 - 33 kV & 11 kV CT / PT
 - Surge Arrestor
 - Control and Protection Relay System
 - Substation Earthing System
 - Station DC System

Following references are considered while formulating these guidelines:

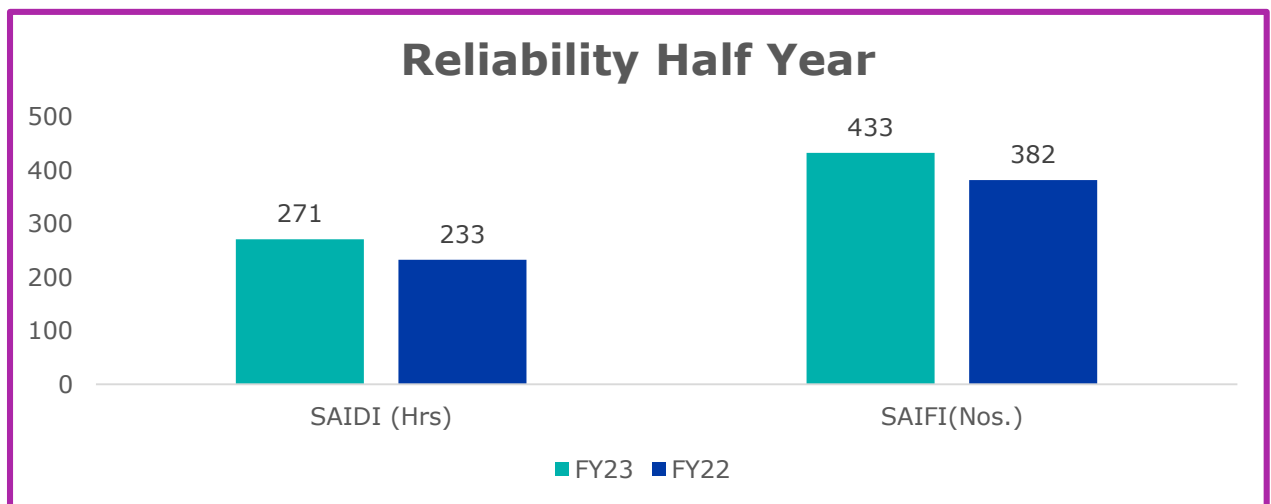
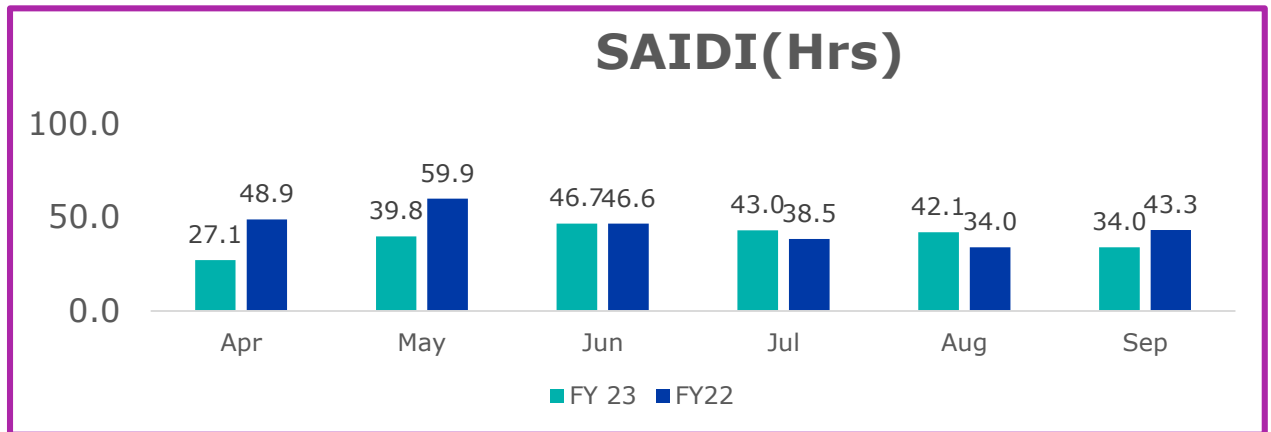
- Tata power's current Condition Monitoring and Testing practices
- Relevant IS / IEC / IEEE standards and CBIP guidelines
- Fault level and no. of electrical faults
- Constraints in site resources / test instruments and maintenance tools etc.
- Dependency on OEM / Service providers

8.2.6 CAPEX requirement for AT&C Loss Reduction

S. No.	Major Category	Activity	Amount in Cr.	Annexure
2	Loss Reduction	Testing equipment for Meter, Meter Reading, HT/LT Accucheck& other material.	5.91	Annexure-12
		Conversion of LT Bare conductor to AB Cable	43.35	Annexure-13
		Meters and metering equipment for energy audit	2.83	Annexure-14
		Equipment for AMR enablement of 3phase consumer meters	0.56	Annexure-15
		Field Testing equipment (PTR testing, PQ analyzer, Switch gear testing kit)	3.96	Annexure-16
Total (2)			56.61	

8.3 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. Below graphs show the comparison of SAIDI and SAIFI



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 Reclosers & 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.

8.3.1 Replacement / Addition of network component in 33/11kV Primary Substation (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 faulty 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, 65 sets of Battery and 50 nos Battery chargers are proposed to be replaced.

8.3.2 33 kV & 11 kV Network Refurbishment / Conductor upgradation:

33kV or 11kV feeders are important asset for a distribution utility which connects various substations and provide power to end consumers. TPNODL has 3007 Ckt. KMs of 33kV and 38339.1 Ckt. KMs of 11kV feeders under its operational area. Besides, 67117.3 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.

Based on the load flow studies, we have identified new line installation. Detail load flow studies have been carried out in this regard and same can be refer to “**Annexure – 51**”.

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. Restrunging of conductor to increase the vertical clearance by reducing the sag.
6. Replacement of the conductor in the sections having multiple joints.
7. Replacement of weak Jumpers and connections.
8. Replacement of binding wire joints with wedge connector to remove hotspots.
9. Installation of Danger boards, Anti climbing devices, stay sets etc. to ensure safety & statutory compliance.

8.3.3 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 Aluminium 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.

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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.

S.No	Description	UOM	Unit Rate	Quantity Considered in this FY 23-24 (Nos.)	Amount
					(in Crores)
1	100 KVA DSS	EA	0.027	50	1.36
2	250 KVA DSS	EA	0.031	45	1.38
3	500 KVA DSS	EA	0.031	12	0.38
Total				107	3.11

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.

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- 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.

8.3.4 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, ACB on 250 KVA & 500 KVA Distribution Substations.

S.No	Description	UOM	Unit Rate	Quantity Considered in this FY 23-24 (Nos.)	Amount
					(in Crores)
1	Supply and Installation of MCCB-100 KVA	EA	0.007	4388	30.56
2	Supply and Installation of ACB -250 KVA	EA	0.011	108	1.15
3	Supply and Installation of ACB-500/315 KVA	EA	0.018	93	1.67
Total				4589	33.38

8.3.5 Installation of Auto-recloser / Sectionalizers, RMUs & FPIs:

Auto-recloser 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

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primary substation affects the supply of consumers connected on all 11kV feeders controlled from that breaker. To improve reliability of power supply at such substations, installation of Auto-recloser, Sectionalizers, Ring Main Units (RMU) and FPIs is being proposed in phase manner. In this year, a total of 10 numbers of Auto recloser / Sectionalizer have been proposed for installation.

TPNODL is also planning to install 50 numbers of RMUs to improve reliability. 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 this year, 1002 sets of FPIs are proposed for installation.

S.No	Description	UOM	Quantity	Unit Rate	Amount (INR)
1	Supply & Installation Auto Recloser/ Sectionalizer	Nos	10	0.133	1.33
3	Supply & Installation RMU 4 way O/D at 11 KV	Nos	10	0.128	1.28
4	Supply & Installation RMU 3 way O/D at 11 KV	Nos	10	0.121	1.21
5	Supply & Installation RMU 1 Way O/D at 11 KV	Nos	25	0.068	1.70
6	Supply & Installation RMU 4 way O/D at 33 KV	Nos	5	0.399	2.00
7	Supply & Installation FPI for OH Lines	set of 3	1002	0.002	1.86
Total					9.38

Benefits

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

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

8.3.6 11 KV Voltage Regulators for voltage improvement

TPNODL has 37296 CKT Km. of 11 kV line to serve electricity in five circles of northern region of Odisha Namely Balasore, Bhadrak, Baripada, Jajpur & Keonjhar. The average total length of 11kV lines is 55 Circuit Km. Even the longest 11 kV line has the total length of 325Km. The high distribution line losses cause severe voltage dip at the Fag-end of the line. The lowest fag end voltage seen on 11kV line ranging from 8kV to 10kV.

Drawbacks of existing system:

Length of 11kV distribution lines feeding to industrial areas are taken care by industries itself using capacitor banks (Voltage regulator) but actually these are very less. Rest

of maximum lines are feeding domestic and agriculture loads having huge number of complaints regarding poor quality of power supply & low reliability.

Some of significant consequences of poor voltage profiles faced by the end user – increased current for constant power loads, redistribution of the existing loads, technical problems (T&D Losses) in DTRs, improper behaviour of consumer loads, cumulative line losses and supply interruption which leads to higher AT&C losses.

Solution:

To overcome the stated challenges & improve upon the voltage profile and quality of power supply, advance power system equipment - Automatic voltage regulators (Power distribution voltage regulators) are required. Simply because, it is not feasible everywhere to shorten the long length of the existing feeder in between & to install a new transformer along with a new feeder specially looking into the huge operational areas & mostly rural. Here the voltage regulator can solve the purpose of booting up the voltage even at the far end where low voltage issues occur.

The voltage regulator takes an incoming voltage that varies with load conditions and maintains a constant output voltage. This helps improve power quality as voltage at the receiving end is maintained constant amidst varying demand, increasing longevity of all load equipment. These regulators can improve the utility's return on investment by reducing line losses and increasing equipment life.

A power distribution voltage regulator is an auto transformer that is able to add or subtract voltage to provide consistent system voltage levels. A voltage regulator control senses system voltage and commands the tap changer to operate when voltage changes are needed. The tap changer operation changes the configuration of the auto transformer coil resulting in a change in the voltage.

Construction

Voltage regulators are constructed from three basic parts:

- **Autotransformer:** A transformer with part of one winding common to both the primary and secondary windings.
- **Load tap changer:** The switch is designed to work under load to change the configuration of a transformer coil, providing greater regulator versatility.
- **Voltage regulator control:** The control senses the system and automatically commands the tap changer.

Features



Figure 1: Voltage regulator installed in Bhadrak

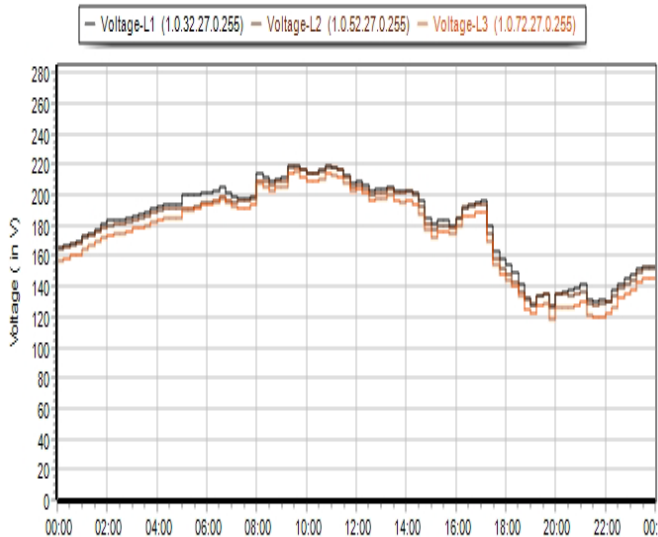
- Can operate up to 2 million mechanical operations (Tap Changer operations)
- 20 years' maintenance free operation
- Inbuilt superior internal arrester provides optimum surge protection against abnormal voltage surges
- Fast response time for voltage correction in fractions of seconds
- The typical voltage regulators available in the power range of 250 to 5000KVA per phase.
- 11kV voltage regulators maintains output voltage 11kV even in input voltage ranging from 8kV to 12kV.



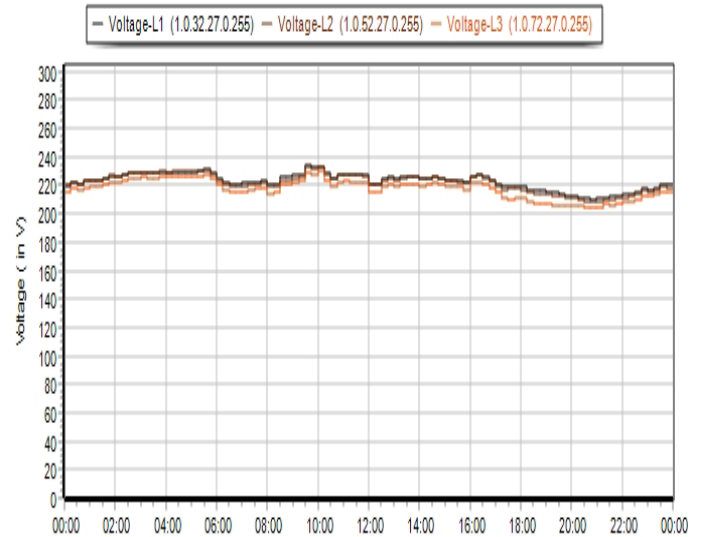
Figure 2: Pole mounted voltage regulator

Benefits

- Avoid the necessity of redistribution the loads on the phases, cable changes or construction of new substations.
- Reduction of the energy interruption rate due to inappropriate voltage level.
- Improvements of the utilities gains due to the continuous supply of energy.
- Proper behaviours of the loads for example: motors, irrigation systems, illumination and electronic loads.
- Better quality and reliability on the utility service.
- Improvement of the voltage levels results on better load power factor and reduction of the energy cost.



Voltage Profile of consumer Before Voltage regulator



Voltage Profile of consumer After Voltage regulator

In FY 23-24 TPNODL has proposed to install 29 Nos. of 11 KV voltage regulators at strategic location just to improve upon voltage profile & quality.

Sr. no	Material	Quantity		UOM
1	11KV Voltage Regulator	29		Nos

8.3.7 Installation of station transformer:

Station Transformer supply the total 'station' load (due to outage of the other station transformer) as well as supply the starting load of a PSS. Supply its proportion of the station load. During the PSS survey it has been gathered that in 8 nos of substations station transformer has not been installed.

So, it is proposed to installed 8 station transformers in the PSS to provide the reliable power to the consumers

8.3.8 Spare equipment for ODSSP & IPDS 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 following observation.

1. Date of Purchase of Material & Handover of PSS almost 4-5 years Gap.
2. Due to the gap moisture ingress in equipment because of improper storage facility by Project Vendor
3. Lack of expertise in commissioning & lack off supervision from WAPCO
4. Design Failure in many PSS (Civil/Electrical Point of view)
5. All the Ethernet switch/RTU model, relay is not supporting in SCADA automation

We have more than 90 no's of PSS under ODSSP & IPDS scheme & as per Contract with OPTCL and Vendor, they are giving 2 years' warranty only to all equipment (Except Switchgear Panel & Power Transformer Substation.

Hence, to ensure highest reliability, all equipment needs to operate properly at all the time we need sufficient amount of Spare Item One time.



Sample Photograph of Kalipada PSS (2019) & MERDA PSS (2020)

8.3.9 Indoor Switchgear (AIS) for 33kV & 11kV

a) Background Switchgear Mechanism

Existing Switchgears were operating and working since 2 decades, observes many kinds of faults transmitted and switching happened at daily basis. Many of the switchgears safety interlock mechanisms got bypassed due to un-availability of spare mechanism. At operation point of view, control wires were damaged, hence the electrical operations not able to perform.

Further, the mechanism parts are weakened not operating and protecting the system during fault scenario. Always faults hits the higher side like OPTCL Grid. Even though maintaining the lower settings, the Electromechanical relays and degraded mechanism not achieve the proper protection of system.

On Safety, the switchgear flashover extract interlocks were bypassed. Overall the switchgear mechanism was in obsolete condition also spares not available at OEM.

b) Electrical Insulation & Clearance:

As mentioned earlier, System has observed many faults and also occurred many flashovers inside the Breaker chamber as well as cable chamber. As we know once the flashover occurs, which is impact the electrical insulation of the breaker and Instrument transformers. Also the flashover creates the carbon spots around the chamber and over the body of equipment. While it is an Indoor system, it reduces the Insulation resistance of equipment. As mentioned above the existing switchgears insulation resistance are very low and always knock the door during low resistive atmospheric conditions. In the last 2 decades, record shows that the switchgears, many of flashovers occurred and system running with a low insulation resistance value which is not reliable, at any time the whole insulation can meet the obsolete condition means total blackout of PSS. To meet this statutory requirement, it is essential to replace old Switchgears.

C) Moisture Ingress

In indoor AIS system widely known for the drawback of Moisture related issues. However, it can be avoided by proper periodic maintenance. Since the system running 2 decades, huge amount of moisture accumulated inside the system, which includes rusting of bolt and nuts, degradation of epoxy surface tracking and enclosures depreciated. Results observing continuous humming noise from the running system also initiate the major flash over in the system and breakdowns.

1.1 Impact of not carrying out the Project

1. System may lead to major breakdowns.
2. Affect the reliability and consumer satisfaction.
3. Safety interlocks not available, human interfere hazarders can be happened.
4. Impact on smooth operation.
5. Parting of weakened mechanism always major blackouts due to upstream tripping.
6. Flashovers can be occurred during manual switching of system, may lead to severe accident.
7. Due to improper/lack of on time protection, high cost equipment may get damage at any time.

Ref Photograph:



8.3.10 Earthing of Power and distribution transformer

In an electrical installation, earthing system play important role for proper working of the power distribution system, and protection of human beings against electric shock.

The Main objectives of an earthing system are to provide an alternate path for the fault current to flow so that it will not endanger the user, maintain the voltage at any part of an electrical system at a known value and prevent excessive voltage on the equipment.

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.

Hence 4589 nos of earthing are proposed in this DPR.

8.3.11 CAPEX requirement for Network Reliability:

S. No.	Major Category	Activity	Amount in Cr.	Annexure
3	Reliability	Replacement/Addition of network component in 33/11kV Primary Substation	10.18	Annexure-17
		11 KV Conductor up gradation	15.07	Annexure-18
		Refurbishment of 11KV/0.415 KV Distribution Substation (DSS)	3.11	Annexure-19
		Installation of LV protection at DSS	33.38	Annexure-20
		Installation of Auto reclosure /Sectionalizers, RMUs	7.52	Annexure-21
		Installation of FPIs for O/H Lines	1.86	Annexure-22
		Installation of AB Switch, HG Fuse & LA for DTRs	25.47	Annexure-23
		11 KV Voltage Regulators for voltage improvement	5.01	Annexure-24
		Installation of Station Transformers(PPS)	0.72	Annexure-25
		Procurement of spares and servicing for ODSSP & IPDS	1.45	Annexure-26
		Earthing of Transformer	14.29	Annexure-27
Total (3)			118.06	

8.4 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 to FY-22.

Consumer Base	FY -19	FY-20	FY -21	FY-22	Avg. Consumer Growth
	17,16,424	19,06,556	20,08,133	20,89,083	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 years and in current FY till Sep-22.

Particulars	FY 18-19	FY 19-20	FY 20-21	FY21-22	FY22-23(till Sept.22)
Failure of Power Transformers (PTR)	15	23	19	29	5
Failure of Distribution Transformers (DTR)	2347	2416	2312	2533	2067

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 supply, faster will be process of providing new connection hence more will be the customer satisfaction.

Reduce over-burdening of existing Distribution transformers, lines etc. thereby reducing power cuts.

8.4.1 Augmentation of 33kV, 11Kv line, Power Transformers and DTs

Augmentation of 11kV 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.

Augmentation/ addition of Power Transformers

To cater the increasing load demand, PTR augmentation/ Addition 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/ Addition of Distribution transformer

To cater the increasing load demand, DT augmentation and new DT addition 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/ addition of new distribution transformer 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. 304 nos. of Single-Phase Transformers are proposed for Augmentation from 10/16 kVA to 25 kVA Single Phase DTs, 160 nos of DTs Proposed for augmentation from 25/63 KVA to 100 KVA, 80 nos of DTs Proposed for augmentation from 100 KVA to 250 KVA & 16 nos of DTs Proposed for augmentation from 200/250 KVA to 400 KVA at different locations and 110 nos of 100 KVA DTs proposed for addition.

In this proposal, TPNODL intends to carry out PTR augmentation for those PTRs which are identified as overloaded at various locations. Total 2 nos PTR are proposed for Augmentation from 5 MVA to 8 MVA, 5 nos additional 5 MVA PTR are proposed where single PTR exiting on PSS.

8.4.2 Addition of 33KV, 11KV and LT lines

In order to provide the reliable and Quality power supply to the consumers in TPNODL's Licensed area, we have conducted the survey of all 33KV feeders to identify the weaker section which require immediate attention. Based on the CYME dist. study reports, it is observed that in some of the feeders, conductor sizes are different resulting into compromising the circuit capacity which is limited to the lowest size of the conductor available in the ckt. Looking at the existing load demand and factoring the projected load growth, it is required to be rectified so as to avoid overloading of the network.

Further, a network study carried out for five circle areas considering the 5 Yrs. load growth and found that some interventions are required to be taken under Capex to provide alternate source to the existing feeders, load balancing on the feeders and reducing the length of the lengthy feeders. This will help in optimizing the feeder loading and will support in shifting the load to another structure or OPTCL grid in case of any source failure.

8.4.3 Addition of new 33/11 kV PSS with associated lines:

- 1. Govindapur PSS** – Presently the consumers of Mining, Jaganathpur, kashipur, Bodadera, Govindpur, Bampar & Mandua area of Keonjhar municipality and Keonjhar sadar block are getting power supply from Gambharia 33/ 11kV Sub-Station. The expected load in near future of Gambharia PSS is 30.5 MVA against the current installed capacity of 25.5 MVA.

Being the part of town and high population the load of these area is growing very fast and in order to provide the quality power with low interruption, the Utility has to be equipped with one more 33/11kV S/s at Govindpur.

After construction of 2x8 MVA 33/11kV GIS Substation at Govindpur future load of Mining, Jaganathpur, kashipur, Bodadera, Govindpur, Bampar & Mandua area of Keonjhar municipality and Keonjhar sadar block can be met with good voltage & uninterrupted Power Supply.

- 2. Badbil PSS** – There are approximately 15000 Nos of consumers are depended on Sundra 33/11KV PSS. Due to long 11KV fine Network and huge no of distribution

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substation regular power outage required for maintenance and rectification work. During any maintenance work all the consumers, Hospital, Public water supply, Industry, Commercial activity, banking system are affected & face power supply outage. Nalda 11KV feeder covers both Municipality & rural area which faces high power interruption due to maintenance work.

Due to excessive load on power transformer & 11KV line Network tail end consumer also faces low voltage issues. Barbil is first growing urban region of keonjhar district as mining Centre of Keonjhar district, all mining of essential colony, commercial activities are connected with common 11kV line network system.

To improve the reliability of the power supply and mitigate the low voltage issues an additional of 33/11KV PSS proposed at Barbil Municipality.

This overall expenditure will help in strengthening the 33KV network to some extent since the requirement is huge but considering the resource availability, it will be done in phase manner.

8.4.4 CAPEX Summary for Network Load Growth

S. No.	Major Category	Activity	Amount in Cr.	Annexure
4	Network Optimisation & Load Growth	Augmentation of Power Transformer	2.60	Annexure-28
		Augmentation of Distribution Transformer	24.57	Annexure-29
		Addition of 11 kV Lines (O/H and U/G)	24.12	Annexure-30
		Addition of 33 kV Overhead Lines(O/H and U/G)	9.80	Annexure-31
		Addition of New PTR at PSS	5.08	Annexure-32
		Addition New DTRs along with Associated HT/LT lines	17.37	Annexure-33
		New 33/11kV PSS with Associated Lines	18.60	Annexure-34
Total (4)			102.14	

8.5 Technology & Civil Infrastructure:

Proposed Technology Transformation Background IT & OT commenced its journey in FY 22, the very first year of TPNODL, by initiating large scale computerization & digitalization efforts in the Company. For year 2021-2022, IT & OT was given Rs 67.75 Cr and for the year 2022-2023 IT & OT was given Rs 67.8 Cr towards CAPEX by honourable Commission towards nine themes and seven themes respectively. However, in two categories Main SCADA and GIS, 50% of the amount was approved but to implement the complete system, it is required to have complete budget. The case is represented again to Hon'ble Commission and full budget has been approved in principle. So, shortfall of the budget is considered now in FY 23-24. The journey of IT & OT adoption, introduction and stabilizing different technologies has begun and many digital initiatives have been considered and many more are planned. The journey will continue to ensure large scale adoption across TPNODL, scale up the pilots which began in FY 2022 and train more and more employee to the new initiatives and introduce path breaking applications built to take advantage of the new interventions so as to maximize the operational gains and efficiencies which would ultimately help reduce the AT&C levels and enhance Consumer Experience.

Pillars for FY 24 – The proposed CAPEX plans for FY 24 revolve around the same themes which were introduced last year with addition to establishment of Data Recovery Centre. The idea is to scale up, strengthen the existing by covering more consumer services, additional divisions and build redundancies in the schemes which have commenced operations in last two financial years. The IT & OT CAPEX for FY 24 will have Shortfall/deducted Budget of FY 21-22 and FY 22-23 along with new capex heads.

- I. IT Infra for Data Centre
- II. Establishment cost of Data Recovery Centre
- III. Software Licenses, Applications and Cyber Security practices
- IV. End Computing Devices and IT Communication Network & System
- V. Operation Technology Implementation of ADMS

GIS mapping of Land Base, Network and consumer indexing for Balance Three Circle

The detail proposals are as follows:

8.5.1 IT Infra for Data Centre

Different applications create lot of data and it is very much required to have one data lake which will contain multiple applications, analytics and MIS and integration with other system. To cater the increasing expectation of consumer to get better services within minimum time we need to have better analytics tool and data repository source. For hosting various applications and consumer data base-oriented MIS we need to implement HANNA box with back up appliances.

Proposal for Hanna box & back up appliance are as follows:

S. No.	Description	Qty	UOM
1	HANNA Box & back up appliance	1	EA

The sum total proposal for all mentioned above one theme is described as below:

IT Infrastructure for Data Centre	Amount in Rs Cr
HANNA Box & back Up appliance	3.5

Benefits

- I. Establishment of HANNA Box will enhance the performance of data analysis
- II. It will increase the performance of the employee with better output
- III. Extracting multiple MIS and fetching consumer data in different query mode and tabular format will eventually increase the performance of the system

8.5.2 Establishment cost of Data Recovery Centre

As mentioned, TPNODL is implementing various technologies and hosting the solution On-premise Data centre at OPTCL data centre, Bhubaneshwar. All the business processes and customer facing applications are running under one data centre. To meet the eventuality, it is very much required to have back up provision which at present is not there. So, it is proposed to put up for having IT infra for DR so that in in case any failure in DC or part of DC or any application at DC then business continuity of system can be run from the DR.

In today's period, it is must to have DR site for IT & OT applications. Data Recovery Centre of TPNODL is planned to be established at Sambalpur district which is in different seismic zone of Bhubaneshwar. It will be the entire replica of TPNODL Bhubaneswar Data Centre. It will have the entire server set-up and backup of all the applications and data base with proper cyber security and data storage.

S. No.	Description	Qty	UOM
1	SAN Switch for storage	2	EA
2	SAN Storage 100 TB	1	EA

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S. No.	Description	Qty	UOM
3	Servers for complete landscape of DC for Replication of DC-DR	12	EA
4	Core Spine Switch	2	EA
5	Core Leaf Switch	4	EA
6	Back up data domain along with software	1	EA
7	Tape Library	1	EA
8	SAP S4 Hana Appliance	1	EA
9	Gateway Firewall	2	EA
10	Web Application Firewall	0	EA
11	DDOS	0	EA
12	Windows OS (Data Center Edition)	130	EA
13	Linux	10	EA
14	Virtualization (Per Processer/CPU)	15	EA
15	Antivirus (Server Edition)	60	EA

The sum total proposal for all mentioned above is described as below:

Data Recovery Centre	Amount in Rs Cr.
Data Recovery Centre for TPNODL for business continuity	16.82

Benefits

- I. Establishment of Data Recovery Centre gives redundancy to entire Dataset, Applications and Technology of TPNODL in case of natural calamity or another hazardous situation.
- II. Establishment of Data Recovery Centre gives will result an integrated approach to ensure redundant access without hampering and day to day activity of TPNODL.

Centralized Data Recovery Centre for pan TPNODL with complete replica of the existing Data Centre

8.5.3 Software Licenses, Applications and Cyber Security practices

8.5.3.1 Software License and Application:

To enhance the network planning and digital enablement for employees and consumers for providing better services, various applications for each function like operation, HR, Projects, and NEG etc. where users can work through various applications for providing faster and better services to our consumers. To make this enable and hosting various developed applications, it is required to invest on various software licenses like CYME licenses and remote desktop application for monitoring and controlling of users and management.

Proposal for Software licenses and applications deployment is mentioned below

S. No.	Description	Qty	UOM
1	Cyme Licenses for Network planning (Enterprise Version)	2	EA
2	Software (Remote Desktop for laptop & desktop trouble shooting)	1	EA

8.5.3.2 Cyber security practices:

For enhancing cyber security measures and for compliance to cyber security guidelines published by Ministry of Power, Government of India, necessary infrastructure is proposed to be invested for protection of various deployed applications and connecting users through secured communication link from their offices to data centre.

There is also a requirement to have a dedicated separate network for OT (SCADA/ADMS) but integration of OT network with IT network is required for various information flow to our front team to get the details and intimating to our consumers, this can be protected through firewall level between IT & OT network.

Proposal for Cyber security software is mentioned below

S. No.	Description	Qty	UOM
1	Enterprise SEIM (Security event and incident management) SOAR (Security orchestration automation and response)	1	EA
2	Web Application Firewall for controlling and monitoring of External Traffic	2	EA
3	Firewall for Integration of IT & OT Environment	2	EA

The sum total proposal for all mentioned above two themes are described as below:

Software Licenses and Applications	Amount in Rs Cr
Software Licenses and Applications	0.75
Cyber Security Measures	7.70

Benefits

- I. Compliance of cyber security guidelines published by MoP will ensure safety of IT/OT applications and data.
- II. CYME application shall be used for NEG team for better and faster load flow analysis of network and along with study and planning of future growth leading to accuracy and transparency.
- III. Penetration of digital services to provide the information faster to our end user and bringing agility in employees for faster work and deliver up to data services to the consumers.

Office will be connected through secured OFC.

8.5.4 End computing devices secure IT Communication Network and System

8.5.4.1 End Computing Devices

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In last two Financial Year, TPNODL procured around 1500 laptops, 300 Desktops for its offices under executive cadre and important persons under non-executive cadre. With more and more penetration of new digital services and new joining in the organization, it is required to have the system for new joining as well as existing staff who have not got the system so far but they will be trained and work on applications through system.

In addition to the system, there are various other software which are required on end devices like MS Office, Antivirus, Active Directory, Password reset portal etc. It also includes additional budget for E-Governance Software for e-digital process enablement at TPNODL offices.

Proposal for end computing devices is mentioned below

S. No.	Description	Qty	UOM
1	Laptops with OS for new joinee of TPNODL	100	EA

8.5.4.2 IT Communication

In FY 23 we have laid approximately 25 km underground OFC connecting 65 locational offices and along with that we have Installed DC router and rack in 105 PSS for smooth SCADA communication. In the current Financial year, we have planned to lay approximately 50 Km underground OFC connecting all major offices and we have also target to automate remaining PSS for smooth controlling of the station resulting better services to the consumers.

In addition to the system, there are various other communication hardware required locational offices such as Section office for redundant and secure internet connectivity.

Proposal for IT communication is mentioned below

S. No.	Description	Qty	UOM
1	DC Router & Rack for PSS Automation	100	EA
2	Underground OFC network for interconnection of Offices	1	EA
3	Locational LAN Work	1	EA

summary of prices of end computing devices is mentioned below:

End Computing Devices	Amount in Rs Cr
End Computing devices along with MS licenses, Antivirus, AD license etc.	0.75
IT Communication consisting of OFC work, L2 Switch, DC Router and etc.	4

Benefits

- I. Enhancing the reach of computerization across the organization
- II. Build a culture of following online processes and less of paper movement
- III. Availability of end user computing devices up to last level like section for proper use of various IT applications towards more effective and transparent execution of business processes.
- IV. Enable seamless real time communication across TPNODL
- V. End user computing devices will enable use of IT applications up to section level. Operating System Licenses shall be needed for the functioning of the end user devices.
- VI. Enable secure and redundant communication system
- VII. Enable communication system for between SCADA and PSS for remote controlling of PSS
- VIII. Seamless connectivity of locational offices such as Section Offices.

8.5.5 Operation Technology Implementation of ADMS and Computer Devices

OpCenEx has been set up with the best of operation technology-SCADA to monitor and control the 33KV/11KV network operations.

We are at the verge of implementation of Main SCADA-ADMS. Supervisory Control and Data Acquisition (SCADA) & Advanced Distribution Management System (ADMS) for monitoring the 33 / 11 kV Primary Sub Station (PSS) and its electrical network topology on real time basis to ensure the network reliability and power availability through proactive remedial actions and necessary analysis for making the system robust and reliable to serve electric power to their consumers. Further, down the line, ADMS will be monitoring up to consumer's outages through its integration with GIS and CRM. Will initiate the remedial action to restore the supply and trigger to network planner to strengthen the areas to improve reliability and quality of power.

In addition to this we require IT Infra such as application, adapter and proxy server to support smooth functioning of SCADA at both the location of Main Data Centre and Backup Data Centre

Proposal for ADMS & end computing devices is mentioned below

S. No.	Item	Qty
1	IT Infra for ADMS (Application, GIS Adapter & Proxy Servers) for Main Data Centre	3
2	IT Infra for ADMS (Application, GIS Adapter & Proxy Servers) for Back Up Data Centre	3
3	Supportive IT Infra (Switches and Router)	Lumsum
4	ADMS Application	Lum Sum
5	Laptops with OS for new joinee of TPNODL	240
6	Laptops with OS for executive of newly opening of Anubhav Kendra in rural area of each section	160

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S. No.	Item	Qty
7	Microsoft office for New Laptops for Point No. 1 &2	500
8	Anti Virus for new Laptop for Point no. 1 &2	500
9	AD CAL License for new Laptop for Point no. 1 &2	500
10	E-Governance Software for e-digital process enablement at TPNODL offices (Additional budget requirement)	1
11	Password Reset Portal for User ID	1

The summary of prices of end computing devices is mentioned below

Operation Technology Implementation of SCADA-ADMS	Amount in Rs Cr
SCADA-ADMS , computing device	10.10

Benefits

- I. Adoption of very strong integrated automated application for pan TPNODL area
- II. Ensure secured and much better services to customers.
- III. Integrated and secure processes with strong access control of PSS
- IV. Monitoring of PSS network assets.
- V. Ensure customer delight and effective solutions for addressing needs
- VI. Enhanced user experience with extensive standard features & functionalities
- VII. Standardized process workflow across organization
- VIII. Centralized data base for synchronized data.

8.5.6 GIS mapping of Land Base, Network and consumer indexing for Balance Three Circle.

TPNODL has implemented GIS system to have better asset management and is on the verge of integration with other technologies. GIS system will strengthen various other business processes viz. energy audit process, technical feasibility, dues verification, network planning. GIS will become the backbone for Electrical linear and nonlinear asset repository as well as its connectivity topology. Being a large geography, GIS will be implemented in parts:

For the FY 21-22 budget of 3 cr. was approved against request of 7.91 cr. and in FY 22-23 budget of 17.97 cr. was approved against request of 35.87 cr. by OERC however, we have submitted prayers for enhancement of budget and put the additional requirement in FY 22-23 budget.

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From the budget of FY 21-22 currently we have implemented GIS software and application for pan TPNO DL and is in the verge of completion of survey of pilot division of BED for which we have given order of the successful bidder of Rs 9.75 cr.

From the curtailed budget of FY 22-23 currently we have initiated data survey of 6 divisions (CED, SED & JED of Balasore Circle and JTED, JRED & KUED of Jajpur Circle) for which we have given order to successful bidder amounting Rs 17.16 cr. Due to curtailed budget we have postponed remaining one division i.e. BTED for next financial year.

In FY 23-24, it is proposed to implement the GIS for remaining three Circles namely Baripada, Bhadrak & Keonjhar it will include project management, field survey, digitization and migration of field data in GIS system

GIS implementation for Baripada, Bhadrak & Keonjhar Circle

S. No.	Description	Qty	UOM
1	Project Management, Site Visit & logistics	1	EA
2	Land base Survey and mapping of Bhadrak Circle	2457	Sq. Km
3	GSS & PSS Survey and mapping of Bhadrak Circle	40	No
4	33 KV Line Survey and mapping with assets Bhadrak Circle	394	Km
5	11Kv Line Survey and mapping with assets Bhadrak Circle	4651	Km
6	LT Network Survey and mapping with assets Bhadrak Circle	7541	Km
7	Asset Numbering and Pole Painting Bhadrak Circle	242722	No
8	Consumer indexing Bhadrak Circle	310000	No
9	Migration / Updation Bhadrak Circle	2456.92	Sq. Km
10	Land base Survey and mapping of Baripada Circle	5000	Sq Km
11	GSS & PSS Survey and mapping of Baripada Circle	65	No
12	33 KV Line Survey and mapping with assets Baripada Circle	775	Km
13	11Kv Line Survey and mapping with assets Baripada Circle	7864	Km
14	LT Network Survey and mapping with assets Baripada Circle	19515	Km
15	Asset Numbering and Pole Painting Baripada Circle	665060	No
16	Consumer indexing Baripada Circle	560000	No
17	Migration / Updation Baripada Circle	5000	Sq. Km

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S. No.	Description	Qty	UOM
18	Land base Survey and mapping of Keonjhar Circle	5200	Sq Km
19	GSS & PSS Survey and mapping of Keonjhar Circle	63	No
20	33 KV Line Survey and mapping with assets Keonjhar Circle	568	Km
21	11Kv Line Survey and mapping with assets Keonjhar Circle	5910	Km
22	LT Network Survey and mapping with assets Keonjhar Circle	9139	Km
23	Asset Numbering and Pole Painting Keonjhar Circle	294348	No
24	Consumer indexing Keonjhar Circle	365000	No
25	Migration / Updation Keonjhar Circle	5209	Sq Km

The proposal for scheme is as follows

GIS Software Implementation and Land Base & Network Survey & Digitization for Balasore & Jajpur Circle	Amount in Rs Cr
GIS implementation of three Circle Bhadrak, Baripada & Keonjhar along with land base, network & consumer survey	27.86

Benefits

- I. Integrated database of pan TPNODL
- II. Integrated processes with strong access control
- III. Ensure customer delight and effective solutions for addressing needs
- IV. Increased Billing and collection efficiency
- V. Enhanced user experience with extensive standard features & functionalities
- VI. Standardized process workflow across organization
- VII. Centralized data base for synchronized data.
- VIII. Enhanced integration and automation capabilities with Non-SAP applications

Using SAP standard capabilities combined with customer presentment platforms for a delightful customer experience

8.5.7 Security cameras, heavy-duty Racking System/ Storage solution at Jajpur Store

In the past few years, surveillance technology has seen an incredible level of evolution that not only makes it far more advanced but also affordable and available to everyone. Security cameras is one of the example of the same.

In our store material of worth crores are available for mitigation of the maintenance and capex activity and there may be always a possibility of the theft /pilferage of the material. So, for better monitoring and recording the activities during 24 hrs. security cameras are required at store of the TPNODL.

There are many important items of the different categories available in the store. As the space in the stores is limited so to accommodate the more material in the limited space with an easily accessible manner heavy-duty storage racking is proposed.

HD racking system Benefits

1. Organised Raw materials, inventory and equipment
2. Faster access to inventory
3. Reduced downtime
4. Optimised cube space
5. Minimum damage of the materials
6. Improve Warehouse safety
7. Improved visibility of all the stored materials
8. Adjustable as per the requirement
9. space-efficient and budget-friendly

8.5.8 Civil Infrastructure

TPNODL currently have offices in all the five circles and subdivisions. Some of them are owned and about 40% offices are on rented property. TPNODL is facing challenge while accommodating additional new employees in current office buildings and infrastructure. The current existing infrastructure are old and needs modernization to provide hygienic, well ventilated and spacious work environment. These office locations are touch base points between end consumers and utility. Hence, aesthetic along with safety of each stakeholder's needs to be focused. To ensure above it is proposed to carry out civil infrastructure of designated offices in phase manner.

1. Up gradation of Road and Offices:

It is observed that various Primary Sub Stations, access road needs repair and strengthening along with drainage system. In addition, it is required to complete structural rehabilitation and refurbishment of existing Offices/ Control Rooms. The area grading/ levelling, repairs to existing cable trenches and trench covers needs to be done for maintaining safety during operation. During rainy season road condition further, worsen.

Following activities are planned to improve the civil infrastructure:

1. Repair/ New wash room construction for substation.
2. Additional Material Storage area

3. New Store building /storage yard
4. New Building for Division/ Subdivision Section/Commercial Office
5. Refurbishment of old building for office at various location
6. Approach road of Offices and PSS

2. Renovation of various office buildings

All field offices building up to 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.

3. Remodelling & Creation of Additional Workspaces in various office buildings.

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

4. Record rooms

Record rooms of Structural Steel and covered with Percolated 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.

5. Cafeteria Canteen

Canteen facilities are the necessity of satisfying employees with a better range of foods and healthy options. Workplace canteens need to provide with options to cater for lunch with meals or light breakfast items and fruit or snacks for mid-afternoon along with tea/ cold drinks/ coffee in order to promote healthy eating & refreshments for employees and stakeholders so as to ensure maximum focus of employees on their work without worrying about their meals.

8.5.9 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
- ❖ **Tables and 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.
- ❖ **Projector and Display screen:** Required in different office to project the data to the team for better understanding during the meetings

8.5.10 Automation of Non-ODSSP & SCADA Integration

OpCenEx has been set up with the best of operation technology-SCADA to monitor and control the 33KV/11KV network operations. Hon'ble Commission has approved Rs.2.55Cr for implementation of Mini SCADA in FY 21-22.

However, we have also initiated to implement Main SCADA/ADMS. Supervisory Control and Data Acquisition (SCADA) & Advanced Distribution Management System (ADMS) are the software system through which TPNODL intends to monitor the 33 / 11 kV Primary Sub Station (PSS) and its electrical network topology on real time basis to ensure the network reliability and power availability through proactive remedial actions and necessary analysis for making the system robust and reliable to serve electric power to their consumers. Further, down the line, ADMS will be monitoring up to consumer's outages through its integration with GIS and CRM

Will initiate the remedial action to restore the supply and trigger to network planner to strengthen the areas to improve reliability and quality of power.

We initiated for procurement of SCADA/ADMS as we have already put up petition to Hon'ble commission for investment and it has been agreed by Hon'ble commission to initiate the procurement and put the proposal in FY 23. Hence, proposal is put up for investment.

Currently, there are 226 numbers of 33/11 kV substations in TPNODL areas out of which 30 PSS is considered to be automated in FY of 21-22. In FY 22-23, total 75 PSS (Non ODSSP PSS - 55 ODSSP + 20 Old) is considered to be covered under automation.

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Similarly, in subsequent year, we will put for automation of left out PSS to cover up 100% PSS.

Automation of non ODSSP PSS (Non ODSSP PSS - 55 ODSSP + 20 Old)

S No.	Item Description	Unit	Quantity
A	Procurement of new Panel		
1	33KV Control Relay Panel for Transformer	EA	50
2	33KV Control Relay Panel For IC/OG	EA	30
3	CR PANEL FOR 11KV VCB	EA	50
B	Revamping of old control panel	EA	50
C	Scada compatibility to ODSSP	LS	1
4	RTU 24-48 V WITH PANEL (Urban)	EA	35
5	RTU 24-48 V WITH PANEL (Rural)	EA	30
6	FRTU and allied Service for Distribution RMU automation	EA	40
7	Low cost Communication (RMU+Rural)	EA	50
8	Transducer+ Misc Items	EA	50
9	RELAY TRANSFORMER DIFFERENTIAL NUMERICAL	EA	50
10	feeder protection relay	EA	160
11	RELAY MASTER TRIP 24V DC	EA	260
12	Ethernet Switch (12/24 Port)	EA	99
13	Integration support for ODSSP PSS	EA	10
14	MFM	EA	99
15	ITC cost of Relays, RTUs, CRP	LS	1

The proposal for themes is as follows

Activity	Amount in Rs Cr
Automation of Non-ODSSP & SCADA Interigation	12.0

Benefits

1. Adoption of very strong integrated automated application for pan TPNODL area
2. Ensure secured and much better services to customers.
3. Integrated and secure processes with strong access control of PSS
4. Monitoring of PSS network assets.
5. Ensure customer delight and effective solutions for addressing needs
6. Enhanced user experience with extensive standard features & functionalities

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7. Standardized process workflow across organization
8. Centralized data base for synchronized data.

8.5.11 Bluetooth Printer, Cash Drop Box, RRG App

S No.	Item Description	Unit	Quantity
1	Bluetooth Printer for collection	EA	600
2	Cash Safe box	EA	50
3	RRG app	EA	1

8.5.12 CAPEX Summary for Technology and Civil Infrastructure

S. No.	Major Category	Activity	Amount in Cr.	Annexure
5	Technology and Civil Infrastructure	Security cameras, heavy-duty Racking system / Storage solutions for Jajpur store	1.5	Annexure-35
		Civil Infrastructure (Office Buildings, PSS, Stores, Approach Roads, Record room, Cafeteria Canteen, MRT office, STS office, STS Lab and others)	29.68	Annexure-36
		Office Administration	5.75	Annexure-37
		Automation of Non-ODSSP & SCADA Interigation	12	Annexure-38
		Bluetooth printer, cash drop box, RRG App	0.88	Annexure-39
		Data Recovery (DR) for Hardware Equipment	16.82	Annexure-40
		Data Center (DC) for Hardware Equipment	3.5	Annexure-41
		End computing devices	0.75	Annexure-42
		Cyber Security	7.7	Annexure-43
		Communication	4.01	Annexure-44
		SCADA-ADMS & Computer Devices	10.10	Annexure-45
		GIS Software Implementation and Land Base & Network Survey & Digitization for 9 Division	27.86	Annexure-46
		Software and Application	0.75	Annexure-47
Drones and its licence	0.3	Annexure-48		
Total (5)			121.60	

8.6 Reducing Carbon Footprint:

Background A carbon footprint is the measure of carbon dioxide (CO₂) and other greenhouse gas (GHG) emissions caused by an individual, organization, product, service, or activity. The size of your carbon footprint depends on a variety of factors, including, but not limited to, modes of transportation, frequency of travel, home or operational energy consumption etc.

There are many ways to reduce the carbon footprints. Minimize the burning of the fuels in vehicles is one of them. As a power distribution company there are lots of travel of our field staff though 2 wheelers and 4 wheelers to serve the consumers. To reduce the carbon foot print without effecting the services to the consumers it is proposed to provide the battery operated 2 wheelers and 4 wheelers to our field staff. in the first year we are proposing 159 electric scooters (one for each section) and 16 nos of electric Cars to perform official duty.

Other way to reduce the carbon footprint is the use of renewable energy. In line we are proposing to installed the roof top solar power plants for our office requirements at our selected offices. Initially We have selected the 7 building (corporate office, 5 circle office and Balasore store).

This will be small contribution to reduce the carbon foot print and also motivate the peoples of Odisha to use the electric vehicle and solar energy.

8.6.1 CAPEX Summary for Reducing Carbon Footprint

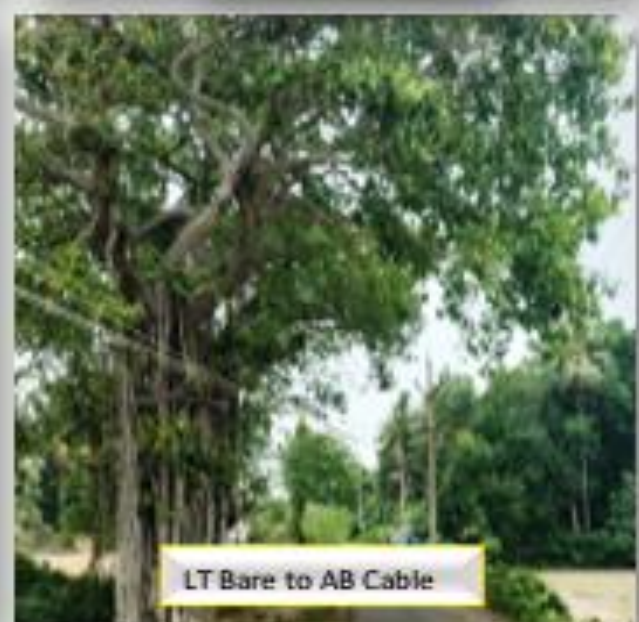
S. No.	Major Category	Activity	Amount	Annexure
6	Reducing Carbon Footprint	Budget for Electric Scooter/Car	3.99	Annexure-49
		Rooftop Solar System on office building (Solar Roof top system (Corp office, circle offices, Balasore Store)	0.99	Annexure-50
Total (6)			4.98	

9. Annexure

9.1 Annexure 1: Sample Photographs related to depilated network & civil infrastructure







9.2 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.

(ii) 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 meters
- 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.

9.3 Annexure 3: Cost Estimate for Fencing of Distribution Substations

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Excavation in all types of ordinary soils	M3	6.92	232	1,605.5
2	Providing and spreading metal 20mm	M3	2.16	2900	6,271.6
3	Supplying, Providing and laying in position plain cement concrete of grade M15 placed to correct line and level in levelling course/fill under or around foundations pits, (Min cement content 300 Kg/m3)	M3	0.82	6275	5,156.8
4	Providing all material and constructing brick masonry 230 mm. thick below plinth	M3	3.46	6200	21,453.3
5	Providing all material and constructing brick masonry 230 mm. thick above plinth	M3	6.49	6350	41,198.1
6	Providing and plastering - 18 mm thk	M2	53.63	450	24,134.9
7	Painting exterior	M2	53.63	220	11,799.3
8	Providing steel and supplying all material, fabricating and erecting structural steel work	MT	0.17	110500	19,117.6
9	Providing and fixing reinforced barbed wire tape (RBT)	RM	51.90	34	1,764.7
10	Providing cartage service and transporting, excavated soil, debris, bricks, concrete,	M3	5.19	450	2,335.6
11	Providing, stretching and fixing Galvanised Iron chain link fencing 2" square and of gauge 10 (bare metal thickness)	M2	7.79	390	3,036.3
12	Painting Synthetic Enamel	M2	4.33	212.38	918.6
Total Cost of materials					1,38,792.52
GST @ 18% of Sub-Total					24,982.65
Sub-Grand Total					1,63,775.17
Per DTR Cost					1,63,775.17
Per 705 DTR Cost in Cr.					11.55

9.4 Annexure 4: Cost Estimate for Boundary wall for Primary substation

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
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	M3	120.4	226.775	27,312.78
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.	M3	19.8	1930	38,194.70
3	Providing and placing to correct line and level, in position, machine mixed reinforced cement concrete RCC of grade M25 with required slump for Raft / footings at all levels including vibrating, curing, providing construction joints, leaving cut-outs/ pockets, placing of inserts/ embedments, dewatering wherever necessary etc., complete all as per drawing , including cost of providing form work for all shapes (including steel plate/ply wood shuttering, strutting, steel scaffolding etc.), but excluding the cost of providing reinforcement, inserts / embedments, and as directed by the ENGINEER	M3	21.5	7527	1,61,905.77
4	Providing and placing to correct line and level, in position, machine mixed reinforced cement concrete RCC of grade M25 with required slump for Pedestals, columns, walls at all levels including vibrating, curing, providing construction joints, leaving cut-outs/ pockets, placing of inserts/ embedments, dewatering wherever necessary etc., complete all as per drawing , including cost of providing form work for all shapes (including steel plate/ply wood shuttering, strutting, steel scaffolding etc.), but excluding the cost of providing reinforcement, inserts / embedments, and as directed by the ENGINEER	M3	11.2	7720	86,155.20

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S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
5	Providing and placing to correct line and level, in position, machine mixed reinforced cement concrete RCC of grade M25 with required slump for Beams / slabs at all levels including vibrating, curing, providing construction joints, leaving cut-outs/ pockets, placing of inserts/ embedments, dewatering wherever necessary etc., complete all as per drawing , including cost of providing form work for all shapes (including steel plate/ply wood shuttering, strutting, steel scaffolding etc.), but excluding the cost of providing reinforcement, inserts / embedments, and as directed by the ENGINEER .	M3	7.5	7720	57,745.60
6	Supplying, Providing and laying in position plain cement concrete of grade M10 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 wherever required etc. complete. (Min cement content 210Kg/m3)	M3	9.2	6079.5	56,113.79
7	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 wherever required etc. complete. (Min cement content 300 Kg/m3)	M3	2.9	6272.5	18,378.43
8	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 steel scaffolding, handling and transporting from site stores, complete as directed by using High yield strength deformed bars conforming to IS 1786 - HYSD Bars	TON	4.5	72375	3,25,687.50
9	Providing all material and constructing brick masonry 230mm. 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.	M3	36.4	6272.5	2,28,507.18

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S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
10	Providing all materials and carrying out sand faced plaster 18 mm thick in single layer and plastering external surfaces of concrete and brick work such as walls, columns, beams etc. with 1:4 cement mortar, including providing & erecting steel scaffolding, hacking of concrete surfaces, curing including bands, drip moulds, grooves, etc. complete with 2% Accoproof or approved waterproofing compound	M2	400.0	434.25	1,73,700.00
11	Providing all materials, tools tackles and labour, preparing the surface by scrapping / sand papering to remove loose scales, making the surface to receive exterior quality paint, Applying a coat of approved Primer and Two Coats of Paint. Including necessary scaffolding / staging etc. complete as directed. Paint shall be of First Quality Manufactured by Asian / Burger / Shalimar paints Exterior quality Plastic Emulsion paint	M2	400.0	212.3	84,920.00
12	Providing all materials, tools tackles and labour, preparing the surface by scrapping / sand papering to remove loose scales, making the surface plain by applying putty, Applying a coat of approved Primer and Two Coats of Paint. Including necessary steel scaffolding / staging etc. complete as directed. Paint shall be of First Quality Manufactured by Asian / Burger / Shalimar paints Synthetic Enamel Paint	M2	6.0	212.3	1,273.80
13	Providing steel and supplying all material, fabricating and erecting structural steel work at all heights including steel scaffolding for roof trusses, purlins, beams, columns, 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. Structural steel section shall be of primary manufacturer and confirm to IS2062 requirements	TON	0.7	86743.85	60,720.70
14	Providing and fixing G I barbed wire of 10 gauge along the boundary wall / fencing on angle iron post with all necessary fitting such as welding of nuts, bolts, clips, split pins, manpower etc. Complete	M	700.0	33.775	23,642.50

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S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
15	Providing and fixing concertina coil of 610 mm dia., 80 Nos. of circles, 200 Nos. of clips, hot dip galvanized. The wire shall be of 12 SWG tensile wire, covering 10 RM with one coil, each RM will have 8 Nos. of circles, including labour, fixing in position on existing V shaped angles including 2 nos. of guard wires and painting with 2 coats of Bus green paint complete at all heights including scaffolding.	M	100.0	458.375	45,837.50
16	Providing, Fabricating and erecting MS gates consisting of MS hollow rectangular or square box sections with 6mm to 8mm thick. 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	MT	0.4	86743.85	34,697.54
17	Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1m above ground level and removal of rubbish up to a distance of 100 m outside of periphery of the area cleared.	M2	100.0	14.47	1,447.00
Total Cost of materials					14,26,239.97
GST @ 18% of Sub-Total					2,56,723.19
Sub-Grand Total					16,82,963.17
Total Cost of one RM					16,829.63
Total Cost of 6376 RM in Cr.					10.731

9.5 Annexure 5: Cost Estimate for Life enhancement of network and maintaining safe horizontal / vertical clearances.

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	WPB 160x152 (30.44KG/Mtr.),11 mtr	No	1204	34321.52	4,13,23,110.1
2	Danger Plate	No	1204	99.2	1,19,436.8
3	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr 1 no	Kg	362.28	93	33,692.4
4	GI barbed wire anticlimbing device	Kg	3612	99.2	3,58,310.4
5	Back Clamp for Barbed wire anticlimbing device 25X3mm. flat, 0.59Kg/Mtr. Flat of 0.510 mtr length 4 nos'	Kg	1449.13	93	1,34,769.5
6	33kV,10kN pin insulator polymer	No	3612	595.2	21,49,862.4

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7	33kV V cross Arm (GI)	No	1204	2232	26,87,328.0
8	GI Back Clamp for 33kV 'V' Cross Arm	No	1204	186	2,23,944.0
9	Top bracket 100X50X5mm GI channel	No	1204	186	2,23,944.0
10	Earthing of Support (Coil Type)	EA	1204	205.84	2,47,831.4
11	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	Kg	315.45	93	29,336.7
12	GI Nut , Bolt & Washer of different sizes	Kg	1745.8	96.72	1,68,853.8
13	GI Plate base(500X500X10mm)	No	1204	1860	22,39,440.0
14	Black Paint	Ltr	602	272.8	1,64,225.6
15	Yellow Colour Paint for Background	Ltr	1204	220	2,64,880.0
Total Cost of materials					5,03,68,965.0
Stock, Storage & Insurance i.e 3%					15,11,068.9
Sub Total					5,18,80,033.9
Contingency @ 3%					15,56,401.0
Tools & Plants @ 2%					10,37,600.7
Transportation @ 7.5%					38,91,002.5
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					
Erection Other @ 10%.					8,87,525.2
Erection PSC Pole @ 20%					
Sub Total					5,92,52,563.3
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Erection of 11 Mtr long WPB Pole including loading & unloading, transportation, providing & laying of 1:1.5:3,M20 Grade,C.C-500x500X1800 mm & cooping of 500x500x450 mm, includes 5 days curing and zebra painting (In Black & Yellow Strips/Zebra)	No	1204	6300	75,85,200.0
Total Civil Part					75,85,200.0
Sub-Total					6,68,37,763.3
Other Over Head (Including Supervision charges)@ 6%					40,10,265.8
Sub-total					7,08,48,029.1
GST @ 18% of Sub-Total					1,27,52,645.2
CESS @ 1% of Sub-Total					7,08,480.3
Sub-Grand Total					8,43,09,154.6
Grand Total in Cr.					8.431

9.6 Annexure 6: Cost Estimate for Yard Fencing with in PSS

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Excavation in all types of ordinary soils	M3	6.92	232	1,605.5
2	Providing and spreading metal 20mm	M3	2.16	2900	6,271.6

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3	Supplying, Providing and laying in position plain cement concrete of grade M15 placed to correct line and level in levelling course/fill under or around foundations pits, (Min cement content 300 Kg/m3)	M3	0.82	6275	5,156.8
4	Providing all material and constructing brick masonry 230 mm. thick below plinth	M3	3.46	6200	21,453.3
5	Providing all material and constructing brick masonry 230 mm. thick above plinth	M3	6.49	6350	41,198.1
6	Providing and plastering - 18 mm thk	M2	53.63	450	24,134.9
7	Painting exterior	M2	53.63	220	11,799.3
8	Providing steel and supplying all material, fabricating and erecting structural steel work	MT	0.17	110500	19,117.6
9	Providing and fixing reinforced barbed wire tape (RBT)	RM	51.90	34	1,764.7
10	Providing cartage service and transporting, excavated soil, debris, bricks, concrete,	M3	5.19	450	2,335.6
11	Providing , stretching and fixing Galvanised Iron chain link fencing 2" square and of gauge 10 (bare metal thickness)	M2	7.79	390	3,036.3
12	Painting Synthetic Enamel	M2	4.33	212.38	918.6
Total Cost of materials					1,38,792.52
GST @ 18% of Sub-Total					24,982.65
Sub-Grand Total					1,63,775.17
Per SQ.Mtr Cost					5,459.17
Total Cost of 1800 SQ.Mtr in Cr.					0.98

9.7 Annexure 7: Cost Estimate for Fire extinguisher & Water Hydrant System.

S No.	Item Description	Amount (INR)
1	RCC water tank	40,00,000.00
2	Main electrical pump	14,00,000.00
3	Main Diesel pump with accessory	20,00,000.00
4	Electrical Jockey pump	1,50,000.00
5	Hydrant Pipe line	1,20,000.00
6	Isolation gate valves	14,00,000.00
7	Water sprinkler system	4,00,000.00
8	Detection and alarm system	15,00,000.00
9	PA system	2,00,000.00
10	Aqueous film forming foam(AFFF)	2,00,000.00
11	Fire extinguisher	2,00,000.00
12	Painting	6,00,000.00
13	Fire pump house and Electric switch gear for power supply with transformer	18,00,000.00
14	Erection, Commissioning & Testing	75,00,000.00
Total Cost of materials		2,08,70,000.00
Per Sqmtr Cost in Cr.		2.087

9.8 Annexure 8: Cost Estimate for Fire wall for PTR "6Mtr*8Mtr"

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Exc in soil, 0-1.5m	M3	20.00	232	4,640.0
2	Prvd & placng rmc m25 for raft	M3	4.00	7550	30,200.0
3	Prvd & placng rmc m25 for columns	M3	1.68	7720	12,969.6
4	Prvd & placng rmc m25 for beams and slabs	M3	1.86	7720	14,382.4
5	PCC, M15 in levelling course	M3	1.00	6275	6,275.0
6	Reinforcement, hysd bars	TON	0.88	100800	88,704.0
7	Prvd & const brick masonry, 230mm	M3	9.66	6300	60,858.0
8	Prov sand faced plaster, 18mm	M2	96.00	450	43,200.0
9	Paint, exterior plastic emulsion	M2	96.00	220	21,120.0
Total Cost of materials					2,82,348.96
GST @ 18% of Sub-Total					50,822.81
Sub-Grand Total					3,33,171.77
Per Sqmtr Cost in Cr.					0.001
Total Cost of 1440 SQ.Mtr in Cr.					1.142

9.9 Annexure 9: Cost Estimate for Defective Cable Replacement

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	2C X 4sq. mm. Armoured Aluminium Cable - XLPE Insulated	kM	1010	60,000	6,06,00,000.0
2	4C X 10sq. mm. Armoured Aluminium Cable - XLPE Insulated	kM	51	1,22,720	62,58,720.0
3	4C X 25sq. mm. Armoured Aluminium Cable - XLPE Insulated	kM	15	1,97,060	29,55,900.0
4	LT Cable for LTCT Meter Replacement	kM	2	3,03,260	4,54,890.0
5	HT Cable for Replacement	kM	3	35,40,000	88,50,000.0
6	Lug & Other	Set	50	500	25,000.0
7	Jointing kit & Other	Set	60	20,000	12,00,000.0
8	Installtion Cost	Nos	35738	550	1,96,55,900.0
Total Cost of materials					10,00,00,410.00
Total cost in Cr					10.00

9.10 Annexure 10: Cost Estimate for Shifting of O/H lines on safety ground on public request

SL NO	Description	UOM	Qty	Amount in Cr.
A	148 sqmm AAAC	Km	15	4.34
TOTAL in Rs Crs				4.34

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	WPB 160x152 (30.44KG/Mtr.),13 mtr	No	405	40427.2	1,63,73,016.0
2	Top Channel 100X50X5mm, 9.56 KG/Mtr., each channel length 4.4 mtr., 2 no's channels required	Kg	2523.84	93.00	2,34,717.1
3	Double Pole Belting Channel 75X40X4.8mm.,7.14KG/Mtr.,each channel length 4.4 Mtr.,5 no's channel required	Kg	3769.92	93.00	3,50,602.6
4	50X50X6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 4.9 mtr., 4 nos angle required	Kg	2646	93.00	2,46,078.0
5	Straight Cross Arm Channel 100X50X5mm,9.56 KG/mtr, each channel length 1.8 Mtr.	Kg	0.00	93.00	-
6	Fish Plate 50X8 mm., 0.97kg/Mtr., each 0.280 mtr. Length	Kg	48.89	93.00	4,546.6
7	Danger Plate	No	405	99.20	40,176.0
8	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr 1 no	Kg	405.00	93.00	37,665.0
9	GI barbed wire anticlimbing device	Kg	1215	99.20	1,20,528.0
10	Back Clamp for Barbed wire anticlimbing device 25X3mm. flat, 0.59Kg/Mtr. Flat of 0.510 mtr length 4 no's	Kg	487.46	93.00	45,333.6
11	33kV,10kN pin insulator polymer	No	1125	595.20	6,69,600.0
12	33kV V cross Arm (GI)	No	345	2232.00	7,70,040.0
13	GI Back Clamp for 33kV 'V' Cross Arm	No	345	186.00	64,170.0
14	Top bracket 100X50X5mm GI channel	No	345	186.00	64,170.0
15	33kV H/W fitting(B&S) 120KN,4 Bolt	Set	180	755.00	1,35,900.0
16	33kV Disc insulator (B&S) 120KN polymer	No	180	1785.60	3,21,408.0
17	Earthing of Support (Coil Type)	EA	405	205.84	83,365.2
18	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	Kg	106.11	93.00	9,868.2
19	PG Clamp for 148 mm ² AAAC conductor	No	180	768.80	1,38,384.0
20	GI Nut , Bolt & Washer of different sizes	Kg	873.75	96.72	84,509.1
21	H.T. Stay clamp	Pair	120	155.00	18,600.0
22	H.T. Stay set (Complete)	Set	120	1302.00	1,56,240.0
23	H.T. Stay Insulator	No	240	62.00	14,880.0
24	7/8 SWG Stay Wire	Kg	1800	93.00	1,67,400.0

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25	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	30	1302.00	39,060.0
26	GI Plate base(500X500X10mm)	No	405	1860.00	7,53,300.0
27	AAA conductor,148 mm2	Km	46.35	101680.00	47,12,868.0
28	50x6 mm GI flat	Kg	180	93.00	16,740.0
29	Black Paint	Ltr	202.5	272.80	55,242.0
30	Yellow Colour Paint for Background	Ltr	405	220.00	89,100.0
Total Cost of materials					2,58,17,507.4
Stock, Storage & Insurance i.e 3%					7,74,525.2
Sub Total					2,65,92,032.6
Contingency @ 3%					7,97,761.0
Tools & Plants @ 2%					5,31,840.7
Transportation @ 7.5%					19,94,402.4
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					
Erection Other @ 10%.					9,17,108.8
Erection PSC Pole @ 20%					
Sub Total					3,08,33,145.5
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Fixing of complete 33kV line stay set includes Turn Buckle Assembly, Stay Rod & Stay plate, Stay Insulator, Stay Wire, stay clamps with Nuts & bolts.BA will do the excavation, supply of 0.5Cum C.C foundation 1:2:4 size (500mmx500mmx800mm)	No.	120	2362.5	2,83,500.0
2	Erection of 13 Mtr long WPB Pole including loading & unloading, transportation, providing & laying of 1:1.5:3,M20 Grade C.C-500x500X2200 mm& cooping of 500x500x450 mm,includes 5 days curing and zebra painting (In Black & Yellow Strips/Zebra)	No	405	7980	32,31,900.0
3	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	30	2415	72,450.0
Total Civil Part					35,87,850.0
Sub-Total					3,44,20,995.5
Other Over Head (Including Supervision charges)@ 6%					20,65,259.7
Sub-total					3,64,86,255.3
GST @ 18% of Sub-Total					65,67,525.9
CESS @ 1% of Sub-Total					3,64,862.6
Sub-Grand Total					4,34,18,643.8
Inspection Fee					-
Drawing Approval					-
Grand Total					4,34,18,643.8
Grand Total in Cr.					4.342

9.11 Annexure 11: Cost Estimate for Intrusion system for theft prevention in store

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Intrusion system for theft prevention in store	LS	1	15,00,000	15,00,000.0
Total Cost of materials					15,00,000.00
Total cost in Cr					0.15

9.12 Annexure 12: Cost Estimate for Testing equipment for Meter, Meter Reading, HT/LT Accu-check & other material.

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Android Mobile for BLE Meter reading	EA	50	20,000.00	10,00,000.0
2	Desktop for Dumping of Meter data	EA	10.00	30,000.00	3,00,000.0
3	Drone	EA	5	15,00,000.00	75,00,000.0
4	HT Accucheck	EA	5.00	1,80,000.00	9,00,000.0
5	Phantom Load for site testing	EA	10	50,000.00	5,00,000.0
6	1 Ph Accucheck	EA	55	20,000.00	11,00,000.0
7	1 Ph & 3 Ph Portable Callibrator (Upto 120A, 0.05 Class)	EA	2	20,00,000.00	40,00,000.0
8	AC Magnet (0.2 T, 10 mT), DC Magnet 0.2 T & 0.27 T	EA	2	75,000.00	1,50,000.0
9	Control Panel for AC & DC Magnet	EA	1	2,00,000.00	2,00,000.0
10	Digital Clamp-on Meter	EA	51	25,000.00	12,75,000.0
11	4 Chanel Oscilloscope with Differential Voltage & Current Probe	EA	1	3,80,000.00	3,80,000.0
12	HV Tester for 1Ph & 3Ph meter with Jig	EA	1	80,000.00	80,000.0
13	Red Phase Instrument	EA	6	5,00,000.00	30,00,000.0
14	Gauss Meter	EA	1	28,000.00	28,000.0
15	20 position test bench for single phase meter	EA	2	75,00,000.00	1,50,00,000.0
16	20 position test bench for three phase meter	EA	1	95,00,000.00	95,00,000.0
17	Temperature and Humidity meter	EA	2.00	7,000.00	14,000.0
18	RS232 to USB converter	EA	8	2,800.00	22,400.0
19	IR Tester	EA	1	50,000.00	50,000.0
20	Variable heat control Soldering Iron	EA	2	18,000.00	36,000.0
21	Differential cost of 1 Ph smart meter vs rent	EA	34000	415.00	1,41,10,000.0
Total Cost of materials					5,91,45,400.0
Total Cost in Cr.					5.91

9.13 Annexure 13: Cost Estimate for Conversion of LT Bare conductor to AB Cable

S. No.	Description	UOM	Qty	Amount in Crores.
A	4x95+1x95+1x16 Sqmm LT AB Cable	Km	152	19.25
B	4x50+1x50+1x16 Sqmm LT AB Cable	Km	219	20.87
C	1x50+1x16 Sqmm LT AB Cable	Km	49	3.24
	Total Cost in Cr.			43.35

A. Cost Estimate Conversion of LT Bare to 4x95+1x95+1x16 Sqmm LT AB Cable

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	1.1KV LT AB Cable 4x95+1x95+1x16mm2	Mtr	156251	421.67	6,58,86,359.2
2	9 mtr long 300 kg PSC pole	No	1062	3720	39,50,268.0
3	RCC base Plate for PSC pole	No	1062	1700	18,05,230.0
4	Danger Plate	No	1062	99.2	1,05,340.5
5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr 1 no	Kg	320	93	29,715.9
6	GI barbed wire anticlimbing device	Kg	3186	99.2	3,16,021.4
7	Back Clamp for Barbed wire anticlimbing device 25X3mm. flat, 0.59Kg/Mtr. Flat of 0.510 mtr length 4 no's	Kg	1278	93	1,18,863.6
8	Pole clamp for EYE hook for XLPE Aerial bunched Cable	Pair	5461	248	13,54,377.6
9	Suspension Clamp with EYE hook for ABC	No.	3793	421.6	15,98,918.0
10	Eye Hook for AB cable for dead end point	No.	1669	74.4	1,24,151.3
11	Conductor Dead End Clamp suitable for bare messenger XLPE Aerial bunched cable(25-70 sq mm)	No.	1669	80.6	1,34,497.2
12	LT Stay Set (Complete)	Set	1669	644.8	10,75,977.8
13	LT Stay Insulator	No	1669	37.2	62,075.6
14	LT Stay clamp	Pair	1669	136.4	2,27,610.7
15	7/12 SWG Stay Wire	Kg	16687	93	15,51,891.0
16	Earthing of Support (Coil Type)	EA	1062	205.84	2,18,581.5
17	PIPE HDPE SIZE 25 MM	Mtr	3186	33.6	1,07,039.5
18	Lug AL 70 Sqmm for 7/8 SWG Wire/Earthing	EA	2124	8.5	18,052.3
19	LT Distribution Box Polycarbonate	No	2731	925	25,25,805.0
20	Cap cable end for ABC	EA	8344	108.98	9,09,274.6
21	IPC 50-150, 50-150 SQ.MM ST.LT Type A	EA	21845	88.29	19,28,677.4
22	IPC EP 95 LT ABC 16-95 & 1.5-16 SQMM ST.LT Type C	EA	16384	88.29	14,46,508.0
23	IPC KZ 2X150 LTABC 25-150 & 6-35(50) sqmm Type B	EA	27306	51.77	14,13,631.6

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24	STEEL STRAP SIZE 20 MMX50 M LONG	ROL	607	1476.14	8,95,721.8
25	BUCKLES FOR STEEL STRAP (1 EA = 100 NOS)	EA	607	490.67	2,97,738.6
26	Cable 1.1kV Al 4CX25 Sq.mm Armoured	Mtr	8192	169.53	13,88,755.9
27	Gland for 1.1kV Al 4X25 Sq.mm	EA	2731	172.41	4,70,782.7
28	Lug AL Crimping 25 Sqmm XLPE Single Hole	EA	10922	13.5	1,47,452.4
29	25x6 mm GI flat	Kg	21238	93	19,75,134.0
30	FRP CROSS ARM 1070MM 415V	EA	5461	981.49	53,60,113.2
31	ISA-50X50C6 GI Angle (4.5KG/M)	Kg	31857	93	29,62,701.0
32	ISMC-75X40X4.8 GI Channel (7.14KG/M)	Kg	31857	93	29,62,701.0
33	GI Nut , Bolt & Washer of different sizes	Kg	2731	96.72	2,64,103.6
34	2C X 4sq. mm. Armoured Aluminium Cable - XLPE Insulated	Mtr	39063	48	18,75,012.0
35	2C X 10sq. mm. Armoured Aluminium Cable - XLPE Insulated	Mtr	15625	63.34	9,89,693.8
36	4C X 10sq. mm. Armoured Aluminium Cable - XLPE Insulated	Mtr	31250	98.23	30,69,707.1
37	Tie Plastic Black size 7.6mmX380mm	EA	6068	6.65	40,352.2
38	Tie Plastic size 9mmX265mm	EA	9102	22.33	2,03,247.7
39	Black Paint	Ltr	1062	272.8	2,89,686.3
40	Yellow Colour Paint for Background	Ltr	2124	220	4,67,236.0
Total Cost of materials					11,05,69,007.0
Stock, Storage & Insurance i.e 3%					33,17,070.2
Sub Total					11,38,86,077.2
Contingency @ 3%					34,16,582.3
Tools & Plants @ 2%					22,77,721.5
Transportation @ 7.5%					85,41,455.8
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					
Erection Other @ 10%.					1,06,03,258.9
Erection PSC Pole @ 20%					
Sub Total					13,87,25,095.8
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Fixing of complete LT line stay set includes Turn Buckle Assembly, Stay Rod & Stay plate, Stay Insulator, Stay Wire, Stay clamps with Nuts & bolts BA will do the excavation , supply of 0.5Cum cement concrete foundation 1:2:4 size (500mmx500mmx800mm)	No	1668.7	2362.5	39,42,303.8
2	Erection of 9 MTR PSC Pole including loading and unloading, transportation .Concreting to be done with PCC-1:1.5:3. of size - 500x500x1500 & Padding 500x500x150mm.Scope of work also includes 5 days curing & zebra painting (In Black & Yellow Strips/Zebra)	No	1061.9	6300	66,89,970.0

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3	Dismantling of 9/8 Mtr. PCC/Joist Pole (Serviceable Pole) after digging the pit & taking out the pole, transportation & stacking the pole at a proper place in safe position & refilling the pit with loose earth, ramming including removal & disposal of malba	No.	303	945	2,86,335.0
4	Dismantling of ACSR/AAAC 34/55 mm ² from overhead line, recoiling, loading, transportation, unloading and stacking at a proper place in safe position/site store	Mtr	151700	15.75	23,89,275.0
5	Dismantling of insulator with pin, disc type including loading, transportation, unloading and stacking at a proper place in a safe position /Site store	EA	13653	8.505	1,16,118.8
6	Dismantling of different sizes of service cables	Kg	4551	52.5	2,38,927.5
7	Dismantling of Steel Structure, Nuts & Bolt including loading, transportation, unloading & staking of dismantled material at a proper place in TPNODL store	Kg	3034	78.75	2,38,927.5
Total Civil Part					1,39,01,857.5
Sub-Total					15,26,26,953.3
Other Over Head (Including Supervision charges)@ 6%					91,57,617.2
Sub-total					16,17,84,570.5
GST @ 18% of Sub-Total					2,91,21,222.7
CESS @ 1% of Sub-Total					16,17,845.7
Sub-Grand Total					19,25,23,638.9
Inspection Fee					-
Drawing Approval					-
Grand Total					19,25,23,638.9
Grand Total in Cr.					19.25

B. Cost Estimate Conversion of LT Bare to 4x50+1x50+1x16 Sqmm LT AB Cable

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	1.1KV LT AB Cable 4x50+1x50+1x16mm ²	Mtr	225673	228.42	5,15,48,226.7
2	9 mtr long 300 kg PSC pole	No	1534	3720	57,05,364.0
3	RCC base Plate for PSC pole	No	1534	1700	26,07,290.0
4	Danger Plate	No	1534	99.2	1,52,143.0
5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr 1 no	Kg	461	93	42,918.6
6	GI barbed wire anticlimbing device	Kg	4601	99.2	4,56,429.1
7	Back Clamp for Barbed wire anticlimbing device 25X3mm. flat, 0.59Kg/Mtr. Flat of 0.510 mtr length 4 no's	Kg	1846	93	1,71,674.4
8	Pole clamp for EYE hook for XLPE Aerial bunched Cable	Pair	7888	248	19,56,124.8
9	Suspension Clamp with EYE hook for ABC	No.	5478	421.6	23,09,314.0

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10	Eye Hook for AB cable for dead end point	No.	2410	74.4	1,79,311.4
11	Conductor Dead End Clamp suitable for bare messenger XLPE Aerial bunched cable(25-70 sq mm)	No.	2410	80.6	1,94,254.1
12	LT Stay Set (Complete)	Set	2410	644.8	15,54,032.5
13	LT Stay Insulator	No	2410	37.2	89,655.7
14	LT Stay clamp	Pair	2410	136.4	3,28,737.6
15	7/12 SWG Stay Wire	Kg	24101	93	22,41,393.0
16	Earthing of Support (Coil Type)	EA	1534	205.84	3,15,696.8
17	PIPE HDPE SIZE 25 MM	Mtr	4601	33.6	1,54,597.0
18	Lug AL 70 Sqmm for 7/8 SWG Wire/Earthing	EA	3067	8.5	26,072.9
19	LT Distribution Box Polycarbonate	No	3944	925	36,48,015.0
20	Cap cable end for ABC	EA	12051	108.98	13,13,263.5
21	IPC 50-150, 50-150 SQ.MM ST.LT Type A	EA	31550	88.29	27,85,584.8
22	IPC EP 95 LT ABC 16-95 & 1.5-16 SQMM ST.LT Type C	EA	23663	88.29	20,89,188.6
23	IPC KZ 2X150 LTABC 25-150 & 6-35(50) sqmm Type B	EA	39438	51.77	20,41,705.3
24	STEEL STRAP SIZE 20 MMX50 M LONG	ROL	876	1476.14	12,93,689.1
25	BUCKLES FOR STEEL STRAP (1 EA = 100 NOS)	EA	876	490.67	4,30,023.2
26	Cable 1.1kV Al 4CX25 Sq.mm Armoured	Mtr	11831	169.53	20,05,777.2
27	Gland for 1.1kV Al 4X25 Sq.mm	EA	3944	172.41	6,79,950.6
28	Lug AL Crimping 25 Sqmm XLPE Single Hole	EA	15775	13.5	2,12,965.2
29	25x6 mm GI flat	Kg	30674	93	28,52,682.0
30	FRP CROSS ARM 1070MM 415V	EA	7888	981.49	77,41,600.5
31	ISA-50X50C6 GI Angle (4.5KG/M)	Kg	46011	93	42,79,023.0
32	ISMC-75X40X4.8 GI Channel (7.14KG/M)	Kg	46011	93	42,79,023.0
33	GI Nut , Bolt & Washer of different sizes	Kg	3944	96.72	3,81,444.3
34	2C X 4sq. mm. Armoured Aluminium Cable - XLPE Insulated	Mtr	56418	48	27,08,076.0
35	2C X 10sq. mm. Armoured Aluminium Cable - XLPE Insulated	Mtr	22567	63.34	14,29,412.8
36	4C X 10sq. mm. Armoured Aluminium Cable - XLPE Insulated	Mtr	45135	98.23	44,33,571.8
37	Tie Plastic Black size 7.6mmX380mm	EA	8764	6.65	58,280.6
38	Tie Plastic size 9mmX265mm	EA	13146	22.33	2,93,550.2
39	Black Paint	Ltr	1534	272.8	4,18,393.4
40	Yellow Colour Paint for Background	Ltr	3067	220	6,74,828.0
Total Cost of materials					11,60,83,283.6
Stock, Storage & Insurance i.e 3%					34,82,498.5
Sub Total					11,95,65,782.1
Contingency @ 3%					35,86,973.5
Tools & Plants @ 2%					23,91,315.6
Transportation @ 7.5%					89,67,433.7
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					
Erection Other @ 10%.					1,08,22,300.6

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Erection PSC Pole @ 20%					
Sub Total					14,53,33,805.5
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Fixing of complete LT line stay set includes Turn Buckle Assembly, Stay Rod & Stay plate, Stay Insulator, Stay Wire, Stay clamps with Nuts & bolts BA will do the excavation , supply of 0.5Cum cement concrete foundation 1:2:4 size (500mmx500mmx800mm)	No	2410.1	2362.5	56,93,861.3
2	Erection of 9 MTR PSC Pole including loading and unloading, transportation .Concreting to be done with PCC-1:1.5:3. of size - 500x500x1500 & Padding 500x500x150mm.Scope of work also includes 5 days curing & zebra painting (In Black & Yellow Strips/Zebra)	No	1533.7	6300	96,62,310.0
3	Dismantling of 9/8 Mtr. PCC/Joist Pole (Serviceable Pole) after digging the pit & taking out the pole, transportation & stacking the pole at a proper place in safe position & refilling the pit with loose earth, ramming including removal & disposal of malba	No.	438	945	4,13,910.0
4	Dismantling of ACSR/AAAC 34/55 mm ² from overhead line, recoiling, loading, transportation, unloading and stacking at a proper place in safe position/site store	Mtr	219100	15.75	34,50,825.0
5	Dismantling of insulator with pin, disc type including loading, transportation , unloading and stacking at a proper place in a safe position /Site store	EA	19719	8.505	1,67,710.1
6	Dismantling of different sizes of service cables	Kg	6573	52.5	3,45,082.5
7	Dismantling of Steel Structure, Nuts & Bolt including loading, transportation, unloading & staking of dismantled material at a proper place in TPNODL store	Kg	4382	78.75	3,45,082.5
Total Civil Part					2,00,78,781.3
Sub-Total					16,54,12,586.8
Other Over Head (Including Supervision charges)@ 6%					99,24,755.2
Sub-total					17,53,37,342.0
GST @ 18% of Sub-Total					3,15,60,721.6
CESS @ 1% of Sub-Total					17,53,373.4
Sub-Grand Total					20,86,51,437.0
Inspection Fee					-
Drawing Approval					-
Grand Total					20,86,51,437.0
Grand Total in Cr.					20.87

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C. Cost Estimate Conversion of LT Bare to 1x50+1x16 Sqmm LT AB Cable

Conversation of LT Bare conductor to 1x50+1x16mm ² (considering 29 nos. existing pole + 7 nos. intermediate pole) total = 36 poles					
Out of 7 nos. proposed pole, considering 25 nos. straight point and 11 nos. angular point. In Existing line considering 30% angular point (7 nos. pole) and 70% straight point. (29 nos.) i.e. in Total Line Straight point pole - 25 nos. ; Angular pole - 11 nos.					
S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	1.1KV LT AB Cable 1x50+1x16mm ²	Mtr	50470	52.08	26,28,477.6
2	9 mtr long 300 kg PSC pole	No	343	3720	12,75,960.0
3	RCC base Plate for PSC pole	No	343	1700	5,83,100.0
4	Danger Plate	No	343	99.2	34,025.6
5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr 1 no	Kg	103.2087	93	9,598.4
6	GI barbed wire anticlimbing device	Kg	1029	99.2	1,02,076.8
7	Back Clamp for Barbed wire anticlimbing device 25X3mm. flat, 0.59Kg/Mtr. Flat of 0.510 mtr length 4 no's	Kg	412.8348	93	38,393.6
8	Pole clamp for EYE hook for XLPE Aerial bunched Cable	Pair	1764	248	4,37,472.0
9	Suspension Clamp with EYE hook for ABC	No.	1225	421.6	5,16,460.0
10	Eye Hook for AB cable for dead end point	No.	539	74.4	40,101.6
11	Conductor Dead End Clamp suitable for bare messenger XLPE Aerial bunched cable(25-70 sq mm)	No.	539	80.6	43,443.4
12	LT Stay Set (Complete)	Set	539	644.8	3,47,547.2
13	LT Stay Insulator	No	539	37.2	20,050.8
14	LT Stay clamp	Pair	539	136.4	73,519.6
15	7/12 SWG Stay Wire	Kg	5390	93	5,01,270.0
16	Earthing of Support (Coil Type)	EA	343	205.84	70,603.1
17	PIPE HDPE SIZE 25 MM	Mtr	1029	33.6	34,574.4
18	Lug AL 70 Sqmm for 7/8 SWG Wire/Earthing	EA	686	8.5	5,831.0
19	LT Distribution Box Polycarbonate	No	882	925	8,15,850.0
20	Cap cable end for ABC	EA	2695	108.98	2,93,701.1
21	IPC 50-150, 50-150 SQ.MM ST.LT Type A	EA	7056	88.29	6,22,974.2
22	IPC EP 95 LT ABC 16-95 & 1.5-16 SQMM ST.LT Type C	EA	5292	88.29	4,67,230.7
23	IPC KZ 2X150 LTABC 25-150 & 6-35(50) sqmm Type B	EA	8820	51.77	4,56,611.4
24	STEEL STRAP SIZE 20 MMX50 M LONG	ROL	196	1476.14	2,89,323.4
25	BUCKLES FOR STEEL STRAP (1 EA = 100 NOS)	EA	196	490.67	96,171.3
26	Cable 1.1kV Al 4CX25 Sq.mm Armoured	Mtr	2646	169.53	4,48,576.4
27	Gland for 1.1kV Al 4X25 Sq.mm	EA	882	172.41	1,52,065.6
28	Lug AL Crimping 25 Sqmm XLPE Single Hole	EA	3528	13.5	47,628.0
29	25x6 mm GI flat	Kg	6860	93	6,37,980.0
30	FRP CROSS ARM 1070MM 415V	EA	1764	981.49	17,31,348.4
31	ISA-50X50C6 GI Angle (4.5KG/M)	Kg	10290	93	9,56,970.0

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32	ISMC-75X40X4.8 GI Channel (7.14KG/M)	Kg	10290	93	9,56,970.0
33	GI Nut , Bolt & Washer of different sizes	Kg	882	96.72	85,307.0
34	2C X 4sq. mm. Armoured Aluminium Cable - XLPE Insulated	Mtr	12617.5	48	6,05,640.0
35	2C X 10sq. mm. Armoured Aluminium Cable - XLPE Insulated	Mtr	5047	63.34	3,19,677.0
36	4C X 10sq. mm. Armoured Aluminium Cable - XLPE Insulated	Mtr	10094	98.23	9,91,533.6
37	Tie Plastic Black size 7.6mmX380mm	EA	1960	6.65	13,034.0
38	Tie Plastic size 9mmX265mm	EA	2940	22.33	65,650.2
39	Black Paint	Ltr	343	272.8	93,570.4
40	Yellow Colour Paint for Background	Ltr	686	220	1,50,920.0
Total Cost of materials					1,70,61,237.9
Stock, Storage & Insurance i.e 3%					5,11,837.1
Sub Total					1,75,73,075.1
Contingency @ 3%					5,27,192.3
Tools & Plants @ 2%					3,51,461.5
Transportation @ 7.5%					13,17,980.6
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					
Erection Other @ 10%.					15,03,635.2
Erection PSC Pole @ 20%					
Sub Total					2,12,73,344.7
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Fixing of complete LT line stay set includes Turn Buckle Assembly, Stay Rod & Stay plate, Stay Insulator, Stay Wire, Stay clamps with Nuts & bolts BA will do the excavation , supply of 0.5Cum cement concrete foundation 1:2:4 size (500mmx500mmx800mm)	No	539	2362.5	12,73,387.5
2	Erection of 9 MTR PSC Pole including loading and unloading, transportation .Concreting to be done with PCC-1:1.5:3. of size - 500x500x1500 & Padding 500x500x150mm.Scope of work also includes 5 days curing & zebra painting (In Black & Yellow Strips/Zebra)	No	343	6300	21,60,900.0
3	Dismantling of 9/8 Mtr. PCC/Joist Pole (Serviceable Pole) after digging the pit & taking out the pole, transportation & stacking the pole at a proper place in safe position & refilling the pit with loose earth, ramming including removal & disposal of malba	No.	49	945	46,305.0
4	Dismantling of ACSR/AAAC 34/55 mm ² from overhead line, recoiling, loading, transportation, unloading and stacking at a proper place in safe position/site store	Mtr	49000	15.75	7,71,750.0
5	Dismantling of insulator with pin, disc type including loading, transportation ,unloading and stacking at a proper place in a safe position /Site store	EA	4410	8.505	37,507.1
6	Dismantling of different sizes of service cables	Kg	1470	52.5	77,175.0

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7	Dismantling of Steel Structure,Nuts & Bolt including loading, transportation, unloading & staking of dismantled material at a proper place in TPNODL store	Kg	980	78.75	77,175.0
Total Civil Part					44,44,199.6
Sub-Total					2,57,17,544.2
Other Over Head (Including Supervision charges)@ 6%					15,43,052.7
Sub-total					2,72,60,596.9
GST @ 18% of Sub-Total					49,06,907.4
CESS @ 1% of Sub-Total					2,72,606.0
Sub-Grand Total					3,24,40,110.3
Inspection Fee					-
Drawing Approval					-
Grand Total					3,24,40,110.3
Grand Total in Cr.					3.244

9.14 Annexure 14: Cost Estimate for Meters and metering equipment for energy audit

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Energy Meters for 33 kV,11 kV Feeders, Metering Units	EA	200	4618	9,23,600.00
2	DT Meter Boxes with inbuild CT for Smart Meter installation	-	-	-	-
a	800/5 Amp	EA	50	15000	7,50,000.00
b	400/5 Amp	EA	100	15000	15,00,000.00
c	200/5 Amp	EA	750	15000	1,12,50,000.00
3	Testing and Measuring equipment and Cords	EA	150	1000	1,50,000.00
4	Metering Unit for Section Boundy Metering	EA	50		-
a	400/1 or 400/5	EA	15	113000	16,95,000.00
b	200/1 or 200/5	EA	18	56000	10,08,000.00
5	Software Licence	EA	1	500000	5,00,000.00
Total Cost of materials					1,77,76,600.00
Stock, Storage & Insurance i.e 3%					5,33,298.00
Sub Total					1,83,09,898.00
Contingency @ 3%					5,49,296.94
Tools & Plants @ 2%					3,66,197.96
Transportation @ 7.5%					13,73,242.35
Erection Other @ 10%.					18,30,989.80
Sub Total					2,24,29,625.05
Other Over Head (Including Supervision charges)@ 6%					13,45,777.50
Sub-total					2,37,75,402.55
GST @ 18% of Sub-Total					42,79,572.46
CESS @ 1% of Sub-Total					2,37,754.03
Sub-Grand Total					2,82,92,729.04
Grand Total in Cr.					2.83

9.15 Annexure 15: Cost Estimate Equipment for AMR enablement of 3phase consumer meters

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	AMR for Energy Audit	EA	1000	3305	33,05,000.00
a	SIM Card	EA	1000	16	1,92,000.00
Total Cost of materials					34,97,000.00
Stock, Storage & Insurance i.e 3%					1,04,910.00
Sub Total					36,01,910.00
Contingency @ 3%					1,08,057.30
Tools & Plants @ 2%					72,038.20
Transportation @ 7.5%					2,70,143.25
Erection Other @ 10%.					3,60,191.00
Sub Total					44,12,339.75
Other Over Head (Including Supervision charges)@ 6%					2,64,740.39
Sub-total					46,77,080.14
GST @ 18% of Sub-Total					8,41,874.42
CESS @ 1% of Sub-Total					46,770.80
Sub-Grand Total					55,65,725.36
Grand Total in Cr.					0.56

9.16 Annexure 16: Cost Estimate for Field Testing equipment (PTR testing, PQ analyzer, Switch gear testing kit)

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	INSULATION TESTER DIGITAL 0-5KV	EA	10	75000	7,50,000.0
2	OIL TEST SET 100KV MOTORIZED	EA	4	43340	1,73,360.0
3	CONTACT RESISTANCE METER (CRM 100B)	EA	5	124400	6,22,000.0
4	TAN DELTA & CAPACITANCE MEASUREMENT KIT	EA	1	1889830.51	18,89,830.5
5	TRANSFORMER RATIO METER TRM-200	EA	1	127659.81	1,27,659.8
6	SECONDARY CURRENT INJECTION WITH TIMER	EA	0	169000	-
7	CB TIMER KIT	EA	4	105000	4,20,000.0
8	CT ANALYZER MODEL CTERP-2000	EA	0	1100000	-
9	NEON TESTER 11KV - 33KV - 66KV	EA	70	6913.25	4,83,927.5
10	PRIMARY INJECTION TEST SET 0-600A WITH VARIAC	EA	1	95545	95,545.0
11	TRANSF.WINDING RESISTANCE METER TRM 103	EA	5	190079.98	9,50,399.9

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12	OIL PUMP HAND OPERATED	EA	6	3541.44	21,248.6
13	INFRARED THERMO - SCANNING CAMERA	EA	14	63851.19	8,93,916.7
14	PORTABLE TR OIL AND GAS DGA INSTRUMENT	EA	1	2900000	29,00,000.0
15	METER EARTH RESIS DIGITAL 0-10/1000 OHMS	EA	15	64872.43	9,73,086.5
16	HI-POT TEST SET AC 0-40 KV AC 50 mA.	EA	5	400000	20,00,000.0
17	HI-POT TEST SET AC 0-40 KV DC 50 mA.	EA	8	250000	20,00,000.0
18	TOWER WAGON - (AREIAL TYPE)	EA	1	2783870	27,83,870.0
19	OIL FILTER MACHINE (TROLLEY MOUNTED)	EA	2	1022757.12	20,45,514.2
20	GROUNDING SET FOR O/H LINE PORTABLE	EA	25	19862.29	4,96,557.3
21	OIL SAMPLE COLLECTION BOTTLE FOR DGA	EA	304	1031	3,13,424.0
22	Power Tools battery operated for drilling purpose	EA	20	22881.36	4,57,627.2
23	Power Tools- Battery operated for tightening & loosing of the Nuts / Bolts	EA	20	4941.12	98,822.4
24	Digital Multi Meter (Clamp On Type)	EA	15	17538.22	2,63,073.3
25	INSULATION TESTER DIGITAL 500V-1000V	EA	8	4350	34,800.0
26	SINGLE PHASE VARIAC	EA	4	35000	1,40,000.0
27	THREE PHASE VARIAC	EA	4	51000	2,04,000.0
28	DIGITAL LOW RESISTANCE OHMMETER TRM104	EA	5	139700	6,98,500.0
29	ULTRASONIC INSPECTION KIT	EA	1	1200000	12,00,000.0
30	RELAY TEST SET (DUAL SOURCE THREE PHASE INJECTION KI)	EA	1	2400000	24,00,000.0
31	DISCHARGE ROD FOR 11-33-66KV	EA	16	21240	3,39,840.0
32	DRILLING MACHINE	EA	80	5000	4,00,000.0
33	TOOL KIT HD COMPLETE WITH CANVAS BAG	EA	40	20000	8,00,000.0
34	Vaccumn interrupter tester	EA	2	793671	15,87,342.0
35	Sag height meter	EA	25	31000	7,75,000.0
36	Online power quality molnitoring system	EA	1	204543.39	2,04,543.4
37	Iph current injection kit	EA	16	5000	80,000.0
38	Infrared thermo Scanning Camera(High end)	EA	4	300000	12,00,000.0
39	EARTH RESISTANCE TESTER	EA	5	1,38,127	6,90,635.6
40	DIGITAL ELCOMETER	EA	5	21,186	1,05,932.2
41	INSULATION RESISTANCE TESTER	EA	5	1,48,305	7,41,525.4
42	MEASURING TAPE	EA	6	678	4,067.8
43	DIGITAL CAMERA WITH 128GB MEMORY CARD	EA	6	12,542	75,254.2
44	HARMONIC ANALYZER	EA	2	5,50,000	11,00,000.0
Total Cost of materials					3,35,41,303.5
GST @ 18% of Sub-Total					60,37,434.6
Grand Total					3,95,78,738.1
Grand Total in Cr.					3.96

9.17 Annexure 17: Cost Estimate of Refurbishment of 33kV / 11kV Primary Substation (PSS)

Sick Equipment replacement-BOQ for Sick Equipment replacement (VCB, CT/PT, CRP, Isolator)

S No.	Item Description	Quantity	Unit	Unit Rate (In Cr.)	Amount (INR)
1	33KV VCB -800A	34	EA	2,22,091.00	75,51,094.00
2	33KV CT- 800-400-200/1-1-1	102	EA	40,781.00	41,59,662.00
3	33KV PT	0	EA	19,208.00	-
4	11KV VCB - 1200A	70	EA	2,04,000.00	1,42,80,000.00
5	11KV CT- 300-600/1-1, 400-800-1200/1-1-1	210	EA	33,393.00	70,12,530.00
9	11kv Isolator (1250A)with Earth Switch Double Break_Non Motorized	50	ST	65000	32,50,000.00
10	11kv Isolator (1250A)with Earth Switch Double Break_Motorized	50	ST	1,27,200.00	63,60,000.00
11	14 C 2.5 mm sq Cu Control Cable, un armoured	20000	mtr.	360.00	72,00,000.00
12	10 C 1.5 mm sq Cu Control Cable, un armoured	10000	mtr.	330.00	33,00,000.00
13	2C 2.5mm sq Cu Control Cable, un armoured	10000	mtr.	68.00	6,80,000.00
16	33KV LA	900	EA	7000	63,00,000.00
17	11KV LA	400	EA	4,500.00	18,00,000.00
18	24 V, 100 AH, maintenance free VRLA Battery (Set. 4 Nos of 12V Battery)	10	EA	25,289.00	2,52,890.00
19	24V, 100A Float cum Boost Charger (Float/Boost current as per above VRLA Battery)	10	EA	1,98,851	19,88,510.00
23	30kV, 10kA, Metal Oxide, Class-3, Surge Arrester	100	EA	4,840	4,84,000.00
24	9kV, 5kA, Metal Oxide, Surge Arrester (Distribution Class)	100	EA	2,602	2,60,200.00
Subtotal Material(A)					6,48,78,886.00
Stock, Storage and Insurance@3% of A					19,46,366.58
Sub- Total-B					6,68,25,252.58
T & P Charges @ 2% of B					13,36,505.05
Contingency @ 3% of B					20,04,757.58
Erection Charges@ 20% over PSC pole cost, @ 5% over T/F & @10% over other materials (B)					55,58,223.92
Transportation Charges@7.5% of B					50,11,893.94
Sub-Total C					8,07,36,633.07
Over Head Charges (Including Supervision charges) @6% of C					48,44,197.98
Total D					8,55,80,831.05
Gross Cost					8,55,80,831.05
OR Say					8,55,80,831.00
GST @18%					1,54,04,549.58
CESS 1%					8,55,808.31
Gross Cost (Inc. GST)					10,18,41,188.89
Total(In Crores)					10.18

9.18 Annexure 18: Cost Estimate for 11 KV Conductor up gradation

Sr. no	Material	UOM	Quantity	Amount in Cr.
1	11kV Line Refurbishment-100 sq.mm AAAC	Ckm	146.5	15.07
Total In Cr.				15.07

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	WPB 160x152 (30.44KG/Mtr.),11 mtr	No	1172	34322	4,02,24,821.4
2	Straight Cross Arm Channel 100X50X5mm, 9.56 KG/Mtr., each channel length 1.2 mtr.	Kg	7325.0	93	6,81,225.0
3	Straight Cross Arm Top Channel 100X50X5mm, 9.56 KG/mtr, each channel length 0.306 Mtr.	Kg	2930.0	93	2,72,490.0
4	Fish Plate 50X8 mm., 0.97kg/Mtr., each 0.280 mtr. Length	Kg	849.7	93	79,022.1
5	Danger Plate	No	1172	99.2	1,16,262.4
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr 1 no	Kg	352.7	93	32,796.9
7	GI barbed wire anticlimbing device	Kg	3516	99.2	3,48,787.2
8	Back Clamp for Barbed wire anticlimbing device 25X3mm. flat, 0.59Kg/Mtr. Flat of 0.510 mtr length 4 no's	Kg	1410.6	93	1,31,187.6
9	11kV,5kN pin insulator polymer	No	3516	248	8,71,968.0
10	11kV V cross Arm (GI)	No	879	1004.4	8,82,867.6
11	GI Back Clamp for 11kV 'V' Cros Arm	No	879	99.2	87,196.8
12	11kV F Clamp	No	1172	297.6	3,48,787.2
13	H/W fitting(B&S) 70KN,3 Bolt	Set	1758	434	7,62,972.0
14	11kV Disc insulator (B&S) 70KN polymer	No	1758	1426	25,06,908.0
15	Earthing of Support (Coil Type)	EA	1172	205.84	2,41,244.5
16	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	Kg	454.2	93	42,236.0
17	PG Clamp for 100 mm2 AAAC conductor	No	1758	719.2	12,64,353.6
18	GI Nut , Bolt & Washer of different sizes	Kg	2314.7	96.72	2,23,877.8
19	H.T. Stay clamp	Pair	586	155	90,830.0
20	H.T. Stay set (Complete)	Set	586	1302	7,62,972.0
21	H.T. Stay Insulator	No	586	62	36,332.0
22	7/10 SWG Stay Wire	Kg	5860	93	5,44,980.0
23	GI Plate base(500X500X10mm)	No	1172	1860	21,79,920.0
24	AAA conductor,100 mm2	Km	452.685	68200	3,08,73,117.0
25	Black Paint	Ltr	586	272.8	1,59,860.8
26	Yellow Colour Paint for Background	Ltr	1172	220	2,57,840.0
Total Cost of materials					8,40,24,855.8
Stock, Storage & Insurance i.e 3%					25,20,745.7
Sub Total					8,65,45,601.5

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Contingency @ 3%					25,96,368.0
Tools & Plants @ 2%					17,30,912.0
Transportation @ 7.5%					64,90,920.1
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					
Erection Other @ 10%.					43,20,563.6
Erection PSC Pole @ 20%					
Sub Total					10,16,84,365.3
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Fixing of complete 11KV line stay set includes Turn Buckle Assembly, Stay Rod & Stay plate, Stay Insulator, Stay Wire, Stay clamps with Nuts & bolts BA will do the excvation, supply of 0.5Cum cement concrete foundation 1:2:4 size (500mmx500mmx800mm)	No.	586	2362.5	13,84,425.0
2	Erection of 11 Mtr long WPB Pole including loading & unloading, transportation, providing & laying of 1:1.5:3, M20 Grade, C.C-500x500X1800 mm & cooping of 500x500x450 mm, includes 5 days curing and zebra painting (In Black & Yellow Strips/Zebra)	No	1172	6300	73,83,600.0
3	Dismantling of 9/8 Mtr. PCC/Joist Pole (Serviceable Pole) after digging the pit & taking out the pole, transportation & stacking the pole at a proper place in safe position & refilling the pit with loose earth, ramming including removal & disposal of malba	No.	733	945	6,92,685.0
4	Dismantling of insulator with pin, disc type including loading, transportation, unloading and stacking at a proper place in a safe position /Site store	EA	1465	8.505	12,459.8
5	Dismantling of ACSR/AAAC 80/100 mm ² from overheadline, recoiling, loading, transportation, unloading and stacking at a proper place in safe position/site store	Mtr	452685	15.75	71,29,788.8
6	Dismantling/Removal of V cross arm from pole including loading, transportation, unloading and stacking of dismantled material at a proper place in safe position at site store	EA	733	43.47	31,863.5
7	Dismantling of Steel Structure, Nuts & Bolt including loading, transportation, unloading & staking of dismantled material at a proper place in TPNODL store	Kg	14650	78.75	11,53,687.5
Total Civil Part					1,77,88,509.6
Sub-Total					11,94,72,874.9
Other Over Head (Including Supervision charges)@ 6%					71,68,372.5
Sub-total					12,66,41,247.4
GST @ 18% of Sub-Total					2,27,95,424.5
CESS @ 1% of Sub-Total					12,66,412.5
Sub-Grand Total					15,07,03,084.4
Inspection Fee					-
Drawing Approval					-
Grand Total					15,07,03,084.4
Grand Total in Cr.					15.070

9.19 Annexure 19: Cost Estimate for Refurbishment of 11KV/0.415 KV Distribution Substation (DSS)

Sr. no	Material	UOM	Quantity	Amount in Cr.
A	Refurbishment of 100 KVA 11KV/0.415 KV DSS	Nos.	50	1.36
B	Refurbishment of 250 KVA 11KV/0.415 KV DSS	Nos.	45	1.38
C	Refurbishment of 500 KVA 11KV/0.415 KV DSS	Nos.	12	0.38
Total In Cr.				3.11

A. Cost Estimate for Refurbishment of 100 KVA 11/o.415kV DSS.

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	100 KVA,11/0.4KV(Al) Transformer	No	0	165450	-
2	11kV AB Switch,200A.3pole,50Hz,Horizontal Type	Set	50	9114	4,55,700.0
3	Lightning Arrester (9kV,10kA) DH Class	No	150	1260	1,89,000.0
4	HG Fuse(11KV,200A,3 Pole,50Hz) with PI	Set	50	7588.8	3,79,440.0
5	Conductor 62 mm sq ACSR Rabbit	Mtr	1200	32.79	39,348.0
6	Cable 1.1kV Al 1CX150 Sq.mm Un-armoured	Mtr	1600	260.4	4,16,640.0
7	Gland for 1.1kV Al 1CX150 Sq.mm	EA	200	128.3	25,660.0
8	Top Channel 100X50X5mm (2800 mm long) (9.56Kg./Mtr) (Each 26.77 Kg)	Kg	2676.8	93	2,48,942.4
9	Transformer Base GI Channel 100X50X5mm (2800 mm long) (9.56Kg./Mtr) (Each 26.77 Kg)	Kg	2676.8	93	2,48,942.4
10	AB Switch Mounting Channel 75X40X4.8 mm GI Channel (2800 mm long) (7.14Kg./Mtr)	Kg	1999.2	93	1,85,925.6
11	HG Fuse Channel 75X40X4.8 mm GI Channel (2800 mm long) (7.14Kg./Mtr)	Kg	1999.2	93	1,85,925.6
12	Transformer Belting angle (50X50X6) mm 2800 mm long 2 nos. (7.14 Kg./Mtr.)with side angle	Kg	2499	93	2,32,407.0
13	AB Switch Operating Pipe Channel Support 75X40X4.8 mm GI Channel (625 mm long)(7.14Kg./Mtr)	Kg	223.125	93	20,750.6
14	AB Switch Side Support Channel 75X40X4.8 mm GI Channel(330 mm long)(7.14Kg./Mtr)	Kg	329.5	93	30,643.5
15	HG Fuse Side Support Channel 75X40X4.8 mm GI Channel(330 mm long)(7.14Kg./Mtr)	Kg	329.5	93	30,643.5
16	Cantilever Support Channel 75X40X4.8 mm GI Channel(810 m long)(7.14Kg./Mtr)	Kg	289.17	93	26,892.8

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17	AB Switch Operating Pipe Diagonal Angle Support 50X50X6mm GI(388 mm long)(4.5Kg./Mtr)	Kg	87.3	93	8,118.9
18	AB Switch Operating Pipe Diagonal Base Angle Support 50X50X6mm (340 mm long) GI(4.5Kg./Mtr)	Kg	76.5	93	7,114.5
19	Cantilever Support Angle 50X50X6mm GI (1282 mm long) (4.5Kg./Mtr)	Kg	288.45	93	26,825.9
20	H/W fitting(B&S) 70KN,3 Bolt	Set	150	434	65,100.0
21	11kV Disc insulator (B&S) 70KN polymer	No	150	1426	2,13,900.0
22	50x6 mm GI flat	Kg	300	93	27,900.0
23	25x6 mm GI flat	Kg	300	93	27,900.0
24	GI Nut , Bolt & Washer of different sizes	Kg	1250	96.72	1,20,900.0
25	Lug AL 70 Sqmm for 7/8 SWG Wire/Earthing	EA	2700	8.5	22,950.0
26	Lug AL Crimping 150 Sqmm XLPE One Hole	EA	400	17.71	7,084.0
27	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	250	1302	3,25,500.0
28	PIPE HDPE SIZE 25 MM	Mtr	1150	33.6	38,640.0
29	Connector Mini Wedge 25 Sqmm to Dog	EA	150	72.88	10,932.0
Total Cost of materials					36,19,726.7
Stock, Storage & Insurance i.e 3%					1,08,591.8
Sub Total					37,28,318.5
Contingency @ 3%					1,11,849.6
Tools & Plants @ 2%					74,566.4
Transportation @ 7.5%					2,79,623.9
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					
Erection Other @ 10%.					3,39,305.3
Erection PSC Pole @ 20%					
Sub Total					45,33,663.6
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	250	2415	6,03,750.0
2	Providing and fixing including loading , unloading & transportation of FRP Fencing including Fluorent Sticker(two Mtr. in each post),Supply of Latch Lock, Supply of Hings,Supply of SS Lock with Key excluding civil works as per TPNODL specification.	M2	1500	3310	49,65,000.0
3	Dismantling of Steel Structure, Nuts & Bolt including loading, transportation, unloading & staking of dismantled material at a proper place in TPNODL store	Kg	2500	78.75	1,96,875.0

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4	Dismantling of SINGLE-phase DD Fuse/ DO Fuse set arrangement fitted on structure including removal of all Electric/Earth connections etc., loading, transportation, unloading and staking at a proper place in TPNODL Store	EA	50	840	42,000.0
5	Dismantling of 11 kV GO/AB Switch including removal of all Electric/Earth connections etc., loading, transportation, unloading and staking at a proper place/ site and finally at TPNODL store as per instruction of EIC.	EA	50	1400	70,000.0
6	Dismantling of Lightening Arrester (LA) 9KV 5KA including removal of all Electric/Earth connections etc., loading, transportation, unloading and staking at a proper place/ site and finally at TPNODL store as per instruction of EIC.	EA	150	2335	3,50,250.0
Total Civil Part					62,27,875.0
Sub-Total					1,07,61,538.6
Other Over Head (Including Supervision charges) @ 6%					6,45,692.3
Sub-total					1,14,07,231.0
GST @ 18% of Sub-Total					20,53,301.6
CESS @ 1% of Sub-Total					1,14,072.3
Sub-Grand Total					1,35,74,604.8
Inspection Fee					-
Drawing Approval					-
Grand Total					1,35,74,604.8
Grand Total in Cr.					1.36

B. Cost Estimate for Refurbishment of 250 KVA 11/0.415kV DSS.

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	250 KVA,11/0.4KV(Cu) Transformer	No	0	441439	-
2	11kV AB Switch,400A.3pole,50Hz,Horizontal Type	Set	45	14694	6,61,230.0
3	Lightning Arrester (9kV,10kA) DH Class	No	135	1260	1,70,100.0
4	HG Fuse(11KV,400A,3 Pole,50Hz) with PI	Set	45	14297.2	6,43,374.0
5	Conductor 62 mm sq ACSR Rabbit	Mtr	1080	32.79	35,413.2
6	Cable 1.1kV Al 1CX300 Sq.mm Un-armoured	Mtr	1440	473.68	6,82,099.2
7	Gland for 1.1kV Al 1CX300 Sq.mm	EA	180	840	1,51,200.0
8	Top Channel 100X50X5mm (2800 mm long) (9.56Kg./Mtr) (Each 26.77 Kg)	Kg	2409.12	93	2,24,048.2
9	Transformer Base GI Channel 100X50X5mm (2800 mm long) (9.56Kg./Mtr) (Each 26.77 Kg)	Kg	2409.12	93	2,24,048.2
10	AB Switch Mounting Channel 75X40X4.8 mm GI Channel (2800 mm long) (7.14Kg./Mtr)	Kg	1799.28	93	1,67,333.0
11	HG Fuse Channel 75X40X4.8 mm GI Channel (2800 mm long) (7.14Kg./Mtr)	Kg	1799.28	93	1,67,333.0
12	Transformer Belting angle (50X50X6) mm 2800 mm long 2 nos. (7.14 Kg./Mtr.)with side angle	Kg	2249.1	93	2,09,166.3

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13	AB Switch Operating Pipe Channel Support 75X40X4.8 mm GI Channel (625 mm long)(7.14Kg./Mtr)	Kg	200.8125	93	18,675.6
14	AB Switch Side Support Channel 75X40X4.8 mm GI Channel(330 mm long)(7.14Kg./Mtr)	Kg	296.55	93	27,579.2
15	HG Fuse Side Support Channel 75X40X4.8 mm GI Channel(330 mm long)(7.14Kg./Mtr)	Kg	296.55	93	27,579.2
16	Cantilever Support Channel 75X40X4.8 mm GI Channel(810 m long)(7.14Kg./Mtr)	Kg	260.253	93	24,203.5
17	AB Switch Operating Pipe Diagonal Angle Support 50X50X6mm GI(388 mm long)(4.5Kg./Mtr)	Kg	78.57	93	7,307.0
18	AB Switch Operating Pipe Diagonal Base Angle Support 50X50X6mm (340 mm long) GI(4.5Kg./Mtr)	Kg	68.85	93	6,403.1
19	Cantilever Support Angle 50X50X6mm GI (1282 mm long) (4.5Kg./Mtr)	Kg	259.605	93	24,143.3
20	H/W fitting(B&S) 70KN,3 Bolt	Set	135	434	58,590.0
21	11kV Disc insulator (B&S) 70KN polymer	No	135	1426	1,92,510.0
22	50x6 mm GI flat	Kg	270	93	25,110.0
23	25x6 mm GI flat	Kg	270	93	25,110.0
24	GI Nut , Bolt & Washer of different sizes	Kg	1125	96.72	1,08,810.0
25	Lug AL 70 Sqmm for 7/8 SWG Wire/Earthing	EA	2430	8.5	20,655.0
26	Lug AL Crimping 300 Sqmm XLPE One Hole	EA	360	38.42	13,831.2
27	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	225	1302	2,92,950.0
28	PIPE HDPE SIZE 25 MM	Mtr	1035	33.6	34,776.0
29	Connector Mini Wedge 25 Sqmm to Dog	EA	135	72.88	9,838.8
Total Cost of materials					42,53,416.8
Stock, Storage & Insurance i.e 3%					1,27,602.5
Sub Total					43,81,019.3
Contingency @ 3%					1,31,430.6
Tools & Plants @ 2%					87,620.4
Transportation @ 7.5%					3,28,576.4
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					
Erection Other @ 10%.					4,07,928.1
Erection PSC Pole @ 20%					
Sub Total					53,36,574.8
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	225	2415	5,43,375.0
2	Providing and fixing including loading , unloading & transportation of FRP Fencing including Fluorocent Sticker(two Mtr. in each post),Supply of Latch Lock, Supply of Hings,Supply of SS Lock with Key excluding civil works as per TPNODL specification.	M2	1350	3310	44,68,500.0
3	Dismantling of Steel Structure,Nuts & Bolt including loading,transportation, unloading &	Kg	2250	78.75	1,77,187.5

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	staking of dismantled material at a proper place in TPNODL store				
4	Dismantling of SINGLE phase DD Fuse/ DO Fuse set arrangement fitted on structure including removal of all Electric/Earth connections etc., loading, transportation, unloading and staking at a proper place in TPNODL Store	EA	45	840	37,800.0
5	Dismantling of 11 kV GO/AB Switch including removal of all Electric/Earth connections etc., loading, transportation, unloading and staking at a proper place/ site and finally at TPNODL store as per instruction of EIC.	EA	45	1400	63,000.0
6	Dismantling of Lightning Arrester(LA) 9KV 5KA including removal of all Electric/Earth connections etc., loading, transportation, unloading and staking at a proper place/ site and finally at TPNODL store as per instruction of EIC.	EA	135	2335	3,15,225.0
Total Civil Part					56,05,087.5
Sub-Total					1,09,41,662.3
Other Over Head (Including Supervision charges)@ 6%					6,56,499.7
Sub-total					1,15,98,162.1
GST @ 18% of Sub-Total					20,87,669.2
CESS @ 1% of Sub-Total					1,15,981.6
Sub-Grand Total					1,38,01,812.8
Inspection Fee					-
Drawing Approval					-
Grand Total					1,38,01,812.8
Grand Total in Cr.					1.38

C. Cost Estimate for Refurbishment of 500 KVA 11/o.415kV DSS.

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	500 KVA,11/0.4KV(Cu) Transformer	No	0	719200	-
2	11kV AB Switch,400A.3pole,50Hz,Horizontal Type	Set	12	14694	1,76,328.0
3	Lightning Arrester (9kV,10kA) DH Class	No	36	1260	45,360.0
4	HG Fuse(11KV,400A,3 Pole,50Hz) with PI	Set	12	14297.2	1,71,566.4
5	Conductor 62 mm sq ACSR Rabbit	Mtr	288	32.79	9,443.5
6	Cable 1.1kV Al 1CX630 Sq.mm Un-armoured	Mtr	384	618.45	2,37,484.8
7	Gland for 1.1kV Al 1CX630 Sq.mm	EA	48	510.54	24,505.9
8	Top Channel 100X50X5mm (2800 mm long) (9.56Kg./Mtr) (Each 26.77 Kg)	Kg	642.432	93	59,746.2
9	Transformer Base GI Channel 100X50X5mm (2800 mm long) (9.56Kg./Mtr) (Each 26.77 Kg)	Kg	642.432	93	59,746.2
10	AB Switch Mounting Channel 75X40X4.8 mm GI Channel (2800 mm long) (7.14Kg./Mtr)	Kg	479.808	93	44,622.1
11	HG Fuse Channel 75X40X4.8 mm GI Channel (2800 mm long) (7.14Kg./Mtr)	Kg	479.808	93	44,622.1

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12	Transformer Belting angle (50X50X6) mm 2800 mm long 2 nos. (7.14 Kg./Mtr.)with side angle	Kg	599.76	93	55,777.7
13	AB Switch Operating Pipe Channel Support 75X40X4.8 mm GI Channel (625 mm long)(7.14Kg./Mtr)	Kg	53.55	93	4,980.2
14	AB Switch Side Support Channel 75X40X4.8 mm GI Channel(330 mm long)(7.14Kg./Mtr)	Kg	79.08	93	7,354.4
15	HG Fuse Side Support Channel 75X40X4.8 mm GI Channel(330 mm long)(7.14Kg./Mtr)	Kg	79.08	93	7,354.4
16	Cantilever Support Channel 75X40X4.8 mm GI Channel(810 m long)(7.14Kg./Mtr)	Kg	69.4008	93	6,454.3
17	AB Switch Operating Pipe Diagonal Angle Support 50X50X6mm GI(388 mm long)(4.5Kg./Mtr)	Kg	20.952	93	1,948.5
18	AB Switch Operating Pipe Diagonal Base Angle Support 50X50X6mm (340 mm long) GI(4.5Kg./Mtr)	Kg	18.36	93	1,707.5
19	Cantilever Support Angle 50X50X6mm GI (1282 mm long) (4.5Kg./Mtr)	Kg	69.228	93	6,438.2
20	H/W fitting(B&S) 70KN,3 Bolt	Set	36	434	15,624.0
21	11kV Disc insulator (B&S) 70KN polymer	No	36	1426	51,336.0
22	50x6 mm GI flat	Kg	72	93	6,696.0
23	25x6 mm GI flat	Kg	72	93	6,696.0
24	GI Nut , Bolt & Washer of different sizes	Kg	300	96.72	29,016.0
25	Lug AL 70 Sqmm for 7/8 SWG Wire/Earthing	EA	648	8.5	5,508.0
26	Lug AL Crimping 630 Sqmm XLPE One Hole	EA	96	135.95	13,051.2
27	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	60	1302	78,120.0
28	PIPE HDPE SIZE 25 MM	Mtr	276	33.6	9,273.6
29	Connector Mini Wedge 25 Sqmm to Dog	EA	36	72.88	2,623.7
Total Cost of materials					11,83,385.0
Stock, Storage & Insurance i.e 3%					35,501.5
Sub Total					12,18,886.5
Contingency @ 3%					36,566.6
Tools & Plants @ 2%					24,377.7
Transportation @ 7.5%					91,416.5
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					
Erection Other @ 10%.					1,13,842.3
Erection PSC Pole @ 20%					
Sub Total					14,85,089.6
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	60	2415	1,44,900.0

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2	Providing and fixing including loading , unloading & transportation of FRP Fencing including Fluorocarbon Sticker(two Mtr. in each post),Supply of Latch Lock, Supply of Hinges,Supply of SS Lock with Key excluding civil works as per TPNODL specification.	M2	360	3310	11,91,600.0
3	Dismantling of Steel Structure,Nuts & Bolt including loading,transportation, unloading & staking of dismantled material at a proper place in TPNODL store	Kg	600	78.75	47,250.0
4	Dismantling of SINGLE phase DD Fuse/ DO Fuse set arrangement fitted on structure including removal of all Electric/Earth connections etc., loading, transportation, unloading and staking at a proper place in TPNODL Store	EA	12	840	10,080.0
5	Dismantling of 11 kV GO/AB Switch including removal of all Electric/Earth connections etc., loading, transportation, unloading and staking at a proper place/ site and finally at TPNODL store as per instruction of EIC.	EA	12	1400	16,800.0
6	Dismantling of Lightning Arrester(LA) 9KV 5KA including removal of all Electric/Earth connections etc., loading, transportation, unloading and staking at a proper place/ site and finally at TPNODL store as per instruction of EIC.	EA	36	2335	84,060.0
Total Civil Part					14,94,690.0
Sub-Total					29,79,779.6
Other Over Head (Including Supervision charges)@ 6%					1,78,786.8
Sub-total					31,58,566.4
GST @ 18% of Sub-Total					5,68,542.0
CESS @ 1% of Sub-Total					31,585.7
Sub-Grand Total					37,58,694.0
Inspection Fee					-
Drawing Approval					-
Grand Total					37,58,694.0
Grand Total in Cr.					0.38

9.20 Annexure 20: Cost Estimate for LV Protection at Distribution Substation (DSS)

Sr. no	Material	UOM	Quantity	Amount in Cr.
A	LV Protection for 100 KVA 11KV/0.415 KV DSS	Nos.	4388	30.56
B	LV Protection for 250 KVA 11KV/0.415 KV DSS	Nos.	108	1.15
C	LV Protection for 500 KVA 11KV/0.415 KV DSS	Nos.	93	1.67
Total In Cr.				33.38

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A. Cost Estimate LV Protection for 100 KVA 11/o.415kV DSS.

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	LT Distribution Box for 100 KVA S/S.	EA	4388	30280	13,28,66,709.3
2	CABLE 1.1KV AL 4CX150 SQMM ARM	Mtr	52656	686.86	3,61,67,300.2
3	GLAND FOR ARM CABLE 4X150 SQ.MM	EA	17552	128.3	22,51,921.6
4	LTDB Mounting Support Angle 75X40X4.8mm GI (3 mtr long) (7.14Kg./Mtr)	Kg	19746	93	18,36,378.0
5	25x6 mm GI flat	Kg	30716	93	28,56,588.0
6	GI Nut , Bolt & Washer of different sizes	Kg	13164	96.72	12,73,222.1
7	Lug AL 70 Sqmm for 7/8 SWG Wire/Earthing	EA	8776	8.5	74,596.0
8	Lug AL Crimping 150 Sqmm XLPE One Hole	EA	35104	17.71	6,21,691.8
9	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	4388	1302	57,13,176.0
10	PIPE HDPE SIZE 25 MM	Mtr	13164	33.6	4,42,310.4
Total Cost of materials					18,41,03,893.4
Stock, Storage & Insurance i.e 3%					55,23,116.8
Sub Total					18,96,27,010.2
Contingency @ 3%					56,88,810.3
Tools & Plants @ 2%					37,92,540.2
Transportation @ 7.5%					1,42,22,025.8
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					
Erection Other @ 10%.					1,83,74,243.9
Erection PSC Pole @ 20%					
Sub Total					23,17,04,630.3
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	4388	2415	1,05,97,020.0
Total Civil Part					1,05,97,020.0
Sub-Total					24,23,01,650.3
Other Over Head (Including Supervision charges)@ 6%					1,45,38,099.0
Sub-total					25,68,39,749.3
GST @ 18% of Sub-Total					4,62,31,154.9
CESS @ 1% of Sub-Total					25,68,397.5
Sub-Grand Total					30,56,39,301.7
Inspection Fee					-
Drawing Approval					-
Grand Total					30,56,39,301.7
Grand Total in Cr.					30.564

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B. Cost Estimate LV Protection for 250 KVA 11/o.415kV DSS.

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	ACB LT 400 A	EA	108	39919	43,11,252.0
2	Cable 1.1kV Al 1CX300 Sq.mm Un-armoured	Mtr	3456	473.68	16,37,038.1
3	Gland for 1.1kV Al 1CX300 Sq.mm	EA	432	280	1,20,960.0
4	75X40X4.8 mm Angle for Mounting LT Distribution Box	Kg	5292	93	4,92,156.0
5	50x6 mm GI flat	Kg	1080	93	1,00,440.0
6	25x6 mm GI flat	Kg	864	93	80,352.0
7	GI Nut , Bolt & Washer of different sizes	Kg	324	96.72	31,337.3
8	Lug AL 70 Sqmm for 7/8 SWG Wire/Earthing	EA	216	8.5	1,836.0
9	Lug AL Crimping 630 Sqmm XLPE One Hole	EA	864	135.95	1,17,460.8
10	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	108	1302	1,40,616.0
11	PIPE HDPE SIZE 25 MM	Mtr	324	33.6	10,886.4
Total Cost of materials					70,44,334.6
Stock, Storage & Insurance i.e 3%					2,11,330.0
Sub Total					72,55,664.6
Contingency @ 3%					2,17,669.9
Tools & Plants @ 2%					1,45,113.3
Transportation @ 7.5%					5,44,174.8
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					
Erection Other @ 10%.					7,11,083.0
Erection PSC Pole @ 20%					
Sub Total					88,73,705.7
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	108	2415	2,60,820.0
Total Civil Part					2,60,820.0
Sub-Total					91,34,525.7
Other Over Head (Including Supervision charges)@ 6%					5,48,071.5
Sub-total					96,82,597.2
GST @ 18% of Sub-Total					17,42,867.5
CESS @ 1% of Sub-Total					96,826.0
Sub-Grand Total					1,15,22,290.7
Inspection Fee					-
Drawing Approval					-
Grand Total					1,15,22,290.7
Grand Total in Cr.					1.152

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C. Cost Estimate LV Protection for 500 KVA 11/o.415kV DSS.

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	ACB LT 400 A	EA	186	39919	74,24,934.0
2	Cable 1.1kV Al 1CX630 Sq.mm Un-armoured	Mtr	2976	618.45	18,40,507.2
3	Gland for 1.1kV Al 1CX630 Sq.mm	EA	372	510.54	1,89,920.9
4	75X40X4.8 mm Angle for Mounting LT Distribution Box	Kg	4557	93	4,23,801.0
5	50x6 mm GI flat	Kg	930	93	86,490.0
6	25x6 mm GI flat	Kg	744	93	69,192.0
7	GI Nut , Bolt & Washer of different sizes	Kg	279	96.72	26,984.9
8	Lug AL 70 Sqmm for 7/8 SWG Wire/Earthing	EA	186	8.5	1,581.0
9	Lug AL Crimping 630 Sqmm XLPE One Hole	EA	744	135.95	1,01,146.8
10	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	93	1302	1,21,086.0
11	PIPE HDPE SIZE 25 MM	Mtr	279	33.6	9,374.4
Total Cost of materials					1,02,95,018.2
Stock, Storage & Insurance i.e 3%					3,08,850.5
Sub Total					1,06,03,868.7
Contingency @ 3%					3,18,116.1
Tools & Plants @ 2%					2,12,077.4
Transportation @ 7.5%					7,95,290.2
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					-
Erection Other @ 10%.					10,47,915.0
Erection PSC Pole @ 20%					-
Sub Total					1,29,77,267.3
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	93	2415	2,24,595.0
Total Civil Part					2,24,595.0
Sub-Total					1,32,01,862.3
Other Over Head (Including Supervision charges)@ 6%					7,92,111.7
Sub-total					1,39,93,974.0
GST @ 18% of Sub-Total					25,18,915.3
CESS @ 1% of Sub-Total					1,39,939.7
Sub-Grand Total					1,66,52,829.1
Inspection Fee					-
Drawing Approval					-
Grand Total					1,66,52,829.1
Grand Total in Cr.					1.665

9.21 Annexure 21: Cost Estimate for Installation of Auto Reclosure /Sectionalizer, RMUs, and FPIs for OH Lines

Sr. no	Material	UOM	Quantity	Amount in Cr.
A	Auto-Reclosure	Nos.	10	1.32
B	RMU 4 way Out Door at 11 KV	Nos.	10	1.28
C	RMU 3 way Out Door at 11 KV	Nos.	10	1.20
D	RMU 1 way Out Door at 11 KV	Nos.	25	1.70
E	RMU 4 way Out Door at 33 KV	Nos.	5	1.99
Total In Cr.				7.52

A. Cost Estimate for Installation of Auto Reclosure

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	WPB 160x152 (30.44KG/Mtr.),11 mtr	No	20	34322	6,86,430.4
2	11kV Auto Reclosure	EA	10	696058.18	69,60,581.8
3	Lightning Arrester (9kV,10kA) DH Class	No	30	1260.00	37,800.0
4	25x6 mm GI flat	Kg	150	93.00	13,950.0
5	Danger Plate	No	20	99.20	1,984.0
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr 1 no	Kg	6.02	93.00	559.7
7	GI barbed wire anticlimbing device	Kg	60	99.20	5,952.0
8	Back Clamp for Barbed wire anticlimbing device 25X3mm. flat, 0.59Kg/Mtr. Flat of 0.510 mtr length 4 no's	Kg	24.07	93.00	2,238.7
9	11kV,5kN pin insulator polymer	No	30	248.00	7,440.0
10	Double Pole Belting Channel 75X40X4.8mm.,7.14KG/Mtr.,each channel length 1.66 Mtr.,4 no's channel required	Kg	474.10	93.00	44,090.9
11	Top Channel 100X50X5mm, 9.56 KG/Mtr., each channel length 2.3 mtr., 2 no's channel required	Kg	439.76	93.00	40,897.7
12	50X50X6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 2.671 mtr., 4 nos angle required	Kg	480.78	93.00	44,712.5
13	Fish Plate 50x8 mm., 0.97kg/Mtr., each 0.280 mtr. Length	Kg	16.30	93.00	1,515.5
14	H/W fitting(B&S) 70KN,3 Bolt	Set	60	434.00	26,040.0
15	11kV Disc insulator (B&S) 70KN polymer	No	60	1426.00	85,560.0
16	Earthing of Support (Coil Type)	EA	20	205.84	4,116.8
17	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	Kg	5.24	93.00	487.3
18	PG Clamp for 100 mm ² AAAC conductor	No	60	719.20	43,152.0

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19	GI Nut , Bolt & Washer of different sizes	Kg	120	96.72	11,606.4
20	H.T. Stay clamp	Pair	40	155	6,200.0
21	H.T. Stay set (Complete)	Set	40	1302	52,080.0
22	H.T. Stay Insulator	No	40	62	2,480.0
23	7/10 SWG Stay Wire	Kg	400	93	37,200.0
24	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	20	1302	26,040.0
25	GI Plate base(500X500X10mm)	No	20	1860	37,200.0
26	AAA conductor,100 mm2	Km	0.15	68200	10,230.0
27	Black Paint	Ltr	10	272.8	2,728.0
28	Yellow Colour Paint for Background	Ltr	20	220	4,400.0
Total Cost of materials					81,97,673.8
Stock, Storage & Insurance i.e 3%					2,45,930.2
Sub Total					84,43,604.0
Contingency @ 3%					2,53,308.1
Tools & Plants @ 2%					1,68,872.1
Transportation @ 7.5%					6,33,270.3
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					
Erection Other @ 10%.					7,60,886.1
Erection PSC Pole @ 20%					
Sub Total					1,02,59,940.5
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Fixing of complete 11KV line stay set includes Turn Buckle Assembly, Stay Rod & Stay plate, Stay Insulator, Stay Wire, Stay clamps with Nuts & bolts BA will do the excvation, supply of 0.5Cum cement concrete foundation 1:2:4 size (500mmx500mmx800mm)	No.	40	2362.5	94,500.0
2	Erection of 11 Mtr long WPB Pole including loading & unloading, transportation, providing & laying of 1:1.5:3, M20 Grade, C.C-500x500x1800 mm & cooping of 500x500x450 mm, includes 5 days curing and zebra painting (In Black & Yellow Strips/Zebra)	No	20	6300	1,26,000.0
3	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	20	2415	48,300.0
Total Civil Part					2,68,800.0
Sub-Total					1,05,28,740.5
Other Over Head (Including Supervision charges)@ 6%					6,31,724.4
Sub-total					1,11,60,465.0
GST @ 18% of Sub-Total					20,08,883.7
CESS @ 1% of Sub-Total					1,11,604.6
Sub-Grand Total					1,32,80,953.3

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Inspection Fee	-
Drawing Approval	-
Grand Total	1,32,80,953.3
Grand Total in Cr.	1.328

B. Cost Estimate for Installation of 11kV 4 Way RMU

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	RMU 11kV 4 Way 2x630A BKR O/D LLVV	EA	10	532991	53,29,910.0
2	75X40X4.8 mm G.I Channel (7.14Kg. / Mtr)	Kg	499.8	93.00	46,481.4
3	50x6 mm GI flat	Kg	600	93.00	55,800.0
4	25x6 mm GI flat	Kg	100	93.00	9,300.0
5	Danger Plate	No	50	99.20	4,960.0
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr 1 no	Kg	15.05	93.00	1,399.2
7	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	40	1302.00	52,080.0
8	GI Nut , Bolt & Washer of different sizes	Kg	50.00	96.72	4,836.0
9	11kV AL 3CX300 Sqmm XLPE Cable armoured	Mtr	700	1481.80	10,37,260.0
10	Heat shrinkable jointing kit for 3Cx300mm ² 11KV XLPE Cable(indoor type)	No	30.00	11250.52	3,37,515.6
11	Heat shrinkable jointing kit for 3Cx300mm ² 11KV XLPE Cable(outdoor type)	No	30.00	16392.80	4,91,784.0
12	PIPE G.I.100MM DIA HEAVY CLASS PLAIN END	Mtr	60.00	1593.70	95,622.0
13	PIPE HDPE SIZE 25 MM	Mtr	60.00	33.60	2,016.0
14	Lug AL Crimping 95 Sqmm XLPE Single hole	EA	40	11.83	473.2
15	AAA conductor,100 mm2	Km	0.2	68200.00	13,640.0
Total Cost of materials					74,83,077.4
Stock, Storage & Insurance i.e 3%					2,24,492.3
Sub Total					77,07,569.7
Contingency @ 3%					2,31,227.1
Tools & Plants @ 2%					1,54,151.4
Transportation @ 7.5%					5,78,067.7
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					2,74,490.4
Erection Other @ 10%.					2,16,412.0
Erection PSC Pole @ 20%					
Sub Total					91,61,918.3
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Providing and fixing including loading , unloading & transportation of FRP Fencing (5Mtr x 4 Mtr) including Flurocent Sticker(two Mtr. in each post),Supply of Latch Lock, Supply of Hings,Supply of SS Lock with Key excluding civil works as per TPNODL specification.	M2	200	3310	6,62,000.0

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2	Construction of 3-way/4-way/5way RMU Plinth with Brick, Mortar, 12 mm cement plaster.Scope includes excavation of earth for foundation and supply of raw material i.e. sand, cement, bricks and removal of extra malba if any	LS	10	24150	2,41,500.0
3	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	40	2415	96,600.0
Total Civil Part					10,00,100.0
Sub-Total					1,01,62,018.3
Other Over Head (Including Supervision charges)@ 6%					6,09,721.1
Sub-total					1,07,71,739.4
GST @ 18% of Sub-Total					19,38,913.1
CESS @ 1% of Sub-Total					1,07,717.4
Sub-Grand Total					1,28,18,369.9
Inspection Fee					-
Drawing Approval					-
Grand Total					1,28,18,369.9
Grand Total in Cr.					1.282

C. Cost Estimate for Installation of 11kV 3 Way RMU

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	RMU 11kV 3 Way 2x630A BKR O/D LVV	EA	10	484749	48,47,490.0
2	75X40X4.8 mm G.I Channel (7.14Kg. / Mtr)	Kg	499.8	93.00	46,481.4
3	50x6 mm GI flat	Kg	600	93.00	55,800.0
4	25x6 mm GI flat	Kg	100	93.00	9,300.0
5	Danger Plate	No	50	99.20	4,960.0
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr 1 no	Kg	15.05	93.00	1,399.2
7	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	40	1302.00	52,080.0
8	GI Nut , Bolt & Washer of different sizes	Kg	50.00	96.72	4,836.0
9	11kV AL 3CX300 Sqmm XLPE Cable armoured	Mtr	700	1481.80	10,37,260.0
10	Heat shrinkable jointing kit for 3Cx300mm ² 11KV XLPE Cable(indoor type)	No	30.00	11250.52	3,37,515.6
11	Heat shrinkable jointing kit for 3Cx300mm ² 11KV XLPE Cable(outdoor type)	No	30.00	16392.80	4,91,784.0
12	PIPE G.I.100MM DIA HEAVY CLASS PLAIN END	Mtr	60.00	1593.70	95,622.0
13	PIPE HDPE SIZE 25 MM	Mtr	60.00	33.60	2,016.0
14	Lug AL Crimping 95 Sqmm XLPE Single hole	EA	40	11.83	473.2
15	AAA conductor,100 mm2	Km	0.2	68200.00	13,640.0
Total Cost of materials					70,00,657.4
Stock, Storage & Insurance i.e 3%					2,10,019.7

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Sub Total					72,10,677.1
Contingency @ 3%					2,16,320.3
Tools & Plants @ 2%					1,44,213.5
Transportation @ 7.5%					5,40,800.8
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					2,49,645.7
Erection Other @ 10%.					2,16,412.0
Erection PSC Pole @ 20%					
Sub Total					85,78,069.5
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Providing and fixing including loading , unloading & transportation of FRP Fencing (5Mtr x 4 Mtr) including Flurocent Sticker(two Mtr. in each post),Supply of Latch Lock, Supply of Hings,Supply of SS Lock with Key excluding civil works as per TPNODL specification.	M2	200	3310	6,62,000.0
2	Construction of 3-way/4-way/5way RMU Plinth with Brick, Mortar, 12 mm cement plaster.Scope includes excavation of earth for foundation and supply of raw material i.e. sand, cement, bricks and removal of extra malba if any	LS	10	24150	2,41,500.0
3	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	40	2415	96,600.0
Total Civil Part					10,00,100.0
Sub-Total					95,78,169.5
Other Over Head (Including Supervision charges)@ 6%					5,74,690.2
Sub-total					1,01,52,859.6
GST @ 18% of Sub-Total					18,27,514.7
CESS @ 1% of Sub-Total					1,01,528.6
Sub-Grand Total					1,20,81,903.0
Inspection Fee					-
Drawing Approval					-
Grand Total					1,20,81,903.0
Grand Total in Cr.					1.208

D. Cost Estimate for Installation of 11kV 1 Way RMU

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	RMU 11kV 1 Way 1x630A BKR O/D LV	EA	25	260000	65,00,000.0
2	75X40X4.8 mm G.I Channel (7.14Kg. / Mtr)	Kg	1249.5	93.00	1,16,203.5
3	50x6 mm GI flat	Kg	1500	93.00	1,39,500.0
4	25x6 mm GI flat	Kg	250	93.00	23,250.0
5	Danger Plate	No	125	99.20	12,400.0

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6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr 1 no	Kg	37.61	93.00	3,498.0
7	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	50	1302.00	65,100.0
8	GI Nut , Bolt & Washer of different sizes	Kg	125.00	96.72	12,090.0
9	11kV AL 3CX300 Sqmm XLPE Cable armoured	Mtr	750	1481.80	11,11,350.0
10	Heat shrinkable jointing kit for 3Cx300mm ² 11KV XLPE Cable(indoor type)	No	50.00	11250.52	5,62,526.0
11	Heat shrinkable jointing kit for 3Cx300mm ² 11KV XLPE Cable(outdoor type)	No	50.00	16392.80	8,19,640.0
12	PIPE G.I.100MM DIA HEAVY CLASS PLAIN END	Mtr	150.00	1593.70	2,39,055.0
13	PIPE HDPE SIZE 25 MM	Mtr	150.00	33.60	5,040.0
14	Lug AL Crimping 95 Sqmm XLPE Single hole	EA	100	11.83	1,183.0
15	AAA conductor,100 mm2	Km	0.5	68200.00	34,100.0
Total Cost of materials					96,44,935.5
Stock, Storage & Insurance i.e 3%					2,89,348.1
Sub Total					99,34,283.5
Contingency @ 3%					2,98,028.5
Tools & Plants @ 2%					1,98,685.7
Transportation @ 7.5%					7,45,071.3
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					3,34,750.0
Erection Other @ 10%.					3,17,223.1
Erection PSC Pole @ 20%					
Sub Total					1,18,28,042.0
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Providing and fixing including loading , unloading & transportation of FRP Fencing (4Mtr x 3 Mtr) including Flurocent Sticker(two Mtr. in each post),Supply of Latch Lock, Supply of Hings,Supply of SS Lock with Key excluding civil works as per TPNODL specification.	M2	300	3310	9,93,000.0
2	Construction of 1-Way/3-way/4-way/5way RMU Plinth with Brick, Mortar, 12 mm cement plaster.Scope includes excavation of earth for foundation and supply of raw material i.e. sand, cement, bricks and removal of extra malba if any	LS	25	24150	6,03,750.0
3	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	50	2415	1,20,750.0
Total Civil Part					17,17,500.0
Sub-Total					1,35,45,542.0
Other Over Head (Including Supervision charges)@ 6%					8,12,732.5
Sub-total					1,43,58,274.5
GST @ 18% of Sub-Total					25,84,489.4
CESS @ 1% of Sub-Total					1,43,582.7

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Sub-Grand Total	1,70,86,346.7
Inspection Fee	-
Drawing Approval	-
Grand Total	1,70,86,346.7
Grand Total in Cr.	1.709

E. Cost Estimate for Installation of 33kV 4 Way RMU

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	RMU 33kV 4 Way 2x630A BKR O/D	EA	5	2133866	1,06,69,330.0
2	75X40X4.8 mm G.I Channel (7.14Kg. / Mtr)	Kg	249.9	93.00	23,240.7
3	50x6 mm GI flat	Kg	300	93.00	27,900.0
4	25x6 mm GI flat	Kg	50	93.00	4,650.0
5	Danger Plate	No	25	99.20	2,480.0
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr 1 no	Kg	7.52	93.00	699.6
7	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	20	1302.00	26,040.0
8	GI Nut , Bolt & Washer of different sizes	Kg	25.00	96.72	2,418.0
9	33kV AL 3CX300 Sqmm XLPE Cable armoured	Mtr	350	2177.44	7,62,104.0
10	Heat shrinkable jointing kit for 3Cx300 mm ² 33KV XLPE Cable(indoor type)	N	15.00	25423.72	3,81,355.8
11	Heat shrinkable jointing kit for 3Cx300mm ² 33KV XLPE Cable(outdoor type)	No	15.00	41236.20	6,18,543.0
12	PIPE G.I.100MM DIA HEAVY CLASS PLAIN END	Mtr	30.00	1593.70	47,811.0
13	PIPE HDPE SIZE 25 MM	Mtr	30.00	33.60	1,008.0
14	Lug AL Crimping 95 Sqmm XLPE Single hole	EA	20	11.83	236.6
15	AAA conductor,148 mm2	Km	0.1	101680.00	10,168.0
Total Cost of materials					1,25,77,984.7
Stock, Storage & Insurance i.e 3%					3,77,339.5
Sub Total					1,29,55,324.2
Contingency @ 3%					3,88,659.7
Tools & Plants @ 2%					2,59,106.5
Transportation @ 7.5%					9,71,649.3
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					5,49,470.5
Erection Other @ 10%.					1,93,909.3
Erection PSC Pole @ 20%					
Sub Total					1,53,18,119.6
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Providing and fixing including loading , unloading & transportation of FRP Fencing (5Mtr x 4Mtr) including Flurocent Sticker(two Mtr. in each post),Supply of Latch Lock, Supply of Hings,Supply of SS Lock with Key excluding civil works as per TPNODL specification.	M2	100	3310	3,31,000.0

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2	Construction of 1-Way/3-way/4-way/5way RMU Plinth with Brick, Mortar, 12 mm cement plaster.Scope includes excavation of earth for foundation and supply of raw material i.e. sand, cement, bricks and removal of extra malba if any	LS	5	24150	1,20,750.0
3	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	20	2415	48,300.0
Total Civil Part					5,00,050.0
Sub-Total					1,58,18,169.6
Other Over Head (Including Supervision charges)@ 6%					9,49,090.2
Sub-total					1,67,67,259.7
GST @ 18% of Sub-Total					30,18,106.8
CESS @ 1% of Sub-Total					1,67,672.6
Sub-Grand Total					1,99,53,039.1
Inspection Fee					-
Drawing Approval					-
Grand Total					1,99,53,039.1
Grand Total in Cr.					1.995

9.22 Annexure 22: Cost Estimate for Installation of FPI for OH Lines

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	COMMUNICABLE FPI 11KV O/H	EA	1002	11677.97	1,17,01,325.9
Total Cost of materials					1,17,01,325.94
Stock, Storage & Insurance i.e 3%					3,51,039.78
Sub Total					1,20,52,365.72
Contingency @ 3%					3,61,570.97
Tools & Plants @ 2%					2,41,047.31
Transportation @ 7.5%					9,03,927.43
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					
Erection Other @ 10%.					12,05,236.57
Erection PSC Pole @ 20%					
Sub Total					1,47,64,148.00
Other Over Head (Including Supervision charges)@ 6%					8,85,848.88
Sub-total					1,56,49,996.89
GST @ 18% of Sub-Total					28,16,999.44
CESS @ 1% of Sub-Total					1,56,499.97
Sub-Grand Total					1,86,23,496.29
Inspection Fee					
Drawing Approval					
Grand Total					1,86,23,496.29
Grand Total in Cr.					1.86

9.23 Annexure 23: Cost Estimate for Installation of AB Switch, HG Fuse & LA for DTRs

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	AB switch Mounting Channel 75X40X4.8mm, 7.14KG/Mtr, each channel length 3 Mtr., 2 no's channel required	Kg	196592.76	93.0	1,82,83,126.7
2	AB Switch Side Support Channel 100X50X5mm,9.56 KG/Mtr., each channel length 0.35 mtr., 2 no's channel required	Kg	30709.588	93.0	28,55,991.7
3	Channel Support for down Pipe 75X40X4.8mm., 7.14KG/Mtr., each channel length 0.8 Mtr., 1 no's channel required	Kg	26212.368	93.0	24,37,750.2
4	25x6 mm GI flat	Kg	71588.4	93.0	66,57,721.2
5	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	Kg	9017.385	93.0	8,38,616.8
6	GI Nut , Bolt & Washer of different sizes	Kg	22945	96.7	22,19,240.4
7	Lightning Arrester (9kV,10kA) DH Class	No	13767	1240.0	1,70,71,080.0
8	11kV AB Switch,200A.3pole,50Hz,Horizontal Type	Set	4589	11550.0	5,30,02,950.0
9	H.G.Fuse(11KV.200A.3Pole)with PI	Set	4589	7589.0	3,48,25,921.0
10	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	4589	1302.0	59,74,878.0
11	AAA conductor,100 mm2	Km	91.78	68200.0	62,59,396.0
12	All. Cable lug of different size	No	73424	17.7	13,00,339.0
Total Cost of materials					15,17,27,011.0
Stock, Storage & Insurance i.e 3%					45,51,810.3
Sub Total					15,62,78,821.4
Contingency @ 3%					46,88,364.6
Tools & Plants @ 2%					31,25,576.4
Transportation @ 7.5%					1,17,20,911.6
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					
Erection Other @ 10%.					1,50,12,469.7
Erection PSC Pole @ 20%					
Sub Total					19,08,26,143.7
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	4589	2415	1,10,82,435.0
Total Civil Part					1,10,82,435.0
Sub-Total					20,19,08,578.7
Other Over Head (Including Supervision charges)@ 6%					1,21,14,514.7

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Sub-total	21,40,23,093.5
GST @ 18% of Sub-Total	3,85,24,156.8
CESS @ 1% of Sub-Total	21,40,230.9
Sub-Grand Total	25,46,87,481.2
Inspection Fee	-
Drawing Approval	-
Grand Total	25,46,87,481.2
Grand Total in Cr.	25.47

9.24 Annexure 24: Cost Estimate for Installation of 11kV Voltage Regulator

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	500 KVA Voltage Regulator	EA	29	7,00,000	2,03,00,000.0
2	WPB 160x152 (30.44KG/Mtr.),11 mtr	No	58	34,322	19,90,648.2
3	11KV COVERED CONDUCTOR DOG	Mtr	1218	326.12	3,97,214.2
4	AB Switch (11KV,400A.3pole,50Hz)	EA	58	14,694.00	8,52,252.0
5	Lightening Arrester(9KV,5KA)	EA	174	1215.2	2,11,444.8
6	H.G.Fuse(11KV.400A.3Pole)with PI	EA	174	14,297	24,87,712.8
7	Top Pressure Channel (100X50X6) mm 2.8 Mtr 2 Nos (9.2 Kg. / Mtr.) with Galvanization	KG	2988.16	93	2,77,898.9
8	AB Switch and HG Fuse Mounting Channel (75x40X6)mm 2.8 Mtr long 4Nos (6.8 Kg./Mtr.) with Galvanization	KG	4417.28	93	4,10,807.0
9	50x50x6 mm M.S Angle (4.50Kg. / Mtr)	KG	1559.04	80.6	1,25,658.6
10	75x40x6 mm M.S Channel (6.80Kg. / Mtr)	KG	2208.64	80.6	1,78,016.4
11	11 KV Disc Insulator T & C Type 45 KN POLYMER	NO	174	1066.4	1,85,553.6
12	11 KV hard ware fitting T & C Type 45KN	NO	174	161.2	28,048.8
13	50x6 mm G I flat	KG	1450	93	1,34,850.0
14	25x6 mm G I flat	KG	976.72	93	90,835.0
15	G.I NUTS,BOLTS & WASHERS	KG	580	96.72	56,097.6
16	H.T. Stay clamp	Pair	116	155.00	17,980.0
17	H.T. Stay set (Complete)	Set	116	1302.00	1,51,032.0
18	H.T. Stay Insulator	No	116	62.00	7,192.0
19	7/10 SWG Stay Wire	Kg	1160	93.00	1,07,880.0
20	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	EA	203	1,302	2,64,306.0
21	PG Clamp 100 Sq mm	EA	348	719.2	2,50,281.6
22	Black Paint	Ltr	29	272.80	7,911.2
23	Yellow Colour Paint for Background	Ltr	58	220.00	12,760.0
Total Cost of materials					2,85,46,380.6
Stock, Storage & Insurance i.e 3%					8,56,391.4
Sub Total					2,94,02,772.0
Contingency @ 3%					8,82,083.2

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Tools & Plants @ 2%					5,88,055.4
Transportation @ 7.5%					22,05,207.9
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					11,47,968.4
Erection Other @ 10%.					5,85,727.1
Erection PSC Pole @ 20%					
Sub Total					3,48,11,814.0
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Fixing of complete 11KV line stay set includes Turn Buckle Assembly, Stay Rod & Stay plate, Stay Insulator, Stay Wire, Stay clamps with Nuts & bolts BA will do the excvation, supply of 0.5Cum cement concrete foundation 1:2:4 size (500mmx500mmx800mm)	No.	116	2362.5	2,74,050.0
2	Erection of 11 Mtr long WPB Pole including loading & unloading, transportation, providing & laying of 1:1.5:3, M20 Grade, C.C-500x500X1800 mm & cooping of 500x500x450 mm, includes 5 days curing and zebra painting (In Black & Yellow Strips/Zebra)	No	58	6300	3,65,400.0
3	Construction of Plinth with Brick, Mortar, 12 mm cement plaster and for 250-1000KVA transformer as per TPNODL drawing. Scope of work includes excavation of earth, supply of Civil material for construction, desposal of extra malba	No	29	31878	9,24,462.0
4	Providing and fixing including loading , unloading & transportation of FRP Fencing including Flurocent Sticker(two Mtr. in each post), Supply of Latch Lock, Supply of Hings, Supply of SS Lock with Key excluding civil works as per TPNODL specification.	M2	870	3310	28,79,700.0
5	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	203	2415	4,90,245.0
Total Civil Part					49,33,857.0
Sub-Total					3,97,45,671.0
Other Over Head (Including Supervision charges)@ 6%					23,84,740.3
Sub-total					4,21,30,411.3
GST @ 18% of Sub-Total					75,83,474.0
CESS @ 1% of Sub-Total					4,21,304.1
Sub-Grand Total					5,01,35,189.5
Inspection Fee					-
Drawing Approval					-
Grand Total					5,01,35,189.5
Grand Total in Cr.					5.01

9.25 Annexure 25: Cost Estimate for Installation of Station Transformer (PPS)

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	100 KVA,33/0.4 KV(Cu) Transformer,BIS Energy level-II	No	8	360000	28,80,000.0
2	WPB 160x152 (30.44KG/Mtr.),11 mtr	No	16	34321.52	5,49,144.3
3	Top Channel 100X50X5mm, 9.56 KG/Mtr., each channel length 4.5mtr., 2 no's channel required	Kg	320	93	29,760.0
4	AB Switch Mounting Channel 75X40X4.8 mm GI Channel 4500mm long (7.14Kg./Mtr),2 no's Channel required	Kg	320	93	29,760.0
5	HG Fuse Channel 75X40X4.8 mm GI Channel 4.5mtr long (7.14Kg./Mtr), 2 no's channel required	Kg	304	93	28,272.0
6	Cantilever Support Channel Supporting AB Switch 75X40X4.8mm GI 1.5mtr long) (7.14Kg./Mtr),2 no's channel required	Kg	96	93	8,928.0
7	Cantilever Support Channel Supporting HG Fuse 75X40X4.8mm GI 1.5mtr long) (7.14Kg./Mtr),2 no's channel required	Kg	96	93	8,928.0
8	Angle for cantilever arrangement for AB switch 75X40X4.8mm,7.14Kg/mtr ,3mtr long, 2 no's angle required	Kg	160	93	14,880.0
9	Angle for cantilever arrangement for HG fuse 75X40X4.8mm,7.14Kg/mtr, 3mtr long, 2 no's required	Kg	160	93	14,880.0
10	LTDB Mounting Support Angle 75X40X4.8mm GI (3 mtr long) (7.14Kg./Mtr)	Kg	96	93	8,928.0
11	33kV H/W fitting(B&S) 120KN,4 Bolt	Set	24	755	18,120.0
12	33kV Disc insulator (B&S) 120KN polymer	No	24	1785.6	42,854.4
13	33kV AB Switch,200A,3Pole,50Hz,Horizontal Type	Set	8	18724	1,49,792.0
14	HG Fuse(33KV,200A,3 Pole,50Hz) with PI	Set	8	16082.8	1,28,662.4
15	Lightning Arrester (30kV,10kA) (Station Class,Class 3) with Surge Counter	EA	24	7506.94	1,80,166.6
16	LTDB for 100KVA, 33/0.433kV Station Transformer	No	8	30279.56	2,42,236.5
17	H.T. Stay clamp	Pair	8	155	1,240.0
18	H.T. Stay set (Complete)	Set	8	1302	10,416.0
19	H.T. Stay Insulator	No	8	62	496.0
20	7/10 SWG Stay Wire	Kg	80	93	7,440.0
21	Earthing of Support (Coil Type)	EA	16	205.84	3,293.4
22	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	Kg	4.192	93	389.9
23	25x6 mm GI flat	Kg	80	93	7,440.0
24	GI Nut , Bolt & Washer of different sizes	Kg	96	96.72	9,285.1
25	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	40	1302	52,080.0
26	Cable 1.1kV Al 1CX150 Sq.mm Un-armoured	Mtr	80	260.4	20,832.0

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27	Gland for 1.1kV Al 1CX150 Sq.mm	EA	64	128.3	8,211.2
28	AAA conductor,100 mm2	Km	0.8	68200	54,560.0
29	PG Clamp for 100 mm2 AAAC conductor	No	24	719.2	17,260.8
30	GI Plate base(500X500X10mm)	No	0	1860	-
31	Danger Plate	No	16	99.2	1,587.2
32	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr 1 no	Kg	4.8144	93	447.7
33	GI barbed wire anticlimbing device	Kg	48	99.2	4,761.6
34	Back Clamp for Barbed wire anticlimbing device 25X3mm. flat, 0.59Kg/Mtr. Flat of 0.510 mtr length 4 no's	Kg	19.2576	93	1,791.0
35	Black Paint	Ltr	8	272.8	2,182.4
36	Yellow Colour Paint for Background	Ltr	16	220	3,520.0
Total Cost of materials					45,42,546.5
Stock, Storage & Insurance i.e 3%					1,36,276.4
Sub Total					46,78,822.9
Contigency @ 3%					1,40,364.7
Tools & Plants @ 2%					93,576.5
Transportation @ 7.5%					3,50,911.7
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					1,48,320.0
Erection Other @ 10%.					1,06,710.9
Erection PSC Pole @ 20%					
Sub Total					55,18,706.6
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Fixing of complete 11KV line stay set includes Turn Buckle Assembly,Stay Rod & Stay plate,Stay Insulator,Stay Wire,Stay clamps with Nuts & bolts BA will do the excvation, supply of 0.5Cum cement concrete foundation 1:2:4 size (500mmx500mmx800mm)	No.	8	2362.5	18,900.0
2	Erection of 11 Mtr long WPB Pole including loading & unloading,transportation,providing & laying of 1:1.5:3,M20 Grade,C.C-500x500X1800 mm & cooping of 500x500x450 mm,includes 5 days curing and zebra painting (In Black & Yellow Strips/Zebra)	No	16	6300	1,00,800.0
3	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	40	2415	96,600.0
Total Civil Part					2,16,300.0
Sub-Total					57,35,006.6
Other Over Head (Including Supervision charges)@ 6%					3,44,100.4
Sub-total					60,79,107.0
GST @ 18% of Sub-Total					10,94,239.3
CESS @ 1% of Sub-Total					60,791.1

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Sub-Grand Total	72,34,137.3
Inspection Fee	-
Drawing Approval	-
Grand Total	72,34,137.3
Grand Total in Cr.	0.723

9.26 Annexure 26: Cost Estimate for Installation of Spares equipment and servicing for ODSSP & IPDS PSS.

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	SPUR GEAR, 33KV VCB	Nos.	5	13890	69,450.0
2	SPRING DRUM ASSEMBLY, 33KV VCB	Nos.	2	23990	47,980.0
3	CLOSING COIL 48V FOR 33KV VCB	Nos.	10	9557	95,570.0
4	SPRING CHARGE MOTOR FOR VCB 33KV	Nos.	5	48244	2,41,220.0
5	AUXILIARY SWITCH 4NO/3NC 33KV VCB	Nos.	10	14738	1,47,380.0
6	LIMIT SWITCH, MOTOR CUT OFF FOR VCB 33KV	Nos.	10	14743	1,47,430.0
7	SPOUT W/O FX CONTACT UP TO 2500A 33KVVCB	Nos.	25	63788	15,94,700.0
8	SPOUT TO CT CONNECTION-1250A FOR SPOUT	Nos.	25	21960	5,49,000.0
9	CONTACT ASSEMBLY FOR SPOUT	Nos.	25	21960	5,49,000.0
10	INSULATOR POST TYPE FOR BUSBAR	Nos.	25	8860	2,21,500.0
11	DASH POT ASSEMBLY	Nos.	10	12489	1,24,890.0
12	SHOCK ABSORBER ASSEMBLY	Nos.	10	36522	3,65,220.0
13	CLOSE COIL FOR VCB 11KV	Nos.	25	7888	1,97,200.0
14	RELEASE COIL ASSEMBLY W/O COIL, 11KV VCB	Nos.	25	8329	2,08,225.0
15	TRIPPING COIL 48V FOR 11KV VCB	Nos.	25	6086	1,52,150.0
16	TRIP COIL ASSEMBLY W/O COIL	Nos.	25	8819	2,20,475.0
17	RELEASE PROP PIN	Nos.	20	1522	30,440.0
18	RELEASE LEVER ASSEMBLY	Nos.	20	2453	49,060.0
19	OPENING BUFFER	Nos.	30	957	28,710.0
20	BUFFER FOR SPRING	Nos.	30	1558	46,740.0
21	SPRING CHARGING MOTOR WITH GEAR BOX	Nos.	10	39209	3,92,090.0
22	LIMIT SWITCH 2NO/NC-RIGHT SIDE	Nos.	10	12255	1,22,550.0
23	LIMIT SWITCH 2NO/NC-LEFT SIDE	Nos.	10	12255	1,22,550.0
24	MICRO SWITCH ASSEMBLY FOR HWX MECHANISM	Nos.	5	6413	32,065.0
25	AUX SWITCH 12 WAY FOR VCB 11KV	Nos.	10	11978	1,19,780.0
26	1PH BUSBAR SPOUT 800/1250A PANEL	Nos.	30	36608	10,98,240.0
27	1PH BUSBAR SPOUT 800/1250A PANEL,Y	Nos.	30	36608	10,98,240.0
28	1PH CIRCUIT SPOUT 800/1250A PANEL	Nos.	30	32158	9,64,740.0

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29	HRC FUSE-PT HT SIDE VTF-11, 3A	Nos.	10	3987	39,870.0
30	LIMIT SWITCH-1NO+1NC-SERVICE/TEST	Nos.	5	1278	6,390.0
Total Cost of materials					90,82,855.00
Stock, Storage & Insurance i.e 3%					2,72,485.65
Sub Total					93,55,340.65
Contingency @ 3%					2,80,660.22
Tools & Plants @ 2%					1,87,106.81
Transportation @ 7.5%					7,01,650.55
Erection Other @ 10%.					9,35,534.07
Sub Total					1,14,60,292.30
Other Over Head (Including Supervision charges)@ 6%					6,87,617.54
Sub-total					1,21,47,909.83
GST @ 18% of Sub-Total					21,86,623.77
CESS @ 1% of Sub-Total					1,21,479.10
Sub-Grand Total					1,44,56,012.70
Grand Total					1,44,56,012.70
Grand Total in Cr.					1.45

9.27 Annexure 27: Cost Estimate for Earthing of Transformer

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	7/10 SWG G I stay wire, Grade -2	EA	137670.00	93.00	1,28,03,310.0
2	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	EA	13767.00	1302.00	1,79,24,634.0
3	FLAT GI SIZE 25X6 MM	EA	123903.00	93.00	1,15,22,979.0
4	FLAT GI SIZE 50X6 MM	EA	123903.00	93.00	1,15,22,979.0
5	Hexagonal Bolts with Nuts(GI)	EA	20650.50	101.68	20,99,742.8
6	PIPE HDPE SIZE 20 MM	ST	82602.00	93.00	76,81,986.0
7	Aluminium Cable Sockets 95 mm2	ST	55068.00	24.80	13,65,686.4
Total Cost of materials					6,49,21,317.2
Stock, Storage & Insurance i.e 3%					19,47,639.5
Sub Total					6,68,68,956.8
Contingency @ 3%					20,06,068.7
Tools & Plants @ 2%					13,37,379.1
Transportation @ 7.5%					50,15,171.8
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					-
Erection Other @ 10%.					48,40,658.4
Erection PSC Pole @ 20%					-
Sub Total					8,00,68,234.7
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing	No	13767.00	2415	3,32,47,305.0

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chamber (Size: 2'x2') and RCC or other suitable slab cover				
Total Civil Part				3,32,47,305.0
Sub-Total				11,33,15,539.7
Other Over Head (Including Supervision charges)@ 6%				67,98,932.4
Sub-total				12,01,14,472.1
GST @ 18% of Sub-Total				2,16,20,605.0
CESS @ 1% of Sub-Total				12,01,144.7
Sub-Grand Total				14,29,36,221.8
Inspection Fee				-
Drawing Approval				-
Grand Total				14,29,36,221.8
Grand Total in Cr.				14.294

9.28 Annexure 28: Cost Estimate for Augmentation of Power Transformer

Sr.No.	Description	UOM	Qty	Amount
				in Crores
1	Augmentation of Power Transformer 5 MVA to 8 MVA	Nos	2	2.60
Total in Cr.				2.60

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	8MVA 33/11KV Power Transformer with OLTC	No	2	7119067.80	1,42,38,135.6
2	AAA conductor,232 mm2	Km	0.5	203450.00	1,01,725.0
3	PG Clamp for 232 mm2 AAAC conductor	No	36	1495.00	53,820.0
4	12 bolted (M-12) "T" clamp for 232 mm ² conductor	No	24	1248.00	29,952.0
5	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	30	1365.00	40,950.0
6	33KV Post Insulator	No	6	2054.00	12,324.0
7	33KV O/D VCB-1600A, with indoor CR panel without PT, with outdoor CT (600-300-150/1-1A, 15VA, STC 25KA/3sec, class: 0.5, 5P10) for Transformer protection	No	2	767000.00	15,34,000.0
8	33 KV 1250 AMP Double break (Turn & twist center rotating) isolator without earth switch with PI(Porcelain)	Set	4	118664.00	4,74,656.0
9	Lightning Arrester(30KV,10KA) (Station Class,class-2)	No	12	10660.5	1,27,926.0
10	GI Nut , Bolt & Washer of different sizes	Kg	80	101.40	8,112.0
11	50x6 mm GI flat	Kg	300	97.50	29,250.0
Total Cost of materials					1,66,50,850.6
Stock, Storage & Insurance i.e 3%					4,99,525.5
Sub Total					1,71,50,376.1
Contingency @ 3%					5,14,511.3

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Tools & Plants @ 2%					3,43,007.5
Transportation @ 7.5%					12,86,278.2
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					8,12,265.0
Erection Other @ 10%					2,48,509.6
Erection PSC Pole @ 20%					-
Sub Total					2,03,54,947.8
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	30	2415	72,450.0
2	Dismantling of 5/8/12.6MVA 33/11kV PTR, Loading, Transportation within 30 Kms	No	2	79695	1,59,390.0
3	Dismantling of Steel Structure,Nuts & Bolt including loading,transportation, unloading & staking of dismantled material at a proper place in TPNODL store	Kg	200	78.75	15,750.0
Total Civil Part					2,47,590.0
Sub-Total					2,06,02,537.8
Other Over Head (Including Supervision charges)@ 6%					12,36,152.3
Sub-total					2,18,38,690.0
GST @ 18% of Sub-Total					39,30,964.2
CESS @ 1% of Sub-Total					2,18,386.9
Sub-Grand Total					2,59,88,041.1
Inspection Fee					-
Drawing Approval					-
Grand Total					2,59,88,041.1
Grand Total in Cr.					2.60

9.29 Annexure 29: Cost Estimate for Augmentation of Distribution Transformer

Sr.No.	Description	UOM	Qty	Amount
				in Crores
A	Augmentation of DTR 10/16 KVA to 25 KVA	Nos	304	6.31
B	Augmentation of DTR 25/63 KVA to 100 KVA	Nos.	160	7.98
C	Augmentation of DTR 100 KVA to 250 KVA	Nos.	80	7.83
D	Augmentation of DTR 200/250 KVA to 400 KVA	Nos.	16	2.45
Total				24.57

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A. Cost Estimation for Augmentation of DTR 10/16 KVA to 25 KVA

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	25 KVA,11/0.25KV(Al) Transformer	No	304	53800.00	1,63,55,200.0
2	LT Distribution Box for 25 KVA S/S.	EA	304	18513.20	56,28,012.8
3	11kV AB Switch,200A.2pole,50Hz,Horizontal Type	Set	304	6572.00	19,97,888.0
4	Lightning Arrester (9kV,10kA) DH Class	No	608	1260.00	7,66,080.0
5	HG Fuse(11KV,200A,2 Pole,50Hz) with PI	Set	304	5084.00	15,45,536.0
6	Conductor 100 mm sq AAAC	Mtr	7296	68.20	4,97,587.2
7	Cable 1.1kV Al 1CX50 Sq.mm Un-armoured	Mtr	3040	63.66	1,93,526.4
8	Gland for 1.1kV Al 1CX50 Sq.mm	EA	1216	263.00	3,19,808.0
9	Transformer Base GI Channel 100X50X5mm (2800 mm long) (9.56Kg./Mtr) (Each 26.77 Kg)	Kg	16274.944	93.00	15,13,569.8
10	AB Switch Mounting Channel 75X40X4.8 mm GI Channel (2800 mm long) (7.14Kg./Mtr)	Kg	12155.136	93.00	11,30,427.6
11	HG Fuse Channel 75X40X4.8 mm GI Channel (2800 mm long) (7.14Kg./Mtr)	Kg	12155.136	93.00	11,30,427.6
12	AB Switch Operating Pipe Channel Support 75X40X4.8 mm GI Channel (625 mm long)(7.14Kg./Mtr)	Kg	1356.6	93.00	1,26,163.8
13	AB Switch Side Support Channel 75X40X4.8 mm GI Channel(330 mm long)(7.14Kg./Mtr)	Kg	2003.36	93.00	1,86,312.5
14	HG Fuse Side Support Channel 75X40X4.8 mm GI Channel(330 mm long)(7.14Kg./Mtr)	Kg	2003.36	93.00	1,86,312.5
15	Cantilever Support Channel 75X40X4.8 mm GI Channel(810 m long)(7.14Kg./Mtr)	Kg	1758.1536	93.00	1,63,508.3
16	AB Switch Operating Pipe Diagonal Angle Support 50X50X6mm GI(388 mm long)(4.5Kg./Mtr)	Kg	530.784	93.00	49,362.9
17	AB Switch Operating Pipe Diagonal Base Angle Support 50X50X6mm (340 mm long) GI(4.5Kg./Mtr)	Kg	465.12	93.00	43,256.2
18	Cantilever Support Angle 50X50X6mm GI (1282 mm long) (4.5Kg./Mtr)	Kg	1753.776	93.00	1,63,101.2
19	LTDB Mounting Support Angle 75X40X4.8mm GI (3 mtr long) (7.14Kg./Mtr)	Kg	1368	93.00	1,27,224.0
20	H/W fitting(B&S) 70KN,3 Bolt	Set	912	434.00	3,95,808.0
21	11kV Disc insulator (B&S) 70KN polymer	No	912	1426.00	13,00,512.0
22	25x6 mm GI flat	Kg	1824	93.00	1,69,632.0
23	GI Nut , Bolt & Washer of different sizes	Kg	3648	96.72	3,52,834.6
24	Lug AL 70 Sqmm for 7/8 SWG Wire/Earthing	EA	16416	8.50	1,39,536.0
25	Lug AL Crimping 50 Sqmm XLPE One Hole	EA	2432	7.09	17,242.9
26	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	1520	1302.00	19,79,040.0
27	PIPE HDPE SIZE 25 MM	Mtr	6992	33.60	2,34,931.2

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28	Connector Mini Wedge 25 Sqmm to Dog	EA	912	72.88	66,466.6
Total Cost of materials					3,67,79,308.0
Stock, Storage & Insurance i.e 3%					11,03,379.2
Sub Total					3,78,82,687.2
Contingency @ 3%					11,36,480.6
Tools & Plants @ 2%					7,57,653.7
Transportation @ 7.5%					28,41,201.5
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					8,42,292.8
Erection Other @ 10%.					18,99,842.0
Erection PSC Pole @ 20%					-
Sub Total					4,53,60,157.9
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	1520	2415	36,70,800.0
2	Dismantling of existing 11/0.4kV,3 Phase Distribution Transformer 16KVA including removal of HT/LT leads,earth connections & unloading by crane. Scope also includes loading, transportation, unloading & staking at a proper place in safe position/site store	No	304	1417.5	4,30,920.0
3	Dismantling of Steel Structure,Nuts & Bolt including loading,transportation, unloading & staking of dismantled material at a proper place in TPNODL store	Kg	7600	78.75	5,98,500.0
Total Civil Part					47,00,220.0
Sub-Total					5,00,60,377.9
Other Over Head (Including Supervision charges)@ 6%					30,03,622.7
Sub-total					5,30,64,000.6
GST @ 18% of Sub-Total					95,51,520.1
CESS @ 1% of Sub-Total					5,30,640.0
Sub-Grand Total					6,31,46,160.7
Inspection Fee					-
Drawing Approval					-
Grand Total					6,31,46,160.7
Grand Total in Cr.					6.315

B. Cost Estimation for Augmentation of DTR 25/63 KVA to 100 KVA

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	100 KVA,11/0.4KV(Al) Transformer	No	160	165450.00	2,64,72,000.0
2	LT Distribution Box for 100 KVA S/S.	EA	160	30279.56	48,44,729.6

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3	11kV AB Switch,200A.3pole,50Hz,Horizontal Type	Set	160	9114.00	14,58,240.0
4	Lightning Arrester (9kV,10kA) DH Class	No	480	1260.00	6,04,800.0
5	HG Fuse(11KV,200A,3 Pole,50Hz) with PI	Set	160	7588.80	12,14,208.0
6	Conductor 62 mm sq ACSR Rabbit	Mtr	3840	32.79	1,25,913.6
7	Cable 1.1kV Al 1CX150 Sq.mm Un-armoured	Mtr	5120	260.40	13,33,248.0
8	Gland for 1.1kV Al 1CX150 Sq.mm	EA	640	128.30	82,112.0
9	Top Channel 100X50X5mm (2800 mm long) (9.56Kg./Mtr) (Each 26.77 Kg)	Kg	8565.76	93.00	7,96,615.7
10	Transformer Base GI Channel 100X50X5mm (2800 mm long) (9.56Kg./Mtr) (Each 26.77 Kg)	Kg	0	93.00	-
11	AB Switch Mounting Channel 75X40X4.8 mm GI Channel (2800 mm long) (7.14Kg./Mtr)	Kg	6397.44	93.00	5,94,961.9
12	HG Fuse Side Support Channel 75X40X4.8 mm GI Channel(330 mm long)(7.14Kg./Mtr)	Kg	6397.44	93.00	5,94,961.9
13	Transformer Belting angle (50X50X6) mm 2800 mm long 2 nos. (7.14 Kg./Mtr.)with side angle	Kg	0	93.00	-
14	AB Switch Operating Pipe Channel Support 75X40X4.8 mm GI Channel (625 mm long)(7.14Kg./Mtr)	Kg	714	93.00	66,402.0
15	AB Switch Side Support Channel 75X40X4.8 mm GI Channel(330 mm long)(7.14Kg./Mtr)	Kg	1054.4	93.00	98,059.2
16	HG Fuse Side Support Channel 75X40X4.8 mm GI Channel(330 mm long)(7.14Kg./Mtr)	Kg	1054.4	93.00	98,059.2
17	Cantilever Support Channel 75X40X4.8 mm GI Channel(810 m long)(7.14Kg./Mtr)	Kg	925.344	93.00	86,057.0
18	AB Switch Operating Pipe Diagonal Angle Support 50X50X6mm GI(388 mm long)(4.5Kg./Mtr)	Kg	279.36	93.00	25,980.5
19	AB Switch Operating Pipe Diagonal Base Angle Support 50X50X6mm (340 mm long) GI(4.5Kg./Mtr)	Kg	244.8	93.00	22,766.4
20	Cantilever Support Angle 50X50X6mm GI (1282 mm long) (4.5Kg./Mtr)	Kg	923.04	93.00	85,842.7
21	LTDB Mounting Support Angle 75X40X4.8mm GI (3 mtr long) (7.14Kg./Mtr)	Kg	720	93.00	66,960.0
22	H/W fitting(B&S) 70KN,3 Bolt	Set	480	434.00	2,08,320.0
23	11kV Disc insulator (B&S) 70KN polymer	No	480	1426.00	6,84,480.0
24	50x6 mm GI flat	Kg	960	93.00	89,280.0
25	25x6 mm GI flat	Kg	960	93.00	89,280.0
26	GI Nut , Bolt & Washer of different sizes	Kg	4000	96.72	3,86,880.0
27	Lug AL 70 Sqmm for 7/8 SWG Wire/Earthing	EA	8640	8.50	73,440.0
28	Lug AL Crimping 150 Sqmm XLPE One Hole	EA	1280	17.71	22,668.8
29	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	800	1302.00	10,41,600.0
30	PIPE HDPE SIZE 25 MM	Mtr	3680	33.60	1,23,648.0
31	Connector Mini Wedge 25 Sqmm to Dog	EA	480	72.88	34,982.4
Total Cost of materials					4,14,26,496.9

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Stock, Storage & Insurance i.e 3%					12,42,794.9
Sub Total					4,26,69,291.8
Contingency @ 3%					12,80,078.8
Tools & Plants @ 2%					8,53,385.8
Transportation @ 7.5%					32,00,196.9
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					13,63,308.0
Erection Other @ 10%.					15,27,577.4
Erection PSC Pole @ 20%					-
Sub Total					5,08,93,838.7
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	800	2415	19,32,000.0
2	Dismantling of existing 11/0.4kV,3 Phase Distribution Transformer 63KVA including removal of HT/LT leads, earth connections & unloading by crane.Scope also includes loading, transportation, unloading & staking at a proper place in safe position/site store	No	160	1890	3,02,400.0
3	Providing and fixing including loading , unloading & transportation of FRP Fencing including Flurocent Sticker(two Mtr. in each post),Supply of Latch Lock, Supply of Hings,Supply of SS Lock with Key excluding civil works as per TPNODL specification.	M2	2880	3310	95,32,800.0
4	Dismantling of Steel Structure,Nuts & Bolt including loading,transportation, unloading & staking of dismantled material at a proper place in TPNODL store	Kg	8000	78.75	6,30,000.0
Total Civil Part					1,23,97,200.0
Sub-Total					6,32,91,038.7
Other Over Head (Including Supervision charges)@ 6%					37,97,462.3
Sub-total					6,70,88,501.1
GST @ 18% of Sub-Total					1,20,75,930.2
CESS @ 1% of Sub-Total					6,70,885.0
Sub-Grand Total					7,98,35,316.3
Inspection Fee					-
Drawing Approval					-
Grand Total					7,98,35,316.3
Grand Total in Cr.					7.984

C. Cost Estimation for Augmentation of DTR 100 KVA to 250 KVA

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	250 KVA,11/0.4KV(Cu) Transformer	No	80	441439.32	3,53,15,145.6
2	ACB LT 400 A	EA	80	39919	31,93,520.0
3	11kV AB Switch,400A,3pole,50Hz,Horizontal Type	Set	80	14694.00	11,75,520.0
4	Lightning Arrester (9kV,10kA) DH Class	No	240	1260.00	3,02,400.0
5	HG Fuse(11KV,400A,3 Pole,50Hz) with PI	Set	80	14297.20	11,43,776.0
6	Conductor 62 mm sq ACSR Rabbit	Mtr	1920	32.79	62,956.8
7	Cable 1.1kV Al 1CX300 Sq.mm Un-armoured	Mtr	2560	473.68	12,12,620.8
8	Gland for 1.1kV Al 1CX300 Sq.mm	EA	320	840.00	2,68,800.0
9	Top Channel 100X50X5mm (2800 mm long) (9.56Kg./Mtr) (Each 26.77 Kg)	Kg	4282.88	93.00	3,98,307.8
10	Transformer Base GI Channel 100X50X5mm (2800 mm long) (9.56Kg./Mtr) (Each 26.77 Kg)	Kg	0	93.00	-
11	AB Switch Mounting Channel 75X40X4.8 mm GI Channel (2800 mm long) (7.14Kg./Mtr)	Kg	3198.72	93.00	2,97,481.0
12	HG Fuse Channel 75X40X4.8 mm GI Channel (2800 mm long) (7.14Kg./Mtr)	Kg	3198.72	93.00	2,97,481.0
13	Transformer Belting angle (50X50X6) mm 2800 mm long 2 nos. (7.14 Kg./Mtr.)with side angle	Kg	0	93.00	-
14	AB Switch Operating Pipe Channel Support 75X40X4.8 mm GI Channel (625 mm long)(7.14Kg./Mtr)	Kg	357	93.00	33,201.0
15	AB Switch Side Support Channel 75X40X4.8 mm GI Channel(330 mm long)(7.14Kg./Mtr)	Kg	527.2	93.00	49,029.6
16	HG Fuse Side Support Channel 75X40X4.8 mm GI Channel(330 mm long)(7.14Kg./Mtr)	Kg	527.2	93.00	49,029.6
17	Cantilever Support Channel 75X40X4.8 mm GI Channel(810 m long)(7.14Kg./Mtr)	Kg	462.672	93.00	43,028.5
18	AB Switch Operating Pipe Diagonal Angle Support 50X50X6mm GI(388 mm long)(4.5Kg./Mtr)	Kg	139.68	93.00	12,990.2
19	AB Switch Operating Pipe Diagonal Base Angle Support 50X50X6mm (340 mm long) GI(4.5Kg./Mtr)	Kg	122.4	93.00	11,383.2
20	Cantilever Support Angle 50X50X6mm GI (1282 mm long) (4.5Kg./Mtr)	Kg	461.52	93.00	42,921.4
21	LTDB Mounting Support Angle 75X40X4.8mm GI (3 mtr long) (7.14Kg./Mtr)	Kg	360	93.00	33,480.0
22	H/W fitting(B&S) 70KN,3 Bolt	Set	240	434.00	1,04,160.0
23	11kV Disc insulator (B&S) 70KN polymer	No	240	1426.00	3,42,240.0
24	50x6 mm GI flat	Kg	440	93.00	40,920.0

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25	25x6 mm GI flat	Kg	440	93.00	40,920.0
26	GI Nut , Bolt & Washer of different sizes	Kg	2000	96.72	1,93,440.0
27	Lug AL 70 Sqmm for 7/8 SWG Wire/Earthing	EA	4320	8.50	36,720.0
28	Lug AL Crimping 300 Sqmm XLPE One Hole	EA	640	38.42	24,588.8
29	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	400	1302.00	5,20,800.0
30	PIPE HDPE SIZE 25 MM	Mtr	1840	33.60	61,824.0
31	Connector Mini Wedge 25 Sqmm to Dog	EA	240	72.88	17,491.2
Total Cost of materials					4,53,26,176.5
Stock, Storage & Insurance i.e 3%					13,59,785.3
Sub Total					4,66,85,961.7
Contingency @ 3%					14,00,578.9
Tools & Plants @ 2%					9,33,719.2
Transportation @ 7.5%					35,01,447.1
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					18,18,730.0
Erection Other @ 10%.					10,24,768.3
Erection PSC Pole @ 20%					-
Sub Total					5,53,65,205.3
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	400	2415	9,66,000.0
2	Dismantling of existing 11/0.4kV,3 Phase Distribution Transformer 63KVA including removal of HT/LT leads, earth connections & unloading by crane.Scope also includes loading, transportation, unloading & staking at a proper place in safe position/site store	No	80	1890	1,51,200.0
3	Dismantling of Steel Structure,Nuts & Bolt including loading,transportation, unloading & staking of dismantled material at a proper place in TPNODL store	Kg	8320	78.75	6,55,200.0
4	Providing and fixing including loading , unloading & transportation of FRP Fencing including Flurocent Sticker(two Mtr. in each post),Supply of Latch Lock, Supply of Hings,Supply of SS Lock with Key excluding civil works as per TPNODL specification.	M2	720	3310	23,83,200.0
5	Construction of Plinth with Brick, Mortar, 12 mm cement plaster and for 250-1000KVA transformer as per TPNODL drawing.Scope of work includes excavation of earth,supply of Civil material for construction, desposal of extra malba	LS	80	31878	25,50,240.0

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Total Civil Part	67,05,840.0
Sub-Total	6,20,71,045.3
Other Over Head (Including Supervision charges)@ 6%	37,24,262.7
Sub-total	6,57,95,308.0
GST @ 18% of Sub-Total	1,18,43,155.4
CESS @ 1% of Sub-Total	6,57,953.1
Sub-Grand Total	7,82,96,416.5
Inspection Fee	-
Drawing Approval	-
Grand Total	7,82,96,416.5
Grand Total in Cr.	7.830

D. Cost Estimation for Augmentation of DTR 200/250 KVA to 400 KVA

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	400 KVA,11/0.4KV(Cu) Transformer	No	16	740016.61	1,18,40,265.8
2	ACB LT 400 A	EA	32	39919	12,77,408.0
3	11kV AB Switch,400A.3pole,50Hz,Horizontal Type	Set	16	14694.00	2,35,104.0
4	Lightning Arrester (9kV,10kA) DH Class	No	48	1260.00	60,480.0
5	HG Fuse(11KV,400A,3 Pole,50Hz) with PI	Set	16	14297.20	2,28,755.2
6	Conductor 62 mm sq ACSR Rabbit	Mtr	384	32.79	12,591.4
7	Cable 1.1kV Al 1CX300 Sq.mm Un-armoured	Mtr	1024	473.68	4,85,048.3
8	Gland for 1.1kV Al 1CX300 Sq.mm	EA	128	840.00	1,07,520.0
9	Top Channel 100X50X5mm (2800 mm long) (9.56Kg./Mtr) (Each 26.77 Kg)	Kg	856.576	93.00	79,661.6
10	Transformer Base GI Channel 100X50X5mm (2800 mm long) (9.56Kg./Mtr) (Each 26.77 Kg)	Kg	0	93.00	-
11	AB Switch Mounting Channel 75X40X4.8 mm GI Channel (2800 mm long) (7.14Kg./Mtr)	Kg	639.744	93.00	59,496.2
12	HG Fuse Channel 75X40X4.8 mm GI Channel (2800 mm long) (7.14Kg./Mtr)	Kg	639.744	93.00	59,496.2
13	Transformer Belting angle (50X50X6) mm 2800 mm long 2 nos. (7.14 Kg./Mtr.)with side angle	Kg	0	93.00	-
14	AB Switch Operating Pipe Channel Support 75X40X4.8 mm GI Channel (625 mm long)(7.14Kg./Mtr)	Kg	71.4	93.00	6,640.2
15	AB Switch Side Support Channel 75X40X4.8 mm GI Channel(330 mm long)(7.14Kg./Mtr)	Kg	105.44	93.00	9,805.9
16	HG Fuse Side Support Channel 75X40X4.8 mm GI Channel(330 mm long)(7.14Kg./Mtr)	Kg	105.44	93.00	9,805.9
17	Cantilever Support Channel 75X40X4.8 mm GI Channel(810 m long)(7.14Kg./Mtr)	Kg	92.5344	93.00	8,605.7
18	AB Switch Operating Pipe Diagonal Angle Support 50X50X6mm GI(388 mm long)(4.5Kg./Mtr)	Kg	27.936	93.00	2,598.0

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19	AB Switch Operating Pipe Diagonal Base Angle Support 50X50X6mm (340 mm long) GI(4.5Kg./Mtr)	Kg	24.48	93.00	2,276.6
20	Cantilever Support Angle 50X50X6mm GI (1282 mm long) (4.5Kg./Mtr)	Kg	92.304	93.00	8,584.3
21	LTDB Mounting Support Angle 75X40X4.8mm GI (3 mtr long) (7.14Kg./Mtr)	Kg	144	93.00	13,392.0
22	H/W fitting(B&S) 70KN,3 Bolt	Set	48	434.00	20,832.0
23	11kV Disc insulator (B&S) 70KN polymer	No	48	1426.00	68,448.0
24	50x6 mm GI flat	Kg	192	93.00	17,856.0
25	25x6 mm GI flat	Kg	192	93.00	17,856.0
26	GI Nut , Bolt & Washer of different sizes	Kg	400	96.72	38,688.0
27	Lug AL 70 Sqmm for 7/8 SWG Wire/Earthing	EA	864	8.50	7,344.0
28	Lug AL Crimping 300 Sqmm XLPE One Hole	EA	256	38.42	9,835.5
29	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	80	1302.00	1,04,160.0
30	PIPE HDPE SIZE 25 MM	Mtr	368	33.60	12,364.8
31	Connector Mini Wedge 25 Sqmm to Dog	EA	48	72.88	3,498.2
Total Cost of materials					1,48,08,417.9
Stock, Storage & Insurance i.e 3%					4,44,252.5
Sub Total					1,52,52,670.4
Contingency @ 3%					4,57,580.1
Tools & Plants @ 2%					3,05,053.4
Transportation @ 7.5%					11,43,950.3
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					6,09,773.7
Erection Other @ 10%.					3,04,446.1
Erection PSC Pole @ 20%					-
Sub Total					1,80,73,474.0
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	80	2415	1,93,200.0
2	Dismantling of existing 11/0.4kV,3 Phase Distribution Transformer 63KVA including removal of HT/LT leads, earth connections & unloading by crane.Scope also includes loading, transportation, unloading & staking at a proper place in safe position/site store	No	16	1890	30,240.0
3	Dismantling of Steel Structure,Nuts & Bolt including loading,transportation, unloading & staking of dismantled material at a proper place in TPNODL store	Kg	1664	78.75	1,31,040.0

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4	Providing and fixing including loading , unloading & transportation of FRP Fencing including Flurocent Sticker(two Mtr. in each post),Supply of Latch Lock, Supply of Hings,Supply of SS Lock with Key excluding civil works as per TPNODL specification.	M2	144	3310	4,76,640.0
5	Construction of Plinth with Brick, Mortar, 12 mm cement plaster and for 250-1000KVA transformer as per TPNODL drawing.Scope of work includes excavation of earth,supply of Civil material for construction, desposal of extra malba	LS	16	31878	5,10,048.0
Total Civil Part					13,41,168.0
Sub-Total					1,94,14,642.0
Other Over Head (Including Supervision charges)@ 6%					11,64,878.5
Sub-total					2,05,79,520.5
GST @ 18% of Sub-Total					37,04,313.7
CESS @ 1% of Sub-Total					2,05,795.2
Sub-Grand Total					2,44,89,629.4
Inspection Fee					-
Drawing Approval					-
Grand Total					2,44,89,629.4
Grand Total in Cr.					2.45

9.30 Annexure 30: Cost Estimate for Addition of 11kV OH Lines

Sr.No.	Description	UOM	Qty	Amount
				in Crores
A	11 kV Addition Line (O/H) -100 sq.mm AAAC	Ckm	85	16.43
B	11 kV Addition Line (U/G) - 3Cx400 sqmm	Km	7.2	7.69
Total				24.12

A. Cost Estimate for 11kV Addition Line (O/H) 100 sqmm AAAC

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	WPB 160x152 (30.44KG/Mtr.),11 mtr	No	1870	34321.52	6,41,81,242.4
2	Top Channel 100X50X5mm, 9.56 KG/Mtr., each channel length 2.3 mtr., 2 no's channel required	Kg	7475.92	93.00	6,95,260.6

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3	Double Pole Belting Channel 75X40X4.8mm.,7.14KG/Mtr.,each channel length 1.66 Mtr.,4 no's channel required	Kg	8059.63	93.00	7,49,545.8
4	50X50X6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 2.671 mtr., 4 nos angle required	Kg	8173.26	93.00	7,60,113.2
5	Straight Cross Arm Channel 100X50X5mm, 9.56 KG/Mtr., each channel length 1.2 mtr.	Kg	0	93.00	-
6	Straight Cross Arm Top Channel 100X50X5mm, 9.56 KG/mtr, each channel length 0.306 Mtr.	Kg	0	93.00	-
7	Fish Plate 50X8 mm., 0.97kg/Mtr., each 0.280 mtr. Length	Kg	277.03	93.00	25,764.0
8	Danger Plate	No	1870	99.20	1,85,504.0
9	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr 1 no	Kg	1870	93.00	1,73,910.0
10	GI barbed wire anticlimbing device	Kg	5610	99.20	5,56,512.0
11	Back Clamp for Barbed wire anticlimbing device 25X3mm. flat, 0.59Kg/Mtr. Flat of 0.510 mtr length 4 no's	Kg	2250.73	93.00	2,09,318.1
12	11kV,5kN pin insulator polymer	No	4335	248.00	10,75,080.0
13	11kV V cross Arm (GI)	No	1360	1004.40	13,65,984.0
14	GI Back Clamp for 11kV 'V' Cros Arm	No	1360	99.20	1,34,912.0
15	Top bracket 100X50X5mm GI channel	No	1360	186.00	2,52,960.0
16	H/W fitting(B&S) 70KN,3 Bolt	Set	1020	434.00	4,42,680.0
17	11kV Disc insulator (B&S) 70KN polymer	No	1020	1426.00	14,54,520.0
18	Earthing of Support (Coil Type)	EA	1870	205.84	3,84,920.8
19	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	Kg	489.94	93.00	45,564.4
20	PG Clamp for 100 mm2 AAAC conductor	No	1020	719.20	7,33,584.0
21	GI Nut , Bolt & Washer of different sizes	Kg	4088.5	96.72	3,95,439.7
22	H.T. Stay clamp	Pair	680	155.00	1,05,400.0
23	H.T. Stay set (Complete)	Set	680	1302.00	8,85,360.0
24	H.T. Stay Insulator	No	680	62.00	42,160.0
25	7/10 SWG Stay Wire	Kg	6800	93.00	6,32,400.0
26	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	170	1302.00	2,21,340.0
27	GI Plate base(500X500X10mm)	No	1870	1860.00	34,78,200.0
28	AAA conductor,100 mm2	Km	262.65	68200.00	1,79,12,730.0
29	50x6 mm GI flat	Kg	1020	93.00	94,860.0
30	Crimping type Midspan Compression Joint for 100mm2 AAA Conductor	No	0	4500.00	-
31	Black Paint	Ltr	680	272.80	1,85,504.0
32	Yellow Colour Paint for Background	Ltr	1530	220.00	3,36,600.0
Total Cost of materials					9,77,17,368.9
Stock, Storage & Insurance i.e 3%					29,31,521.1
Sub Total					10,06,48,890.0
Contingency @ 3%					30,19,466.7

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Tools & Plants @ 2%					20,12,977.8
Transportation @ 7.5%					75,48,666.7
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					
Erection Other @ 10%.					32,06,118.3
Erection PSC Pole @ 20%					
Sub Total					11,64,36,119.6
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Fixing of complete 11KV line stay set includes Turn Buckle Assembly, Stay Rod & Stay plate, Stay Insulator, Stay Wire, Stay clamps with Nuts & bolts BA will do the excavation, supply of 0.5Cum cement concrete foundation 1:2:4 size (500mmx500mmx800mm)	No.	680	2362.5	16,06,500.0
2	Erection of 11 Mtr long WPB Pole including loading & unloading, transportation, providing & laying of 1:1.5:3, M20 Grade, C.C- 500x500X1800 mm & cooping of 500x500x450 mm, includes 5 days curing and zebra painting (In Black & Yellow Strips/Zebra)	No	1870	6300	1,17,81,000.0
3	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	170	2415	4,10,550.0
Total Civil Part					1,37,98,050.0
Sub-Total					13,02,34,169.6
Other Over Head (Including Supervision charges)@ 6%					78,14,050.2
Sub-total					13,80,48,219.7
GST @ 18% of Sub-Total					2,48,48,679.6
CESS @ 1% of Sub-Total					13,80,482.2
Sub-Grand Total					16,42,77,381.5
Inspection Fee					-
Drawing Approval					-
Grand Total					16,42,77,381.5
Grand Total in Cr.					16.43

B. Cost Estimate for 11 kV Addition Line (U/G) 3Cx400 sqmm XLPE

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	11kV AL 3CX400 Sqmm XLPE Cable armoured	Mtr	14400	2296.28	3,30,66,432.0
2	Heat shrinkable jointing kit for 3Cx400mm ² 11KV XLPE Cable(outdoor type)	No	30	17240.96	5,17,228.8
3	Heat shrinkable jointing kit for 3Cx400mm ² 11KV XLPE Cable(Straight Through)	No	44	31393.08	13,81,295.5
4	Lightning Arrester (30kV,10kA) (Station Class,Class 2)	EA	44	3379.00	1,48,676.0

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5	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	14	1302.00	18,228.0
6	50x6 mm GI flat	Kg	144	93.00	13,392.0
Total Cost of materials					3,51,45,252.3
Stock, Storage & Insurance i.e 3%					10,54,357.6
Sub Total					3,61,99,609.9
Contingency @ 3%					10,85,988.3
Tools & Plants @ 2%					7,23,992.2
Transportation @ 7.5%					27,14,970.7
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					
Erection Other @ 10%.					2,12,241.0
Erection PSC Pole @ 20%					
Sub Total					4,09,36,802.1
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Laying, Commissioning & Testing of Trenchless ducts with 200 mm dia HDPE pipe casing using HDD machine including supply of HDPE pipe as per IS 4984, PN4 Class PE63 as per IS:4984. UG cable including looping at cable terminations and straight through, This is including laying of cable-11kV for all type of rating (Double Run)	Mtr	7200	2742	1,97,42,400.0
2	Supply and Installation of cable Route marker including transportation from site/tent, excavation, refilling, disposing of malba, flooding with water, ramming/compacting of foundation as per TPNODL specifications and drawing.	No	240	1012	2,42,880.0
3	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	14	2415	33,810.0
Total Civil Part					2,00,19,090.0
Sub-Total					6,09,55,892.1
Other Over Head (Including Supervision charges)@ 6%					36,57,353.5
Sub-total					6,46,13,245.7
GST @ 18% of Sub-Total					1,16,30,384.2
CESS @ 1% of Sub-Total					6,46,132.5
Sub-Grand Total					7,68,89,762.3
Inspection Fee					-
Drawing Approval					-
Grand Total					7,68,89,762.3
Grand Total in Cr.					7.689

9.31 Annexure 31: Cost Estimate for Addition of 33kV OH Lines

Sr.No.	Description	UOM	Qty	Amount
				in Crores
A	33 kV Addition Line (O/H) -148 sq.mm AAAC	Ckm	30	8.67
B	33kV Addition Line (U/G) -3Cx400 sqmm	Km	1	1.13
Total				9.80

A. Cost Estimate for 33 kV Addition Line (O/H) 148 sqmm AAAC

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	WPB 160x152 (30.44KG/Mtr.),13 mtr	No	810	40427.2	3,27,46,032.0
2	Top Channel 100X50X5mm, 9.56 KG/Mtr., each channel length 4.4 mtr., 2 no's channel required	Kg	5047.68	93.00	4,69,434.2
3	Double Pole Belting Channel 75X40X4.8mm.,7.14KG/Mtr.,each channel length 4.4 Mtr.,5 no's channel required	Kg	7539.84	93.00	7,01,205.1
4	50X50X6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 4.9 mtr., 4 nos angle required	Kg	5292	93.00	4,92,156.0
5	Straight Cross Arm Channel 100X50X5mm,9.56 KG/mtr, each channel length 1.8 Mtr.	Kg	0.00	93.00	-
6	Fish Plate 50X8 mm., 0.97kg/Mtr., each 0.280 mtr. Length	Kg	97.78	93.00	9,093.2
7	Danger Plate	No	810	99.20	80,352.0
8	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr 1 no	Kg	810.00	93.00	75,330.0
9	GI barbed wire anticlimbing device	Kg	2430	99.20	2,41,056.0
10	Back Clamp for Barbed wire anticlimbing device 25X3mm. flat, 0.59Kg/Mtr. Flat of 0.510 mtr length 4 no's	Kg	974.92	93.00	90,667.2
11	33kV,10kN pin insulator polymer	No	2250	595.20	13,39,200.0
12	33kV V cross Arm (GI)	No	690	2232.00	15,40,080.0
13	GI Back Clamp for 33kV 'V' Cros Arm	No	690	186.00	1,28,340.0
14	Top bracket 100X50X5mm GI channel	No	690	186.00	1,28,340.0
15	33kV H/W fitting(B&S) 120KN,4 Bolt	Set	360	755.00	2,71,800.0
16	33kV Disc insulator (B&S) 120KN polymer	No	360	1785.60	6,42,816.0
17	Earthing of Support (Coil Type)	EA	810	205.84	1,66,730.4
18	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	Kg	212.22	93.00	19,736.5
19	PG Clamp for 148 mm ² AAAC conductor	No	360	768.80	2,76,768.0
20	GI Nut , Bolt & Washer of different sizes	Kg	1747.5	96.72	1,69,018.2
21	H.T. Stay clamp	Pair	240	155.00	37,200.0
22	H.T. Stay set (Complete)	Set	240	1302.00	3,12,480.0

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23	H.T. Stay Insulator	No	480	62.00	29,760.0
24	7/8 SWG Stay Wire	Kg	3600	93.00	3,34,800.0
25	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	60	1302.00	78,120.0
26	GI Plate base(500X500X10mm)	No	810	1860.00	15,06,600.0
27	AAA conductor,148 mm2	Km	92.7	101680.00	94,25,736.0
28	50x6 mm GI flat	Kg	360	93.00	33,480.0
29	Black Paint	Ltr	405	272.80	1,10,484.0
30	Yellow Colour Paint for Background	Ltr	810	220.00	1,78,200.0
Total Cost of materials					5,16,35,014.8
Stock, Storage & Insurance i.e 3%					15,49,050.4
Sub Total					5,31,84,065.2
Contingency @ 3%					15,95,522.0
Tools & Plants @ 2%					10,63,681.3
Transportation @ 7.5%					39,88,804.9
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					
Erection Other @ 10%.					18,34,217.7
Erection PSC Pole @ 20%					
Sub Total					6,16,66,291.1
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Fixing of complete 33kV line stay set includes Turn Buckle Assembly, Stay Rod & Stay plate, Stay Insulator, Stay Wire, Stay clamps with Nuts & bolts. BA will do the excvaton, supply of 0.5Cum C.C foundation 1:2:4 size (500mmx500mmx800mm)	No.	240	2362.5	5,67,000.0
2	Erection of 13 Mtr long WPB Pole including loading & unloading, transportation, providing & laying of 1:1.5:3, M20 Grade C.C-500x500X2200 mm & cooping of 500x500x450 mm, includes 5 days curing and zebra painting (In Black & Yellow Strips/Zebra)	No	810	7980	64,63,800.0
3	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	60	2415	1,44,900.0
Total Civil Part					71,75,700.0
Sub-Total					6,88,41,991.1
Other Over Head (Including Supervision charges)@ 6%					41,30,519.5
Sub-total					7,29,72,510.5
GST @ 18% of Sub-Total					1,31,35,051.9
CESS @ 1% of Sub-Total					7,29,725.1
Sub-Grand Total					8,68,37,287.5
Inspection Fee					-
Drawing Approval					-
Grand Total					8,68,37,287.5

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Grand Total in Cr.	8.684
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B. Cost Estimate for 33 kV Addition Line (U/G) 3Cx400 sqmm XLPE

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	33kV AL 3CX400 Sqmm XLPE Cable armoured	Mtr	2000	2519.68	50,39,360.0
2	Heat shrinkable jointing kit for 3Cx400mm ² 33KV XLPE Cable(outdoor type)	No	2	41236.20	82,472.4
3	Heat shrinkable jointing kit for 3Cx400mm ² 33KV XLPE Cable(Straight Through)	No	2	85056.56	1,70,113.1
4	Lightning Arrester (30kV,10kA) (Station Class,Class 2)	EA	3	3379.00	10,137.0
5	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	2	1302.00	2,604.0
6	50x6 mm GI flat	Kg	10	93.00	930.0
Total Cost of materials					53,05,616.5
Stock, Storage & Insurance i.e 3%					1,59,168.5
Sub Total					54,64,785.0
Contingency @ 3%					1,63,943.6
Tools & Plants @ 2%					1,09,295.7
Transportation @ 7.5%					4,09,858.9
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					
Erection Other @ 10%.					27,156.2
Erection PSC Pole @ 20%					
Sub Total					61,75,039.4
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Laying, Commissioning & Testing of Trenchless ducts with 200 mm dia HDPE pipe casing using HDD machine including supply of HDPE pipe as per IS 4984, PN4 Class PE63 as per IS:4984. UG cable including looping at cable terminations and straight through, This is including laying of cable-33kV for all type of rating (Double Run)	Mtr	1000	2783.9	27,83,898.3
2	Supply and Installation of cable Route marker including transportation from site/tent, excavation, refilling, disposing of malba, flooding with water, ramming/compacting of foundation as per TPNODL specifications and drawing.	No	33	1012	33,396.0
3	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	2	2415	4,830.0
Total Civil Part					28,22,124.3
Sub-Total					89,97,163.7
Other Over Head (Including Supervision charges)@ 6%					5,39,829.8

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Sub-total	95,36,993.5
GST @ 18% of Sub-Total	17,16,658.8
CESS @ 1% of Sub-Total	95,369.9
Sub-Grand Total	1,13,49,022.2
Inspection Fee	-
Drawing Approval	-
Grand Total	1,13,49,022.2
Grand Total in Cr.	1.135

9.32 Annexure 32: Cost Estimate for Addition of New PTR at PSS

Sr.No.	Description	UOM	Qty	Amount
				in Crores
A	Addition of New 5 MVA Transformer	Nos.	5	5.08
Total				5.08

A. Cost Estimate for Addition of New 5 MVA Transformer

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	5MVA 33/11KV Power Transformer	No	5.00	5372881.36	2,68,64,406.8
2	33kV 1250 Amp Outdoor VCB	No	5.00	669600	33,48,000.0
3	AAA conductor,232 mm2	Km	0.08	194060.00	14,554.5
4	PG Clamp for 232 mm2 AAAC conductor	No	75.00	1426.00	1,06,950.0
5	12 bolted (M-12) "T" clamp for 232 mm ² conductor	No	30.00	1190.40	35,712.0
6	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	50.00	1302.00	65,100.0
7	33KV Post Insulator	No	15.00	1959.20	29,388.0
8	GI Nut , Bolt & Washer of different sizes	Kg	100.00	96.72	9,672.0
9	50x6 mm GI flat	Kg	160.00	93.00	14,880.0
10	33kV,10kN pin insulator polymer	EA	15.00	595.20	8,928.0
11	Lightning Arrester (30kV,10kA) (Station Class,Class 2)	EA	30.00	3379.00	1,01,370.0
Total Cost of materials					3,05,98,961.3
Stock, Storage & Insurance i.e 3%					9,17,968.8
Sub Total					3,15,16,930.1
Contingency @ 3%					9,45,507.9
Tools & Plants @ 2%					6,30,338.6
Transportation @ 7.5%					23,63,769.8
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					
Erection Other @ 10%.					31,44,987.7

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Erection PSC Pole @ 20%					
Sub Total					3,86,01,534.1
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Foundation of Power transformer (6'x6'x8')	LS	5	120000	6,00,000.0
2	Testing	No	5	161700	8,08,500.0
3	Foundation of VCB	LS	5	35000	1,75,000.0
4	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	50.00	2415	1,20,750.0
Total Civil Part					17,04,250.0
Sub-Total					4,03,05,784.1
Other Over Head (Including Supervision charges)@ 6%					24,18,347.0
Sub-total					4,27,24,131.2
GST @ 18% of Sub-Total					76,90,343.6
CESS @ 1% of Sub-Total					4,27,241.3
Sub-Grand Total					5,08,41,716.1
Inspection Fee					-
Drawing Approval					-
Grand Total					5,08,41,716.1
Grand Total in Cr.					5.08

9.33 Annexure 33: Cost Estimate for Addition of New DTRs along with Associated HT/LT lines

Sr.No.	Description	UOM	Qty	Amount
				in Crores
A	Addition of New 100 KVA Transformer with associated HT/LT Lines	Nos.	110	17.37
Total				17.37

A. Cost Estimate for Addition of New 100 KVA Transformer with Associated Lines

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
Part - A	DTR				
1	100 KVA,11/0.4KV(Al) Transformer	No	110	165450.00	1,81,99,500.0
2	WPB 160x152 (30.44KG/Mtr.),11 mtr	No	220	34321.52	75,50,734.4
3	LT Distribution Box for 100 KVA S/S.	EA	110	30279.56	33,30,751.6

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4	11kV AB Switch,200A,3pole,50Hz,Horizontal Type	Set	110	9114.00	10,02,540.0
5	Lightning Arrester (9kV,10kA) DH Class	No	330	1260.00	4,15,800.0
6	HG Fuse(11KV,200A,3 Pole,50Hz) with PI	Set	110	7588.80	8,34,768.0
7	Conductor 62 mm sq ACSR Rabbit	Mtr	2640	32.79	86,565.6
8	Cable 1.1kV Al 1CX150 Sq.mm Un-armoured	Mtr	3520	260.40	9,16,608.0
9	Gland for 1.1kV Al 1CX150 Sq.mm	EA	440	128.30	56,452.0
10	Top Channel 100X50X5mm (2800 mm long) (9.56Kg./Mtr) (Each 26.77 Kg)	Kg	6930	93.00	6,44,490.0
11	Transformer Base GI Channel 100X50X5mm (2800 mm long) (9.56Kg./Mtr) (Each 26.77 Kg)	Kg	6930	93.00	6,44,490.0
12	AB Switch Mounting Channel 75X40X4.8 mm GI Channel (2800 mm long) (7.14Kg./Mtr)	Kg	5390	93.00	5,01,270.0
13	HG Fuse Side Support Channel 75X40X4.8 mm GI Channel(330 mm long)(7.14Kg./Mtr)	Kg	5390	93.00	5,01,270.0
14	Transformer Belting angle (50X50X6) mm 2800 mm long 2 nos. (7.14 Kg./Mtr.)with side angle	Kg	6490	93.00	6,03,570.0
15	AB Switch Operating Pipe Channel Support 75X40X4.8 mm GI Channel (625 mm long)(7.14Kg./Mtr)	Kg	880	93.00	81,840.0
16	AB Switch Side Support Channel 75X40X4.8 mm GI Channel(330 mm long)(7.14Kg./Mtr)	Kg	724.9	93.00	67,415.7
17	HG Fuse Side Support Channel 75X40X4.8 mm GI Channel(330 mm long)(7.14Kg./Mtr)	Kg	724.9	93.00	67,415.7
18	Cantilever Support Channel 75X40X4.8 mm GI Channel(810 m long)(7.14Kg./Mtr)	Kg	636.174	93.00	59,164.2
19	AB Switch Operating Pipe Diagonal Angle Support 50X50X6mm GI(388 mm long)(4.5Kg./Mtr)	Kg	192.06	93.00	17,861.6
20	AB Switch Operating Pipe Diagonal Base Angle Support 50X50X6mm (340 mm long) GI(4.5Kg./Mtr)	Kg	168.3	93.00	15,651.9
21	Cantilever Support Angle 50X50X6mm GI (1282 mm long) (4.5Kg./Mtr)	Kg	634.59	93.00	59,016.9
22	LTDB Mounting Support Angle 75X40X4.8mm GI (3 mtr long) (7.14Kg./Mtr)	Kg	495	93.00	46,035.0
23	H/W fitting(B&S) 70KN,3 Bolt	Set	330	434.00	1,43,220.0
24	11kV Disc insulator (B&S) 70KN polymer	No	330	1426.00	4,70,580.0
25	50x6 mm GI flat	Kg	880	93.00	81,840.0
26	25x6 mm GI flat	Kg	880	93.00	81,840.0
27	GI Nut , Bolt & Washer of different sizes	Kg	2750	96.72	2,65,980.0
28	Lug AL 70 Sqmm for 7/8 SWG Wire/Earthing	EA	5940	8.50	50,490.0

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29	Lug AL Crimping 150 Sqmm XLPE One Hole	EA	880	17.71	15,584.8
30	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	550	1302.00	7,16,100.0
31	PIPE HDPE SIZE 25 MM	Mtr	2530	33.60	85,008.0
32	Connector Mini Wedge 25 Sqmm to Dog	EA	330	72.88	24,050.4
Part - B	HT Line				
S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	WPB 160x152 (30.44KG/Mtr.),11 mtr	No	770	34321.52	2,64,27,570.4
2	Top Channel 100X50X5mm, 9.56 KG/Mtr., each channel length 2.3 mtr., 2 no's channel required	Kg	5667.2	93.00	5,27,049.6
3	Double Pole Belting Channel 75X40X4.8mm.,7.14KG/Mtr.,each channel length 1.66 Mtr.,4 no's channel required	Kg	8377.6	93.00	7,79,116.8
4	50X50X6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 2.671 mtr., 4 nos angle required	Kg	5913.6	93.00	5,49,964.8
5	Straight Cross Arm Channel 100X50X5mm, 9.56 KG/Mtr., each channel length 1.2 mtr.	Kg	8580	93.00	7,97,940.0
6	Straight Cross Arm Top Channel 100X50X5mm, 9.56 KG/mtr, each channel length 0.306 Mtr.	Kg	1930.7376	93.00	1,79,558.6
7	Fish Plate 50X8 mm., 0.97kg/Mtr., each 0.280 mtr. Length	Kg	179.256	93.00	16,670.8
8	Danger Plate	No	770	99.20	76,384.0
9	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr 1 no	Kg	770	93.00	71,610.0
10	GI barbed wire anticlimbing device	Kg	2310	99.20	2,29,152.0
11	Back Clamp for Barbed wire anticlimbing device 25X3mm. flat, 0.59Kg/Mtr. Flat of 0.510 mtr length 4 no's	Kg	926.772	93.00	86,189.8
12	11kV,5kN pin insulator polymer	No	1980	248.00	4,91,040.0
13	11kV V cross Arm (GI)	No	550	1004.40	5,52,420.0
14	GI Back Clamp for 11kV 'V' Cros Arm	No	550	99.20	54,560.0
15	Top bracket 100X50X5mm GI channel	No	550	186.00	1,02,300.0
16	H/W fitting(B&S) 70KN,3 Bolt	Set	660	434.00	2,86,440.0
17	11kV Disc insulator (B&S) 70KN polymer	No	660	1426.00	9,41,160.0
18	Earthing of Support (Coil Type)	EA	770	205.84	1,58,496.8
19	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	Kg	201.74	93.00	18,761.8
20	PG Clamp for 100 mm ² AAAC conductor	No	660	719.20	4,74,672.0
21	GI Nut , Bolt & Washer of different sizes	Kg	2172.5	96.72	2,10,124.2
22	H.T. Stay clamp	Pair	440	155.00	68,200.0
23	H.T. Stay set (Complete)	Set	440	1302.00	5,72,880.0
24	H.T. Stay Insulator	No	440	62.00	27,280.0

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25	7/10 SWG Stay Wire	Kg	4400	93.00	4,09,200.0
26	40mm nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No	110	1302.00	1,43,220.0
27	GI Plate base(500X500X10mm)	No	770	1860.00	14,32,200.0
28	AAA conductor,100 mm2	Km	101.97	68200.00	69,54,354.0
29	50x6 mm GI flat	Kg	880	93.00	81,840.0
30	Crimping type Midspan Compression Joint for 100mm2 AAA Conductor	No	0	4500.00	-
31	Black Paint	Ltr	385	272.80	1,05,028.0
32	Yellow Colour Paint for Background	Ltr	770	220.00	1,69,400.0
Part - C	LT Line				
S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	1.1KV LT AB Cable 4x95+1x95+1x16mm2	Mtr	27500	421.67	1,15,95,925.0
2	9 mtr long 300 kg PSC pole	No	550	3720.00	20,46,000.0
3	RCC base Plate for PSC pole	No	550	1700.00	9,35,000.0
4	Danger Plate	No	550	99.20	54,560.0
5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr 1 no	Kg	165.495	93.00	15,391.0
6	GI barbed wire anticlimbing device	Kg	1375	99.20	1,36,400.0
7	Back Clamp for Barbed wire anticlimbing device 25X3mm. flat, 0.59Kg/Mtr. Flat of 0.510 mtr length 4 no's	Kg	661.98	93.00	61,564.1
8	Pole clamp for EYE hook for XLPE Aerial bunched Cable	Pair	550	248.00	1,36,400.0
9	Suspension Clamp with EYE hook for ABC	No.	330	421.60	1,39,128.0
10	Eye Hook for AB cable for dead end point	No.	220	74.40	16,368.0
11	Conductor Dead End Clamp suitable for bare messenger XLPE Aerial bunched cable(25-70 sq mm)	No.	220	80.60	17,732.0
12	LT Stay Set (Complete)	Set	220	644.80	1,41,856.0
13	LT Stay Insulator	No	220	37.20	8,184.0
14	LT Stay clamp	Pair	220	136.40	30,008.0
15	7/12 SWG Stay Wire	Kg	2200	93.00	2,04,600.0
16	Earthing of Support (Coil Type)	EA	550	205.84	1,13,212.0
17	PIPE HDPE SIZE 25 MM	Mtr	1650	33.60	55,440.0
18	Lug AL 70 Sqmm for 7/8 SWG Wire/Earthing	EA	1100	8.50	9,350.0
19	LT Distribution Box Polycarbonate	No	550	925.00	5,08,750.0
20	Cap cable end for ABC	EA	1100	108.98	1,19,878.0
21	IPC 50-150, 50-150 SQ.MM ST.LT Type A	EA	4400	88.29	3,88,476.0
22	IPC EP 95 LT ABC 16-95 & 1.5-16 SQMM ST.LT Type C	EA	3300	88.29	2,91,357.0
23	IPC KZ 2X150 LTABC 25-150 & 6-35(50) sqmm Type B	EA	5500	51.77	2,84,735.0
24	STEEL STRAP SIZE 20 MMX50 M LONG	ROL	110	1476.14	1,62,375.4

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25	BUCKLES FOR STEEL STRAP (1 EA = 100 NOS)	EA	110	490.67	53,973.7
26	Cable 1.1kV Al 4CX25 Sq.mm Armoured	Mtr	1650	169.53	2,79,724.5
27	Gland for 1.1kV Al 4X25 Sq.mm	EA	550	172.41	94,825.5
28	Lug AL Crimping 25 Sqmm XLPE Single Hole	EA	1100	13.50	14,850.0
29	25x6 mm GI flat	Kg	8250	93.00	7,67,250.0
30	FRP CROSS ARM 1070MM 415V	EA	1100	981.49	10,79,639.0
31	ISA-50X50C6 GI Angle (4.5KG/M)	Kg	5775	93.00	5,37,075.0
32	ISMC-75X40X4.8 GI Channel (7.14KG/M)	Kg	5775	93.00	5,37,075.0
33	GI Nut , Bolt & Washer of different sizes	Kg	275	96.72	26,598.0
34	2C X 4sq. mm. Armoured Aluminium Cable - XLPE Insulated	Mtr	6875	48.00	3,30,000.0
35	2C X 10sq. mm. Armoured Aluminium Cable - XLPE Insulated	Mtr	2750	63.34	1,74,185.0
36	4C X 10sq. mm. Armoured Aluminium Cable - XLPE Insulated	Mtr	5500	98.23	5,40,265.0
37	Tie Plastic Black size 7.6mmX380mm	EA	1100	6.65	7,315.0
38	Tie Plastic size 9mmX265mm	EA	1650	22.33	36,844.5
39	Black Paint	Ltr	550	272.80	1,50,040.0
40	Yellow Colour Paint for Background	Ltr	550	220.00	1,21,000.0
Total Cost of materials					10,28,56,037.1
Stock, Storage & Insurance i.e 3%					30,85,681.1
Sub Total					10,59,41,718.2
Contingency @ 3%					31,78,251.5
Tools & Plants @ 2%					21,18,834.4
Transportation @ 7.5%					79,45,628.9
Erection Transformer/Breaker/WPB/H Pole/Joist Poles @ 5%					9,37,274.3
Erection Other @ 10%.					47,34,893.1
Erection PSC Pole @ 20%					
Sub Total					12,48,56,600.4
Sl no	Civil & Services	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Fixing of complete 11KV line stay set includes Turn Buckle Assembly, Stay Rod & Stay plate, Stay Insulator, Stay Wire, Stay clamps with Nuts & bolts BA will do the excvation, supply of 0.5Cum cement concrete foundation 1:2:4 size (500mmx500mmx800mm)	No.	440	2362.5	10,39,500.0
2	Erection of 11 Mtr long WPB Pole including loading & unloading, transportation, providing & laying of 1:1.5:3, M20 Grade, C.C-500x500X1800 mm & cooping of 500x500x450 mm, includes 5 days curing and zebra painting (In Black & Yellow Strips/Zebra)	No	990	6300	62,37,000.0

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3	Installation of Earthing pipe with 40mm dia 3 Mtr long Class-B GI Pipe & include supply of all required material like Salt, Charcoal, Nuts-Bolt ,PVC Pipe PCC & brick work for earthing chamber (Size: 2'x2') and RCC or other suitable slab cover	No	660	2415	15,93,900.0
4	Fixing of complete LT line stay set includes Turn Buckle Assembly, Stay Rod & Stay plate, Stay Insulator, Stay Wire, Stay clamps with Nuts & bolts BA will do the excvation , supply of 0.5Cum cement concrete foundation 1:2:4 size (500mmx500mmx800mm)	No	220	2362.5	5,19,750.0
5	Erection of 9 MTR PSC Pole including loading and unloading, transportation .Concreting to be done with PCC-1:1.5:3. of size - 500x500x1500 & Padding 500x500x150mm.Scope of work also includes 5 days curing & zebra painting (In Black & Yellow Strips/Zebra)	No	550	6300	34,65,000.0
Total Civil Part					1,28,55,150.0
Sub-Total					13,77,11,750.4
Other Over Head (Including Supervision charges)@ 6%					82,62,705.0
Sub-total					14,59,74,455.4
GST @ 18% of Sub-Total					2,62,75,402.0
CESS @ 1% of Sub-Total					14,59,744.6
Sub-Grand Total					17,37,09,602.0
Inspection Fee					-
Drawing Approval					-
Grand Total					17,37,09,602.0
Grand Total in Cr.					17.37

9.34 Annexure 34: Cost Estimate for New 33/11kV PSS with Associated Lines

A. 33/11kV Govindpur PSS

B. 33/11kV Badbil PSS

9.35 Annexure 35: Cost Estimate for Security cameras, heavy-duty Racking system / Storage solutions for Jajpur store

S No.	Item Description	Unit	Quantity	Unit Rate in Lac	Amount (INR)in Lacs
1	Security Cameras	LS	3	16	48.0
2	Heavy-duty Racking system / Storage solutions	LS	1.00	102	102.0
Total Cost of materials					150.00
Grand Total in Cr.					1.50

9.36 Annexure 36: Cost Estimate for Civil Infrastructure

S No.	Item Description	Unit	Quantity	Unit Rate	Amount (INR)
				in Lacs	in Lacs
1	New Section Office	Nos.	4	25	100
2	Sec Office / PSS Renovation	Nos.	112	5	560
3	New PSS Control room	Nos.	4	35	140
4	Store office	Nos.	1	50	50
5	Circle Office (Bhadrak upperfloors)	Nos.	1	150	150
6	Division Office	Nos.	2	125	250
7	SDO Office	Nos.	7	20	140
8	MRT Office stores	Nos.	4	20	80
9	Approach Road	RMT	1895	0.17	322.15
10	OPCENECX New Building	Nos.	1	90	90
11	Record Room	Sqm	200	0.2	40
12	Storage room for stores	Nos.	46	8	368
13	Cafeteria Canteen	Sqm	850	0.12	102
14	Guest House	Nos.	1	50	50
15	Saftey training room	Nos.	5	10	50
16	Devlopment of store at Balasore, keonjhar, Baripada	Nos.	1	83.33	83.33
17	Construction of Indoor shed for Meters	Sqm	200	0.34	68
18	Devlopment of Betnoti new store Boundary, levelling, road work	Ls	1	175	175
19	Concreting of stores area, drainage etc	Ls	1	150	150
Total Cost of materials					2968.48
Grand Total in Cr.					29.68

9.37 Annexure 37: Cost Estimate for Office Administration

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Air Conditioners	Nos.	50	40000	20,00,000.00
2	Chairs/Executive chairs/Visitors Chairs	Nos.	2000	10000	2,00,00,000.00

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3	Tables	Nos.	200	30000	60,00,000.00
4	Other furniture & fixture	LS	Various	3000000	2,50,000.00
5	Water Cooler	Nos.	50	45000	22,50,000.00
6	Water Dispenser	Nos.	20	10000	2,00,000.00
7	RO	Nos.	50	18000	9,00,000.00
8	Aqua guard	Nos.	20	10000	2,00,000.00
9	Photocopy Machine	Nos.	10	100000	10,00,000.00
10	Projector and display screen	Nos.	5	37000	1,85,000.00
11	Window blinds	Nos.	35	15000	5,25,000.00
12	Fan ceiling / Wall mounted / Pedestal Fan/ Exhaust Fan	Nos.	100	2000	2,00,000.00
13	Refrigerator	Nos.	50	22000	11,00,000.00
14	TV	Nos.	15	35000	5,25,000.00
15	EPBAX System	Nos.	72	30000	21,60,000.00
16	Car under employee car policy	Nos.	15	1200000	1,80,00,000.00
17	Mislanious capex	LS	Various	2000000	20,00,000.00
Total Cost of materials					5,74,95,000.00
Total Cost in Cr.					5.75

9.38 Annexure 38: Cost Estimate for Automation of Non-ODSSP & SCADA Interigation

S No.	Item Description	Unit	Quantity	Unit rate in Rs.	Amount (INR)
A	Procurment of new Panel				
1	33KV Control Relay Panel For Transformer	EA	50	341721	1,70,86,050.00
2	33KV Control Relay Panel For IC/OG	EA	30	210000	63,00,000.00
3	CR PANEL FOR 11KV VCB	EA	50	210000	1,05,00,000.00
B	Revamping of old control panel	EA	50	60000	30,00,000.00
C	Scada compatillibility to ODSSP	LS	1	9800000	98,00,000.00
4	RTU 24-48 V WITH PANEL (Urban)	EA	35	312000	1,09,20,000.00
5	RTU 24-48 V WITH PANEL (Rural)	EA	30	110000	33,00,000.00
6	FRTU and allied Service for Distribution RMU automation	EA	40	110000	44,00,000.00
7	Low-cost Communication(RMU+Rural)	EA	50	20000	10,00,000.00
8	Transducer+ Misc Items	EA	50	4000	2,00,000.00
9	RELAY TRANSFORMER DIFFERENTIAL NUMERICAL	EA	50	98505	49,25,250.00
10	feeder protection relay	EA	160	83000	1,32,80,000.00
11	RELAY MASTER TRIP 24V DC	EA	260	8113	21,09,380.00
12	Ethernet Switch (12/24 Port)	EA	99	112844	1,11,71,556.00
13	Integration support for ODSSP PSS	EA	10	177000	17,70,000.00
14	MFM	EA	99	13000	12,87,000.00

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15	ITC cost of Relays, RTUs, CRP	LS	1	675978.9	6,75,978.90
Total Cost in material					10,17,25,214.90
GST @ 18% of Sub-Total					1,83,10,538.68
Grand Total					12,00,35,753.58
Grand Total in Cr.					12.00

9.39 Annexure 39: Cost Estimate for Bluetooth printer, cash drop box, RRG App

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Bluetooth Printer for collection	EA	600	4618	0.28
2	Cash Safe box	EA	50	40000	0.20
3	RRG app	EA	1	4000000	0.40
Total Cost of materials					0.88

9.40 Annexure 40: Cost Estimate for Disaster Recovery (DR) for Hardware Equipment

S. No.	Description	Unit cost (INR inclusive of Tax)	Qty	Amt.
1	SAN Switch for storage	7155396	2	1,43,10,792
2	SAN Storage 100 TB	31199998	1	3,11,99,998
3	Servers for complete landscape of DC for Replication of DC-DR	2400000	12	2,88,00,000
4	Core Spine Switch	2100000	2	42,00,000
5	Core Leaf Switch	2050000	4	82,00,000
6	Back up data domain along with software	3986820	1	39,86,820
7	Tape Library	1743779	1	17,43,779
8	SAP S4 Hana Appliance	35000000	1	3,50,00,000
9	Gateway Firewall	11099999	2	2,21,99,998
10	Web Application Firewall	8500000	0	-
11	DDOS	21804399	0	-
12	Windows OS (Data Center Edition)	51000	130	66,30,000
13	Linux	365056	10	36,50,560
14	Virtualization (Per Processer/CPU)	350499	15	52,57,485
15	Antivirus (Server Edition)	51000	60	30,60,000
Total Amount				16,82,39,431
Total in Cr.				16.82

9.41 Annexure 41: Cost Estimate for Data Center (DC) for Hardware Equipment

S. No.	Description	Unit cost (INR inclusive of Tax)	Qty	Amount in Cr.
1	HANNA Box & back Up appliance	35000000.00	1	3.50
Total in Cr.				3.50

9.42 Annexure 42: Cost Estimate for End computing devices

S.No	Description	Unit cost (INR , inclusive of tax)	Qty	Amt.
1	Laptops with OS for new joinee of TPNODL	75,000	100	75,00,000
Total				75,00,000
Total in Cr.				0.75

9.43 Annexure 43: Cost Estimate for Cyber Security

S. No.	Description	Unit cost (INR including Tax)	Qty	Amt.
1	Enterprise SEIM(Security event and incident management) SOAR (Security orchestration automation and response)	50000000	1	50000000
2	Web Application Firewall for controlling and monitoring of External Traffic with HA environment	8500000	2	17000000
3	Firewall for Integration of IT & OT Environment	5000000	2	10000000
Total				77000000
Total in Cr.				7.70

9.44 Annexure 44: Cost Estimate for Communication

S. No.	Description	Unit cost (INR including Tax)	Qty	Amt.
1	DC Router & Rack for PSS Automation	150000	100	15000000
2	OFC Laying	25000000	1	25000000
3	Locational LAN Work	10000000	1	10000000
4	L2 POE Switch	125000	30	3750000
Total				40050000
Total in Cr.				4.01

9.45 Annexure 45: Cost Estimate for SCADA-ADMS and End Computing Device

S. No.	Item	Unit cost (INR inclusive of Tax)	Qty	Amt.
1	IT Infra for ADMS (Application, GIS Adapter & Proxy Servers) for Main Data Centre	1500000	3	45,00,000
2	IT Infra for ADMS (Application, GIS Adapter & Proxy Servers) for Back Up Data Centre	1500000	3	45,00,000
3	Supportive IT Infra (Switches and Router)	1500000	Lumsum	15,00,000
4	ADMS Application	30000000	Lum Sum	3,00,00,000
5	Laptops with OS for new joinee of TPNODL	75000	240	1,80,00,000
6	Laptops with OS for executive of newly opening of Anubhav Kendra in rural area of each section	75000	160	1,20,00,000
7	Microsoft office for New Laptops for Point No. 1 &2	28866	500	1,44,33,000
8	Anti Virus for new Laptop for Point no. 1 &2	3650	500	18,25,000
9	AD CAL License for new Laptop for Point no. 1 &2	3100	500	15,50,000
10	E-Governance Software for e-digital process enablement at TPNODL offices (Additional budget requirement)	10900000	1	1,09,00,000
11	Password Reset Portal for User ID	1800000	1	18,00,000
Total Amount				10,10,08,000
Total in Cr.				10.10

9.46 Annexure 46: Cost Estimate for GIS Software Implementation and Land Base & Network Survey & Digitization for 3 Circle

Sr.No	Item	Unit cost (INR inclusive of Tax)	Quantity	Unit	Amt
1	Project Management, Site Visit & logistics	1800000	1	No	18,00,000

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2	Lanbase Survey and mapping of Bhadrak Circle	3187	2457	Sq Km	78,29,680
3	GSS & PSS Survey and mapping of Bhadrak Circle	5724	40	No	2,28,973
4	33 Kv Line Survey and mapping with assets Bhadrak Circle	1529	394	Km	6,02,882
5	11Kv Line Survey and mapping with assets Bhadrak Circle	2003	4651	Km	93,16,426
6	LT Network Survey and mapping with assets Bhadrak Circle	2118	7541	Km	1,59,68,563
7	Asset Numbering and Pole Painting Bhadrak Circle	46	242722	No	1,11,12,806
8	Consumer indexing Bhadrak Circle	43	310000	No	1,33,51,700
9	Migration / Updation Bhadrak Circle	870	2456.926	Sq Km	21,37,241
Total Bhadrak Circle Data Surevy Costing					6,05,48,272
10	Lanbase Survey and mapping of Baripada Circle	3187	5000	Sq Km	1,59,33,894
11	GSS & PSS Survey and mapping of Baripada Circle	5724	65	No	3,72,082
12	33 Kv Line Survey and mapping with assets Baripada Circle	1529	775	Km	11,84,848
13	11Kv Line Survey and mapping with assets Baripada Circle	2003	7864	Km	1,57,51,299
14	LT Network Survey and mapping with assets Baripada Circle	2118	19515	Km	4,13,24,545
15	Asset Numbering and Pole Painting Baripada Circle	46	665060	No	3,04,49,085
16	Consumer indexing Baripada Circle	43	560000	No	2,41,19,200
17	Migration / Updation Baripada Circle	870	5000	Sq Km	43,49,421
Total Baripada Circle Data Surevy Costing					13,34,84,373
18	Lanbase Survey and mapping of Keonjhar Circle	3187	5200	Sq Km	1,65,71,250
19	GSS & PSS Survey and mapping of Keonjhar Circle	5724	63	No	3,60,633
20	33 Kv Line Survey and mapping with assets Keonjhar Circle	1529	568	Km	8,68,642
21	11Kv Line Survey and mapping with assets Keonjhar Circle	2003	5910	Km	1,18,38,585
22	LT Network Survey and mapping with assets Keonjhar Circle	2118	9139	Km	1,93,53,241
23	Asset Numbering and Pole Painting Keonjhar Circle	46	294348	No	1,34,76,428
24	Consumer indexing Keonjhar Circle	43	365000	No	1,57,20,550
25	Migration / Updation Keonjhar Circle	870	5209	Sq Km	45,31,138
Total Keonjhar Circle Data Surevy Costing					8,27,20,466
Total Amount					27,85,53,111
Total in Cr.					27.86

9.47 Annexure 47: Cost Estimation for Software and Application

S.No	Description	Unit cost (INR , inclusive of tax)	Qty	Amt.
1	Cyme Licenses for Network planning (Enterprise Version)	2000000	2	4000000
2	Software (Remote Desktop for laptop & desktop trouble shooting)	3500000	1	3500000
Total				75,00,000
Total in Cr.				0.75

9.48 Annexure 48: Cost Estimation for Drones and its license

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Drone & Its Licence	No	2	1,50,000	3,00,000.0
Total Cost of materials					3,00,000.00
Total cost in Cr					0.030

9.49 Annexure 49: Cost Estimation for Budget for Electric Scooter/Car

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Electrical Car	No	16	1000000	1,60,00,000.0
2	Electrical Scooter	No	159	150000	2,38,50,000.0
Total Cost of materials					3,98,50,000.0
Total cost in Cr					3.99

9.50 Annexure 50: Cost Estimation for Rooftop Solar System on office building

S No.	Item Description	Unit	Quantity	Unit Rate in Rs.	Amount (INR)
1	Rooftop Solar System on office building. (20KW for Crop. Office & Balasore Store, 10 KW for 5 Circle	KW	90	110000	99,00,000.0
Total Cost of materials					99,00,000.0
Total cost in Cr					0.99

