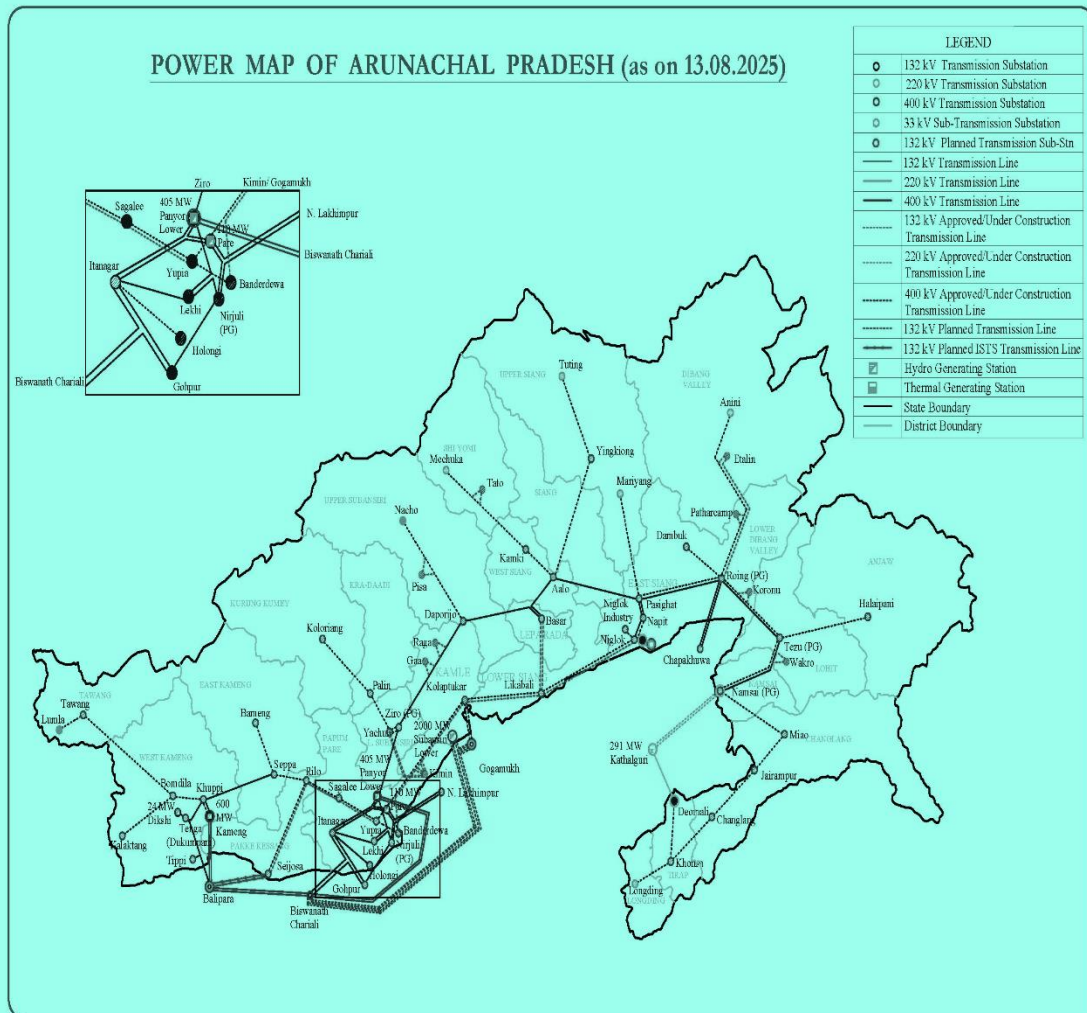




REPORT ON INTRA STATE TRANSMISSION RESOURCE ADEQUACY PLAN FOR ARUNACHAL PRADESH BY THE YEAR 2034-35



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 Arunachal Pradesh 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 Arunachal Pradesh, 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 of Arunachal Pradesh in 2024-25 was 218 MW, and Projected Peak Demand by 2034-35 is estimated to 826, which is higher than the Electric Power Survey report. The peak demand is estimated considering the alloy industrial load at Niglok area and construction power to various upcoming hydro projects. Further, existing Intra-state Installed generation Capacity in the state is about 31.5 MW and state has planned 224 MW of hydro plant by 2034-35. Presently, the state has total 572 ckm of 132 kV, 19 ckm of 220 kV transmission lines. It has transformation capacity of 341 MVA at 132 kV, 100 MVA at 220 kV level.

Considering the anticipated demand including construction power for new hydro projects, generation capacity, demand pattern, operational feedback from NERLDC and SLDC, system studies have been conducted for High Hydro and Low Hydro scenarios for the timeframe 2031-32 & 2034-35 in consultation with Arunachal Pradesh, CTUIL and Grid-India. Based on the studies, the requirement of transmission system by the year 2034-35 has been identified.

A total of 1103 MVA transformation capacity addition/augmentation and 846.5 ckm of new transmission lines/reconductoring of old lines at an estimated cost of ₹ 1608.87 Crs. 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 recommended proposals is given below:

Financial Year	MVA Capacity Addition	ckm Addition	Reconductoring (ckm)	Estimated Cost (in ₹ Cr.)

	132 kV	220 kV	132 kV	220 kV	132 kV	
2026-27	160	-	5.3	-	101.5	144.68
2027-28	403	-	102.7	-	-	471.04
2028-29	20	500	214	10	-	499.31
2029-30	20	-	413	-	-	493.84
Total	603	500	735	10	101.5	1608.87

To ensure reliable and adequate power supply in Arunachal Pradesh by 2034-35, substantial investments and infrastructure upgrades are essential. With a projected demand of 826 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 Arunachal Pradesh by the year 2034-35

1. Demographics

Arunachal Pradesh, situated in the extreme North-East of India and it is the largest state of the Region. The state remains as a hidden treasure of minerals and natural resources till today. Arunachal Pradesh, known for its pristine natural beauty and rugged terrain, holds immense potential in the field of hydropower.

2. Electricity profile of state

2.1. Power generation-demand scenario of state:

2.1.1. In the FY 2024-25, Arunachal Pradesh had peak power demand of 218 MW and total energy requirement of 1050 MU. As on 31.07.2024, state has central sector allocation of 628.42 MW which is majorly from hydro. In addition, the state has state sector installed capacity of 116.61 MW and private sector installed capacity of 38.54 MW. The per capita consumption of the state is 651 kWh in the year 2022-23.

2.1.2. Peak demand & Energy of Arunachal Pradesh state is given at Table 2-1 below

Table 2-1 Peak demand & Energy of Arunachal Pradesh

Financial Year	Peak Demand(MW)	Energy(MU)
2018-19	150	869
2019-20	158	753
2020-21	158	719
2021-22	197	875
2022-23	167	915
2023-24	186	1014
2024-25	218	1050

Source: Power Supply Position Report, CEA

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

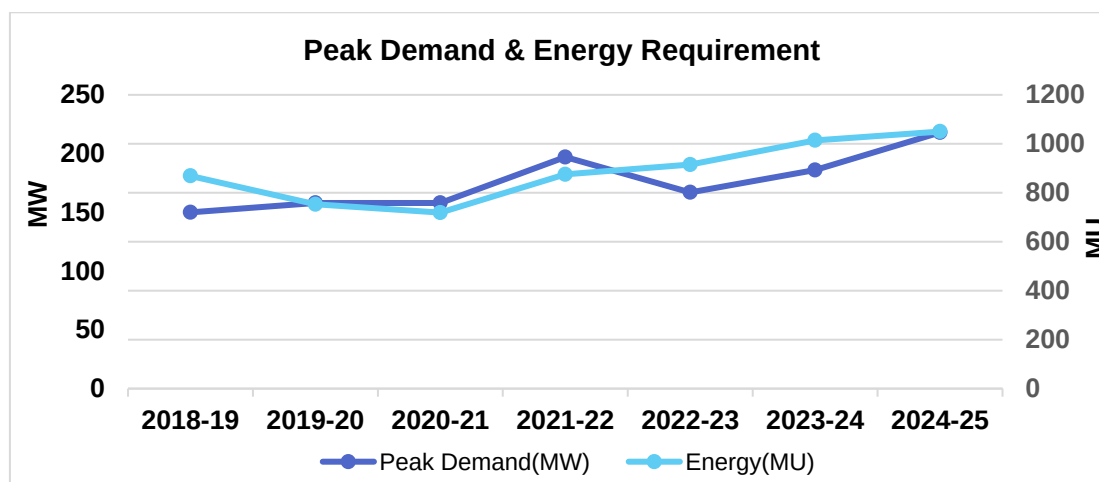


Figure 2-1 Energy requirement

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

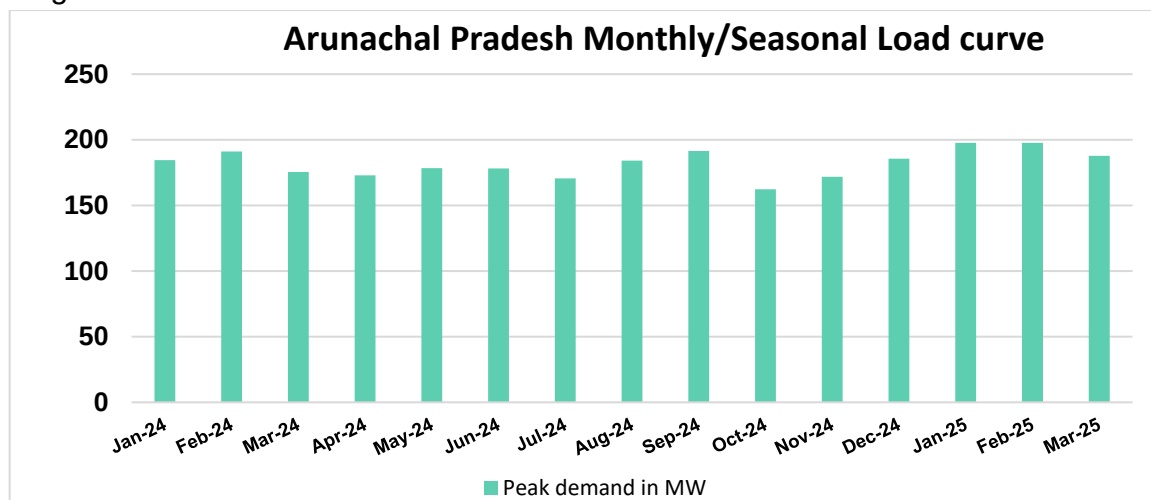


Figure 2-2 Seasonal Load Curve

2.1.5. Daily peak generally occurs in the evening period. The graph indicating of Hourly Load variation in the FY 2024-25 is given at Figure 2-3 below:

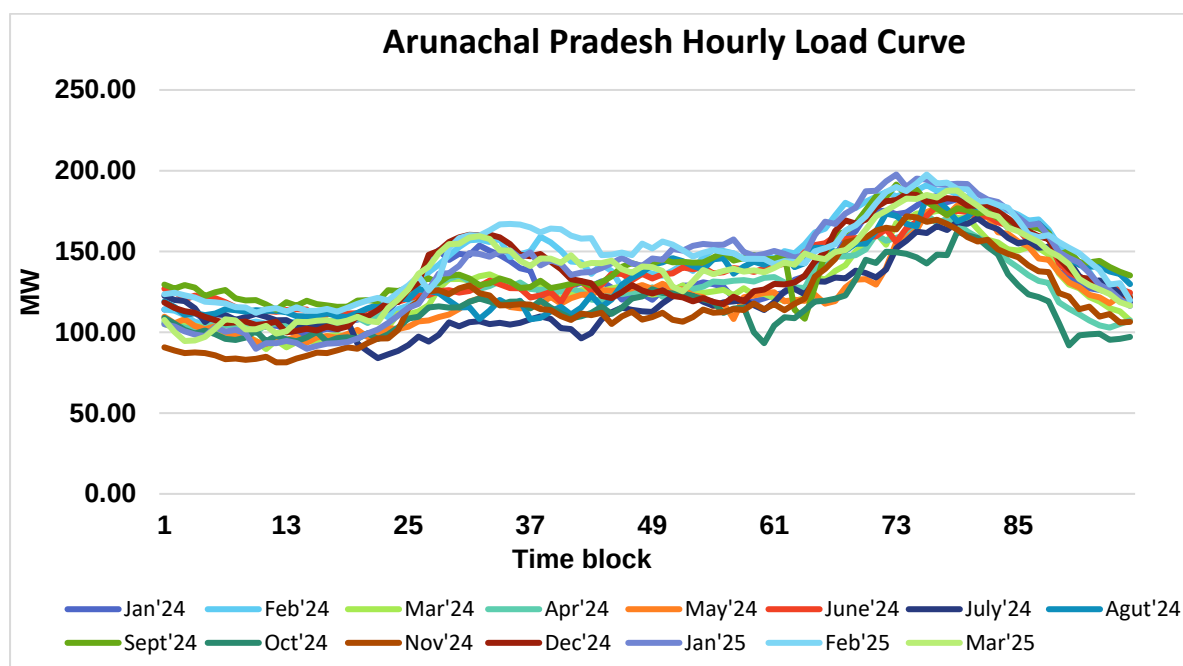


Figure 2-3 Hourly Load Curve

2.1.6. Contracted capacity (MW) by Arunachal Pradesh as on March-2025 is given at Table 2-2 below:

Table 2-2 Contracted capacity by Arunachal Pradesh

(all fig. in MW)

SECTOR	HYDRO	THERMAL					NUC LEAR	R.E.S. (MNRE)	TOTAL
		COAL	LIGNITE	GAS	DIESEL	TOTAL			
State	0	0	0	0	0	0	0	116.61	116.61

Private	0	0	0	0	0	0	0	38.85	38.85
Central allocation	544.55	37.05	0	46.82	0	83.87	0	0	628.42
Total	544.55	37.05	0	46.82	0	83.87	0	155.46	783.88
%	69.5%	4.7%	0.0%	6.0%	0.0%	10.7%	0.0%	19.8%	100.0%

Source: Installed Capacity Report, CEA

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

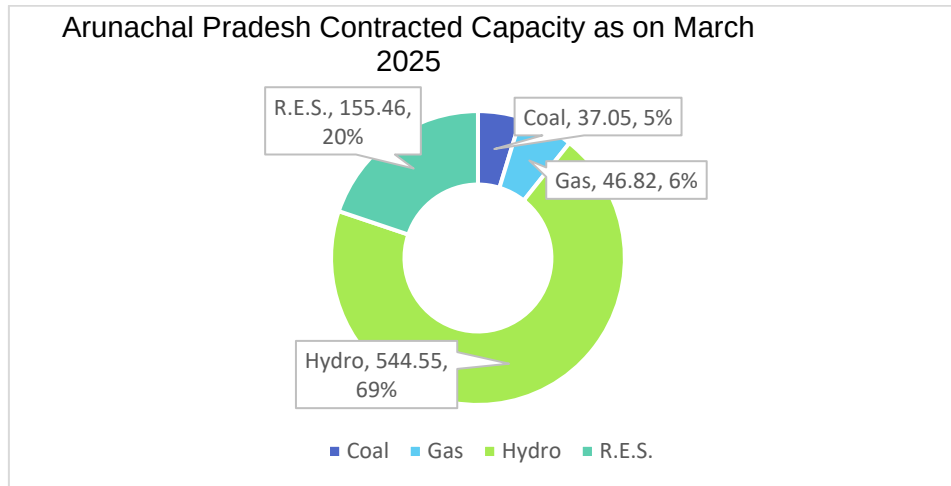


Figure 2-4 Contracted Capacity

2.1.8. As on March 2025, the General Network Access (GNA) quantum for ISTS drawal of the state is 225 MW and Available Transfer Capability (ATC) for FY 2024-25 is 210 MW.

3. Existing Transmission System

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

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

3.1.1. Intra State Transmission assets of Arunachal Pradesh state in past four years is given at Table 3-1 below

Table 3-1 Intra State Transmission assets in Arunachal Pradesh

Financial Year	Voltage (kV)	Transmission lines (ckm)	Substation (MVA)
2018-19	132	396	182
	220	19	100
	Total	415	282
2019-20	132	450	182
	220	19	100
	Total	469	282
2020-21	132	450	192
	220	19	100
	Total	469	292
2021-22	132	450	208
	220	19	100

Financial Year	Voltage (kV)	Transmission lines (ckm)	Substation (MVA)
	Total	469	308
2022-23	132	450	223
	220	19	100
	Total	469	323
2023-24	132	462	223
	220	19	100
	Total	481	323
2024-25	132	572	341
	220	19	100
	Total	591	441

Arunachal Pradesh state has total 572 ckm of 132 kV & 19 ckm of 220 kV transmission line and 341 MVA of 132 kV & 100 MVA of 220 kV Substation capacity in Intra-state transmission system.

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

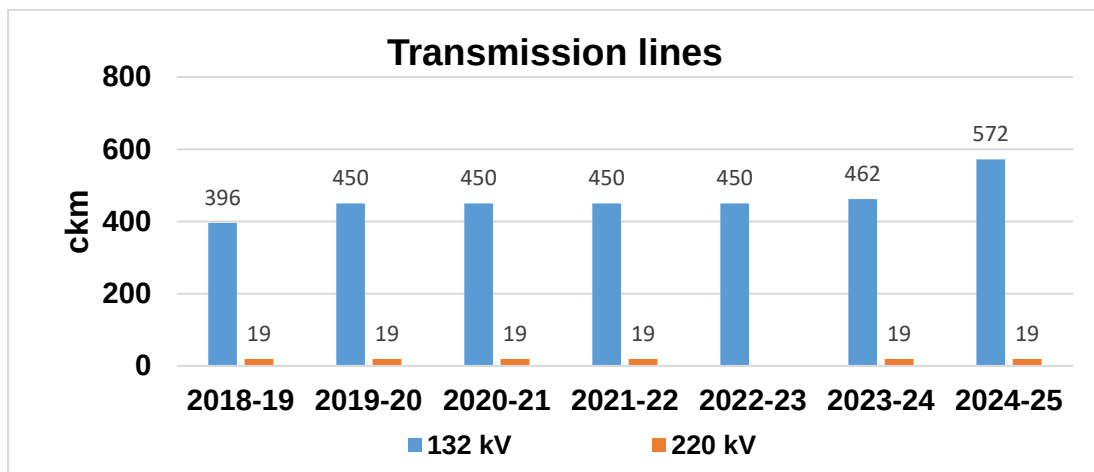


Figure 3-1 Existing Transmission Line

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

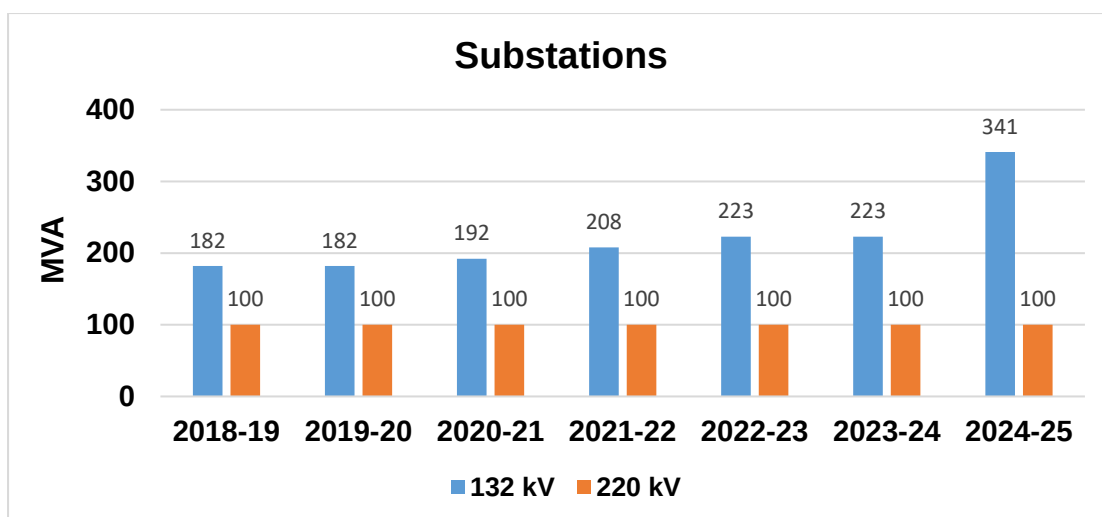


Figure 3-2 Existing Substations

3.2. Existing Inter State Transmission system in the state:

- 3.2.1. The state has five Nos. of 132/33 kV ISTS substations, having total capacity of 205 MVA at Roing, Tezu, Namsai, Ziro and Nirjuli. Further, state has a 220/132 kV, 320 MVA ISTS substation at Namsai.
- 3.2.2. State has total 1811 ckm of existing ISTS network and 1322 ckm of planned / under construction ISTS network. Brief details of the ISTS network (including ISTS lines owned by states) are given at Table 3-2:

Table 3-2 Existing ISTS in Arunachal Pradesh

Voltage level	Existing
132 kV	654 ckm + 32 ckm (ISTS line owned by state)
220 kV	150 ckm + 19 ckm (ISTS line owned by state)
400 kV	1106 ckm
Total	1961 ckm (including 51 ckm ISTS line owned by state)

4. Under implementation Transmission System

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

The summary of under implementation Intra-state transmission system in Arunachal Pradesh are given at below:

Voltage (kV)	Transmission lines (ckm)	Substations (MVA)
132	1515	541

4.2. Detailed of under implementation and planned ISTS system in Arunachal Pradesh (as on March, 2025) are as given below:

4.2.1. Under Construction ISTS: RTM Mode

- i. **NER-NR/WR Interconnector-I:** Major portion of the scheme has been commissioned.

- Lower Subansiri – Biswanath Chariyali 400 kV 2xD/c (Twin Lapwing) line: Matching with Lower Subansiri (2000MW) HEP. One no. D/c line-I Commissioned in 31-03-2023.

(The 2nd D/c line is completed and antitheft charged on 24-03-2024. DOCO petition filed in CERC. First hearing scheduled in July'24.)

ii. NERES-XXIII: 14th Dec 2026

- Stringing of 2nd circuit of Pasighat (Arunachal Pradesh) – Roing (POWERGRID) 132 kV S/c on D/c line with ACSR Panther conductor commensurate with rating and maximum operating temperature of 1st circuit: 103 km
- Stringing of 2nd circuit of Roing (POWERGRID) – Tezu (POWERGRID) 132 kV S/c on D/c line with ACSR Panther conductor commensurate with rating and maximum operating temperature of 1st circuit: 73 km
- Stringing of 2nd circuit of Tezu (POWERGRID) – Namsai (POWERGRID) 132 kV S/c on D/c line with ACSR Panther conductor commensurate with rating and maximum operating temperature of 1st circuit: 95.24km
- Extension at Pasighat (DoP, Arunachal Pradesh): 1 No. 132 kV AIS line bay for termination of 2nd circuit of Pasighat (Arunachal Pradesh) – Roing (POWERGRID) 132 kV D/c line
- Extension at Roing (POWERGRID) S/s: 2 Nos. 132 kV AIS line bay for termination of 2nd circuit of Pasighat (Arunachal Pradesh) – Roing (POWERGRID) 132 kV D/c line and 2nd circuit of Roing (POWERGRID) – Tezu (POWERGRID) 132 kV D/c line.
- Extension at Tezu (POWERGRID) S/s: 2 Nos. 132 kV AIS line bay for termination of 2nd circuit of Roing (POWERGRID) – Tezu (POWERGRID) 132 kV D/c line and 2nd circuit of Tezu (POWERGRID) – Namsai (POWERGRID) 132 kV D/c line
- Extension at Namsai (POWERGRID) S/s: 1 No. 132 kV AIS line bay for termination of 2nd circuit of Tezu (POWERGRID) – Namsai (POWERGRID) 132 kV D/c line.

4.2.2. Under Construction ISTS: TBCB Mode

i. NERES-XVI: M/s NERES XVI Power Transmission Limited, a subsidiary of M/s Techno Electric and Engineering Company Limited (TEECL) 30th Nov 2026 (only Arunachal Pradesh portion)

- Extension works at Gerukamukh (Arunachal Pradesh) 132 kV S/s
 - 2 Nos. of 132 kV line bays for termination of Gogamukh (ISTS) – Gerukamukh (Arunachal Pradesh) 132kV D/c line
- Gogamukh (ISTS) – Gerukamukh (Arunachal Pradesh) 132 kV ACSR Zebra D/c line

- LILO of one D/c (ckt-1 & ckt-2 of line-1) of Lower Subansiri – Biswanath Chariali 400 kV (Twin Lapwing) 2xD/c lines at Gogamukh S/s

5. System operator feedback:

- 5.1. The operational constraint faced in the Intra-state transmission network by Arunachal Pradesh 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 NERLDC 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 Arunachal Pradesh 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 (%)
<i>Actual Peak</i>	2024-25	218	
<i>As per 20th EPS</i>	2025-26	211	-3.21
	2026-27	223	1.14
	2027-28	234	2.39
	2028-29	246	3.07
	2029-30	259	3.51
	2030-31	271	3.69
<i>State Estimated Peak electricity demand</i>	2031-32	778	19.93
	2034-35	826	14.25

6.2. Industrial Demand:

- 6.2.1. The following Alloy industries are expected to come progressively from 2024-25 in Niglok area.

- Ather Alloy (36 MW),
- Alloy Craft Industry (30 MW)
- Arunachal Ferro Alloy (90 MW)

- 6.2.2. In addition to above, the construction power requirements for various upcoming hydro projects in Arunachal Pradesh have also been considered. The details of construction power requirement are given at Table 6-2 below :

Table 6-2 Construction Power Requirements for various upcoming hydro projects in Arunachal Pradesh

S.No.	Name of Hydro Plant	Installed Capacity (in MW)	Maximum Construction Power requirement (in MW)
1.	Tato-I HEP	186	16
2.	Tato-II HEP	700	

3.	Heo HEP	240	
4.	Naying HEP	1000	
5.	Etalin HEP	3097	20
6.	Attunli HEP	680	9
7.	Kalai-II HEP	1200	9
8.	Dibang HEP	2880	50
9.	Kamala HEP	1720	29
10.	U.Subansiri HEP	1605	30

6.3. The following Parameters were considered during the study

6.3.1. The total intra state generation installed capacity is 255.6 MW by the year 2034-35. The details of existing and upcoming generation (to be connected at 132 kV voltage level) is given at Table 6-3 and Table 6-4 respectively below:

Table 6-3 Existing Intra-state generation

S.No.	Name of Generating Plant	Type	Installed Capacity (MW)	Location
1.	Dikshi	Hydro	24	West Kameng
2.	Khangtheng	Hydro	7.5	Tawang

Table 6-4 Upcoming intra-state generation

S. No.	Name of generating plant	Installed capacity (MW)	Location	Time frame considered for the study
1.	Kamalang	24.6 (3x8.20)	Lohit	2027-28
2.	Pareng	14.5	Papumpare	2027-28
3.	Palsi	24 (3x8)	Upper Siang	2027-28
4.	Keyi	23 (2x11.5)	Keyi Panyor	2027-28
5.	Khuitam	66 (3x22)	West Kameng	2027-28
6.	Panyor Lepa	21 (3x7)	Keyi Panyor	2027-28
7.	Halaipani	16	Anjaw	2027-28
8.	Dengzi	10	West Kameng	2027-28
9.	Nyikgong	13	Upper Siang	2027-28
10.	Ressing	12	Papumpare	2027-28

6.3.2. Peak Demand: 778 MW (including 498 MW non-scalable industrial demand) by the year 2031-32 and 826 MW (including 498 MW non-scalable industrial demand) by 2034-35.

6.3.3. Scenario of Study:

S.No.	Scenario	Demand Factor	Dispatch Factors
1.	Low Hydro	100%	Hydro Plant: 20%
2.	High Hydro	100%	Hydro Plant: 90%

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 the operational feedback from Arunachal Pradesh SLDC and NERLDC, as well as the provisions in the Manual on Transmission Planning Criteria, 2025, studies were conducted to identify the state's transmission system requirements. New elements/ augmentations detailed in Paragraph 8 are proposed to keep the system parameters within limits during base case and contingency scenarios.

Taking into account of identified system and related assumptions the import/export on tie lines by the year 2031-32 are presented at Table 7-1 below:

Table 7-1 Study results for the timeframe of 2031-32

Parameter↓ / Scenario→	Low hydro	High hydro
Generation despatch (intra-state + ISGS located in state) (in MW)	2340	10529
Demand (in MW)	776	779
Net interchange ((-)import / (+)export) at ISTS-STU periphery (in MW)	-729	-566

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 timeframe of 2034-35

Parameter↓ / Scenario→	Low hydro	High hydro
Generation despatch (intra-state + ISGS located in state) (in MW)	5208	23534
Demand (in MW)	826.1	825.7
Net interchange ((-)import / (+)export) at ISTS-STU periphery (in MW)	-777	-613

- 7.2. The peak demand with Low hydro scenario was found to be critical scenario during the system studies.
- 7.3. The line flows and voltage were within permissible limits as mentioned in the Manual on Transmission Planning Criteria, 2025 in the critical as well as other scenario after modelling the required additional transmission system by 2031-32 & 2034-35.
- 7.4. The planned transmission system of the state is N-1 contingency criteria compliant. The planned system addresses all the constraints in the Intra-state transmission as mentioned by Arunachal Pradesh SLDC and NERLDC listed at **Annexure-I** and **Annexure-II** respectively.

- 7.5. According to CEA's generation recourse adequacy report for Arunachal Pradesh (2031-32), Arunachal Pradesh is likely to witness energy deficit of 35.4 MUs only in 2023-24 with the existing and planned capacity addition. As per the study, in order to meet the above deficit Arunachal Pradesh has to contract 18 MW of Short Term power through market. The contracted hydro capacity of Arunachal Pradesh for the year 2031-32 is 904 MW. However, the hydro capacity required to meet the demand reliably in 2031-32 is 467 MW. The balance hydro capacity of 437 MW is likely to be available as surplus and may be traded with other states.
- 7.6. The agreed system by the year 2031-32 & 2034-35 was modelled and studied considering the N-1 contingency criteria and no constraints were observed in transmission system of Arunachal Pradesh taking into account additional contracted capacity requirement as mentioned in para above. Hence, the transmission system as planned by 2031-32 & 2034-35 (including new schemes identified in this report) ensures Transmission Resource Adequacy.
- 7.7. The construction power requirements for various upcoming hydro projects have also been considered. Since construction power will only be required for few years, full reliability of the system has not been considered.

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 Arunachal Pradesh

S.No	Transmission System	Justification	Estimated Cost (in Rs. Cr.)	Remarks
1.	i. Establishment of new 2x200 + 2x50 MVA, 220/132/33 kV S/s at Niglok (Arp)	To cater the industrial load at Niglok and to avoid overloading of InSTS systems.	139.75	Time frame: 2028-29
	ii. Niglok (Arp)- Niglok (ISTS) 220 kV D/c line (10 ckm) alongwith 2 Nos. of associated bays at Niglok		32.75	
2.	i. Establishment of new 132/33 kV, 2x10 MVA S/s at Kimin (Papum Pare)	The length of existing 33 kV distribution line feeding Kimin area is around 47 km and the area faces frequent trippings, voltage/power quality issues etc.	55.96	Time frame: 2028-29
	ii. LILO of Yupia - Gerukamukh 132 kV S/c line at 132/33 kV Kimin S/s. (7.5 km loop in and 7.5 km loop out.)		25.87	
	iii. 2 nd circuit stringing of Gerukamukh – Yupia – Banderdewa 132 kV line	The proposed Kimin S/s would improve reliability and power quality issues in the area.	26.54	

	(bypassed at Yupia) (84 ckm) alongwith associated bays at Gerukamukh & Banderdewa S/s			
	iv. LILO of Gerukamukh – Banderdewa (bypassed at Yupia) 132 kV D/c line at 132/33 kV Kimin S/s. (7.5 km loop in and 7.5 km loop out.)		32.48	
3.	i. Establishment of new 132/33 kV, 2x50 MVA S/s at Gaa	To cater to the construction power requirement of Kamala HEP the substation at Gaa is proposed.	70.82	Time frame: 2027-28
	ii. LILO of Ziro – Daporijo 132 kV S/c line at Gaa with HTLS 900 A. (0.35 km loop in and 0.35 km loop out.)		1.98	Ziro – Daporijo 132 kV S/c line to be reconductored in Intra-STS with HTLS-1000 A.
4.	i. Establishment of new 132/33 kV, 2x31.5 MVA S/s at Tato (Shi Yomi),	For quality powering of the systems being built at Yorlung, Manigong, Lamang, Tadadege, Tato, and Mechuka in Shi Yomi district, to ensure reliable power supply to military establishments in the border district and to provide a 132 kV node for meeting the construction power requirements of the upcoming HEPs at Tato.	62.67	Time frame: 2027-28
	ii. LILO of Kamki (Kamba) – Mechuka 132 kV S/c line at Tato (Shi Yomi) - (5 km loop in and 5 km loop out.)		14.51	
	iii. Construction of 132 kV Line Bay at Kamki (Kamba)		1.92	
5.	i. Establishment of new 132/33kV, 2x10 MVA S/s at Wakro	To cater to local loads and for enabling evacuation of generation of the 24.6 MW Kamlang HEP near Wakro.	55.96	Time frame: 2027-28
	ii. LILO of Tezu-Namsai 132 kV S/c line at 132/33 kV Wakro S/s (02 km loop in and 02 km loop out.)		6.90	
6.	i. Establishment of new 132/33kV, 2x10 MVA S/s at Koronu	To cater to local loads and upcoming industrial loads (20 MW+42 MW) near Koronu/Roing.	55.96	Time frame: 2027-28
	ii. LILO of both circuits of Roing-Tezu 132 kV D/c line at 132/33 kV Koronu S/s (04 km loop in and 04 km loop out.)		27.6	

7.	i. Establishment of new 132/33kV, 2x80 MVA S/s at Patharcamp	To cater to the construction power requirement of HEPs near Etalin and Dibang Multi Purpose Project.	74.09	Time frame: 2026-27
	ii. LILO of Roing – Anini 132 kV S/c line at Patharcamp S/s (5.28 ckm)		26.74	
	iii. Construction of 01 No. of 132 kV Line Bay at Roing		1.92	
8.	i. Establishment of new 132/33kV, 2x50 MVA S/s at Etalin		70.82	Time frame: 2027-28
	ii. LILO of Patharcamp-Anini 132 kV S/c line at Etalin S/s (02 km loop in and 02 km loop out.)		3.45	
	iii. 2 nd Circuit Stringing of Roing-Etalin 132 kV line (65 ckm)		20.54	
	iv. Construction of 01 No. of 132 kV Line Bay at Roing		1.92	
9.	i. Establishment of new 132/33 kV, 2x50 MVA S/s at Pisa	To cater to the construction power requirement of Upper Subansiri HEP the substation at Pisa is proposed.	70.82	Time frame: 2027-28
	ii. LILO of Daporijo-Nacho 132 kV S/c line at Pisa with ACSR Panther (1.5 km loop in and 1.5 km loop out.)		5.17	
10.	i. Establishment of new 132/33 kV, 2x10 MVA S/s at Raga	The approximate distance between Ziro to Raga is around 45 km. Presently, power supply at Raga is through low voltage long lines which faces frequent trippings and voltage regulation issues. The proposed Raga S/s would improve reliability and power quality issues in the area.	55.96	Time frame: 2029-30
	ii. LILO of Ziro-Daporijo 132 kV S/c line at Raga with HTLS 900A-(6.5 km loop in and 6.5 km loop out.)		36.76	

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 Arunachal Pradesh

S.No	Transmission System	Justification	Estimated Cost (in Rs. Cr.)	Remarks
1.	Likabali – Basar 132 kV D/c line (160 ckm) alongwith associated bays	The upcoming 400 km long 'Khuppi-Pasighat 132 kV line via Seppa, Rilo, Sagalee, Naharlagun, Gerukamukh, Likabali, Niglok, Napit and Pasighat' under Comprehensive Scheme shall be running in parallel to the existing 132 kV long radial line of RHEP to Pasighat via Ziro, Daporijo, Aalo and Pasighat of equal length without any inter-connecting anchoring and power source in between. Hence, for stabilizing power flow of both these two lines and increase redundancies, the proposed inter-connecting line is essential.	289.18	Time frame: 2029-30 This line shall be implemented along with 400/132 kV Gerukamukh S/s
2.	2 nd circuit Stringing of Gerukamukh / Kolaptukar – Likabali 132 kV S/c line on D/c tower (57 ckm) alongwith associated bays	To meet the power requirement of the industrial consumers at Niglok the stringing of the second circuit of Gerukamukh – Likabali line is required.	19.43	Time frame: 2029-30 This line shall be implemented along with 400/132 kV Gerukamukh and in tandem with physical progress of the principal line under Comprehensive Scheme
3.	2 nd circuit Stringing of Likabali – Niglok 132 kV S/c line on D/c tower (67 ckm) alongwith associated bays	To meet the power requirement of the industrial consumers at Niglok the stringing of the second circuit of Likabali – Niglok line is required.	22.06	Time frame: 2029-30 This line shall be implemented in tandem with physical progress of the principal line under Comprehensive Scheme.

S.No	Transmission System	Justification	Estimated Cost (in Rs. Cr.)	Remarks
4.	2 nd circuit Stringing of Seijosa – Rilo 132 kV line (44 ckm) alongwith associated bays	2 nd circuit stringing of the Seijosa-Yupia transmission corridor is essential for improving the reliability of the western and central districts of Arunachal Pradesh through capacity augmentation and benefiting from the proposed Gerukhamukh-Yupia-Yachuli-Banderdewa interconnectivity.	24.89	Time frame: 2029-30 In matching time-frame of Balipara – Seijosa 132 kV D/c line.
5.	2 nd circuit Stringing of Rilo – Sagali 132 kV line (33 ckm) alongwith associated bays		21.99	
6.	2 nd circuit Stringing of Sagali – Yupia 132 kV line (39 ckm) alongwith associated bays		23.57	Time frame: 2029-30
7.	Kimin – Yachuli (Ziro-New) 132 kV D/c line (100 ckm) alongwith associated bays	The Kimin-Yachuli line will provide interconnectivity between the parallel lines RHEP-Pasighat and Khuppi-Pasighat improving overall system reliability and ensure voltage stability during contingencies.	185.96	Time frame: 2028-29 This line shall be implemented in matching time frame of Kimin Substation

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 Arunachal Pradesh

S.No	Transmission System	Justification	Estimated Cost (in Rs. Cr.)	Remarks
1.	Lekhi – Chimpur 132 kV S/c line (14.5 ckm) along with upgradation of requisite bay equipment	Lekhi – Chimpur 132 kV Transmission Line was commissioned in 2007 for 132 kV but operated at 33 kV, was strung with old inventory ACSR Lynx conductors. These have deteriorated, causing frequent burns and outages. Replacement with ACSR Panther is proposed to ensure reliability, align with other 132 kV lines, and maintain uniform spares availability.	6.56	Time frame: 2026-27

		- Ampacity of Existing conductor- 340 A at 75° (ACSR Lynx) - Year of commissioning- 2007 - Restranging with same sized conductor with ampacity equivalent to Panther		
2.	Ziro – Daporijo 132 kV S/c line (87 ckm) (being LILOed at Raga) along with upgradation of requisite bay equipment	The Ziro–Daporijo–Basar–Aalo–Pasighat transmission corridor is the main backbone for central and eastern Arunachal Pradesh. It will also supply construction power to the hydro-electric projects coming up in the Subansiri and Siang basins. Therefore, reconductoring of the lines with high ampacity conductors is required. - Ampacity of existing conductor- 374 A at 75 deg (ACSR Panther) - Ampacity of HTLS Conductor- 900 A. - Year of Commissioning: 2004	35.37	Time frame: 2026-27

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

8.4. 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. The requirement of Inter-state transmission system (ISTS) in Arunachal Pradesh would be identified after the study of complete transmission system including neighbouring states and GNA quantum indicated by the state.

10. Reactive Power Compensation:

10.1. The state to install capacitor banks around the locations at lower voltage level as to maintain minimum reactive power exchange with the grid and maintain the voltage within permission levels.

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

11.1. A total of 1103 MVA transformation capacity addition/augmentation and 846.5 ckm of new transmission lines/reconductoring of old lines at an estimated cost of ₹ 1608.87 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 brief summary of voltage wise identified transmission system of the state by 2034-35 is as below:

220 kV Transmission system

S.No	Transmission system	No.	Length (in ckm)	Capacity (MVA)	Estimated Cost (₹ Cr.)*
1.	New substation	01	-	500	139.75
2.	Augmentation of existing substation	-	-	-	-
3.	New transmission line including LILO and 2 nd Ckt Stringing	01	10	-	32.75
4.	Reconductoring of transmission line	-	-	-	-

132 kV Transmission system

S.No	Transmission system	No.	Length (in ckm)	Capacity (MVA)	Estimated Cost (₹ Cr.)*
1.	New substation	09	-	603	573.06
2.	Augmentation of existing substation	-	-	-	-
3.	New transmission line including LILO and 2 nd Ckt Stringing	19	735	-	821.38
4.	Reconductoring of transmission line	02	101.5	-	41.93

*Note: The estimated cost of the above transmission system is based on SoR 2021-22 of the state.

- 11.2. Summary of year-wise MVA capacity, ckm addition and tentative expenditure required for implementation of above recommended proposals is given Table 11-1 at below:

Table 11-1 Yearwise implementation summary of proposed transmission system

Financial Year	MVA Capacity Addition		ckm Addition		Reconductoring (ckm)	Estimated Cost (in ₹ Cr.)
	132 kV	220 kV	132 kV	220 kV	132 kV	
2026-27	160	-	5.3	-	101.5	144.68
2027-28	403	-	102.7	-	-	471.04
2028-29	20	500	214	10	-	499.31
2029-30	20	-	413	-	-	493.84
Total	603	500	735	10	101.5	1608.87

12. Conclusion

- 12.1. By the year 2034-35, the power demand of Arunachal Pradesh would be increasing significantly. Total expected demand of Arunachal Pradesh by the year 2034-35 is around 826 MW. This anticipated increase in demand includes the expected industrial load coming progressively from 2024-25 to 2034-35.
- 12.2. A total of 224 MW of Hydro generation connected with Intra-state transmission network at 132 kV voltage level are expected to be commissioned by 2034-35.
- 12.3. The construction power requirements for various upcoming hydro projects have also been considered. Since construction power will only be required for few years, full reliability of the system has not been considered.
- 12.4. In order to meet this growing load demand, evacuation of power from hydro generation, construction power to various upcoming hydro projects and for drawal of power from ISTS in accordance with GNA requirement of Arunachal Pradesh by 2034-35, the intra-state as well as inter-state transmission system of Arunachal Pradesh need to be strengthened. It has been observed that the transmission system infrastructure in Arunachal Pradesh at voltage levels of 132 kV and 220 kV needs to be upgraded.
- 12.5. 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.
- 12.6. 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).
- 12.7. It is recommended that Arunachal Pradesh shall update their intra-state transmission systems on the PM GatiShakti (PMGS) National Master Plan on regular basis.
- 12.8. The quantum of GNA is nearing the ATC of the Arunachal Pradesh 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.
- 12.9. A total of 1103 MVA transformation capacity addition/augmentation and 846.5 ckm of new transmission lines/reconductoring of old lines at an estimated cost of ₹ 1608.87 Crs. would be required for implementing the intra-state transmission proposals for meeting the electricity demand of the state by the year 2034-35.

Annexure-I

Operational Feedback from Arunachal Pradesh SLDC.

S. No.	Element	Constraint/Observation
1.	132/33 kV Ziro S/s	The load in Ziro area with the power source from 15 MVA at Ziro 132/33 kV Sub-Station have crossed 16 MW in the peak hours of winter season, due to which load shedding in lower voltages had to be implemented. As Such capacity enhancement 132/33 kV Ziro Sub-Station is required as early as possible. There have been Communication challenges during Realtime operation as Mobile phone doesn't work very well in all locations, hence implementation of VOIP in every Sub-Station shall be very helpful.
2.	132/33 kV Itanagar S/s	The load in Capital area with the power source from 40 MVA at Chimpu 132/33 kV Sub-Station have crossed 36 MW in the peak hours, due to which load shedding in lower voltages had to be implemented. As Such capacity enhancement at 132/33 kV Chimpu Sub-Station is required as early as possible.
3.	132/33 kV Aalo, Dapo, Pasighat S/s	Considering the difficulties in communication during real-time operations due to the inconsistent performance of mobile phones in various locations, the implementation of VOIP in each substation would be highly beneficial. The transmission line connecting Ziro, Dapo, Aalo, and Pasighat is aging, resulting in frequent and undesirable tripping events caused by issues such as disc punctures and jumper breakdowns. Moreover, the expansion of the line from Roing to Chapakhowa and from Namsai to Kathalguri has pushed the line loading to its maximum capacity. Consequently, the early provision of a double circuit or conductor strengthening from Namsai to Panyor is necessary.
4.	132/33 kV Tenga, Khupi, Tippi S/s	Currently, the Tippi 132/11 kV S/s is configured as a T-Connection on the Balipara-Tenga Line, which presents operational challenges until it is converted to a LILO configuration. Furthermore, as this line extends to Kimi (Kameng Hydro Electric Project), a double-circuit design is recommended. The difficulties in communication during real-time operations due to the inconsistent performance of mobile phones in various locations, the implementation of VOIP in each substation would be highly beneficial.

Operational feedback from NERLDC/NLDC

a) ICT constraints in Arunachal Pradesh system

Constraints in System	Comments	Affected station
Non-Compliant of N-1 criteria of 132 kV Tinsukia-Ledo-Rupai - Chapakhowa-Roing-Pasighat-Along-Basar-Daporijo-Ziro-Panyor HEP link	132 kV Tinsukia-Ledo-Rupai link are having very old conductor, the links is not able to sustain more then 60 MW load for longer period, thus grid disturbance occured on tripping of link from the farthest end i.e. 132 kV Tinsukia-Ledo or 132 kV Tinsukia -Rupai or 132 kV Panyor HEP-Ziro line.	Ledo, Rupai, Chapakhowa, Roing, Pasighat, Along, Basar,Daporijo,Ziro, Tezu and Namsai

POWER MAP OF ARUNACHAL PRADESH (upto the year 2034-35)

