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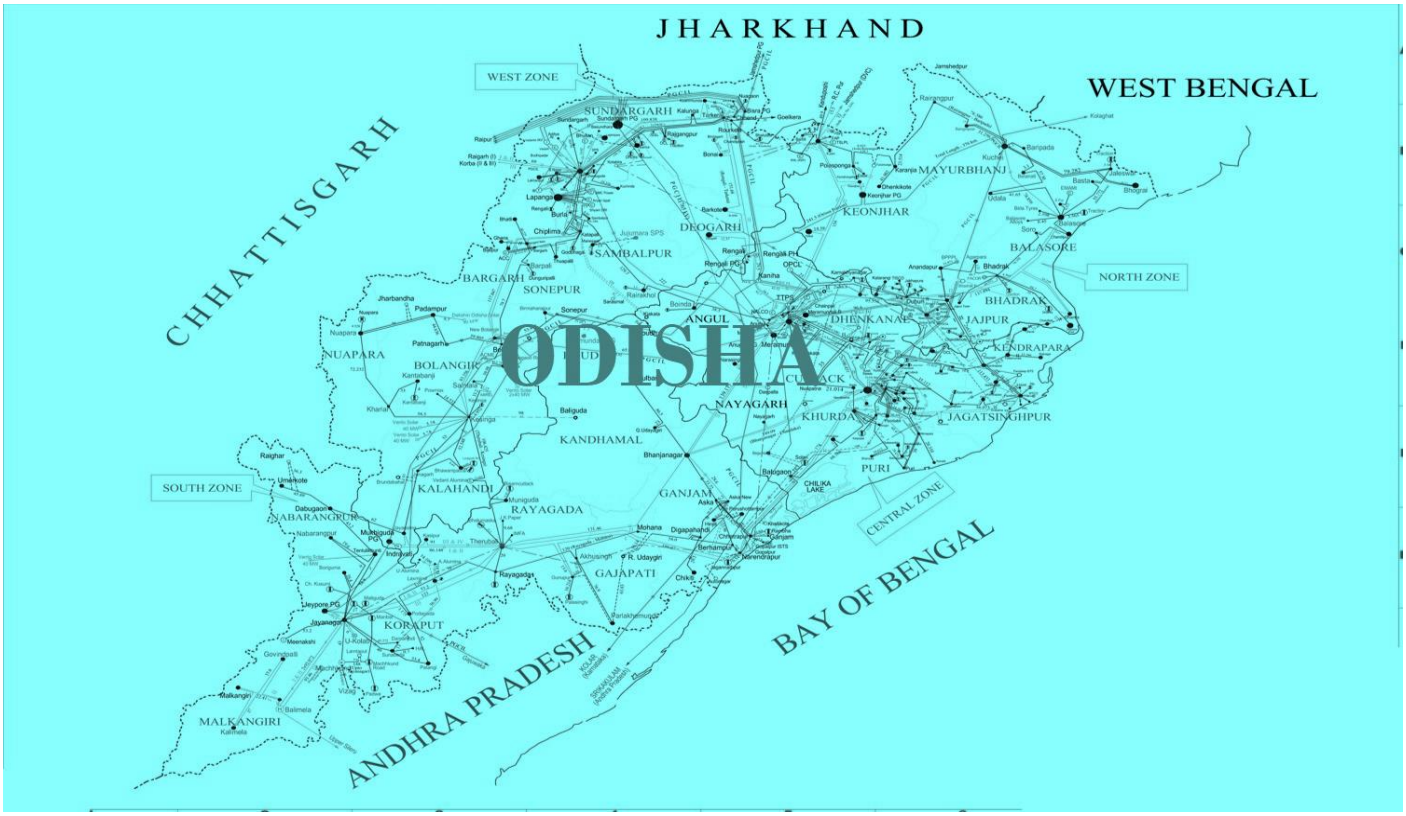
REPORT ON INTRA STATE TRANSMISSION RESOURCE ADEQUACY PLAN FOR ODISHA BY THE YEAR 2034-35



CENTRAL ELECTRICITY AUTHORITY

New Delhi

Disclaimer

This Intra-State Transmission Resource Adequacy Plan for the State has been prepared based on data and inputs provided by the State utilities. The analysis, findings, and conclusions contained herein rely on the accuracy, completeness, and timeliness of the information furnished by the State. Any errors, omissions, or inconsistencies in the data may influence the results of this study.

The Central Electricity Authority (CEA) has facilitated and supported the State in the preparation of this plan to address intra-state transmission requirements. The recommendations of this study—including but not limited to the establishment of new substations, construction of new transmission lines, reconductoring of existing lines, and augmentation of substations— depends upon data furnished by the State utilities. It is suggested to take up new intra-state elements, commensurate to the generation/demand in the area.

Executive Summary

Electricity (Transmission System Planning, Development and Recovery of Inter-State Transmission Charges) Rules 2021, provides that CEA to draw up short term plan every year on rolling basis for up to next five years and perspective plan every alternate year on rolling basis for next ten years.

Further, Guidelines for Resource Adequacy Planning Framework for India issued by MoP on 28.06.2023 provides that CEA to prepare the Resource Adequacy Plan for each states. Generation resource adequacy studies for the Odisha State has already been carried out by CEA.

For the transmission part, this report presents a comprehensive assessment of the intra-state transmission infrastructure in Odisha, with projections and planning aimed at ensuring transmission resource adequacy by the year 2034-35. The analysis incorporates current electricity demand, projected growth, existing and planned transmission assets, and key recommendations for strengthening the state's transmission network.

The highest peak demand met by Odisha in 2024-25 was 6,905 MW, and Projected Peak Demand by 2034-35 is estimated to 11,400 MW, which is near about the Electric Power Survey report. Further, existing Installed Capacity in the state is about 8335 MW including allocation from Central Sector Generation. Presently, the state has 8,607 ckm of 132 kV lines, 6,835 ckm of 220 kV lines and 1,197 ckm of 400 kV lines. It has transformation capacity of 10,290 MVA at 132 kV, 12,292 MVA at 220 kV and 3,835 MVA at 400 kV level.

Considering the anticipated demand, generation capacity, demand pattern, operational feedback from ERLDC and SLDC, system studies have been conducted for Summer evening peak, Winter evening peak (High Thermal), June Solar Max, February Night Off-peak and August Peak Load demand scenarios for the timeframe 2031-32 and 2034-35 in consultation with Odisha, CTUIL and Grid-India. Based on the studies, the requirement of transmission system by the year 2034-35 has been identified.

A total of 22,680 MVA transformation capacity addition/augmentation and 4,836 ckm of new transmission lines and 295 ckm reconductoring of old lines and 146 ckm underground cabling at an estimated cost of ₹ 12,798 cr. would be required in the intra-state transmission system for meeting the electricity demand of the state by the year 2034-35. Further, reactive power compensation need to be provided at various substations at distribution level for addressing low voltage issues.

Summary of year-wise MVA capacity, ckm addition and tentative expenditure required for implementation of above recommended proposals is given below

Year	Capacity Addition (in MVA)				Transmission line addition (in ckm)				Reconductoring (in ckm)			UG Cable (ckm)	Estimated Cost (in Rs. Cr.)
	132 kV	220 kV	400 kV	765 kV	132 kV	220 kV	400 kV	765 kV	132 kV	220 kV	400 kV	132 kV	
2026-27	0	480	2080	0	474.76	160	350	0	129.79	65.72	25.6	98	2397.31
2027-28	360	0	1000	3000	148	50	50	74	74.06	0	0	48	1884

2028-29	0	640	3600	0	56	56	1210	0	0	0	0	0	1947
2029-30	0	160	500	3000	0	0	200	760	0	0	0	0	2973
2030-31	0	0	2000	0	0	0	114	0	0	0	0	0	590
2031-32	0	0	0	3000	0	0	56	50	0	0	0	0	741
2032-33	0	0	1000	0	0	180	586	0	0	0	0	0	1373
2033-34	0	0	0	0	0	0	0	0	0	0	0	0	0
2034-35	360	0	1500	0	62	60	140	0	0	0	0	0	893
Total	**720**	**1280**	**11680**	**9000**	**740.76**	**506**	**2706**	**884**	**203.85**	**65.72**	**25.6**	**146**	**12798.31**

To ensure reliable and adequate power supply in Odisha by 2034-35, substantial investments and infrastructure upgrades are essential. With a projected demand of 11,400 MW and local generation and contracted capacity covering only part of this, a robust and resilient transmission network becomes critical. The outlined plan, if implemented timely, will ensure resource adequacy and support economic and industrial development in the state.

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Intra State Transmission Resource Adequacy of Odisha by the year 2034-35

1. Demographics

Odisha is a state in Eastern India, with Bhubaneswar as its capital. It is bordered by the Indian states of West Bengal to the north, Jharkhand to the west, Chhattisgarh to the south-west, and Andhra Pradesh to the south. To the east, it has a coastline along the Bay of Bengal. Odisha covers an area of 155,707 square kilometers (60,119 square miles) and has a population of over 46 million. The state is known for its rich cultural heritage, temples, and diverse communities, including Odia, Tribal, and other ethnic groups. The primary languages spoken are Odia and various tribal languages. Odisha has a significant presence in industries such as steel, aluminium, and textiles, and is also known for its vast mineral resources, particularly bauxite, iron ore, and coal.

2. Electricity profile of state

2.1. Power generation-demand scenario of state:

2.1.1. In the FY 2024-25, Odisha had peak electricity demand of 6905 MW and for FY 2023-24 total electrical energy requirement of 41358 MU. As on March 2025, state has central sector allocation of 1980.22 MW which includes hydro plants (105.01 MW), RES (MNRE) (10 MW) and thermal plants (1865.21 MW). In addition, installed capacity in state sector is 3840.52 MW and installed capacity in private sector is 2513.99 MW. Per capita consumption of the state was 2419 kWh in the year 2022-23.

2.1.2. Peak demand & Energy met by Odisha state during previous seven years is given at Table 2-1 below

Table 2-1 Peak demand & Energy of Odisha

Odisha	Peak Demand(MW)	MW as per EPS	Energy(MU)	MUs as per EPS
2018-19	5,357	4,816	32,145	29,124
2019-20	5,292	5,016	29,692	30,302
2020-21	4,984	5,176	29,848	31,224
2021-22	5,643	5,645	38,339	38,344
2022-23	6,566	6,490	42,631	43,060
2023-24	6,927	6,635	41,358	43,582
2024-25	6,905	6,918	42,786	44,985

Source: PSP and EPS Reports of CEA

2.1.3. The graph indicating the above Peak Demand (MW) & Energy (MU) is given at Figure 2-1 below.

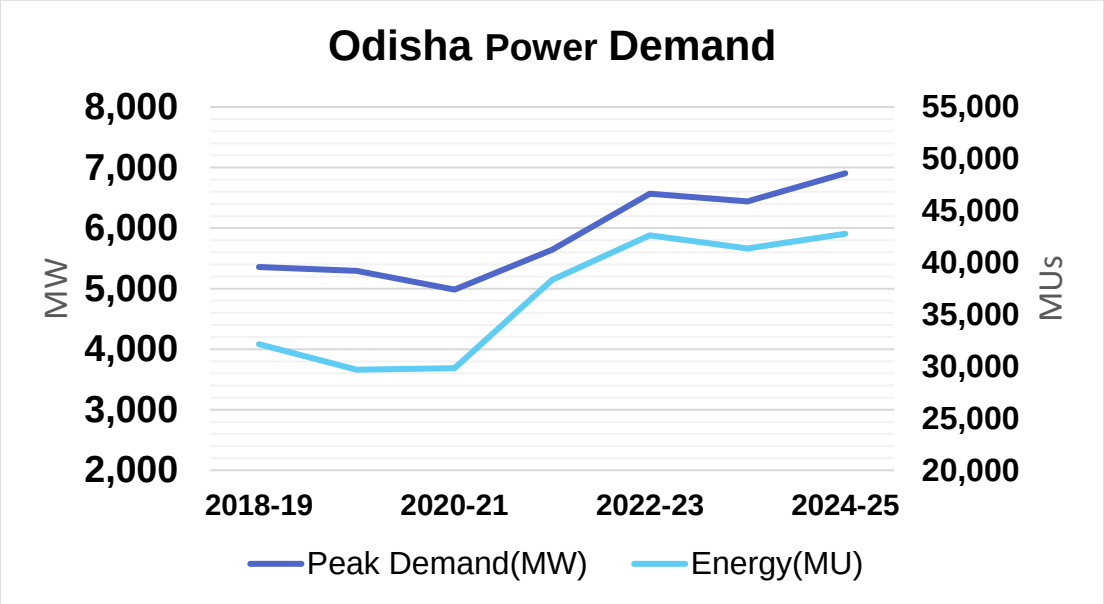


Figure 2-1 Peak Demand and Energy

2.1.4. The peak demand of Odisha generally occurs in the summers. The graph indicating of Seasonal Load variation in the year 2024 is given at Figure 2-2 below.

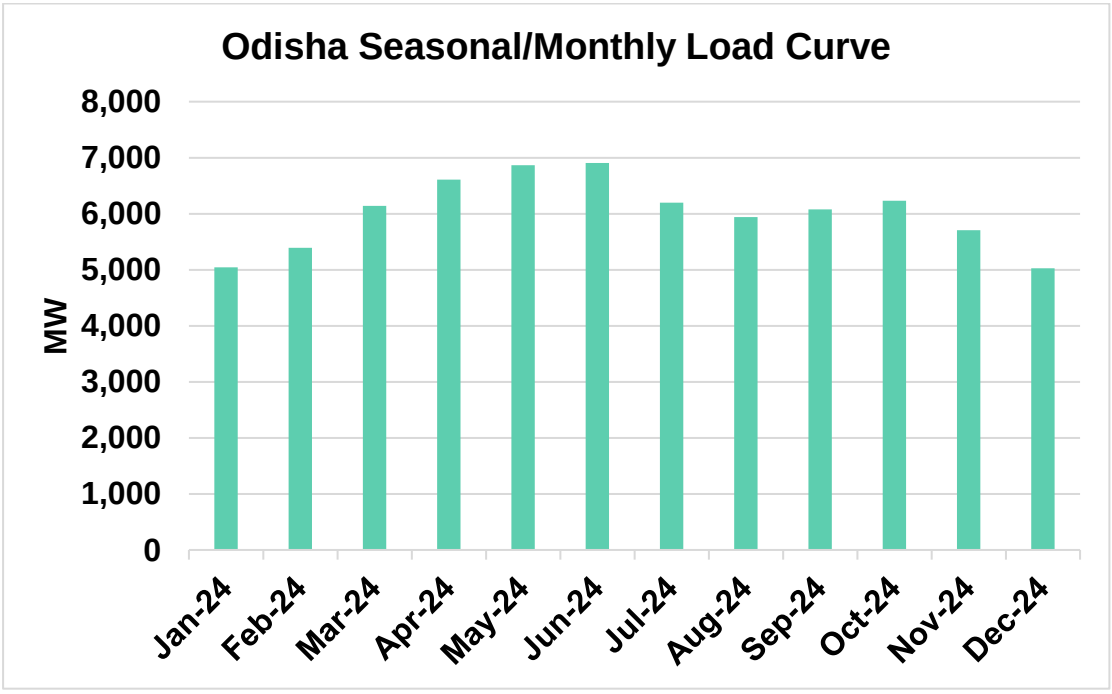


Figure 2-2 Seasonal Load Curve

2.1.5. The graph indicating of Hourly Load variation for four months in the year 2024 is given at Figure 2-3 below. It indicated that peak demand generally occurs in the evening hours of the day.

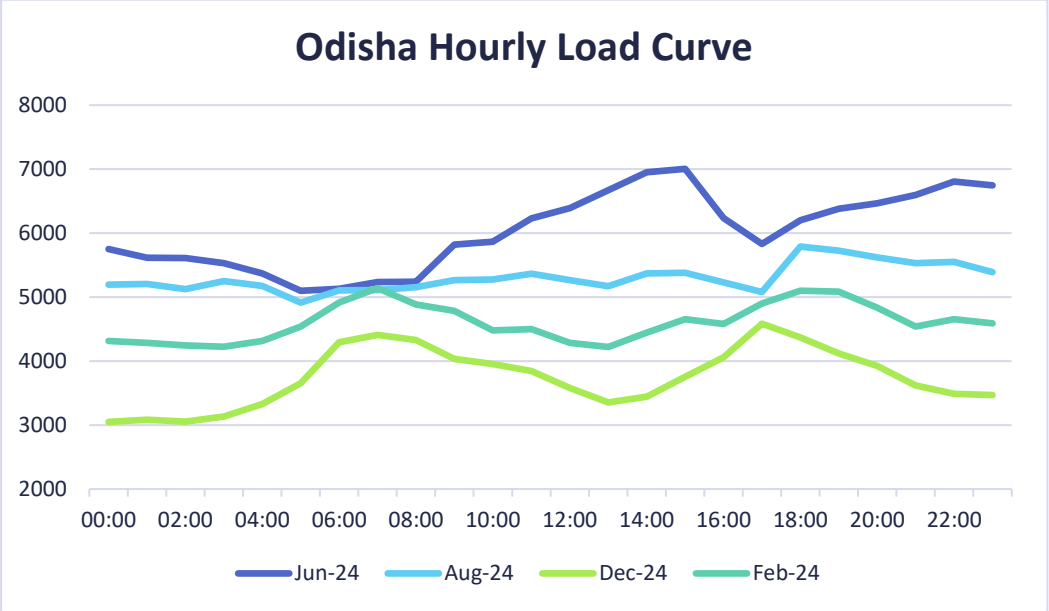


Figure 2-3 Hourly Load Curve

2.1.6. The projected peak electricity demand as per 20th EPS report is 12347 MW in the year 2036-37.

2.1.7. Contracted capacity (MW) by Odisha as on March 2025 is given at Table 2-2 below:

Table 2-2 contracted and installed capacity

SECTOR	HYDRO		THERMAL				NUCL-EAR	R.E.S. (MNRE)	TOTAL
		COAL	LIGNITE	GAS	DIESEL	TOTAL			
State	2074.22	1740	0	0	0	1740	0	26.30	3840.52
Private	0	1746	0	0	0	1746	0	767.99	2513.99
Central allocation	105.01	1865.21	0	0	0	1865.21	0	10	1980.22
Total	2179.23	5351.21	0.00	0.00	0.00	5351.21	0.00	804.29	8334.73
%	26.15	64.20	0.00	0.00	0.00	64.20	0.00	9.65	100

Source: Installed Capacity Report, CEA

2.1.8. The graph indicating the generation capacity mix is given at Figure 2-4 below

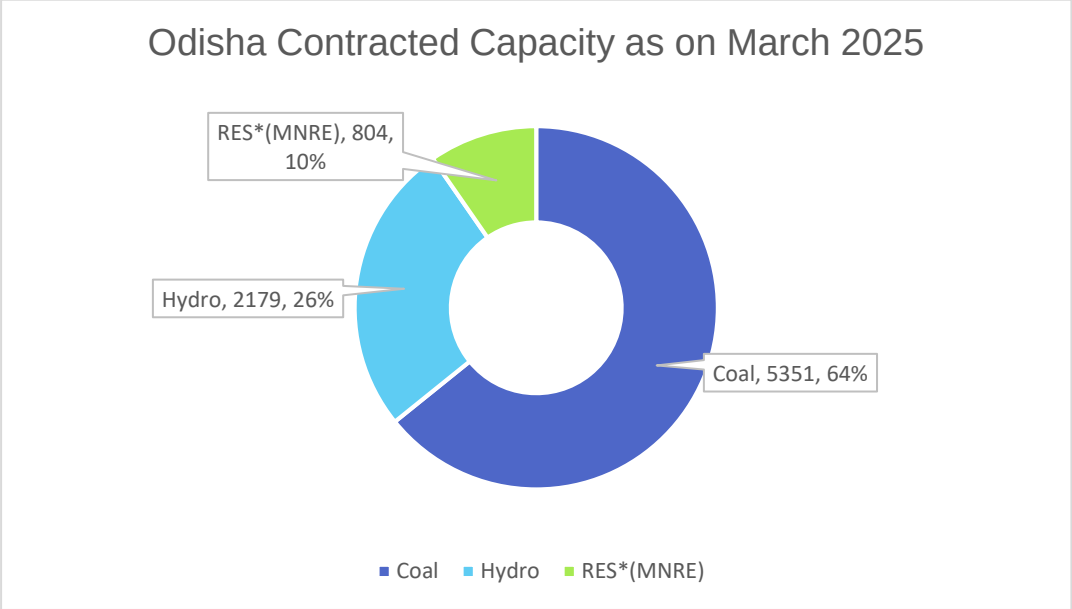


Figure 2-4 Contracted Capacity

2.1.9. As on March 2025, the General Network Access (GNA) quantum for ISTS drawal is 2157 MW and Available Transfer Capability (ATC) of the state is 4202 MW (Import ATC) and 1407 MW (Export ATC) respectively.

3. Existing Transmission System

The details of existing Intra-state and Inter-state transmission system in Odisha are as under.

3.1. Existing Intra State Transmission assets (as on March 2025):

3.1.1. Growth of intra State Transmission assets of Odisha state in past five years is given at Table 3-1 below

Table 3-1 Intra State Transmission assets in Odisha

Financial Year	Voltage (kV)	Transmission lines (ckm)	Substations (MVA)
2018-19	132	6824	8101
	220	5975	8610
	400	1197	2520
2019-20	132	6983	8547
	220	6191	9540
	400	1197	2835
2020-21	132	7396	9166
	220	6222	10300
	400	1197	2835
2021-22	132	8011	9449
	220	6499	11120
	400	1197	3835

2022-23	132	8157	9844
	220	6676	11666
	400	1197	3835
2023-24	132	8480	10161
	220	6831	12272
	400	1197	3835
2024-25	132	8607	10290
	220	6835	12292
	400	1197	3835

**Source: State data*

3.1.2. Odisha state has total 8607 ckm of 132 kV, 6835 ckm of 220 kV, 1197 ckm of 400 kV transmission line and 10290 MVA of 132 kV, 12292 MVA of 220 kV, 3835 MVA of 400 kV Substation capacity in Intra-state transmission system.

3.1.3. The graph indicating of year on year growth of Transmission lines is given at Figure 3-1 below.

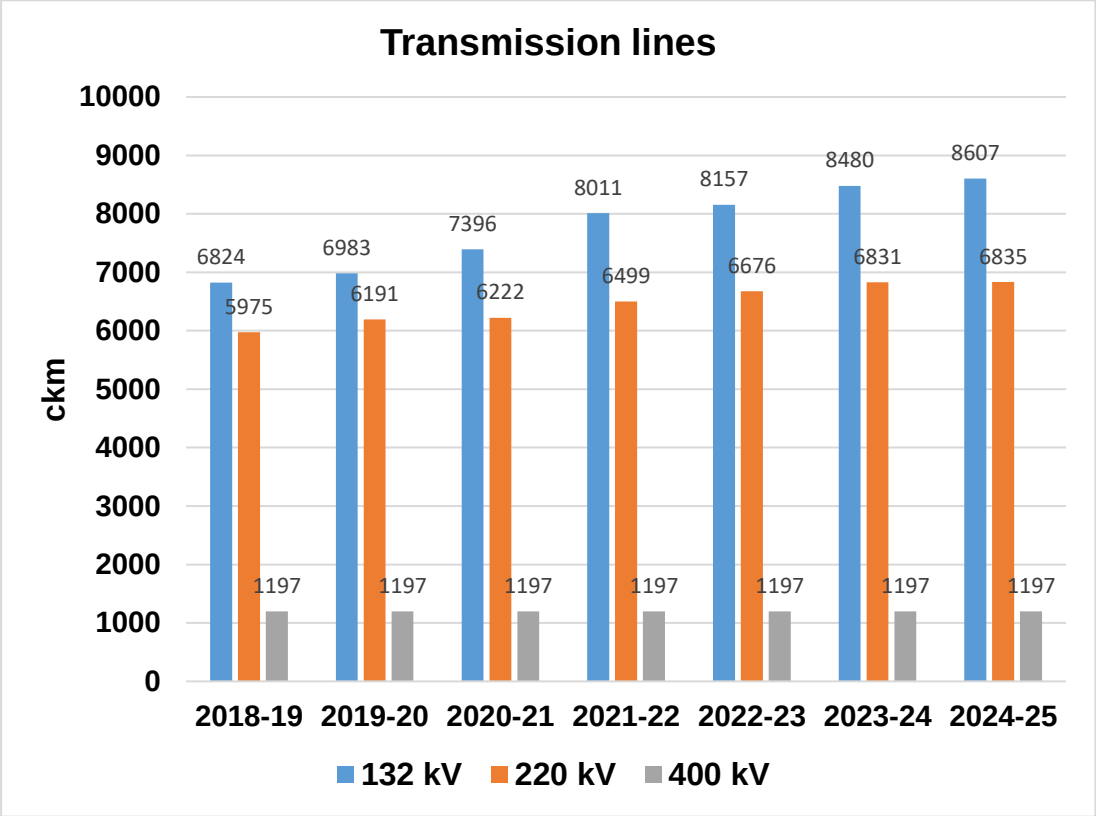


Figure 3-1 Existing Intra-state Transmission Line

3.1.4. The graph indicating of year on year growth of substation MVA capacity is given at Figure 3-2 below.

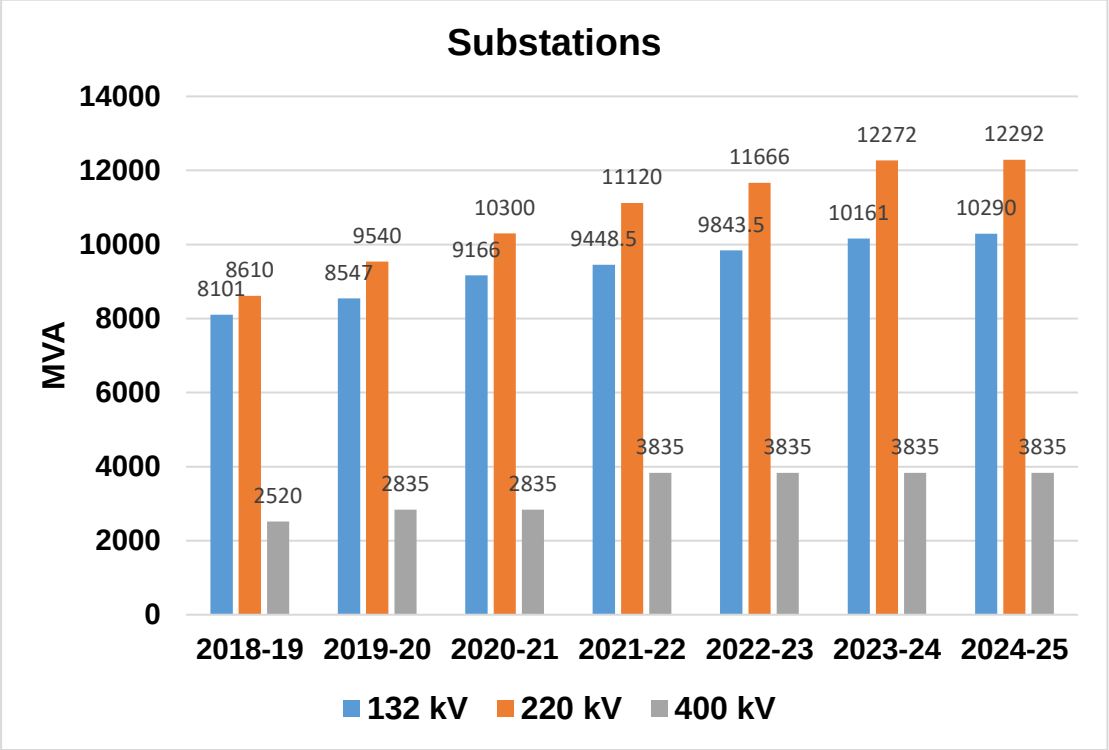


Figure 3-2 Existing Substations

3.2. Existing Inter-State Transmission system in the state:

3.2.1. The State has 11 nos. (19,175 MVA+1,000 MW HVDC) existing substation capacity. Further, 1 nos. of 400/220 kV, 500 MVA ISTS substation at Pandiabil and 2 nos. of 765/400 kV, 6000 MVA ISTS substation at Paradeep & Gopalpur is under implementation which is scheduled for completion in November 2026 and December 2027 respectively.

3.2.2. The State has a total of 10,315 ckm of existing ISTS network and 1,130 ckm + re-cond. 543 ckm of under construction network. Brief details of the ISTS network (including ISTS lines owned by states) are given at Table 3-2 below:

Table 3-2 Existing, under-implementation ISTS of Odisha

Transmission lines	**Existing**	**Under Construction**
400 kV	4683 ckm	240 ckm + re-cond. 543 ckm
765 kV	2894 ckm	890 ckm
HVDC	2738 ckm	-
Total	10,315 ckm	1,130 ckm + re-cond. 543 ckm
Substations	**Existing**	**Under Construction**
400/220/132kV	1 (1130MVA+320MVA) Baripada	-
400/220kV	7 (5725MVA) Bolangir, Indravati, Pandiabil, Jeypore, Keonjhar, Rengali & Rourkela	1 (500MVA) Pandiabil (Augmentation)

765/400kV	2 (12000MVA) Angul & Sundargarh	2 (3000MVA + 3000MVA) Paradeep and Gopalpur
HVDC (Back-to-Back)	1 (2x500MW) Gazuwaka	-
Total	**11 Nos. (19175MVA+ 1000MW HVDC)**	**2 Nos. (6500MVA)**

4. Under Implementation Transmission System

4.1. Under implementation Intra-State Transmission assets (as on March 2025):

4.1.1. The summary of under implementation Intra-state transmission system in Odisha as on March 2025 are as under.

Table 4-1 Under Implementation Intra-State Transmission assets in Odisha (as on March 2025)

Voltage (kV)	Transmission lines (ckm)	Substations (MVA)
132	1316.28	772.00
220	1049.8	1600.00
400	281.20	1500

4.1.2. The graph showing summary of under implementation Intra State Transmission assets of Odisha state is given at Figure 4-1 below

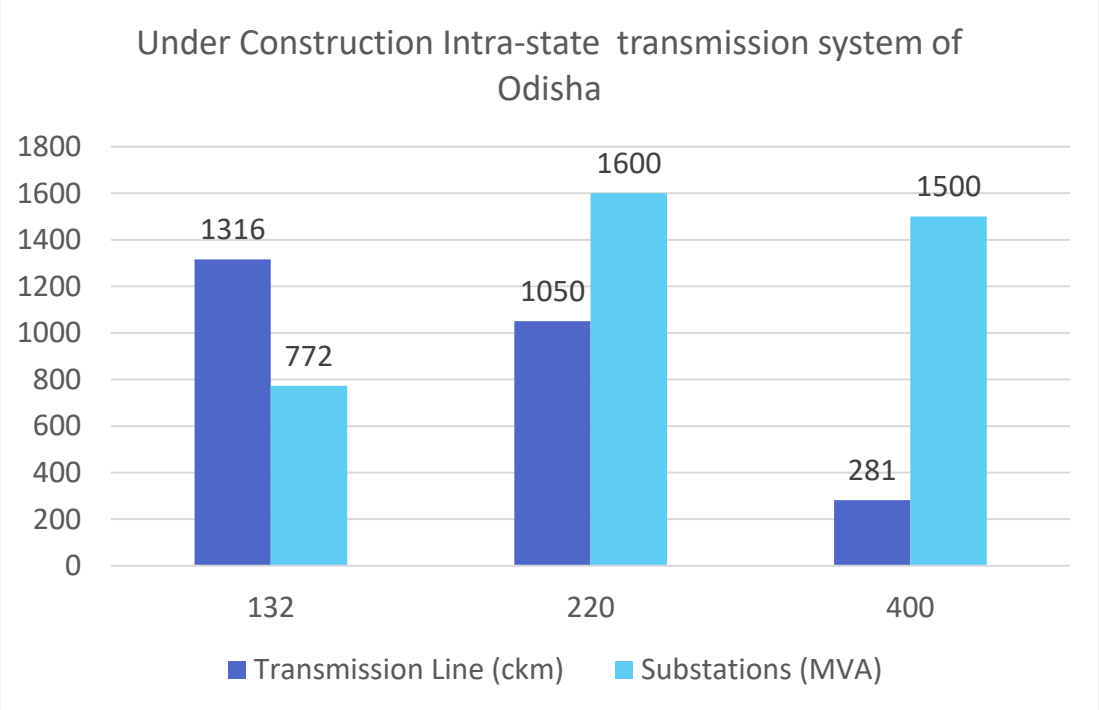


Figure 4-1 Under Construction Intra-state transmission system as on March 2025

4.2. Under implementation Inter-State Transmission assets (as on March 2025):

Detailed of under implementation ISTS network in Odisha (as on March, 2025) are as given below:

4.2.1. **Under Construction ISTS** (RTM mode)

i. ERES-XXIX: Nov 2025

- Reconductoring of Jharsuguda/Sundargarh (POWERGRID) – Rourkela (POWERGRID) 400kV 2xD/c Twin Moose line with Twin HTLS conductor (with ampacity Single HTLS as 1228A at nominal voltage). (1404ckm)
- Bay upgradation at Rourkela (POWERGRID) end for 3150A rating – 04 nos. diameters in one and half breaker scheme (except 09 nos. existing circuit breakers which are of minimum 3150 A rating).

Note: *No upgradation in line bays is envisaged at Jharsuguda/Sundargarh (POWERGRID) S/s as the existing line bays are rated for 3150A.*

ii. ERES-42: Sep 2026

- Installation of new 1x500MVA, 400/220kV (3rd) ICT at Pandiabili (POWERGRID) S/s along with associated bay at 220kV level [using the bay no. 413 at 400kV level, which is already under implementation under ERBS-I scheme].

  Note: *POWERGRID is inter alia implementing a full diameter (413-414-415) under ERBS-I scheme for termination of one circuit of Talcher-III – Pandiabili (POWERGRID) 400kV D/c line in bay no. 415. The other bay of the diameter viz. 413 is planned to be used for termination of the 3rd 400/220kV ICT*

iii. ERES-43: Mar 2026

- Reconductoring of Talcher (NTPC) – Meramundali (OPTCL) 400kV D/c (Twin Moose) line (one circuit via Angul and bypassed at Angul) with Twin HTLS conductor (with ampacity of single HTLS as 1228A) – 140ckm
- Upgradation of associated 400kV bay equipment at Talcher (NTPC)
- Upgradation of associated 400kV bay equipment at Meramundali (OPTCL)

Note:

a) NTPC and OPTCL to provide unconditional access to the ISTS licensee for upgradation of identified bay equipment at their respective substation / generation switchyard. The equipment released after replacement shall be handed over to NTPC and OPTCL on as is where is basis by the ISTS licensee.

b) *ISTS licensee needs to coordinate with NTPC and OPTCL for replacement of equipments at Talcher switchyard and Meramundali S/s respectively.*

iv. ERBS-I: Sep 2026

- Extension at Pandiabili 400/220kV GIS substation
  - 400kV GIS line bays: 2 nos. *(i.e. one full diameter 413-414-415)*

    [Bay no. 415 shall be used for termination of one ckt of Talcher-III – Pandiabili 400kV D/c dedicated transmission line (line under the scope of NTPC Ltd.)]
  - 400kV GIB: 600m approx.

[For termination of one ckt of Talcher-III – Pandiabili 400kV D/c dedicated transmission line (line under the scope of NTPC Ltd.) in existing bay no. 410]

4.2.2. **Under Construction ISTS** (TBCB mode)

i. Inter-regional ER-WR Interconnection (SPV Name: ER-WR Transmission Limited): April 2025 - *by POWERGRID*

- Jeypore (POWERGRID) – Jagdalpur (CSPTCL) 400kV D/c line (conductor with minimum capacity of 2100 MVA/Ckt at nominal voltage)
- 2 no. of 400kV GIS line bays at Jeypore (POWERGRID) S/s for termination of above line
- 2 no. of 400kV line bays at Jagdalpur (CSPTCL) S/s for termination of above line

ii. ERES-XXXIV: Nov 2026 (by M/s Paradeep Transmission Limited i.e. M/s TATA Power)

- Establishment of Paradeep 765/400kV, 2x1500MVA GIS S/s (7x500MVA single phase units including one spare).
- Angul (POWERGRID) – Paradeep 765kV D/c line along with 765kV, 1x330MVAr switchable line reactor with 500ohm NGR (with NGR bypass arrangement) at Paradeep end in both circuits (190km)
- Paradeep – Paradeep (OPTCL) 400kV D/c (Quad) line (10km)
- 2 nos. 765kV, 330MVAr (7x110MVAr single phase units including one spare unit for both bus and line reactors) Bus Reactors along with associated bays at Paradeep substation
- 2 nos. 420kV, 125MVAr Bus reactor
- 2 nos. 765kV line bays (along with space for future switchable line reactor) at Angul 765/400kV S/s for termination of Angul (POWERGRID) – Paradeep 765kV D/c line.

- 2 nos. 400kV GIS diameters [2 no. of bays in different diameter for termination of Paradeep (ISTS) – Paradeep (OPTCL) 400kV D/c (Quad) line and utilization of balance 2 Nos. shall be identified in future for connecting transmission line/reactor/ICT as per ISTS requirement].

  #*As the bus scheme of Paradeep (OPTCL) GIS S/s is one and half breaker scheme, 2 nos. full diameter i.e. 4 nos. of GIS bays needs to be implemented in the scheme for requirement of 2 nos. GIS bays for termination of Paradeep (OPTCL) – Paradeep 400kV D/c (Quad) line in two different diameters. Utilisation of other 2 nos. GIS bays of these diameters shall be identified in future for connecting transmission line/reactor/ICT as per ISTS requirement.*

Note:

(a) *POWERGRID shall provide space at Angul (POWERGRID) 765/400kV S/s for implementation of 2 no. of 765kV line bays (along with space for future switchable line reactor) for termination Angul (POWERGRID) – Paradeep 765kV D/c line.*

(b) *OPTCL shall provide space at under implementation Paradeep (OPTCL) 400/220kV GIS S/s (expected by Dec 2024) for implementation of 2 no. of 400kV GIS line bays for termination of Paradeep – Paradeep (OPTCL) 400kV D/c (Quad) line and utilization of balance 2 no. of bays shall be identified in future for connecting transmission line/reactor/ICT as per ISTS requirement..*

iii. ERES-XXXIX: Dec 2027 (by M/s ERES-XXXIX Power Transmission Limited i.e. M/s TATA Power):

- Establishment of Gopalpur 765/400 kV 2x1500 MVA GIS S/s
- Angul (POWERGRID) – Gopalpur 765 kV D/c line along with 765 kV, 1x330 MVAr switchable line reactor with 500 ohm NGR (with NGR bypass arrangement) at Gopalpur end in both circuits
- Gopalpur – Gopalpur (OPTCL) 400 kV D/c (Quad) line (10km) @
- 2 nos. 765kV AIS line bays (along with space for future switchable line reactor) at Angul 765/400 kV S/s for termination of Angul (POWERGRID) – Gopalpur 765 kV D/c line, including bus extension in GIS of about 3000m.
- 2 nos. 400 kV GIS line bays at Gopalpur (OPTCL) S/s for termination of Gopalpur – Gopalpur (OPTCL) 400 kV D/c (Quad) line.

Note:

(a) Implementation of this scheme may be taken up only upon receipt of Connectivity/GNA applications by CTU/OPTCL.

(b) *@To be reviewed based on inputs of OPTCL regarding availability of contagious land for establishment of both 765/400kV (ISTS) and 400/220kV (Intra-state) substations at Gopalpur.*

(c) *#The bus scheme of 400kV level at Gopalpur (OPTCL) GIS S/s shall be one and half breaker scheme, 2 nos. full diameter i.e. 4 nos. of GIS bays needs to be implemented in the scheme for requirement of 2 nos. GIS bays for termination of Gopalpur (OPTCL) – Gopalpur 400kV D/c (Quad) line in two different diameters. Utilisation of other 2 nos. GIS bays of these diameters shall be identified in future.*

(d) *POWERGRID shall provide space at Angul (POWERGRID) 765/400kV S/s for implementation of 2 nos. of 765kV GIS/Hybrid line bays (along with space for future switchable line reactor) for termination Angul (POWERGRID) – Gopalpur 765kV D/c line.*

(e) *OPTCL shall provide space at under implementation Gopalpur (OPTCL) 400/220kV GIS S/s for implementation of 2 nos. of 400kV GIS line bays for termination of Gopalpur (ISTS)*

iv. ERGS-I: Scheme Agreed in 16th NCT meeting & subsequently completion schedule change agreed in 19th NCT. Bidding is being undertaken by PFCCL. Completion schedule 28-03-2028

- LILO of both circuits of Angul – Sundargarh (Jharsuguda) 765 kV 2xS/c lines at NLC-Talabira generation switchyard

Note: *NLC India Ltd. shall provide following at 765 kV level its Talabira generation switchyard:*

(a) *2 no. 765kV GIS line bays with PIR in different diameters for termination of Talabira – Sundargarh (Jharsuguda) 765 kV D/c line.*

(b) *2 no. of 765kV GIS line bays with PIR in different diameters for termination of Talabira – Angul 765 kV D/c line, each with 765 kV, 1x240MVAr (3x80MVAr single phase units) switchable line reactor along with 400ohm NGR (with NGR bypass arrangement). There shall be total 7x80MVAr single phase units against 2x240 MVAr line reactors and the 7th 1-phase unit shall be spare as hot stand by. The spare 1-phase shunt reactor unit shall be placed and connected in such a way that the spare unit can be utilized without its physical movement. Further, the connection arrangement of switchable line reactors shall be such that it can be used as line reactor as well as bus reactor with suitable NGR bypass arrangement.*

v. Planned ISTS System

(I). Paradeep – Andaman HVDC Interconnection: Approved in 26th NCT.

A. Transmission Line

a) 400 kV D/c (Twin Moose) Paradeep 765/400 kV GIS S/s - Paradeep HVDC Station line: 12 km

b) Paradeep HVDC Station – Andaman Island: 320 kV, 500 MW HVDC Undersea Cable: 1150 km

c) Andaman Island – Nicobar Island 320 kV, 250 MW HVDC Undersea Cable: 550 km

Remarks: 66 kV lines at Andaman and Nicobar side not considered and expected to be under Andaman & Nicobar Electricity Department Scope

B. Substation

a) Establishment of new HVDC station at Paradeep, Odisha

- ±320 kV, 250 MW VSC based Symmetric Monopole HVDC terminal at Paradeep, Odisha
- Power will be injected at 400 kV AC bus through VSC converter Transformers
  - 400 kV line bays (AIS): 2 nos. for termination of Paradeep HVDC Station – Paradeep 765/400 kV GIS Substation (400 kV D/c Twin Moose) line
  - 400 kV VSC bays: 2 Nos. for evacuation through VSC Pole

b) Extension at Paradeep 765/400 kV GIS Substation S/S

- 2 Nos. 400 kV line bays (GIS) at Paradeep 765/400 kV GIS Substation S/S for termination Paradeep HVDC Station – Paradeep 765/400 kV GIS Substation 400 kV D/c (Twin Moose) line

c) Establishment of new HVDC station at Andaman Island

- ±320 kV, 250 MW VSC based Symmetric Monopole HVDC terminal at Andaman Island
- Power will be drawn at 66 kV AC bus through VSC interface transformers
  - 12 nos. 66 kV GIS line bays for termination of outgoing 66kV feeder
  - 1 No. 66 kV GIS (3000 A) VSC Bay for evacuation from VSC System

d) Establishment of new HVDC station at Nicobar Island

- ±320 kV, 250 MW VSC based Symmetric Monopole HVDC terminal at Nicobar Island

- Power will be drawn at 66 kV AC bus through VSC interface transformers
  - 12 Nos. 66 kV GIS line bays for termination of outgoing 66kV feeder
  - 1 No. 66 kV GIS (3000 A) VSC Bay for evacuation from VSC System

5. System operator feedback

5.1. The operational constraint faced in the Intra-state transmission network by Odisha SLDC including transmission line constraints, ICT constraints, nodes experiencing high voltage/ low voltage are attached at **Annexure-I**.
The operational constraint faced in the Intra-state and Inter-state transmission network by ERLDC including transmission line constraints, ICT constraints, nodes experiencing high voltage/ low voltage are attached at **Annexure-II**.

6. Assumptions for study

6.1. Peak electricity demand (MW) of Odisha according to the 20th EPS Report and as estimated by the state are given at Table 6-1 below:

Table 6-1 Peak electricity demand

Reference↓ / Parameter→	**Year**	**Peak Demand (MW)**	**CAGR**
Actual Peak	2024-25	6905	
As per 20th EPS	2025-26	7252	5.03
	2026-27	7630	5.12
	2027-28	8053	5.26
	2028-29	8514	5.38
	2029-30	9107	5.69
	2030-31	9456	5.38
	2031-32	9782	5.10
State Estimated Peak electricity demand	2034-35	11400*	5.14
As per 20th EPS	2036-37	12347	4.96

**including upcoming industrial demand.*

6.2. **Industrial Demand:**

The details of major upcoming Industries are as under.

6.2.1. The total upcoming industrial demand of intra-state system is 2924 MW which is expected by 2035 at following locations

a) **Duburi :** TATA - 700 MVA, JSPL – 300 MVA

b) **Balasore :** 300 MW

c) **Bhadrak :** FACOR – 145 MW, Dhamra LMG – 30 MVA

d) **Neulopoi :** M/s Waree Energies Ltd. – 330 MW (Solar Panel Manufacturing Plant), M/s Kalyani Steel Ltd.- 203 MW

e) **Naraj :** M/s JSW Group – 350 MW (Integrated EV Complex)

f) **Khurdha :** Mundamba Industrial Park (45 MW)

g) **Angul :** Angul Aluminium Park (50 MW)

h) **Paradeep :** Paradeep Plastic Park (55 MW)

i) **Joda :** Rungta Mines-(118 MW), JSW-mines-(118 MW), Triveni Earth movers-(100 MW), Tata steel-(40 MW), ESSR-(40 MW)

6.3. Generation capacity by 2031-32 and 2034-35

The additional generation capacity expected in the state by 2031-32 is 8,430 MW.

The details of upcoming generation by considered for the study time frame i.e. 2031-32 and 2034-35 are as under.

Table 6-2 Upcoming generation by 2034-35

Sl. No	Technology	Place	Capacity	Capacity in Intra-STS (MW)	Considered in Study Time Frame
1.	Thermal	TTPS-III – (Talchar)	1320	660	2031-32
2.	Thermal	Talabira	2400	400	2031-32
3.	Thermal	Darlipalli-II (800 MW)	800	400	2031-32
4.	Thermal	OPGC Stg.-III	1320	1320	2031-32
5.	Floating Solar (FS)	Hirakud Basin	3000	3000	2031-32
6.	FS & PSP	Hirakud & Chipilima Basin	1000	1000	2031-32
7.	PSP	Upper Kolab	320	320	2034-35
8.	PSP	Balimela	500	500	2034-35
9.	PSP	Upper Indravati	600	600	2031-32
10.	Solar	Mamunda	50	50	2031-32
11.	Floating Solar (FS)	Rengali	500	500	2034-35
12.	Wind	Deomali	250	250	2031-32
		Rayagada	250	250	2031-32
		Paradeep-Astaranga	500	500	2031-32
13.	PSP	Duburi (Khandadhar)	700	700	2034-35
14.	PSP	Sunki / Narayanpatna	1000	1000	2034-35
15.	Hydro	Kharag	63	63	2034-35

Total	**14573**	**11513**	

6.3.1. The additional generation capacity expected in the state by 2034-35 is 11513 MW. Presently, two generations are also being implemented in the central sector, namely Talcher-III (2x660MW) of NTPC Ltd. and Talabira (3x800MW) of NLC Ltd. Both shall be dual connected, enabling the state to draw its share of power directly from generation switchyard.

6.3.2. For the purpose of the study the Mundra UMPP in Gujarat state has been considered as Swing/Slack Bus.

6.4. The following Parameters were considered during the study

a) The total intra state generation installed capacity: 15000 MW (including 5,000 MW RE Power) by 2031-32 and 20600 MW by 2034-35 (including 10,000 MW RE Power).

b) The Inter-state Generation capacity located in Odisha has been considered as 18,600 MW. Further, an HVDC terminal of 6000 MW has been considered at Begunia. Thus, there will be total 24,600 MW injection at ISTS in Odisha.

c) Peak Demand: 9,782 MW by the year 2031-32 and 11,400 MW (including 3915 MW non-scalable industrial demand) by 2034-35

d) Additional demand of 12,000 MW has been considered at ISTS network (Paradeep – 6,000 MW and Gopalpur – 6,000 MW).

e) The demand pattern of the State such as seasonal and hourly variation are consitent, however to capture the load variations, and high solar injection from adjecent states, the scenarios considered for the study are mentioned at Table 6-3 .

Table 6-3 Demand and dispatch of the study

S.No.	Scenario	Demand Factor	Dispatch Factors		
			Hydro	Thermal	Solar
1.	Peak Demand (Summer Evening Peak-Scenario-5)	100%	90%	75%	0%
2.	High Thermal (Winter Evening Peak-Scenario-8)	70%	60%	75%	0%
3.	June Solar Max (Scenario-4)	90%	70%	55%	85%
4.	February Night Off-peak (Scenario-9)	50%	30%	60%	0%
5.	August Peak Load (Scenario-2)	85%	90%	75%	0%

7. Study Results

7.1. Based on the demand and generation projections, the State has outlined its need for new transmission elements. Taking into account operational feedback from Odisha SLDC and ERLDC, as well as the provisions in the Manual on Transmission Planning Criteria (with Amendment-I), 2025, studies were conducted to identify the state's transmission system requirements, which are detailed in Paragraph 8. Taking in account of identified system and related assumptions, the import/export on tie lines by the year 2031-32 are presented in Table 7-1 below:

Table 7-1 Study Results for the time frame 2031-32

Parameter↓ / Scenario→	**Peak Demand (Summer Evening Peak-Scenario-5)**	**High Thermal (Winter Evening Peak-Scenario-8)**	**June Solar Max (Scenario-4)**	**February Night Off-peak (Scenario-9)**	**August Peak Load (Scenario-2)**
Generation despatch (intra-state + ISGS located in state) (in MW)	14800 *(Intra: 4400 & ISTS*: 10400*	13400 *(Intra: 3000 & ISTS*: 10400*	14200 *(Intra: 3700 & ISTS*: 10500*	11600 *(Intra: 2100 & ISTS*: 9500*	14300 *(Intra: 4400 & ISTS*: 9900*
Total load including losses (in MW)	22500 *(Intra:10200 & ISTS: 12300)*	19700 *(Intra:7300 & ISTS: 12400)*	21800 *(Intra:9400 & ISTS: 12400)*	17600 *(Intra: 5300 & ISTS*: 12300*	21100 *(Intra:8800 & ISTS: 12300)*
Net interchange ((-) import / (+)export) at ISTS-STU periphery (in MW)	5500	3600	5500	2500	4200

**Power Import of HVDC at Begunia is taken into consideration.*

The import/export on tie lines by the year 2034-35 are presented in Table 7-2 below.

Table 7-2 Study Results for the time frame 2034-35

Parameter↓ / Scenario→	**Peak Demand (Summer Evening Peak-Scenario-5)**	**High Thermal (Winter Evening Peak-Scenario-8)**	**June Solar Max (Scenario-4)**	**February Night Off-peak (Scenario-9)**	**August Peak Load (Scenario-2)**
Generation despatch (intra-state + ISGS located in state) (in MW)	17000 *(Intra: 6500 & ISTS*: 10500*	15700 *(Intra: 5300 & ISTS*: 10400)*	15000 *(Intra: 4500 & ISTS*: 10500)*	13700 *(Intra: 4200 & ISTS: 9500)*	17400 *(intra: 7500 & ISTS* 9900)*
Total load including losses (in MW)	24300 *(Intra:12000 & ISTS: 12300)*	20900 *(Intra: 8500 & ISTS:12400)*	23600 *(Intra: 11000 & ISTS: 12600)*	18500 *(Intra: 6200 & ISTS: 12300)*	22500 *(Intra:10200 & ISTS: 12300)*

Net interchange ((-) import / (+)export) at ISTS-STU periphery (in MW)	5300	2700	6300	1500	2800

**Power Import of HVDC at Begunia is taken into consideration.*

7.2. The June Solar Max scenario (i.e. scenario-4) was found to be critical scenario during the system studies.

7.3. The line flows and voltage were in permissible limit as mentioned in the Manual on Transmission Planning Criteria (with Amendment-I), 2025 in the critical as well as other scenario after modelling the required additional transmission system by 2031-32 and 2034-35.

7.4. The planned transmission system of the state is N-1 contingency criteria compliant. The planned system addresses the all the constraints in the Intra-state transmission as mentioned by Odisha SLDC and ERLDC at **Annexure-I** and **Annexure-II** respectively. The constraints in ISTS system mentioned at **Annexure-II** would be duly taken care in the Inter-state transmission planning.

7.5. According to CEA's generation recourse adequacy report for Odisha (2033-34) Odisha is likely to have unserved energy in coming years and may need to contract non-fossil capacities for meeting energy requirements other than the planned capacities. The additional quantum of capacities required (other than already planned) to be contracted by 2033-34 is as under.

- 55 MW from Coal,
- 4168 MW from solar,
- 1026 MW from Wind,
- 645 MW from Hydro,
- 3393 MW of DRE

7.6. The agreed system by the year 2031-32 and 2034-35 was modelled and studied considering the N-1 contingency criteria, in such situation no constraints were observed in transmission system of Odisha taking into account of above future contract capacity requirement. Hence, the transmission system as planned by 2031-32 and 2034-35 (including new schemes identified in this report) ensure the Resource Adequacy in the Transmission system of the State.

8. Intra-state Transmission system requirement by 2034-35.

8.1. New substations alongwith their associated transmission lines which are required by 2034-35 are listed at Table 8-1 below

Table 8-1 New substations alongwith their associated transmission lines of Odisha

Sl. No	Name of the Project with scope of work	Justification	Estimated Cost (₹. Cr.)	Time-frame
1.	i. **Establishment of new 400/220/33 kV, (2x500 + 2x40) MVA S/s at Bhandaripokhari Textile Park (Bhadrak)**	Upcoming loads in Bhadrak command area FACOR - 145MW Dhamra LMG - 30MVA System strengthening over loading of Duburi – Bhadrak – Balasore line	259	2026-27
	ii. 420 kV, 1x125 MVAr Bus reactor along with associated bays		13	
	iii. LILO of Duburi – Kuchei 400 kV S/c line at Bhandaripokhari (30 ckm Loop In & 30 ckm Loop Out)		98	
	iv. LILO of Kuchei – Pandiabil 400 kV S/c line at Bhandaripokhari (30 ckm Loop In & 30 ckm Loop Out)		98	
	v. Bhandaripokhari - Bhadrak 220kV D/c line (70 ckm)		26	
	vi. LILO of Dhamra – Duburi New 220 kV S/c line at Bhandaripokhari (05 ckm Loop In & 05 ckm Loop Out)		4	
2.	i. **Establishment of new 400/220 kV, 2x500 MVA S/s at Neulapoi (Dhenkanal)**	Upcoming loads in Dhenkanal command area Waree- 660 MVA Kalani Steel -203 MW	210	2026-27
	ii. 420kV, 1x125 MVAr Bus reactor along with associated bays		13	
	iii. LILO of Meramunduli-B – Duburi 400 kV D/c line at Neulapoi (46ckm Loop In & 46ckm Loop Out)		151	
	iv. LILO of Meramunduli-A – Mendhasal 400 kV D/c line at Neulapoi (50 ckm Loop In & 50 ckm Loop Out)		165	
3.	i. **Establishment of new 220/132 kV, 2x160 MVA S/s at Khuntuni (Dhenkanal)**	System strengthening - overloading of Dhenkanal - ICCL line	50	2026-27
	ii. Neulapoi – Khuntuni 220 kV D/c line (40 ckm line length)		15	
4.	i. **Establishment of new 220/33kV, 2x80 MVA S/s at Koida**	to meet additional load requirement of 69MW in the industrial area	70	2026-27
	ii. Koida – Barbil GSS 220 kV D/c line (40 ckm line length)		15	
5.	i. **Establishment of new 400/220 kV, 2x500 MVA S/s at Remuli (Joda)**	To meet the load requirement of upcoming	187	2027-28

Sl. No	Name of the Project with scope of work	Justification	Estimated Cost (₹. Cr.)	Time-frame
	ii. 420kV, 1x125 MVAr Bus reactor along with associated bays	industries in Joda command area	13	Additional 3rd ICT would be required by the year 2034-35
	iii. LILO of Kaniha – Bisra 400 kV D/c line at Remuli (25ckm Loop In & 25ckm Loop Out)		503	
	iv. LILO of Telkoi – Joda 220 kV S/c line at Remuli (15ckm Loop In & 15ckm Loop Out)		24	
	v. LILO of Keonjhar (OPTCL) – Joda 220VkV S/c line at Remuli (10ckm Loop in & 10ckm Loop out)		24	
	vi. Remuli – Barbil (upgradation of existing 132kV Barbil GSS to 220kV GSS) 220 kV D/c line (80 ckm line length)		129	
6.	**i. Establishment of new 765/400 kV, 2x1500 MVA S/s at Duburi-765 (Kendujhar)**	Upcoming loads in Duburi command area TATA – 700 MVA JSPL – 300 MVA And evacuation of power of Duburi (Khandadhar) 700 MW PSP	452	2027-28
	ii. 765kV, 1x240 MVAr Bus reactor along with associated bays		34	
	iii. 420kV, 1x125 MVAr Bus reactor along with associated bays		13	
	iv. LILO of Angul – Paradeep PG 765 kV D/c line at Duburi (15 ckm Loop In & 15ckm Loop Out)		165	
	v. Duburi 765/400 kV S/s – Duburi 400/220 kV 400 kV D/c line (44 ckm line length)		72	
7.	**i. Establishment of new 400/220 kV, 2x500 MVA S/s at Gopalpur**	Power supply for Green Ammonia and Green Hydrogen Industries like ACME, AVAADA, HHPFPL	197	2028-29
	ii. 420kV, 1x125 MVAr Bus reactor along with associated bays		13	
	iii. Gopalpur (PG) – Gopalpur (OPTCL) 400kV D/c line (30 ckm line length)		60	
	iv. Pandiabili – Gopalpur (OPTCL) 400 kV D/c line (340 ckm line length)		323	
	v. LILO of Narendrapur – Aska New 220 kV S/c line at Gopalpur (OPTCL) (05ckm Loop In & 05ckm Loop Out)		4	
	vi. LILO of Narendrapur – Gunupur 220 kV S/c line at Gopalpur (OPTCL) (10 ckm Loop In & 10 ckm Loop Out)		8	

Sl. No	Name of the Project with scope of work	Justification	Estimated Cost (₹. Cr.)	Time-frame
8.	**i. Establishment of new 400/220 kV, 2x500 MVA S/s at Theruvali (Rayagada)**	Evacuation of PSP power of Indravati – 600 MW	157	2028-29
	ii. 420 kV, 1x125 MVAr Bus reactor along with associated bays		13	
	iii. Gopalpur (OPTCL) – Theruvali 400 kV D/c line (400 ckm line length) along with 80MVAr line reactor in each ckt at Theruvali end		380	
	iv. Theruvali – Jeypore PG 400 kV D/c line (260 ckm line length)		247	
	v. Indravati PSP – Theruvali 400 kV D/c line (180 ckm line length)		171	
9.	**i. Establishment of new 220/132/33kV, 2x160 MVA S/s at Choudwar Industrial**	To meet upcoming industrial load at OTM, Choudwar & system strengthening for Choudwar command area	86	2028-29
	ii. Bidanasi – Choudwar Industrial 220 kV D/C line (36 ckm line length)		20	
	iii. LILO of Bahugram - ICCL 132 kV line at Choudwar Industrial (10 ckm Loop In & 10 ckm Loop Out)		10	
	iv. LILO of Choudwar – Bidanasi 132 kV line at Choudwar Industrial (08 ckm Loop In & 08 ckm Loop Out)		8	
10.	**i. Establishment of new 765/400 kV, 2x1500 MVA S/s at Kolabira**	Evacuation of 1320 MW OPGC power and 1200 MW power Floating Solar from Hirakud	452	2029-30
	ii. 765kV, 1x240 MVAr Bus reactor along with associated bays		34	
	iii. 420kV, 1x125 MVAr Bus reactor along with associated bays		13	
	iv. Sundergarh-B – Kolabira 765 kV D/c line (140 ckm line length)		385	
	v. Duburi (OPTCL) – Kolabira 765 kV D/c line (620 ckm line length) along with 1x330MVAr line reactor in each ckt at Kolabira end & 1x240MVAr line reactor in each ckt at Duburi end)		1705	
	vi. OPGC unit-5,6 – Kolabira 400 kV D/c Quad line (80 ckm Line Length)		131	

Sl. No	Name of the Project with scope of work	Justification	Estimated Cost (₹. Cr.)	Time-frame
	vii. Hirakud (Floating Solar) – Kolabira 400 kV D/c line (120 ckm line length)		197	
11.	**i. Establishment of new 400/220 kV, 2x500 MVA Tarkera GSS**	To meet upcoming industrial load of RSP(450MW), Other industrial Growth (200MW)	167	2030-31
	ii. 420kV, 1x125 MVAr Bus reactor along with associated bays		13	
	iii. LILO of Rourkela – Jharsuguda 400 kV D/c line at Tarkera (15 ckm Loop In & 15 ckm Loop Out) (rating commensurate with Rourela – Jharsuguda 400kV D/c line being recounductored under ERES-XXIX).		60	
12.	**i. Establishment of new 400/220 kV, 2x500 MVA S/s at Naraj**	To meet the load requirement of JSW - 350 MW	199	2030-31
	ii. 420kV, 1x125 MVAr Bus reactor along with associated bays		13	
	iii. Naraj – Khuntuni 400 kV D/c line (64 ckm line length)		105	
	iv. LILO of Meramundali – Mendhasal 400 kV D/c line at Naraj (10 ckm Loop In & 10 ckm Loop Out)		33	
13.	**i. Establishment of new 765/400 kV , 2x1500 MVA, S/s at Khuntuni**	System strengthening - to meet additional load requirement of JSW, Waree, Kalyani Steel, etc. (approx - 1200 MW)	465	2031-32
	ii. 765 kV, 1x240 MVAr Bus reactor along with associated bays		34	
	iii. 420 kV, 1x125 MVAr Bus reactor along with associated bays		13	
	iv. Angul – Khuntuni 765 kV D/c line (50 ckm line length)		137	
	v. Neulapoi – Khuntuni 400 kV D/c line (56 ckm line length)		92	
14.	**i. 400 kV Pooling Station at Jayanagar**	To evacuate PSP power of Balimela (500 MW), Upper Kolab (320 MW) and Sunki (1000 MW)	176	2032-33
	ii. 420kV, 1x125 MVAr Bus reactor along with associated bays		13	
	iii. LILO of Jeypore – Theruvali 400 kV D/c line at Jayanagar (25 ckm Loop In & 25 ckm Loop Out)		82	
	iv. Balimela - Upper Kolab - Jayanagar Pooling Station 400 kV D/c line (76 ckm line length)		125	

Sl. No	Name of the Project with scope of work	Justification	Estimated Cost (₹. Cr.)	Time-frame
15.	**i. Establishment of new 400/220 kV , 2x500 MVA Grid Substation at Titlagarh**	To mitigate low voltage pockets of the command area and evacuation of Solar Projects. System Strengthening	170	2032-33
	ii. 420kV, 1x125 MVAr Bus reactor along with associated bays		13	
	iii. Titlagarh – Kolabira 400kV D/C line (460 ckm line length) along with 420kV, 1x80MVAr line reactor in each ckt at Titlagarh end.		727	
	iv. Titlagarh – Kesinga 220kV D/c line (40 ckm line length)		15	
	v. Titlagarh – Nuapada (upgradation of existing 132kV Nuapada GSS to 220kV GSS) 220KV D/C line(140 ckm line length)		52	
17.	**i. Creation of 132 kV level at Nuabetanda 220/33kV under implementation S/s with (2x160+2x20 MVA) transformation capacity**	To strengthen the reliability at Konark	40	2034-35
	ii. Nuabetanda – Konark 132 kV D/c line (62 ckm)		16	
18.	i. **Creation of 132 kV level at Sarasmal 220/33 kV under implementation S/s with (2x160+2x20 MVA) transformation capacity**	To strengthen the reliability at Barpali	40	2027-28
	ii. Sarasmal – Barpali 132 kV D/c line (68 ckm)		17	
19.	**i. Establishment of new 400/220 kV , 2x500 MVA Grid Substation at Rengali**	Evacuation of 500 MW Floating Solar at Rengali	112	2034-35
	ii. Rengali – Meramundali 400 kV D/c line (140 ckm)		588	

8.2. New Intra-state Transmission lines which are required by 2034-35 are listed at Table 8-2 below

Table 8-2 New Transmission lines of Odisha

Sl.No.	Transmission System	Justification	Estimated Cost (in Rs. Cr.)	Time frame
1.	TTPS – Meramundali-B 400 kV D/c line (38 ckm)	Evacuation of Power from TTPS (2x660 MW)	47.00	2026-27

Sl.No.	Transmission System	Justification	Estimated Cost (in Rs. Cr.)	Time frame
2.	Kantabanji – Patnagarh 132 kV S/c on D/c tower (39.93 ckm)	Radial to Ring Conversion	25.48	2026-27
3.	LILO of Budhipadar – Sundergarh 132 kV S/c line at Bamra (35.42 ckm)	Radial to Ring Conversion	25.48	2026-27
4.	Ghense – Padampur 132 kV S/c Line on D/c Tower (40.47. ckm)	Radial to Ring Conversion	19.82	2026-27
5.	Dhenkikote – Turmunga 132 kV D/c Line (85.04 ckm)	Radial to Ring Conversion	30.5	2026-27
6.	Jayapatna – Junagarh 132 kV D/c Line (92.9 ckm)	System strengthening	47.4	2026-27
7.	Paralakhemundi – Akhusing 132 kV D/c line (14 ckm)	System strengthening	7.2	2026-27
8.	2nd circuit stringing of Kendrapada – Pattamundai 132 kV S/c line (20 ckm)	System strengthening	10	2026-27
9.	2nd circuit stringing of Atri – Banki 132 kV S/c line (20 ckm)	System strengthening	10	2026-27
10.	2nd circuit stringing of Banki – Nuapatna 132 kV S/c line (21 ckm)	System strengthening	10	2026-27
11.	2nd circuit stringing of Khariar – Nuapara 132 kV S/c line (72 ckm)	System strengthening	37	2026-27
12.	Khariar – Kantabanji 132 kV S/c line (33 ckm)	System strengthening	13	2026-27
13.	2nd circuit stringing of Nimapada – Konark 132 kV S/c line (20 ckm)	System strengthening	10	2028-29
14.	Kharag HEP– Baliguda 220 kV D/c line (60 ckm)	For evacuation of 63 MW Hydro power at Kharag	47	2034-35

8.3. Reconductoring of existing transmission lines which are required by 2034-35 are listed at Table 8-3 below

Table 8-3 Reconductoring of existing transmission lines of Odisha

S.No	Transmission System	Justification	Estimated Cost (in Rs. Cr.)	Time frame
1.	Cuttack – Jagtsingpur 132 kV S/c line along with upgradation of requisite bay equipment (35.69 ckm)	Due to increased loading in the area reconductoring of this line is required. • Ampacity of Existing conductor- 80 MW • Year of commissioning – 1996	21.76	2026-27

S.No	Transmission System	Justification	Estimated Cost (in Rs. Cr.)	Time frame
		• Ampacity of HTLS conductor – 160 MW		
2.	Kesura – Pratapsasana – Ransingpur 132 kV S/c line along with upgradation of requisite bay equipment (35.58 ckm)	Due to increased loading in the area reconductoring of this line is required. • Ampacity of Existing conductor- 80 MW • Year of commissioning – 2000 • Ampacity of HTLS conductor – 160MW	19.81	2026-27
3.	Chaipal – Angul 132 kV S/c line along with upgradation of requisite bay equipment (15.02 ckm)	Due to increased loading in the area reconductoring of this line is required. • Ampacity of Existing conductor- 80 MW • Year of commissioning – 2001 • Ampacity of HTLS conductor – 160 MW	10.5	2026-27
4.	Angul – TTPS 132 kV S/c line along with upgradation of requisite bay equipment (15.98 ckm)	Due to increased loading in the area reconductoring of this line is required. • Ampacity of Existing conductor- 80 MW • Year of commissioning – 1963 • Ampacity of HTLS conductor – 160 MW	10.8	2026-27
5.	Katapali – Bargarh 132 kV S/c line along with upgradation of requisite bay equipment(74.06 ckm) The line subsequently has been made LILO at Thuapali	Due to increased loading in the area reconductoring of this line is required. • Ampacity of Existing conductor- 80 MW • Year of commissioning – 1979 • Ampacity of HTLS conductor – 160 MW	55	2027-28
6.	Bidanasi – Choudwar 132 kV S/c line (14.29 ckm)	Due to increased loading in the area reconductoring of this line is required. • Ampacity of Existing conductor- 80 MW • Year of commissioning – 1969 • Ampacity of HTLS conductor – 160 MW	10.3	2026-27

S.No	Transmission System	Justification	Estimated Cost (in Rs. Cr.)	Time frame
7.	Barbil - Bee kay steel 132 kV S/c line along with upgradation of requisite bay equipment (13.23 ckm) The Line subsequently has been made LILO at various points	Due to increased loading in the area reconductoring of this line is required. • Ampacity of Existing conductor- 80 MW • Year of commissioning – 2010 • Ampacity of HTLS conductor – 160 MW	24.6	2026-27
8.	OPGC(IB) – Lapanga 400 kV line along with upgradation of requisite bay equipment (25.6 ckm)	Due to increased loading in the area reconductoring of this line is required. • Ampacity of Existing conductor- 1050 MW • Year of commissioning – 2018 • Ampacity of HTLS conductor – 2300 MW	97.36	2026-27
9.	Budhipadar –Lapanga 220 kV D/c Line along with upgradation of requisite bay equipment(18.2 ckm)	Due to increased loading in the area reconductoring of this line is required. • Ampacity of Existing conductor- 180 MW • Year of commissioning – 2007 • Ampacity of HTLS conductor –300 MW	31.94	2026-27
10	Lapanga – Katapali 220 kV D/c Line along with upgradation of requisite bay equipment(47.52 ckm)	Due to increased loading in the area reconductoring of this line is required. • Ampacity of Existing conductor- 180MW • Year of commissioning – 2007 • Ampacity of HTLS conductor – 300 MW	81.45	2026-27

Note: - Before taking up the reconductoring, state shall ensure the tower healthiness and communsurate rating of Bay equipment.

8.4. New Under Ground lines which are required by 2034-35 are listed at Table 8-4 below

Table 8-4 New under Ground lines of Odisha

S.No	Transmission System	Justification	Estimated Cost (in Rs. Cr.)	Time frame
1.	Argul GSS –Ransinghpur GSS 132 kV UG Cabling. (25 ckm)	Laying of UG Cable for disaster resilient infrastructure	144.93	2026-27

S.No	Transmission System	Justification	Estimated Cost (in Rs. Cr.)	Time frame
2.	Narendrapur GSS – Berhampur GSS 132 kV UG Cabling (27 ckm)	Laying of UG Cable for disaster resilient infrastructure	166.34	2026-27
3.	Balasore GSS – Chandipur GSS 132 kV UG Cabling (15 ckm)	Laying of UG Cable for disaster resilient infrastructure	98.1	2026-27
4.	Chandaka GSS – Mancheswar-A GSS 132 kV UG Cabling (16 ckm)	Laying of UG Cable for disaster resilient infrastructure	104.34	2026-27
5.	Samangara GSS –Puri GSS 132 kV UG Cabling (5 ckm)	Laying of UG Cable for disaster resilient infrastructure	38.3	2026-27
6.	Samuka GSS –Puri GSS 132 kV UG Cabling (10 ckm)	Laying of UG Cable for disaster resilient infrastructure	66.9	2026-27
7.	Autonagar –Narendrapur and Autonagar – Berhampur 132/33 kV UG Cabling (24 km) (two circuits)	Laying of UG Cable for disaster resilient infrastructure	156.00	2027-28

8.5. Augmentation of Substations which are required by 2034-35 are listed at Table 8-5 below

Table 8-5 Augmentation of Substations of Odisha

S.No	Transmission System	Justification	Estimated Cost (in Rs. Cr.)	Remarks
1.	Augmentation of transformer capacity by Replacement of 3x315 MVA ICT with 3x500 MVA at 400/220/132 kV at **Mendhasal S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 3x315 MVA	120.00	**Time frame:** 2028-29 The replaced 3x315 MVA ICTs would be kept as spare. Total capacity after Augmentation**:** 3x500 MVA
2.	Augmentation of transformer capacity by Replacement of 2x315 MVA ICT with 2x500 MVA at 400/220/132 kV at **Duburi New S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x315+1x500 MVA	80.00	**Time frame:** 2028-29 The replaced 2x315 MVA ICTs would be kept as spare.

S.No	Transmission System	Justification	Estimated Cost (in Rs. Cr.)	Remarks
				Total capacity after Augmentation**:** 3x500 MVA
3.	Augmentation of transformer capacity by adding 1x500 MVA ICT at 400/220/132 kV at **Lapanga S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x315 MVA	40.00	**Time frame:** 2029-30 Total capacity after Augmentation**:** 2x315+500 MVA
4.	Augmentation of transformer capacity by addition of 1x160 MVA ICT at 220/132 kV at **Aska New S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x160 MVA	20.00	**Time frame:** 2028-29 Total capacity after Augmentation**:** 3x160 MVA
5.	Augmentation of transformer capacity by addition of 1x160 MVA ICT at 220/132 kV at **Jayanagar S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x160 MVA	20.00	**Time frame:** 2028-29 Total capacity after Augmentation**:** 3x160 MVA
6.	Augmentation of transformer capacity by addition of 1x160 MVA ICT at 220/132 kV at **Bargarh new S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 260 MVA	16.00	**Time frame:** 2029-30 Total capacity after Augmentation**:** 420 MVA
7.	Augmentation of transformer capacity by addition of 1x500 MVA ICT 400/220 kV at **Remuli (Joda)**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required.	90	**Time frame:** 2034-35 Total capacity after Augmentation**:**3* 500 MVA

8.6. The power map of the state, including the above planned system is attached at **Annexure-III**

9. Inter-state Transmission system requirement by 2034-35.

9.1. Options being explored in ISTS

9.1.1. The requirement of Inter-state transmission system (ISTS) in Odisha would be identified after the study of complete transmission system including neighbouring states, however options has been suggested in ISTS which are detailed hereunder.

9.1.2. The new planned ISTS substation viz. Paradeep 765/400kV and Gopalpur 765/400kV in ISTS and Khuntuni 765/400kV, Neulapoi 400/220kV and Naraj 400/220kV in intra-state, are dependent on Angul (POWERGRID) 765/400 kV for power supply.

9.1.3. Angul (POWERGRID) 765/400 kV is also major point for ER-SR interconnection, wherein Angul – Srikakulam 2nd 765 kV D/c line has been planned. Any major mishap at Angul S/s could jeopardise power supply to all these major industrial complexes.

9.1.4. The presently planned system for Paradeep and Gopalpur can meet about 3 to 3.5 GW demand at each location.

9.1.5. To meet the future upcoming and projected demand in ISTS and intra-state, a new 765 kV substation at Begunia has been envisaged with connection to Khuntuni, Paradeep, and Gopalpur. Begunia S/s can be fed either directly through a HVDC or through a combination of HVDC and 1100kV UHVAC corridor or even through only AC system.

9.1.6. Keeping in view the evacuation requirement from Renewable Energy projects in Northern Region and Western Region and bulk power drawl requirement in Odisha, two alternatives are proposed:

a) Alt-1: ±800kV, 6000MW HVDC Bipole from NR/WR to Begunia in Odisha (about 1800 km)

b) Alt-2: HVDC to Champa + 1100kV UHVAC Champa – Bolangir – Begunia.

10. Reactive compensation:

10.1. The system studies of the State has identified the Reactive power compensation requirement by 2034-35 at transmission level (132 kV and above voltage level)

10.2. The following reactive power compensation requirement has been identified to be implemented alongwith implementation of above recommended Intra-state transmission system:

Sl. No	Name of the Substation/Node	Reactor

1	(2x500 + 2x40) MVA, 400/220/33kV S/S at **Bhandaripokhari Textile Park** (Bhadrak)	420kV, 1x125MVAr Bus reactor along with associated bays
2	2x500 MVA, 400/220kV S/S at **Neulapoi** (Dhenkanal)	420kV, 1x125MVAr Bus reactor along with associated bays
3	2x500 MVA, 400/220kV S/S at **Remuli**	420kV, 1x125MVAr Bus reactor along with associated bays
4	2x1500 MVA, 765/400kV S/S at **Duburi-765 (Kendujhar)**	i. 765kV, 1x240MVAr Bus reactor along with associated bays ii.420kV, 1x125MVAr Bus reactor along with associated bays
5	2x500 MVA, 400/220kV S/S at **Gopalpur**	420kV, 1x125MVAr Bus reactor along with associated bays
6	2x500 MVA, 400/220kV S/S at **Theruvali** (Rayagada)	i. 420kV, 1x125MVAr Bus reactor along with associated bays ii. 420kV, 1x80 MVAr Line reactor along with associated bays for Gopalpur D/c line
7	2x1500 MVA, 765/400kV S/S at **Kolabira**	i. 765kV, 1x240MVAr Bus reactor along with associated bays ii. 765kV, 1x240MVAr Line reactor along with associated bays for Duburi 765kV D/c line. iii.420kV, 1x125MVAr Bus reactor along with associated bays
8	2x500 MVA 400/220kV **Tarkera** GSS	420kV, 1x125MVAr Bus reactor along with associated bays
9	2x500 MVA, 400/220kV S/S at **Naraj**	420kV, 1x125MVAr Bus reactor along with associated bays
10	2x1500 MVA, 765/400kV S/S at **Khuntuni**	i. 765kV, 1x240MVAr Bus reactor along with associated bays ii.420kV, 1x125MVAr Bus reactor along with associated bays
11	400kV Pooling Station at **Jayanagar**	420kV, 1x125MVAr Bus reactor along with associated bays
12	2x500 MVA,400/220 kV Grid Substation at **Titlagarh**	i. 420kV, 1x125MVAr Bus reactor along with associated bays ii. 420kV , 1x80MVAr Line reactor along with associated bays for Kolabira D/c line
13	2x500 MVA, 400/220kV S/s at **Balasore**	420kV, 1x125MVAr Bus reactor along with associated bays
14	2x160MVA 220/132/33kV S/s at **Jayanagar**	245kV, 1x50MVAr Bus reactor along with associated bays

11. Summary of identified transmission system by 2034-35:

11.1. A total of 24390 MVA transformation capacity addition/augmentation and 3981 ckm of new transmission lines/reconductoring of old lines at an estimated cost of Rs 11674.65 Crs. would be required for implementing the intra-state transmission proposals for meeting the electricity demand of the state by the year 2034-35.

The summary of voltage wise identified transmission system of the state by 2034-35 is as below:

11.1.1. 765 kV Transmission system

S.No	Transmission system	No.	Length (in ckm)	Capacity (in MVA)	Estimated Cost (Rs. Cr.)*
1.	New substation	3	-	9000	1369
2.	Augmentation of existing substation	-	-	-	-
3.	New transmission line including LILO and 2nd Ckt Stringing	5	884	-	2464
4.	Reconductoring of transmission line	-	-	-	-
5.	Underground Cable	-	-	-	-
6.	Bus Reactor	3	-	-	102

11.1.2. 400 kV Transmission system

S.No	Transmission system	No.	Length (in ckm)	Capacity (in MVA)	Estimated Cost (Rs. Cr.)*
1.	New substation	10	-	9080	1834
2.	Augmentation of existing substation	4	-	2600	330
3.	New transmission line including LILO and 2nd Ckt Stringing	21	-	-	4383
4.	Reconductoring of transmission line	1	25.6	-	97.36
5.	Underground Cable	-	-	-	-
6.	Bus Reactor	12	-	-	156

11.1.3. 220 kV Transmission system

S.No	Transmission system	No.	Length (in ckm)	Capacity (in MVA)	Estimated Cost (Rs. Cr.)*
1.	New substation	3	-	800	206
2.	Augmentation of existing substation	3	-	480	56
3.	New transmission line including LILO and 2nd Ckt Stringing	12	516	-	254
4.	Reconductoring of transmission line	2	65.72	-	113.39
5.	Underground Cable	-	-	-	-
6.	Bus Reactor	-	-	-	-

11.1.4. **132 kV Transmission system**

S.No	Transmission system	No.	Length (in ckm)	Capacity (in MVA)	Estimated Cost (Rs. Cr.)*
1.	New substation	2	-	720	80
2.	Augmentation of existing substation	-	-	-	-
3.	New transmission line including LILO and 2nd Ckt Stringing	17	740.76	-	425.88
4.	Reconductoring of transmission line	7	203.85	-	152.77
5.	Underground Cable	7	146	-	774.91
6.	Bus Reactor	-	-	-	-

11.2. Summary of year-wise MVA capacity, ckm addition and tentative expenditure required for implementation of above recommended proposals is given below

Year	**Capacity Addition (in MVA)**				**Transmission line addition (in ckm)**				**Reconductoring (in ckm)**			**Under ground Cable (ckm)**	**Estimated Cost (in Rs. Cr.)**
	132 kV	**220 kV**	**400 kV**	**765 kV**	**132 kV**	**220 kV**	**400 kV**	**765 kV**	**132 kV**	**220 kV**	**400 kV**	**132 kV**	
2026-27	0	480	2080	0	474.76	160	350	0	129.79	65.72	25.6	98	2397.31
2027-28	360	0	1000	3000	148	50	50	74	74.06	0	0	48	1884
2028-29	0	640	3600	0	56	56	1210	0	0	0	0	0	1947
2029-30	0	160	500	3000	0	0	200	760	0	0	0	0	2973
2030-31	0	0	2000	0	0	0	114	0	0	0	0	0	590
2031-32	0	0	0	3000	0	0	56	50	0	0	0	0	741
2032-33	0	0	1000	0	0	180	586	0	0	0	0	0	1373
2033-34	0	0	0	0	0	0	0	0	0	0	0	0	0
2034-35	360	0	1500	0	62	60	140	0	0	0	0	0	893
Total	**720**	**1280**	**11680**	**9000**	**740.76**	**506**	**2706**	**884**	**203.85**	**65.72**	**25.6**	**146**	**12798.31**

12. Conclusion

12.1. By the year 2034-35, the power demand of Odisha would be increasing significantly. Total expected demand of Odisha by the year 2034-35 is around 11,400 MW. This anticipated increase in demand includes the expected industrial load coming progressively from 2024-25 to 2034-35.

12.2. About 04 Nos. of Pumped Storage hydro power projects and 03 solar projects connected with Intra-state transmission network are expected to be commissioned by 2034-35.

12.3. In order to meet this growing load demand, evacuation of power from solar and hydro generation and for drawal of power from ISTS in accordance with GNA requirement of Odisha by 2034-35, the intra-state as well as inter-state transmission system of the state need to be strengthened. It has been observed that the transmission system infrastructure in Odisha at voltage levels of 132 kV, 220 kV and 400 kV needs to be upgraded.

12.4. The planned network is related to the intra-state transmission system of the State, the State is also advised to plan its downstream network at distribution level in matching timeframe with this planned transmission system.

12.5. At some of the sub-stations there may be low voltage issues due to long lines the State is advised to installed suitable capacitor at distribution level (i.e. 33 kV or 11 kV level). The compensation requirement is given at Paragraph-10 above in this report.

12.6. It is recommended that Odisha shall update their intra-state transmission systems on the PM GatiShakti (PMGS) National Master Plan on regular basis.

12.7. The quantum of GNA is nearing the ATC of the Odisha and demand of the state is increasing, therefore, the state is advice to take up their transmission system strengthening progressively. As per CERC (Connectivity and General Network Access to the Inter-State Transmission System) Regulations, 2022 States (STUs) may apply for additional GNA once in a financial year by the month of September for the next 3 (three) financial years. Therefore, it is suggested that State shall asses their GNA requirement and apply well before considering the timelines prescribed in the regulations.

12.8. A total of 19,820 MVA transformation capacity addition/augmentation and 4,250 ckm of new transmission lines/reconductoring/underground cabling at an estimated cost of ₹ 10,532.31 cr. would be required for implementing the intra-state transmission proposals for meeting the electricity demand of the state by the year 2031-32.

12.9. Further, a total of 22,680 MVA transformation capacity addition/augmentation and 5,278 ckm of new transmission lines/reconductoring/underground cabling at an estimated cost of ₹ 12,798.31 cr. would be required for implementing the intra-state transmission proposals for meeting the electricity demand of the state by the year 2034-35.

12.10. To ensure reliable and adequate power supply in Odisha by 2034-35, a robust and resilient transmission network becomes critical. The outlined plan, if implemented timely, will ensure resource adequacy and support economic and industrial development in the state.

Annexure-I

Operational Feedback from Odisha SLDC.

a) Odisha SLDC has observed overloading in following transmission lines in base case scenario.

Sl No	Name of Line	Loading (MW)
1	132KV Joda – Polasponga line	79
2	132KV Bolangir New – Sonepur line	85
3	132KV Lapanga – Aryan line	80
4	132KV Meramundali – Khajuriakata line	70
5	132KV Katapali – Thuapali line	80
6	220KV Meramundali – Narasinghpur line	170
7	220KV Meramundali – Bhanjanagar line	170

b) Overloading observed in following transmission lines Under N-1 Contingency Condition

1	132KV Budhipadar – Kalugaon line	75
2	132KV Tarkera – Kalugaon line	75
3	220KV Budhipadar – Lapanga Circuit – I & II	160
4	220KV Lapanga – Katapali Circuit – I & II	140
5	220KV Katapali – Baragarh New line	135
6	400KV OPGC – Lapanga Circuit – I & II	670
7	400KV Lapanga – Meramundali Circuit – I & II	530
8	400KV Meramundali – Mendhasal Circuit – I & II	530

Annexure-II

Operational feedback from ERLDC/NLDC

a) Constraints in Transmission Lines in Odisha 220 kV and above system

Sl. No	Corridor	Season/ Antecedent Conditions
1	220 kV Baripada-Balasore D/C	High drawl by Odisha
2	220 kV Budhipadar-Lapanga D/C 220 kV Budhipadar-Vedanta D/C	Observed since last 2 years with high injection from 220 kV Vedanta, Low 220 kV IBTPS generation, High demand, less generation at Rengali Hydro.
3	220 kV Pandiabili – Atri D/C	High demand with low hydro generation in South Odisha
4	220 kV Lapanga – Katapalli D/C 220 kV Bolangir – New Bolangir D/C	Upgradation of 132 kV Kesinga substation to 220/132 kV and its 220 kV interconnection through 400/220 kV Bolangir (PG) and 220/132 kV Sadepalli (OPTCL) has led to increase in load being met through Lapanga area.
5	400 kV OPGC- Lapanga DC	High injection from WR and Drawal of Sterlite
6	400 kV Talcher – Meramundali D/C	High injection from WR, high demand of Odisha and low HVDC Talcher-Kolar export towards SR.
7	400 kV Angul- Bolangir	High demand of Odisha during non-solar hours and when SR drawl is low from Angul point (i.e via Angul-Srikakulam) and high from Jeypore point (i.e via Jeypore-Gazuwaka).

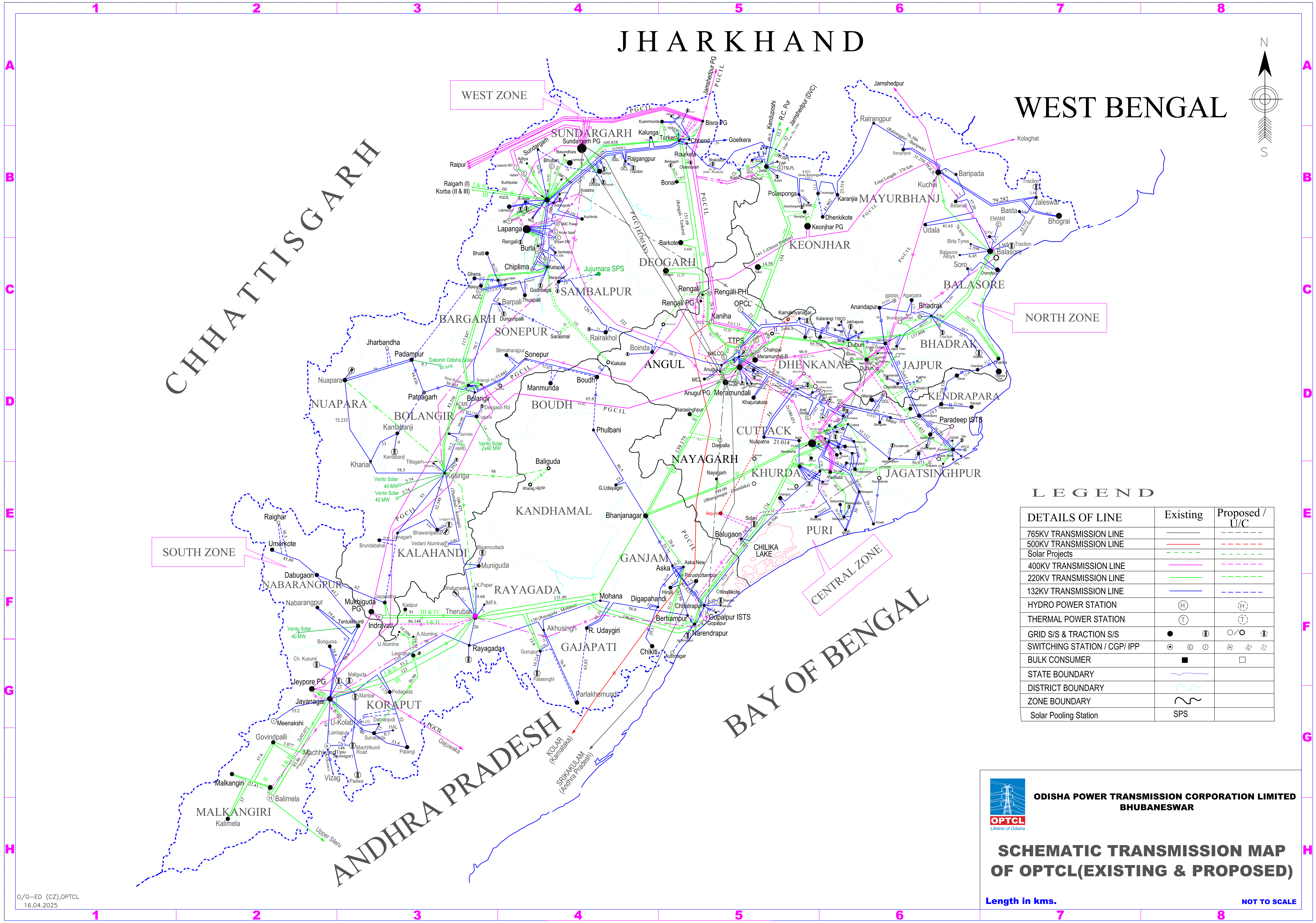
b) ICT constraints in Odisha system

Sl. No	ICT	Season/ Antecedent Conditions
1	400/220 kV 315 MVA ICT at Bolangir -1 & 2	ICTs are not N-1 compliant. During Non-solar hrs due to less injection from WR at Budhipadhar SS and less demand of SR results in higher power availability at Angul SS. These factors result in the loading of ICTs at Bolangir.
2	400/220 kV 315 MVA ICT at Lapanga -1 & 2	During high-demand season
3	400/220 kV 315 MVA ICT at Mendhasal -1 & 2 & 3	During Peak demand in Odisha

c) Low voltage issues in Odisha system

Sl. No	Nodes	Season/ Antecedent Conditions
1	400 kV Mendhasal 400 kV Pandiabili 400 kV Bolangir	Low Voltage was observed during peak hours due to the high loading of lines connected to these SS feeding a high percentage of cooling load which draws a significant amount of reactive power during peak hours, without enough VAR compensation.

Power Map of Odisha including planned system by 2034-35 Annexure-III



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