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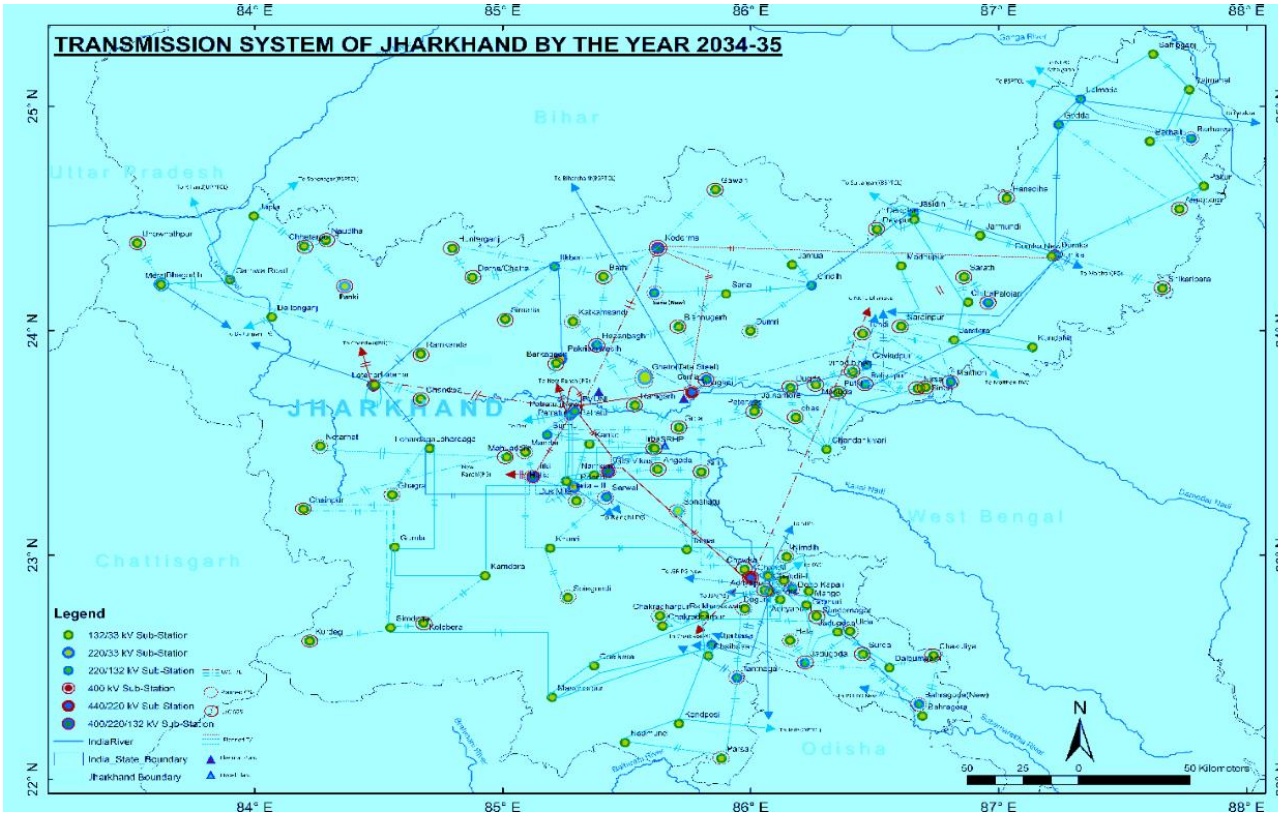
REPORT ON INTRA STATE TRANSMISSION RESOURCE ADEQUACY PLAN FOR JHARKHAND BY THE YEAR 2034-35



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 Jharkhand 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 Jharkhand, 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 Jharkhand in 2024-25 was 2,295 MW, and Projected Peak Demand by 2034-35 is estimated to 6,800 MW, which is more than the Electric Power Survey report. Further, existing Installed Capacity in the state is about 3212.95 MW including allocation from Central Sector Generation. Presently, the state has total 4309 ckm of 132 kV, 2844 ckm of 220 kV, 230.4 ckm of 400 kV transmission line and 4815 MVA of 132 kV, 6025 MVA of 220 kV, 1560 MVA of 400 kV Substation capacity in Intra-state transmission system as on March 2025.

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

A total of 16250 MVA transformation capacity addition/augmentation and 3476.10 ckm of new transmission lines/reconductoring at an estimated cost of ₹ 7021.5 cr. would be required for implementing the intra-state transmission proposals 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)**	**Estimated Cost (in Rs. Cr.)**
	132 kV	**220 kV**	**400 kV**	**132 kV**	**220 kV**	**400 kV**	**132 kV**	
2026-27	-	-	-	-	-	-	-	-
2027-28	440	1040	2350	324	116	102	0.05	1266.298
2028-29	1500	2720	1000	410	448	360	-	2401.326
2029-30	2340	2840	500	812	220	222	57.5	2434.467

Year	Capacity Addition (in MVA)			Transmission line addition (in ckm)			Reconductoring (in ckm)	Estimated Cost (in Rs. Cr.)
	132 kV	220 kV	400 kV	132 kV	220 kV	400 kV	132 kV	
2030-31	320	200		90			114.5	450.07
2031-32		200	320			50	-	209.48
2032-33		80					-	9.72
2033-34	80						-	9.72
2034-35	320			150			-	240.39
Total	**5000.0**	**7080.0**	**4170.0**	**1786.0**	**784.0**	**734.0**	**172.1**	**7021.5**

As loading on some existing/under implementation elements expected to quite low, the state may examine the possibility of load shifting and taking up new elements commensurate to the demand in the area.

To ensure reliable and adequate power supply in Jharkhand by 2034-35, substantial investments and infrastructure upgrades are essential. With a projected demand of 6800 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 Jharkhand by the year 2034-35

1. Demographics

Jharkhand is a state in Eastern part of India, with Ranchi as its capital. It is bordered by the Indian states of Bihar to the north, Uttar Pradesh to the northwest, Chhattisgarh to the west, Odisha to the south, and West Bengal to the east. Jharkhand covers an area of 79,710 square kilometers (30,778 square miles) and has a population of over 33 million. Jharkhand is rich in mineral resources and has been a crucial center for mining and industry, particularly for coal, iron ore, and steel production.

2. Electricity profile of state

2.1. Power generation-demand scenario of state:

2.1.1. In the FY 2024-25, Jharkhand had peak electricity demand of 2,295 MW and electrical energy requirement of 15,203 MU. As on Aug 2025, state has central sector allocation of 1858.60 MW which includes hydro plants (46.98 MW) and thermal plants (1807.62 MW). In addition, installed capacity in state sector is 550.05 MW and installed capacity in private sector is 804.30 MW. The per capita consumption of the state was 992 kWh in the year 2022-23.

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

Table 2-1 Peak demand & Energy of Jharkhand

FY	Peak Demand(MW)	MW as per EPS	Energy(MU)	MUs as per EPS
2018-19	1,339	3,111	8,737	18,941
2019-20	1,396	3,332	8,941	20,242
2020-21	1,651	3,541	9,953	21,469
2021-22	1,887	2,835	11,148	18,355
2022-23	2,253	2,994	13,278	19,334
2023-24	2,193	3,163	14,408	20,677
2024-25	2,295	3,362	15,203	22,112

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.

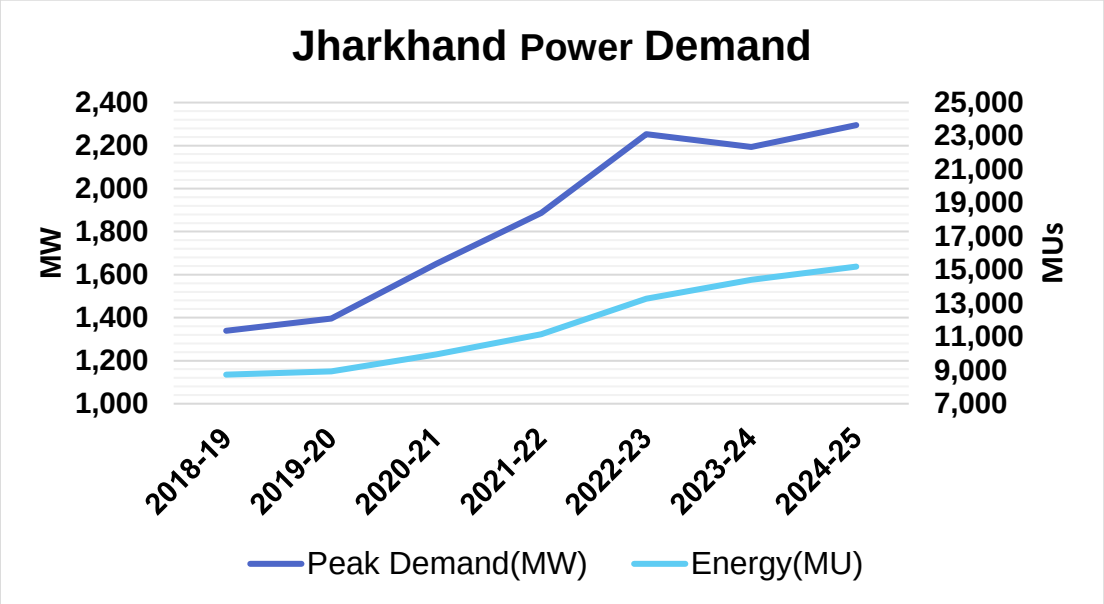


Figure 2-1 Peak Demand and Energy

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

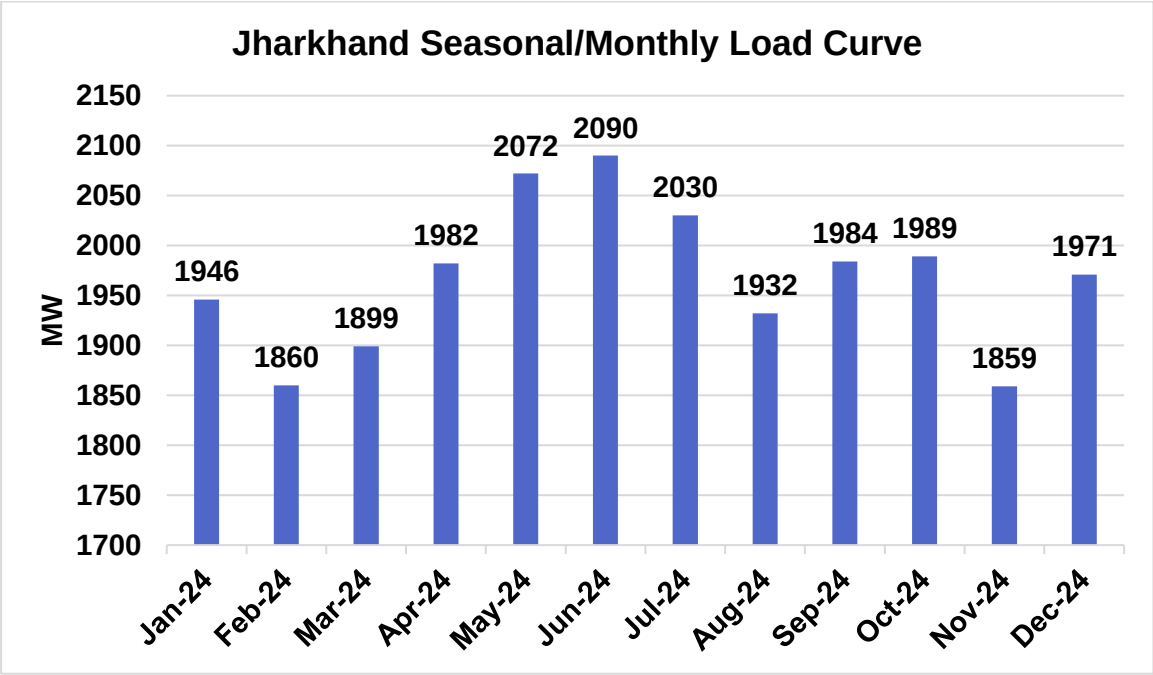


Figure 2-2 Seasonal Load Curve

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.

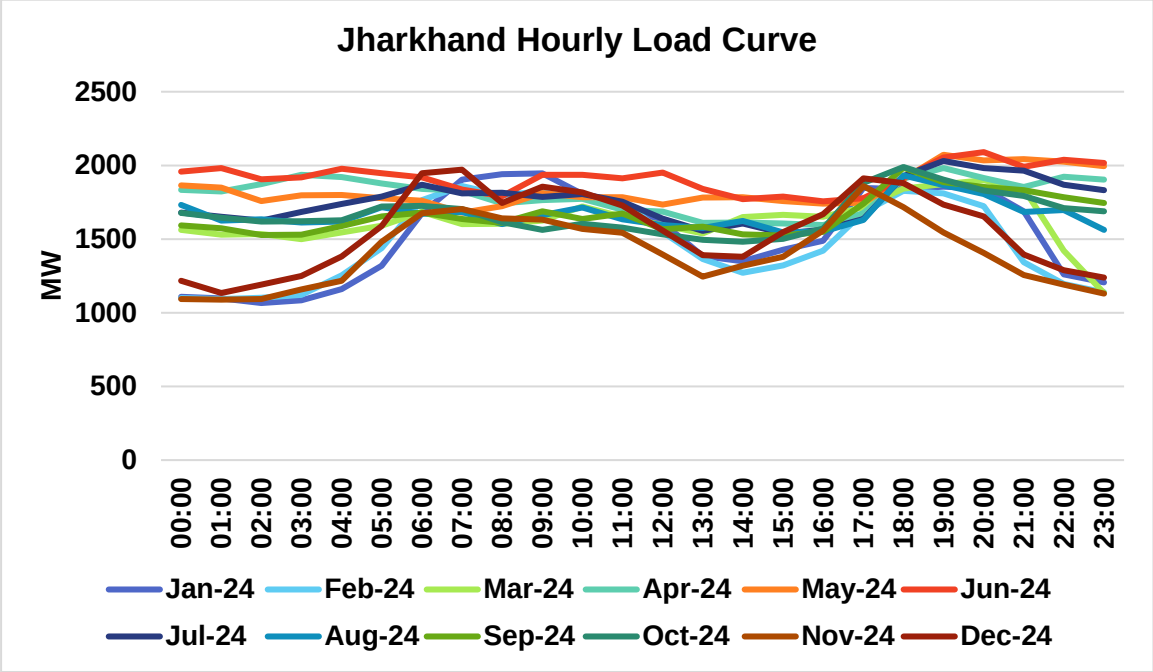


Figure 2-3 Hourly Load Curve

2.1.6. The projected peak electricity demand in Jharkhand as per 20th EPS report will be 6409 MW by the year 2036-37.

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

Table 2-2 contracted and installed capacity

SECTOR	HYDRO		THERMAL				NUCLEAR	R.E.S. (MNRE)	TOTAL
		COAL	LIGNITE	GAS	DIESEL	TOTAL			
State	130.00	420.00	0.00	0.00	0.00	420.00	0.00	0.05	550.05
Private	0.00	580.00	0.00	0.00	0.00	580.00	0.00	224.30	804.30
Central allocation	46.98	1807.62	0.00	0.00	0.00	1807.62	0.00	4.00	1858.60
Total	176.98	2807.62	0.00	0.00	0.00	2807.62	0.00	228.35	3212.95
%	5.51	87.38	0.00	0.00	0.00	87.38	0.00	7.11	100.00

Source: Installed Capacity Report, CEA

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

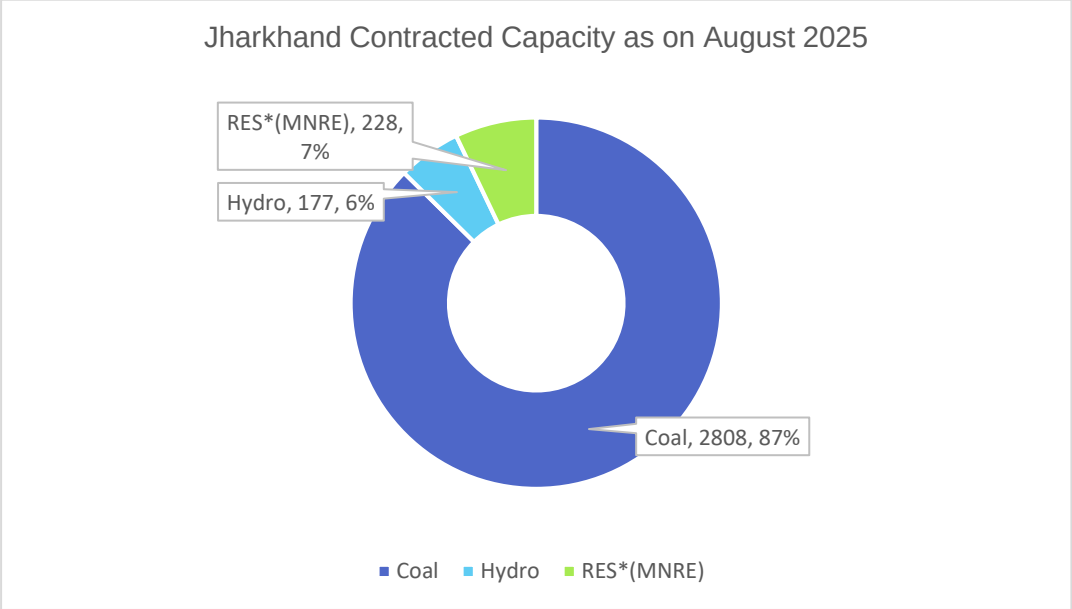


Figure 2-4 Contracted Capacity

2.1.9. As on August 2025, the General Network Access (GNA) quantum for ISTS drawal is 1590 MW and Available Transfer Capability (ATC) of the state is 1946 MW (Import ATC).

3. Existing Transmission System

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

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

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

Table 3-1 Intra State Transmission assets in Jharkhand

Financial Year	Voltage (kV)	Transmission lines (ckm)	Substations (MVA)
2018-19	132	2843.4	3965
	220	1836.21	3315
	400	0	0
	Total	**4679.61**	**7280**
2019-20	132	3168.4	3965
	220	2083.21	3315
	400	0	0
	Total	**5251.61**	**7280**
2020-21	132	3607	4015
	220	2528.41	4315
	400	0	0
	Total	**6135.41**	**8330**

2021-22	132	3678	4165
	220	2709.41	5115
	400	230.4	630
	Total	**6617.81**	**9910**
2022-23	132	3759.4	4265
	220	2852.41	5115
	400	230.4	930
	Total	**6842.21**	**10310**
2023-24	132	4031.2	4465
	220	2852.41	5215
	400	230.4	1560
	Total	**7114.01**	**11240**
2024-25	132	4308.96	4815
	220	2843.8	6025
	400	230.4	1560
	Total	**7383.16**	**12400**

**Source: State data*

3.1.2. As on March 2025, Jharkhand state has total 7383 ckm transmission lines and 12400 MVA sub-station MVA capacity which includes, 4309 ckm of 132 kV, 2844 ckm of 220 kV, 230.4 ckm of 400 kV transmission line and 4815 MVA of 132 kV, 6025 MVA of 220 kV, 1560 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.

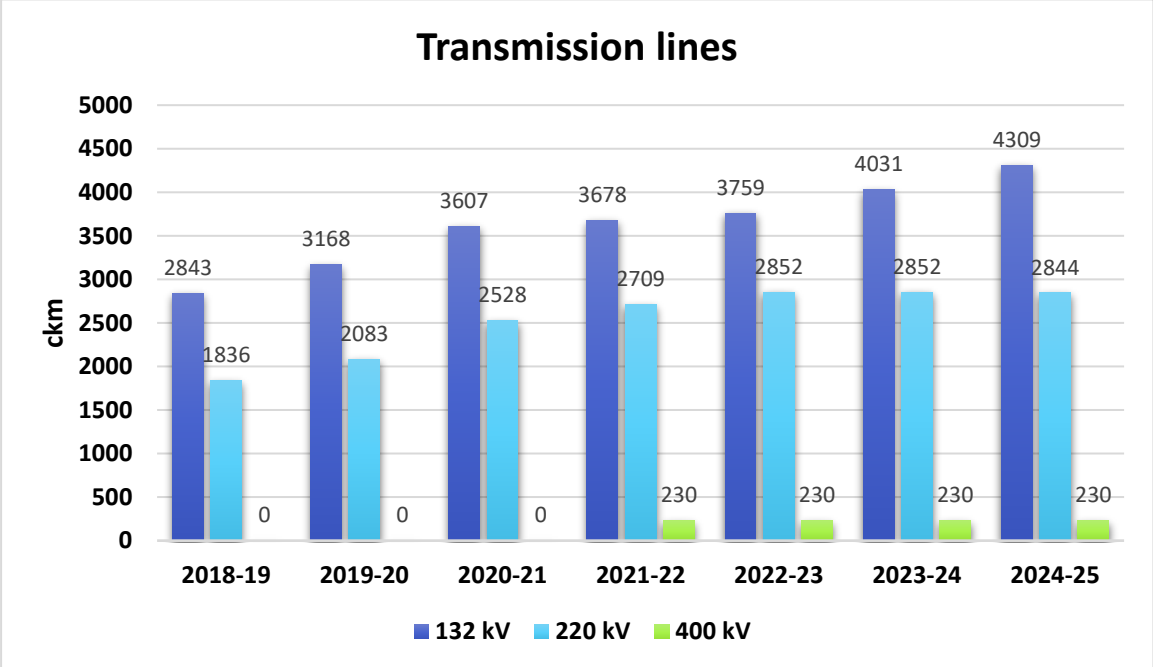


Figure 3-1 Existing Intra-state Transmission Line

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

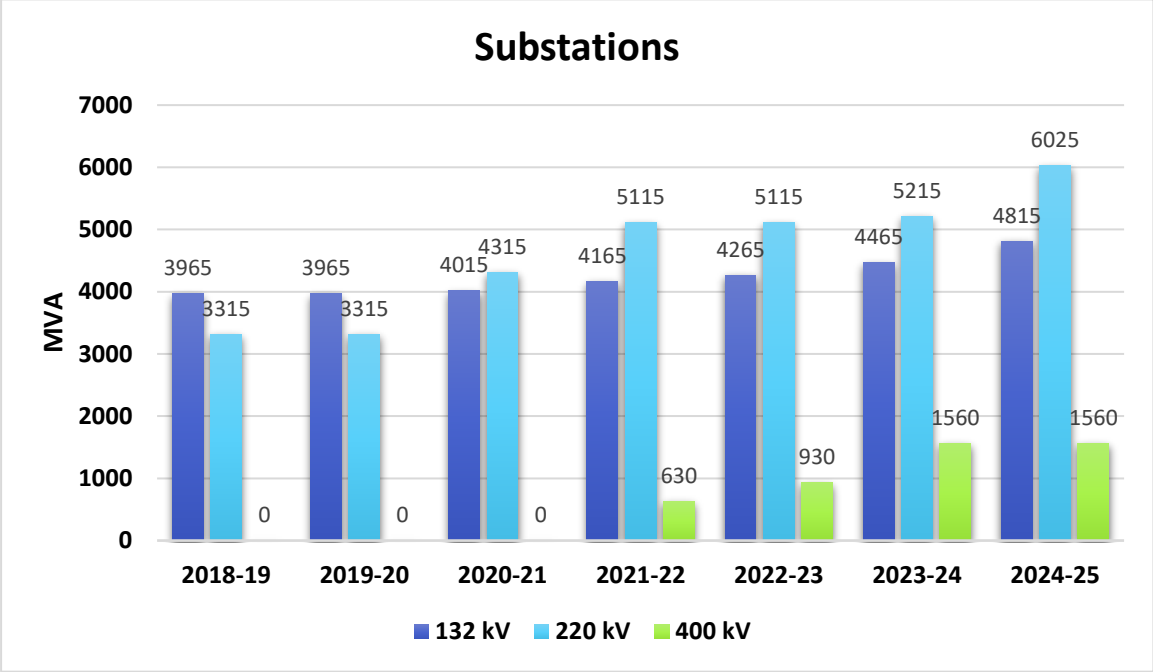


Figure 3-2 Existing Substations

3.2. <u>Existing Inter-State Transmission system in the state:</u>

3.2.1. The State has 7 nos. of existing substation with 7,655 MVA capacity and 3000 MVA of substation capacity is under construction.

3.2.2. The State has a total of 6,949 ckm of existing inter-state transmission lines. Further, 1644 ckm of lines and 54 ckm of reconductoring is under implementation. 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 Jharkhand

Transmission lines	**Existing**	**Under Construction**
220 kV	30 ckm	-
400 kV	5734 ckm	814 ckm + Re-cond. 54 ckm
765 kV	1185 ckm	830 ckm
Total	6949 ckm	**1644 ckm + Recond 54 ckm**
Substations	**Existing**	**Under Construction**
400 kV Switching Station	1 (switching station) Jharkhand Pool	**-**
400/220/132 kV	1 (630 MVA + 320 MVA) Daltonganj (New)	**-**
400/220 kV	4 (3705 MVA) Chaibasa, Jamshedpur Dhanbad & Ranchi	-

765/400 kV	1 (3000 MVA) Ranchi (New)	1 (3000 MVA) Jamshedpur (New)
Total	**7 nos. (7655 MVA)**	**1 no. (3000 MVA)**

4. Under Implementation Transmission System

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

4.1.1. The summary of under implementation Intra-state transmission system as provided by Jharkhand as on August 2025 is at Table 4-1.

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

Voltage (kV)	Transmission lines (ckm)	Substations (MVA)
132	5664.9	5395
220	1352.48	3650
400	1052	2630

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

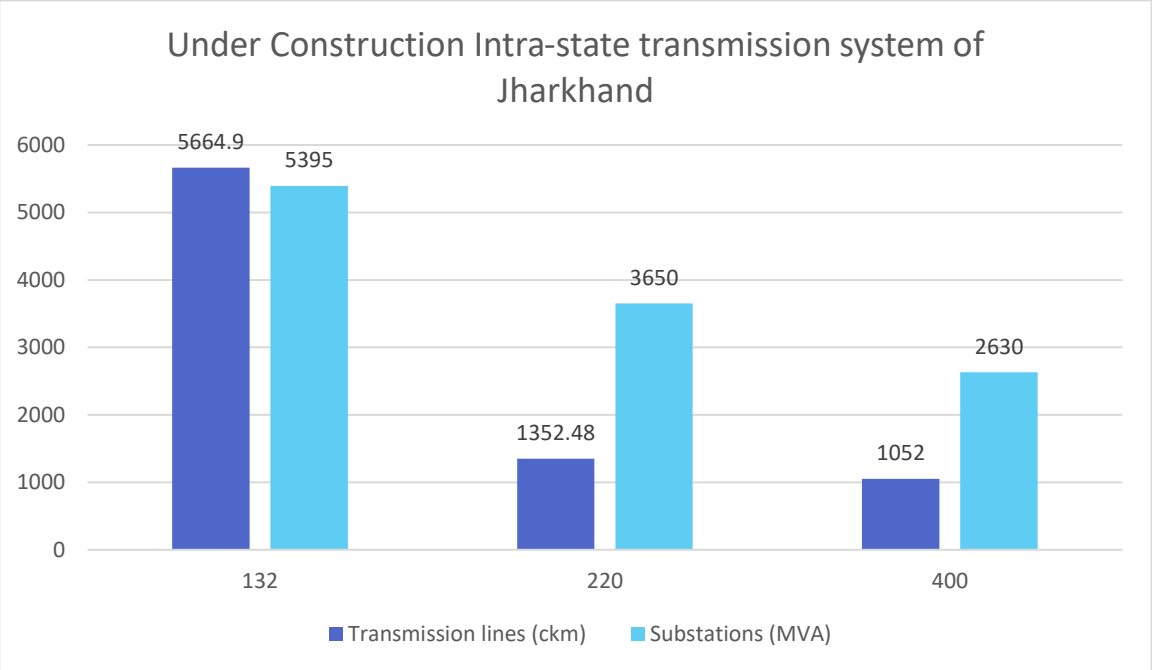


Figure 4-1 Under Construction Intra-state transmission system as on Aug 2025

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

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

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

i. ERES-XXXVIII: Dec 2025

- Shifting of Ranchi (POWERGRID) – Raghunathpur (DVC) 400 kV D/c (Quad) line to bays 431 and 434 in diameters 431-432-433 and 434-435-436 at Ranchi (POWERGRID) end: about 1.27 km new line section (refer note a).
- Dismantling of 1355 m section of Ranchi (POWERGRID) – Raghunathpur (DVC) 400 kV D/c (Quad) line of DVC at Ranchi end from tower location 433 to 438 and scraping of the same (refer note b).
- Shifting of 420 kV, 125 MVAr bus reactor installed in bay 431 to bay no. 413 [vacated after shifting of Ranchi (POWERGRID) – Raghunathpur (DVC) 400 kV ckt-2] at Ranchi (POWERGRID) end
- Shifting of equipment of bay no. 416 [released upon shifting of Ranchi (POWERGRID) – Raghunathpur (DVC) 400kV ckt-3] to bay no. 434 for completion/establishment of bay no. 434 at Ranchi (POWERGRID) end.
- Installation of 420 kV, 1x80 MVAr switchable line reactor, one each in both circuits of Raghunathpur (DVC) – Ranchi-New (POWERGRID) 400 kV D/c (Quad) line (formed after bypassing of existing Ranchi (POWERGRID) – Raghunathpur (DVC) and Ranchi (POWERGRID) – Ranchi-New (POWERGRID) ckt-3 & 4 400 kV D/c (Quad) lines at Ranchi (POWERGRID) through tie circuit breaker in diameters 431-432-433 and 434-435-436) at Ranchi-New (POWERGRID) end along with 400 ohm NGR (including NGR bypass scheme).

Note:

a) *The ISTS licensee shall coordinate with DVC for shifting of Ranchi (POWERGRID) – Raghunathpur (DVC) 400 kV D/c (Quad) line to bays 431 & 434. Further, ISTS licensee shall also take care of completion of communication link upon line shifting.*

b) *The scrap value of the tower members, ACSR conductor, auxiliaries etc. of dismantled assets shall be deducted by the ISTS licensee as per prevailing scrap value to arrive at the final cost of the project. As the scrap value of dismantled assets (about 1355 m of line) is already being adjusted against the project cost of this new scheme, tariff of Ranchi (POWERGRID) – Raghunathpur (DVC) 400kV D/c (Quad) line of DVC shall remain unaffected.*

c) *During the implementation period of the above scheme, ERS can be used for temporary bypassing of Ranchi (POWERGRID) – Raghunathpur (DVC) and Ranchi (POWERGRID) – Ranchi-New (POWERGRID) ckt-3 & 4 lines outside Ranchi S/s so as to facilitate shifting of bus reactor and bay equipment, if required.*

d) *Upon implementation of this scheme, the Ranchi (POWERGRID) – Raghunathpur (DVC) 400 kV D/c (Quad) line may be bypassed from Ranchi S/s with Ranchi – Ranchi (New) 400 kV D/c line (ckt-3 & ckt-*

4) through tie circuit breakers (432 & 435) as per system requirement and based on instructions from Grid-India.

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

i. Immediate Evacuation System for North Karanpura STPP (1980 MW) – *by Adani*

- NKSTPP-Gaya 400 kV D/c (quad) line (196 ckm)**: Dec 2025*** (best efforts)

4.2.3. **Planned ISTS**

WR-ER Inter-Regional Network Expansion Scheme (Only Jharkhand Portion)

i. WR-ER Inter-Regional Network Expansion Scheme-Part A: Approved in 32nd NCT, to be implemented under TBCB (Timeline: 24 Months from date of allocation)

- Establishment of 2x1500MVA, 765/400kV S/s at Jamshedpur (New) in Jharkhand
- Raigarh (Tamnar) – Jamshedpur (New) 765kV D/c line along with 330MVAr switchable line reactors in each ckt at Raigarh (Tamnar) end. (315km)
- LILO of Ranchi (New) – Medinipur 765kV D/c line at Jamshedpur (New) (51km & 49km)
- LILO of Ranchi (New) – New PPSP 400kV D/c line at Jamshedpur (New) (63km)

ii. WR-ER Inter-Regional Network Expansion Scheme-Part B: Approved in 32nd NCT to be implemented under RTM (Timeline: 24 Months from date of allocation)

- Reconductoring of LILO point to New PPSP line section of Ranchi (New) – New PPSP 400kV D/c line with Twin HTLS (ampacity of single HTLS as 1574A at nominal voltage level) (54ckm)

iii. WR-ER Inter-Regional Network Expansion Scheme-Part C: Approved in 32nd NCT to be implemented under TBCB (Timeline:31-03-2029)

- Jamshedpur (New) – Balasore 400kV D/c (Quad) line (174km)
- Extension at Jamshedpur (New) 765/400kV (ISTS) substation: 2 no. 400kV line bays

5. System operator feedback

5.1. The operational constraint faced in the Intra-state transmission network by Jharkhand 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 Jharkhand according to the 20th EPS Report and as estimated by the state are given at Table 6-1. The demand estimated by the state is higher than the EPS for that the state has given justification of expected high growth and industrial demand. Accordingly, the demand figures provided by the State has been considered.

Table 6-1 Peak electricity demand

Reference↓ / Parameter→	**Year**	**Peak Demand (MW)**	**CAGR**
Actual Peak	2024-25	2295	
As per 20th EPS	2025-26	3576	55.82
	2026-27	3808	28.81
	2027-28	4048	20.82
	2028-29	4297	16.98
	2029-30	4597	14.90
	2030-31	4800	13.09
	2031-32	4997	11.76
State Estimated Peak electricity demand	2034-35	**6800**	11.47
As per 20th EPS	2036-37	6409	8.93

**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 2600 MW which is expected by 2035 at following locations

a) M/S Azim Premji Foundation, Ranchi

b) Power supply to pump house of Sone-Kanha underground pipeline project, Garhwa

c) Expansion of GILCD, Garhwa.

d) Expansion of Tata steel west Bokaro plant, Ramgarh.

e) Solar PV plant integrated with 270 MWh BESS at Giridih.

f) Railway load at Dhanbad.

g) Railway load and Dalmia cement Captive power plant at Simaria.

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

6.3.1. 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	PVUNL, Ramgarh	5x800 = 4000 MW	4000	2030
2.	Thermal	TTPS, Lalpania	2x660 = 1320 MW	1320	2030
3.	Solar	Chandankyari, Bokaro	20	20	2027
4.	Solar	TTPS, Lalpania	50	50	2028
5.	Floating Solar (FS)	Chandil	600	600	2028
6.	Floating Solar (FS)	IRBA	100	100	2026
7.	BESS	Giridih	140 MW(90 MW Solar & 300 MWH BESS(6 hrs-Gen mode,9 hrs-Load mode))	140	2028
			Total	**6230**	

6.3.2. The additional generation capacity expected in the state by 2034-35 is 6230 MW.

6.3.3. 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: 7220 MW (including 990 MW RE Power) by 2031-32 and 2034-35 has been considered in the study.

b) The Inter-state Generation capacity located in Jharkhand has been considered as 1980 MW.

c) Peak Demand: 5000 MW by the year 2031-32 and 6800 MW (including 2600 MW non-scalable industrial demand) by 2034-35.

d) 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		Dispatch Factors

		Demand Factor	**Thermal**	**Solar**	**BESS (+ discharging/- charging)**
1.	August Solar Max (Peak-Scenario-1)	70%	60%	100%	-100%
2.	June Peak Demand (Summer Evening Peak-Scenario – 2)	100%	90%	0%	100%
3.	February Solar Max (Scenario-7)	60%	60%	100%	-100%
4.	February Night Off-peak (Scenario-9)	50%	60%	0%	100%

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 Jharkhand 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→	Aug Solar Max (Peak-Scenario-1)	June Peak Demand (Summer Evening Peak-Scenario – 2)	Feb Solar Max (Scenario-7)**)**	February Night Off-peak (Scenario-9)
Generation despatch (intra-state + ISGS located in state) (in MW)	5558 *(intra State: 4370, ISGS: 1188)*	7171 *(intra State: 5389, ISGS: 1782)*	5557 *(intra State: 4370, ISGS: 1188)*	4837 *(intra State: 3649, ISGS: 1188)*
Total load including losses (in MW)	3506	4992	3015	2518
Net interchange ((-) import / (+)export) at ISTS-STU periphery (in MW)	947	435	1438	1166

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→	Aug Solar Max (Peak-Scenario-1)	June Peak Demand (Summer Evening Peak-Scenario – 2)	Feb Solar Max (Scenario-7)**)**	February Night Off-peak (Scenario-9)
Generation despatch (intra-state + ISGS located in state) (in MW)	5558 *(intra State: 4370, ISGS: 1188)*	7171 *(intra State: 5389, ISGS: 1782)*	5557 *(intra State: 4370, ISGS: 1188)*	4837 *(intra State: 3649, ISGS: 1188)*
Total load including losses (in MW)	4751	6865	4048	3419
Net interchange ((-) import / (+)export) at ISTS-STU periphery (in MW)	-302	-1433	398	268

7.2. 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.

7.3. 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 Jharkhand 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.

7.4. According to CEA's generation recourse adequacy report for Jharkhand (2033-34), the state has sufficiently surplus coal based capacity planned such that in order to meet the projected demand. Jharkhand (JBVNL) is likely to not witness energy deficit throughout the period of study i.e. from 2023-24 to 2033-34 with the existing and planned capacity addition. However, Jharkhand (JBVNL) is deficit in fulfilment of its Renewable Purchase Obligations (RPO) as per the MOP notification dated 20th October 2023 and needs to contract additional renewable capacities. The projected capacity and generation mix fulfils the RPO obligation. The coal capacity PLF is expected to remain in the range of 25%-38% for the years till 2033-34 ensuring higher absorption of higher renewable energy. The coal based utilization increases to 35-76% in alternate resilient scenario i.e. if the demand increases and/or the planned capacity tie ups are delayed.

7.5. 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 Jharkhand 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 Jharkhand

Sl. No	Name of the Project with scope of work	Justification	Estimated Cost (Rs. Cr.)	Time Frame
1.	**i. Establishment of New 220/132/33 kV, 2x200+2x80 MVA at Sarwal**	For feeding load to Sidrol, Sadabahar, lali, Jamchuan, Rajaulatu, Sarwal, Rai University, YBN university, Arbind Mill, Technical University. Further this S/s will increase releability of power supply of Ranchi.	138.66	2027-28
	ii. LILO of Chandil old – Ranchi (PG) 220 kV Zebra S/c line at Sarwal (36 ckm)		26.53	
	iii. Sarwal – Khunti 132 kV Panther D/c Line (120 ckm)		72.39	
2.	**i. Establishment of New 132/33 kV, 2x80 MVA at Mandar**	Rapid supply load growth in Mandar area. The proposed S/s would reduce the 33 kV feeder length in discom PSS resulting in better voltage profile and reduce losses. Itki – Mandar line which would be 220 kV Zebra conducter S/c on D/c line will be strung with Zebra for second ckt.	74.95	2028-29
	ii. Mandar – Itki 132 kV Zebra D/c Line (20 ckm)		14.70	
3.	**i. Establishment of New 400/220/132/33 kV, 2x500+2x200+2x80 MVA at Itki**	For feeding load to Itki, Nagri, Bero, Lapung, Soparam, Tasar, ratu area and university like Aziz premzi University & other industry. Further this S/s will increase releability and estability of power supply of state Capital Ranchi being a strong source at 400 kV level.	253.19	2027-28
	ii. LILO of Ranchi New PG – Patratu New 400 kV Twin Moose D/c line at Itki (72ckm)		114.30	
	iii. LILO of Hatia – Loherdaga New 220 kV Zebra D/c line at Itki (60ckm)		44.22	
	iv. Itki – Khunti 132 kV Panther D/c Line (120ckm)		72.39	

Sl. No	Name of the Project with scope of work	Justification	Estimated Cost (Rs. Cr.)	Time Frame
	v. Itki – Ranchi Smart City 220 kV Zebra through LILO of Under-Construction Ranchi Smart City-Mandar S/c on D/c line.(20 ckm)		14.70	
4.	**i. Establishment of New 132/33 kV, 2x80 MVA at Ghagra (Gumla)**	Rapid supply load growth in Gumla district. The proposed S/s would reduce the 33 kV feeder length in discom PSS resulting in better voltage profile and reduce losses. This will also facilitate quality power supply in remote areas.	74.95	2029-30
	ii. Lohardaga (New) – Ghagra 132 kV Panther D/c Line (80ckm)		48.26	
5.	**i. Establishment of New 132/33 kV, 2x80 MVA at Sonahatu**	For feeding load to Sonahatu, Bundu, Rahe &Tamar area. Further this S/s will increase releability of power supply of Bundu area. The proposed S/s would reduce the 33 kV feeder length in discom PSS resulting in better voltage profile and reduce losses.	74.95	2029-30
	ii. Tamar – Sonahatu 132 kV Panther D/c Line (60ckm)		36.19	
	iii. Silli – Sonahatu 132 kV Panther D/c Line (90ckm)		54.29	
6.	**i. Establishment of New 132/33 kV, 2x80 MVA at Dus Mile Ring Road**	For feeding load to Tupudana, Hazam & some part of Hatia which is rapidly growing small industrial.The proposed S/s would reduce the 33 kV feeder length in discom PSS resulting in better voltage profile and reduce losses.	74.95	2028-29
	ii. Sarwal – Dus Mile Ring Road 132 kV Panther D/c Line (50ckm)		30.16	
7.	**i. Establishment of New 400/132/33 kV, 2x315+2x80 MVA at Vikas with 2x80 MVAr bus reactor and provision for**	For feeding load to Vikas, Irba, Mesra, Ormanjhi, Booty more which are very fast load growing area due to extention of Ranchi,	260.51	2027-28

Sl. No	Name of the Project with scope of work	Justification	Estimated Cost (Rs. Cr.)	Time Frame
	creation of 220 kV level in future	establishment of big hospitals, water treatment plants. This S/s will increase releability and estability of power supply of state Capital Ranchi being a strong source at 400 kV level.		
	ii. LILO of PVUNL – Chandil New 400 kV Quad moose D/c line at Vikas (30ckm)		57.15	
	iii. LILO of Irba – Angada 132 kV panther D/c Line at Vikas (48ckm) iv. LILO point at Angada side to Vikas section of line with high capacity conductor v. Reconductoring of Angada to LILO point with high capacity conductor		91.878	
8.	**i. Establishment of New 400/220 kV, 2x500 MVA at Dumka with 2x80 MVAr bus reactor**	Presently Santhal region has only Maithon (PG) as a main source and voltage issues & transmission constraints are already existing in this region. This S/s will cater above issue in this region in present as well as future scenarios. It will also form 400 kV ring system across Jharkhand thus facilitating reliability of evacuation of PVUNL power.	256.901	2028-29
	ii. Dumka (New) – Koderma 400 kV Quad Moose D/c Line (360ckm)		685.80	
	iii. Shifting of Madanpur – Godda 220 kV Zebra D/c Line to Dumka(New) (04 ckm)		2.95	
	iv. Dumka (New) – Madanpur 220 kV Twin Moose D/c Line (04 ckm)		6.0	
9.	**i. Establishment of New 220/132/33 kV, 2x200 + 2x80 MVA at Barharwa**	For feeding load to Barharwa, and sahibganj region. The proposed S/s would reduce the 33 kV feeder length in discom	138.66	2028-29
	ii. LILO of one ckt of Godda – Lalmatia		84.455	

Sl. No	Name of the Project with scope of work	Justification	Estimated Cost (Rs. Cr.)	Time Frame
	220 kV D/c line at Barharwa(140 ckm)	PSS resulting in better voltage profile and reduce losses. This S/s will increase releability and estability of power supply in Pakur and Sahibganj district.		
	iii. LILO of Pakur – Rajmahal 132 kV Panther S/c line at Barharwa (20 ckm)		12.06	
	iv. Barharwa – Barhait 132 kV Panther D/c Line (40 ckm)		24.13	
10.	**i. Establishment of New 132/33 kV, 2x80 MVA at Ulda**	For feeding load to Ulda region and extension of Jamshedpur The proposed S/s would reduce the 33 kV feeder length in discom PSS resulting in better voltage profile and reduce losses. Further this S/s will increase reliability of power supply.	74.95	2034-35
	ii. Ulda – Jadugoda (New) 132 kV Panther D/c Line (100 ckm)		60.33	
11.	**i. Establishment of New 132/33 kV, 2x80 MVA at Hata**	For feeding load to Hata, Potka & Rajnagar region The propose S/s would reduce the 33 kV feeder length in discom PSS resulting in better voltage profile and reduce losses.	74.95	2034-35
	ii. Hata – Jadugoda (New) 132 kV Panther D/c Line (50 ckm)		30.16	
12.	**i. Establishment of New 220/132/33 kV, 2x200+2x80 MVA at Dobo Kapali**	Rapid supply load growth in Dobo, Jamshedpur region due to extention of Jamshedpur, establishment of big hospitals, rapid urbanization, The propose S/s would reduce the 33 kV feeder length in discom PSS resulting in better voltage profile and reduce losses.	138.66	2028-29
	ii. Dobo – Jamshedpur PG New 220 kV Zebra D/c Line (100 ckm)		73.70	
	iii. Dobo – Kandra 132 kV Panther D/c Line (50 ckm)		30.16	
13.	**i. Establishment of New 132/33 kV, 2x80 MVA at Nimdih**	The proposed S/s would reduce the 33 kV feeder length in discom PSS resulting in better	74.95	2029-30

Sl. No	Name of the Project with scope of work	Justification	Estimated Cost (Rs. Cr.)	Time Frame
	ii. Chandil(Old) – Nimdih 132 kV Panther D/c Line (100ckm)	voltage profile and reduce losses. This will also facilitate quality power supply in remote areas.	60.32	
14.	**i. Establishment of New 132/33 kV, 2x80 MVA at Kanderbera**	Rapid supply load growth in Kanderbera, Jamshedpur region due to extention of Jamshedpur, rapid urbanization, The propose S/s would reduce the 33 kV feeder length in discom PSS resulting in better voltage profile and reduce losses.	74.95	2029-30
	ii. Kanderbera – Dobo 132 kV Panther D/c Line (50 ckm)		30.16	
15.	**i. Establishment of New 220/132/33 kV, 2x200+2x80 MVA at Bahragoda New**	This S/s will improve voltage profile in Dhalbhumgarh, Bahragoda region and will relieve loading on Jadugoda(new) S/s.	138.66	2028-29
	ii. Bahragoda New – Jamshedpur New PG 220kV Zebra D/c Line (200 ckm)		147.40	
	iii. LILO of Surda – Bahragoda 132 kV D/c Panther Line (80ckm)		24.13	
16.	**i. Establishment of New 132/33 kV, 2x80 MVA at Netarhat**	The proposed S/s would reduce the 33 kV feeder length in discom PSS resulting in better voltage profile and reduce losses. This will also facilitate quality power supply in remote forest areas	74.95	2029-30
	ii. Mahuadanr – Netarhat 132 kV Panther D/c Line (80ckm)		48.26	
17.	**i. Establishment of New 132/33 kV, 2x80 MVA at Katkamsandi**	For feeding load to Katkamsandi & Hazaribagh region.The proposed S/s would reduce the 33 kV feeder length in discom PSS resulting in better voltage profile and reduce losses.This S/s will ensure 24x7 power availability and prevent	74.95	2030-31
	ii. Hazaribagh – Katkamsandi 132 kV Panther D/c Line (90ckm)		54.29	

Sl. No	Name of the Project with scope of work	Justification	Estimated Cost (Rs. Cr.)	Time Frame
		load shedding due to dependency on DVC in this region		
18.	i. **Establishment of New 132/33 kV, 3x80 MVA S/s at Ghato**	For feeding load to Ghato & industries namely Tata steel.The proposed S/s would reduce the 33 kV feeder length in discom PSS resulting in better voltage profile and reduce losses.This S/s will ensure 24x7 power availability and prevent load shedding due to dependency on DVC in this region	112.42	2031-32
	ii. LILO of Ramgarh – Hazaribagh 132 kV D/c line at Ghato S/s (50 ckm)		60	
19.	**i. Establishment of New 132/33 kV, 2x80 MVA at Dumri**	For feeding load to Dumri and Giridih region.The proposed S/s would reduce the 33 kV feeder length in discom PSS resulting in better voltage profile and reduce losses.This S/s will ensure 24x7 power availability and prevent load shedding due to dependency on DVC in this region	74.95	2029-30
	ii. Giridih – Dumri 132 kV Panther D/c Line (100 ckm)		60.33	
20.	**i. Establishment of New 132/33 kV, 2x80 MVA at Chakradharpur (Toklo Road)**	Due to space constraint in the existing Chakradharpur S/s and to cater future load growth of Chakradharpur region this S/s is required.	74.95	2028-29
	ii. LILO of Rajkharsawan – Chakradharpur(old) 132 kV Panther D/c line at Chakradharpur (Toklo Road) (10ckm)		6.03	
21.	**i. Establishment of New 132/33 kV,**	The proposed S/s would reduce the 33 kV feeder length in discom	74.95	

Sl. No	Name of the Project with scope of work	Justification	Estimated Cost (Rs. Cr.)	Time Frame
	2x80 MVA at Parsa(Manjhgoan)	PSS resulting in better voltage profile and reduce losses. This will also facilitate quality power supply in remote forest areas		2029-30
	ii. Parsa – Noamundi 132 kV Panther D/c line(92ckm)		55.50	
22.	**i. Establishment of New 132/33 kV, 2x80 MVA at Solegundi(Bandgaon)**	The proposed S/s would reduce the 33 kV feeder length in discom PSS resulting in better voltage profile and reduce losses. This will also facilitate quality power supply in remote forest areas	74.95	2029-30
	ii. Solegundi(Bandgaon) – khunti 132 kV Panther D/c line (70ckm)		42.23	
23.	**i. Establishment of New 220/132/33 kV, 2x200+2x80 MVA at Tantnagar**	The proposed S/s would reduce the 33 kV feeder length in discom PSS resulting in better voltage profile and reduce losses. This will also facilitate quality power supply in remote forest areas. This S/s will improve voltage profile in Chaibasa region.	138.66	2029-30
	ii. Tantnagar – Chaibasa PG 220 kV Panther D/c line (80ckm)		58.96	
	iii. Parsa – Tantnagar 132 kV Panther D/c line(80ckm)		48.26	
24.	**i. Establishment of New 132/33 kV, 2x80 MVA at Duguni**	The proposed S/s would reduce the 33 kV feeder length in discom PSS resulting in better voltage profile and reduce losses. This will also facilitate quality power supply in remote forest areas. This S/s will improve voltage profile in Rajkharsawan region.	74.95	2028-29
	ii. Duguni – Tantnagar 132 kV Panther D/c line(90ckm)		54.29	
25.	**i. Establishment of Saria (New) 220/132/33 kV S/s with 2x200 MVA + 2x80 MVA ICT**	For feeding load to Barkatha, Markacho & Dhanwar region and also for offloading saria gss.The proposed S/s	138.66	2029-30

Sl. No	Name of the Project with scope of work	Justification	Estimated Cost (Rs. Cr.)	Time Frame
	ii. Koderma – Saria (New) 220 kV D/c line (140 ckm)	would reduce the 33 kV feeder length in discom PSS resulting in better voltage profile and reduce losses.This S/s will ensure 24x7 power availability and prevent load shedding due to dependency on DVC in this region	84.455	
	iii. Saria (New) – Saria 132 kV D/c line (10 ckm)		6.032	

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 Jharkhand

Sl. No	Name of the Project with scope of work	Justification	Estimated Cost (₹. Cr.)	Time-frame
1.	LILO of Golmuri – Jadugoda (Old) 132 kV Panther D/c Line at Jadugoda (New) (25 km)	This will provide alternate source to Jadugoda(old) and Golmuri S/s as there would be rapid load growth in both S/s.	30.16	2028-29
2.	Shifting of Hatia-I – Patratu (Old) 132 kV Panther D/c Line at Patratu (New) (06 km)	Due to dismantling of Patraru(old)n S/Y, these lines will be shifted to Patraru(new)	7.24	2027-28
3.	Shifting of DVC – Patratu (Old) 132 kV Panther D/c Line at Patratu (New) (06 km)	Due to dismantling of Patraru(old)n S/Y ,these lines will be shifted to Patraru(new)	7.24	2027-28
4.	TTPS – Koderma 400 kV Quad Moose D/c Line (111 km)	To facilitate evacuation of the proposed TTPS exetension plan (2x660 MW)	422.91	2029-30
5.	Shifting of Lohardaga (Old) – Gumla 132 kV Panther D/c Line at Lohardaga (New) (06 km)	To avoid overloading on 132 kV Lohardaga(new)-Lohardaga(old) D/c line	7.24	2027-28

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 line of Jharkhand

Sl. No	Name of the Project with scope of work	Justification	Estimated Cost (₹. Cr.)	Time-frame
1.	Hatia I – Hatia II ckt-3 132 kV Twin Zebra S/c line(0.05 km)	Due to increased loading in the area reconductoring of this line is required. • Ampacity of Existing conductor – 1388 A • Year of commissioning – 2004 • Ampacity of HTLS conductor – 2400 A	0.13	2027-28
2.	Tamar – Chandil Panther S/c Line(38 km)	Due to increased loading in the area reconductoring of this line is required. • Ampacity of Existing conductor – 374 A • Year of commissioning – before 1990 • Ampacity of HTLS conductor – 1050 A	98.04	2029-30
3.	Chandil – Manique 132 kV Panther S/c line(0.5 km)	Due to increased loading in the area reconductoring of this line is required. • Ampacity of Existing conductor – 374 A • Year of commissioning – before 1990 • Ampacity of HTLS conductor – 1050 A	1.29	2029-30
4.	Chandil – Adityapur 132 kV Panther S/c line(19 km)	Due to increased loading in the area reconductoring of this line is required. • Ampacity of Existing conductor – 374 A • Year of commissioning – before 1990 • Ampacity of HTLS conductor – 1050 A	49.02	2029-30
5.	Japla – Sonenagar 132 kV Panther S/c line(20 km)	Due to increased loading in the area reconductoring of this line is required. • Ampacity of Existing conductor – 374 A • Year of commissioning – before 1990 • Ampacity of HTLS conductor – 1050 A	51.60	2030-31

Sl. No	Name of the Project with scope of work	Justification	Estimated Cost (₹. Cr.)	Time-frame
6.	Deoghar – Jasidih 132 kV Panther D/C line(4 km)	Due to increased loading in the area reconductoring of this line is required. • Ampacity of Existing conductor – 748 A • Year of commissioning – 2021 • Ampacity of HTLS conductor – 2100 A	10.32	2030-31
7.	Kendposi – Noamundi 132 kV Panther S/c line(26 km)	Due to increased loading in the area reconductoring of this line is required. • Ampacity of Existing conductor – 374 A • Year of commissioning – before 1990 • Ampacity of HTLS conductor – 1050 A	67.08	2030-31
8.	Kendposi – Chaibasa(old) 132 kV Panther S/c line(40.5 km)	Due to increased loading in the area reconductoring of this line is required. • Ampacity of Existing conductor – 374 A • Year of commissioning – before 1990 • Ampacity of HTLS conductor – 1050 A	104.49	2030-31
9.	Rajkharsawan – Chaibasa(old) 132 kV Panther S/c line(20 km)	Due to increased loading in the area reconductoring of this line is required. • Ampacity of Existing conductor – 374 A • Year of commissioning – before 1990 • Ampacity of HTLS conductor – 1050 A	51.60	2030-31

8.4. Augmentation of Substations which are required by 2034-35 are listed at Table 8-4 below

Table 8-4 Augmentation of Substations of Jharkhand

S.No	Transmission System	Justification	Estimated Cost (in Rs. Cr.)	Remarks
1.	Augmentation of transformer capacity by replacement of 1x50 MVA ICT with 1x80 MVA at 132/33 kV **Hatia-1 S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 4x50 MVA Augmentation by replacement of 2x50 MVA with 2x80 MVA is under implementation.	10.02	Transformation Capacity by Time frame: **(2027-28):** **3x80+1x50 MVA**
2.	Augmentation of transformer capacity by replacement of 3x150 MVA ICT with 3x200 MVA & 1x200 MVA will be added at **Hatia-II S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 3x150 MVA	62.51	Transformation Capacity by Time frame: **(2028-29) : 4x200 MVA**
3.	Augmentation of transformer capacity by replacement of 1x50 MVA ICT with 1x80 MVA at 132/33 kV **Namkum S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 4x50 MVA Augmentation by replacement of 2x50 MVA with 2x80 MVA is under implementation.	10.02	Transformation Capacity by Time frame: **(2027-28):** **3x80+1x50 MVA**
4.	Augmentation of transformer capacity by addition of 1x80 MVA ICT at 132/33 kV **Kanke S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 3x50 MVA	9.72	Transformation Capacity by Time frame: **(2028-29):** **3x50+1x80 MVA**

5.	Augmentation of transformer capacity by addition of 1x80 MVA ICT at 132/33 kV **Lohardaga S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x80 MVA	9.72	Transformation Capacity by Time frame: **(2029-30):** **3x80 MVA**
6.	Augmentation of transformer capacity by addition of 1x80 MVA ICT at 132/33 kV **Tamar S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x50 MVA	9.72	Transformation Capacity by Time frame: **(2029-30):** **2x50+1x80 MVA**
7.	Augmentation of transformer capacity by replacement of 2x50 MVA ICT with 2x100 MVA at 132/33 kV **Pakur S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x50 MVA	27.34	Transformation Capacity by Time frame: **(2027-28):** **2x100 MVA**
8.	Augmentation of transformer capacity by addition of 1x80 MVA ICT at 132/33 kV **Sahebganj S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x50 MVA	9.72	Transformation Capacity by Time frame: **(2028-29):** **2x50+1x80 MVA**
9.	Augmentation of transformer capacity by addition of 1x80 MVA ICT at 132/33 kV **Rajmahal S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x50 MVA	9.72	Transformation Capacity by Time frame: **(2028-29):** **2x50+1x80 MVA**
10.	Augmentation of transformer capacity by replacement of 2x50 MVA with 2x80 MVA ICT at 220/132/33 kV **Godda S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x150+2x50 MVA	20.04	Transformation Capacity by Time frame: **(2029-30):** **2x150+2x80 MVA**
11.	Augmentation of transformer capacity by replacement of 1x100 MVA with 1x200 MVA ICT & 1x20 MVA with 1x 80 MVA & further addition of 1x200 MVA at	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required.	41.13	Transformation Capacity by Time frame: **(2027-28):** **2x200+2x50**

	220/132/33 kV **Lalmatia S/s**	Existing transformer capacity: 1x100+2x50+1x20 MVA		**+1x80 MVA**
12.	Augmentation of transformer capacity by replacement of 4x100 MVA with 4x200 MVA ICT at 220/132 kV **Chandil(old) S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 4x100 MVA	62.8	Transformation Capacity by Time frame: **(2029-30):** **4x200 MVA**
13.	Augmentation of transformer capacity by replacement of 4x50 MVA with 4x80 MVA ICT at 132/33 kV **Adityapur-1 S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 4x50 MVA	40.08	Transformation Capacity by Time frame: **(2028-29):** **4x80 MVA**
14.	Augmentation of transformer capacity by replacement of 3x50 MVA with 3x100 MVA ICT at 132/33 kV **Golmuri S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 3x50 MVA	41.01	Transformation Capacity by Time frame: **(2028-29):** **3x100 MVA**
15.	Augmentation of transformer capacity by replacement of 1x20 MVA with 1x80 MVA ICT at 132/33 kV **Jadugoda S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x50+1x20 MVA	10.02	Transformation Capacity by Time frame: **(2029-30):** **2x50+1x80 MVA**
16.	Augmentation of transformer capacity by addition of 1x80 MVA at 132/33 kV **Surda S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x50 MVA	9.72	Transformation Capacity by Time frame: **(2033-34):** **2x50+1x80 MVA**

17.	Augmentation of transformer capacity by replacement of 2x20 MVA with 2x80 MVA ICT at 132/33 kV **Japla S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x20 MVA	20.04	Transformation Capacity by Time frame: **(2029-30):** **2x80 MVA**
18.	Augmentation of transformer capacity by addition of 1x200MVA at 220/132 kV **Garhwa New(Bhagodih) S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x150 MVA	15.7	Transformation Capacity by Time frame: **(2029-30):** **2x150+1x200 MVA**
19.	Augmentation of transformer capacity by addition of 1x500 MVA at 400/220 kV **Latehar(New) S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x315 MVA	15.7	Transformation Capacity by Time frame: **(2030-31):** **2x315+1x500 MVA**
20.	Augmentation of transformer capacity by replacement of 2x50 MVA with 2x80 MVA ICT at 132/33 kV **Itkhori(Chatra) S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x150+2x50 MVA	20.04	Transformation Capacity by Time frame: **(2030-31):** **2x150+2x80 MVA**
21.	Augmentation of transformer capacity by addition of 1x80 MVA at 132/33 kV **Saria S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x50 MVA	10.02	Transformation Capacity by Time frame: **(2028-29):** **2x50+1x80 MVA**
22.	Augmentation of transformer capacity by addition of 1x500 MVA at 400/220 kV **Patratu New S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x315 MVA	33.24	Transformation Capacity by Time frame: **(2029-30):** **2x315+1x500 MVA**

23.	Augmentation of transformer capacity by replacement of 2x50MVA with 2x100 MVA at 220/132/33 kV Extension of **Patratu New S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x200+2x50 MVA	27.34	Transformation Capacity by Time frame: **(2031-32):** **2x200+2x100 MVA**
24.	Augmentation of transformer capacity by addition of 1x80 MVA at 400/220/132/33 kV **Koderma S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x500+2x160+2x50 MVA	9.72	Transformation Capacity by Time frame: **(2031-32):** **2x500+2x160 +2x50+1x80 MVA**
25.	Augmentation of transformer capacity by addition of 1x80 MVA at 220/132/33 kV **Hazaribag S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x200+2x50 MVA	9.72	Transformation Capacity by Time frame: **(2032-33):** **2x200+2x50 +1x80 MVA**
26.	Augmentation of transformer capacity by replacement of 2x150MVA with 2x200 MVA + Augmentation of transformer capacity by addition of 1x200MVA & replacement of 2x50MVA with 2x100 MVA at 220/132/33 kV Extension of **Jasidih S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x150+2x50 MVA	58.74	Transformation Capacity by Time frame: **(2029-30):** **3x200+2x100 MVA**
27.	Augmentation of transformer capacity by addition of 1x80 MVA at 220/132/33 kV **Giridih S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x150+2x50 MVA	9.72	Transformation Capacity by Time frame: **(2029-30):** **2x150 +2x50+1x80 MVA**
28.	Augmentation of transformer capacity by	To cater the future load demand and to satisfy N-1	9.72	Transformation Capacity by Time frame:

	addition of 1x80 MVA at 132/33 kV **Jamua S/s**	contingency criteria the Augmentation is required. Existing transformer capacity: 2x50 MVA		**(2028-29):** **2x50+1x80 MVA**
29.	Augmentation of transformer capacity by replacement of 1x20MVA with 1x80 MVA at 132/33 kV **Jamtara S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 1x20+2x50 MVA	10.02	Transformation Capacity by Time frame: **(2027-28):** **2x50+1x80 MVA**
30.	Augmentation of transformer capacity by replacement of 1x20 MVA with 1x80 MVA at 132/33 kV **Chitra S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 1x20+1x50 MVA	10.02	Transformation Capacity by Time frame: **(2028-29):** **1x50+1x80 MVA**
31.	Augmentation of transformer capacity by replacement of 2x20 MVA with 2x50 MVA at 132/33 kV **Chakradharpur Old S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x20 MVA	11.5	Transformation Capacity by Time frame: **(2029-30):** **2x50 MVA**
32.	Augmentation of transformer capacity by replacement of 2x20 MVA with 2x80 MVA at 132/33 kV **Kendposi S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x20 MVA	20.04	Transformation Capacity by Time frame: **(2029-30):** **2x80 MVA**
33.	Augmentation of transformer capacity by replacement of 2x20 MVA with 2x80 MVA at 132/33 kV **Goelkera S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x20 MVA	20.04	Transformation Capacity by Time frame: **(2029-30):** **2x80 MVA**
34.	Augmentation of transformer capacity by replacement of 1x25 MVA with 1x80 MVA at	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required.	10.02	Transformation Capacity by Time frame:

	132/33 kV **Chaibasa(old) S/s**	Existing transformer capacity: 1x25+1x50 MVA		**(2029-30):** **1x50+1x80 MVA**
35.	Augmentation of transformer capacity by replacement of 2x150 MVA with 2x200 MVA & addition of 1x200 MVA at 220/132/33 kV **Chaibasa New(Ulijhari) S/s**	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing transformer capacity: 2x150+2x50 MVA	41.7	Transformation Capacity by Time frame: **(2029-30):** **3x200+2x50 MVA**

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

8.6. Low loading has been observed at existing and under construction transmission lines. The state may take-up the above planned projects in commensurate to the demand in the area.

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

9.1. Options being explored in ISTS

9.1.1. The existing ISTS system in Jharkhand seems sufficient to draw required power from outside the state. However, the requirement of Inter-state transmission system (ISTS) in Jharkhand would be identified after the study of complete transmission system including neighbouring states and GNA quantum indicated by the state.

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.	Amarpara 132/33 kV	50 MVAr Capacitor
2.	Barhait 132/33 kV	50 MVAr Capacitor
3.	Barharwa 132/33 kV	50 MVAr Capacitor
4.	Daltonganj 132/33 kV	25 MVAr Capacitor

5.	Lalmatia 132/33 kV	50 MVAr Capacitor
6.	Noamundi 132/33 kV	20 MVAr Capacitor
7.	Rajmahal 132/33 kV	50 MVAr Capacitor
8.	Sahebganj 132/33 kV	50 MVAr Capacitor
9.	Chas-ITI 132/33 kV	50 MVAr Capacitor
10.	Chitra 132/33 kV	50 MVAr Capacitor
11.	CKP-New 132/33kV	50 MVAr Capacitor
12.	Dalbhumgarh 132/33kV	50 MVAr Capacitor
13.	Deoghar 132/33kV	50 MVAr Capacitor
14.	Garhwa-OLD 132/33kV	50 MVAr Capacitor
15.	Gumla 132/33kV	50 MVAr Capacitor
16.	Jadugoda_old 132/33kV	50 MVAr Capacitor
17.	Jamtara 132/33kV	50 MVAr Capacitor
18.	Japla 132/33kV	50 MVAr Capacitor
19.	Kendposi 132/33kV	50 MVAr Capacitor
20.	Kolebera 132/33kV	50 MVAr Capacitor
21.	Kundhit 132/33kV	50 MVAr Capacitor
22.	Mahuda 132/33kV	50 MVAr Capacitor
23.	Rajkharsawan 132/33kV	50 MVAr Capacitor
24.	Sarath 132/33kV	50 MVAr Capacitor
25.	Silli 132/33kV	50 MVAr Capacitor
26.	Simdega 132/33kV	50 MVAr Capacitor
27.	Ghato 132/33kV	50 MVAr Capacitor
28.	Binod Bihari 132/33kV	50 MVAr Capacitor
29.	Maithon – A 400/220 kV	112 MVAr Reactor
30.	Maithon – A 400/220 kV	112 MVAr Reactor

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

11.1. A total of 20420 MVA transformation capacity addition/augmentation and 4069.55 ckm of new transmission lines/reconductoring of old lines at an estimated cost of Rs 8205.24 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. 400 kV Transmission system

S.No	Transmission system	No.	Length (in ckm)	Capacity (in MVA)	Estimated Cost (Rs. Cr.)*
1.	New substation	4		3590	883.021
2.	Augmentation of existing substation	2		580	42.96
3.	New transmission line	5	734		1340.16
4.	Reconductoring of transmission line	-	-	-	-

11.1.2. 220 kV Transmission system

S.No	Transmission system	No.	Length (in ckm)	Capacity (in MVA)	Estimated Cost (Rs. Cr.)*
1.	New substation	7		2960	906.91
2.	Augmentation of existing substation	11		4120	354.78
3.	New transmission line	10	784		543.37
4.	Reconductoring of transmission line	-	-	-	-

11.1.3. **132 kV Transmission system**

S.No	Transmission system	No.	Length (in ckm)	Capacity (in MVA)	Estimated Cost (Rs. Cr.)*
1.	New substation	14		2240	1049.3
2.	Augmentation of existing substation	22		2760	348.59
3.	New transmission line	29	1786	-	1118.81
4.	Reconductoring of transmission line	9	172.05		433.57

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)	Estimated Cost (in Rs. Cr.)
	132 kV	220 kV	400 kV	132 kV	220 kV	400 kV	132 kV	
2026-27	-	-	-	-	-	-	-	-
2027-28	440	1040	2350	324	116	102	0.05	1266.298
2028-29	1500	2720	1000	410	448	360	-	2401.326
2029-30	2340	2840	500	812	220	222	57.5	2434.467
2030-31	320	200		90			114.5	450.07
2031-32		200	320			50	-	209.48
2032-33		80					-	9.72
2033-34	80						-	9.72
2034-35	320			150			-	240.39
Total	**5000.0**	**7080.0**	**4170.0**	**1786.0**	**784.0**	**734.0**	**172.1**	**7021.5**

12. Conclusion

12.1. By the year 2034-35, the power demand of Jharkhand would be increasing significantly. Total expected demand of Jharkhand by the year 2034-35 is around 6800 MW. This anticipated increase in demand includes the expected industrial load coming progressively from 2024-25 to 2034-35.

12.2. About 2 Nos. of Thermal power projects and 4 Nos. of 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 thermal generation and for drawal of power from ISTS in accordance with GNA

requirement of Jharkhand 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 Jharkhand 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 Jharkhand 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 Jharkhand 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 16250 MVA transformation capacity addition/augmentation and 3476.10 ckm of new transmission lines/reconductoring at an estimated cost of ₹ 7021.5 cr. would be required for implementing the intra-state transmission proposals for meeting the electricity demand of the state by the year 2034-35.

12.9. As loading on some existing/under implementation elements expected to quite low, the state may examine the possibility of load shifting and taking up new elements commensurate to the demand in the area.

12.10. To ensure reliable and adequate power supply in Jharkhand 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 Jharkhand SLDC.

a) Jharkhand SLDC has observed overloading (i.e. >80% of rated capacity) in following Sub-stations in base case scenario.

S. No.	Sub-station	Present capacity(in MVA)	Peak load(in MW)
1.	Daltonganj	100	80
2.	Hatia-2	450	375
3.	Pakur	100	85

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

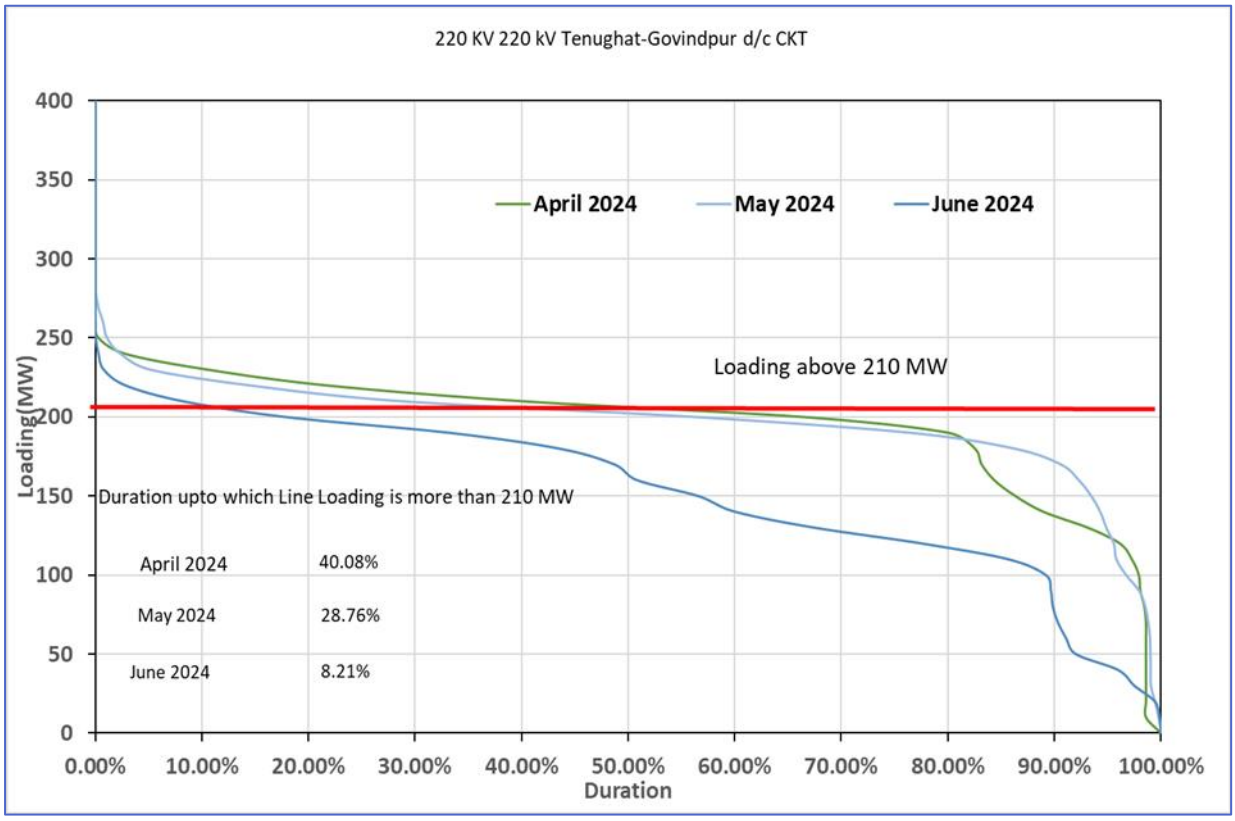
S.No.	Name of transmission line
1.	132 KV D/C Madanpur(Dumka)-Pakur T/L.
2.	132 KV D/C Ramchandrapur-Adityapur T/L
3.	132 KV Rajkharswan-Chandil S/C T/L
4.	132 KV Rajkharswan-Adityapur S/C T/L
5.	132 KV Chaibasa-Goilkera S/c T/L
6.	132 KV D/C Chaibasa-Manoharpur T/L
7.	220 KV D/C Dumka-Jasidih T/L
8.	220 KV D/C Maithon-Dumka T/L
9.	220 KV D/C Tenughat-Govindpur T/L
10.	132 KV S/C Hatia2-Hatia1 3rd Ckt
11.	132 KV S/C Maithon-Jamtara T/L
12.	132 KV S/C Lalmatia-Kahalgaon(NTPC) T/L
13.	220 KV D/C Maithon-Dumka T/L
14.	220 KV S/C Daltonganj(PG)-Latehar T/L

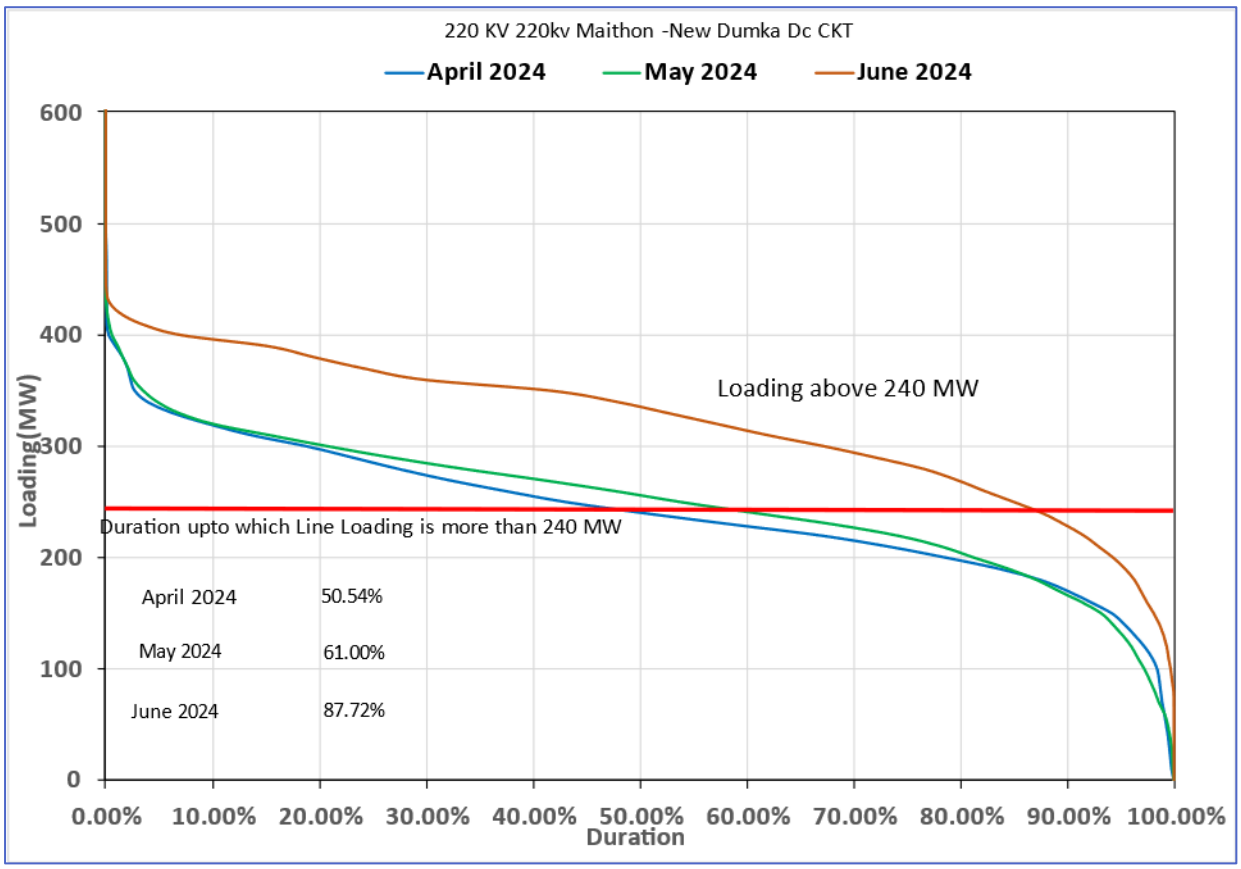
Annexure-II

Operational feedback from ERLDC/NLDC

A. Constraints in Transmission Lines in Jharkhand 220 kV and above system

Sl. No	Corridor	Season/ Antecedent Conditions	Actions to be taken
1	220 kV Tenughat (JUSNL) – Govindpur (JUSNL) D/C	High generation of Tenughat unit Outage of Biharshariff-Tenughat S/C	1. LILO of one ckt of 220kV Dumka-Govindpur at Dhanbad and other ckt at Baliyapur with 220kV Dhanbad-Baliapur D/C (under construction). As per the latest status the said work is under progress and project is expected to be completed by Dec 2025. 2. 220kV Teughat-Gomia D/C and 220kV Tenughat-Hazaribagh D/C (under construction) will provide alternate paths for power evacuation from Tenughat. As per the latest status work is under progress and project is expected to be completed by Dec 2026.
2	220 kV Maithon (PG) - New Dumka (JUSNL) D/C	High loading Jharkhand area and outage of 220 kV Farakka Lalmatia S/C	1. Early restoration of 220 kV Farakka Lalmatia S/C is required for decongesting 220 kV Maithon Dumka D/C. 2. LILO of 220 kV Dumka-Govindpur at 400/220 kV Dhanbad needs to be expedited. The LILO work is expected to be completed by Dec-2025.


220 KV 220 kV Tenughat-Govindpur d/c CKT
April 2024
May 2024
June 2024
Loading above 210 MW
Loading(MW)
Duration upto which Line Loading is more than 210 MW
April 2024 40.08%
May 2024 28.76%
June 2024 8.21%
Duration


220 KV 220kv Maithon -New Dumka Dc CKT
April 2024
May 2024
June 2024
Loading above 240 MW
Loading(MW)
Duration upto which Line Loading is more than 240 MW
April 2024 50.54%
May 2024 61.00%
June 2024 87.72%
Duration

B. ICT constraints in Jharkhand system

Sl. No	ICT	Season/ Antecedent Conditions	Actions to be taken
NIL			

C. Low voltage issues in Jharkhand system

Sl. No	Nodes	Season/ Antecedent Conditions	Actions to be taken
NIL			

Annexure-III

TRANSMISSION SYSTEM OF JHARKHAND BY THE YEAR 2034-35