

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 Sikkim 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 Sikkim, 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 Sikkim in 2024-25 was 138 MW, and Projected Peak Demand by 2034-35 is estimated to 324 MW, which is near about the Electric Power Survey report. Further, contracted Capacity in the state is about 788.82 MW (as on aug 2025) including allocation from Central Sector Generation. Presently, the state has 469.4 ckm of 66 kV lines 106.5 ckm of 132 kV lines and 20 ckm of 220 kV lines. It has transformation capacity of 440.5 MVA at 66 kV, 245 MVA at 132 kV and 200 MVA at 220 kV level.

Considering the anticipated demand, generation capacity, demand pattern, operational feedback from ERLDC and SLDC, system studies have been conducted for Peak Demand with Low hydro and High Hydro scenarios for the timeframe 2031-32 and 2034-35 in consultation with Sikkim, CTUIL and Grid-India. Based on the studies, the requirement of transmission system by the year 2034-35 has been identified.

A total of 1460 MVA transformation capacity addition/augmentation and 268.2 ckm of new transmission lines and 30.4 ckm reconductoring of old lines at an estimated cost of ₹ 1787.72 cr. would be required in the intra-state transmission system for meeting the electricity demand of the state by the year 2034-35. Further, reactive power compensation need to be provided at various substations at distribution level for addressing low voltage issues.

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

Year	Capacity Addition (in MVA)			Transmission line addition (in ckm)			Reconductoring (in ckm)	Estimated Cost (in Rs. Cr.)
	66 kV	132 kV	220 kV	66 kV	132 kV	220 kV	66 kV	
2026-27	-	150	100	-	-	25	30.4	217.67
2027-28	205	-	-	68.7	-	-	-	490.2
2028-29	30	-	-	32	-	-	-	119.84
2029-30	20	55	-	48	40	34	-	521.93
2030-31	-	-	900	-	-	-	-	370
2031-32	-	-	-	-	-	10	-	34.55
2032-33	-	-	-	-	-	-	-	-
2033-34	-	-	-	-	10.5	-	-	33.53
2034-35	-	-	-	-	-	-	-	-
Total	255	205	1000	148.7	50.5	69	30.4	1787.72

To ensure reliable and adequate power supply in Sikkim by 2034-35, substantial investments and infrastructure upgrades are essential. With a projected demand of 324 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.

Table of Contents

Executive Summary	i
1. Demographics	1
2. Electricity profile of state	1
3. Existing Transmission System	4
4. Under Implementation Transmission System	7
5. System operator feedback	8
6. Assumptions for study	9
7. Study Results	11
8. Intra-state Transmission system requirement by 2034-35.	13
9. Inter-state Transmission system requirement by 2034-35.	19
10. Reactive compensation:	20
11. Summary of identified transmission system by 2034-35:	20
12. Conclusion	21
Annexure-I	23
Annexure-II	25
Annexure-III	26
Annexure-IV	29

List of Tables

Table 2-1 Peak demand & Energy of Sikkim	1
Table 2-2 contracted and installed capacity	3
Table 3-1 Intra State Transmission assets in Sikkim	4
Table 3-2 Existing, under-implementation ISTS of Sikkim	7
Table 4-1 Under Implementation Intra-State Transmission assets in Sikkim (as on Oct 2025)	7
Table 6-1 Peak electricity demand	9
Table 6-2 Upcoming generation by 2034-35	10
Table 6-3 Demand and dispatch of the study	11
Table 7-1 Study Results for the time frame 2031-32	12
Table 7-2 Study Results for the time frame 2034-35	12
Table 8-1 New substations alongwith their associated transmission lines of Sikkim.....	13
Table 8-2 New Transmission lines of Sikkim	16
Table 8-3 Reconductoring of existing transmission lines of Sikkim.....	17
Table 8-4 Augmentation of Substations of Sikkim	18

List of Figures

Figure 2-1 Peak Demand and Energy	2
Figure 2-2 Seasonal Load Curve	2
Figure 2-3 Hourly Load Curve	3
Figure 2-4 Contracted Capacity	4
Figure 3-1 Existing Intra-state Transmission Line.....	6
Figure 3-2 Existing Substations.....	6
Figure 4-1 Under Construction Intra-state transmission system as on March 2025	8

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

1. Demographics

Sikkim is a state in Northeast India, with Gangtok as its capital. It is bordered by the Indian states of West Bengal to the south, Bhutan to the east, Nepal to the west, and Tibet (China) to the north. Sikkim covers an area of 7,096 square kilometers (2,740 square miles) and has a population of around 700,000. The state is known for its stunning natural beauty, including the Himalayas, Kangchenjunga (the third-highest peak in the world), and diverse flora and fauna. The population is a mix of various communities, including Nepali, Bhutia, Lepcha, and Tibetan groups, and the primary language spoken is Nepali, along with Bhutia, Tibetan, and Hindi. Sikkim's economy is driven by tourism, agriculture, and horticulture, with the state also being a significant producer of cardamom and organic farming.

2. Electricity profile of state

2.1. Power generation-demand scenario of state:

- In the FY 2024-25, Sikkim had peak electricity demand of 138 MW and total energy requirement of 574 MU. As on Aug 2025, state has central sector allocation of 157.15 MW, which includes hydro plants (74.27 MW) and thermal plants (82.88 MW). In addition, state sector installed capacity is 415.11 MW and private sector installed capacity is 216.56 MW. The per capita electricity consumption of the state was 954 kWh in the year 2022-23.

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

Table 2-1 Peak demand & Energy of Sikkim

	Peak Demand(MW)	MW as per EPS	Energy(MU)	MUs as per EPS
2018-19	106	146	527	548
2019-20	115	154	554	577
2020-21	120	162	546	607
2021-22	133	134	610	616
2022-23	124	141	587	651
2023-24	133	150	544	689
2024-25	138	159	574	730

Source: PSP and EPS Reports of CEA

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

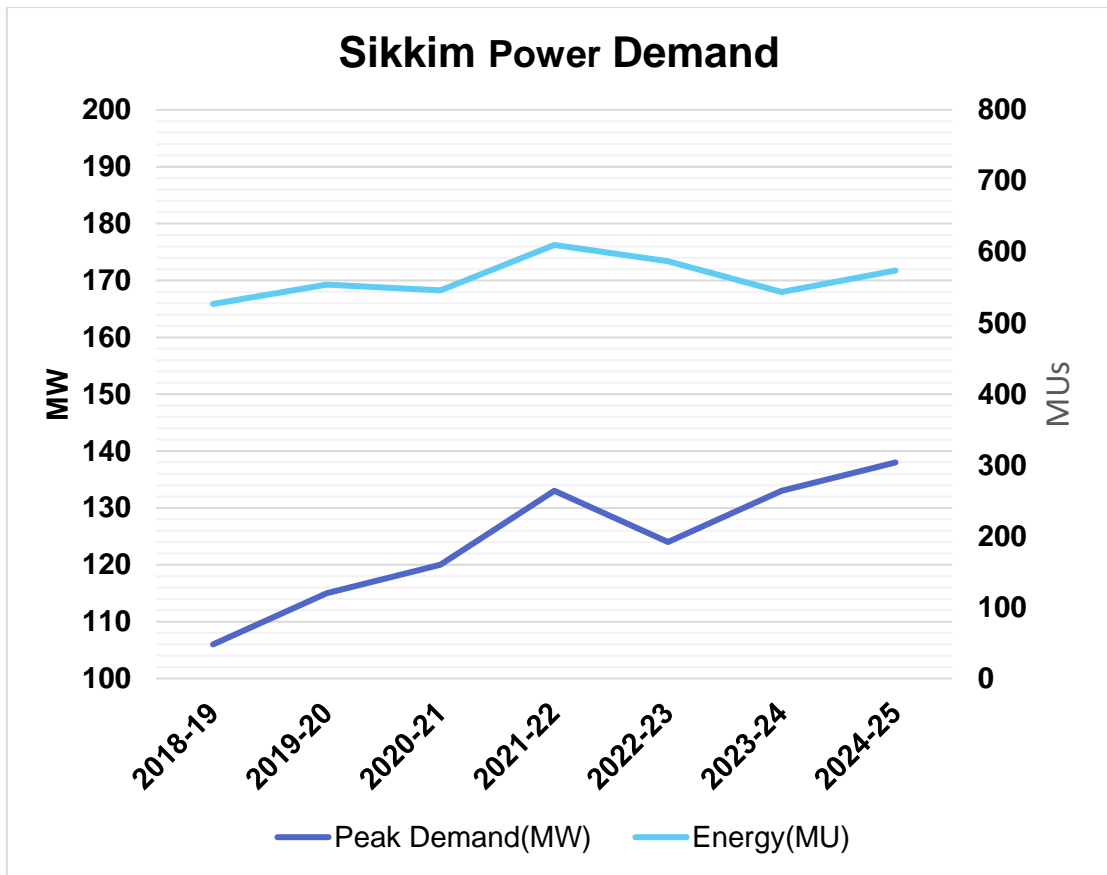


Figure 2-1 Peak Demand and Energy

2.1.3. The peak demand of Sikkim generally occurs in the summers. The graph indicating of Seasonal Load variation in the FY 2024-25 is given at Figure 2-2 below.

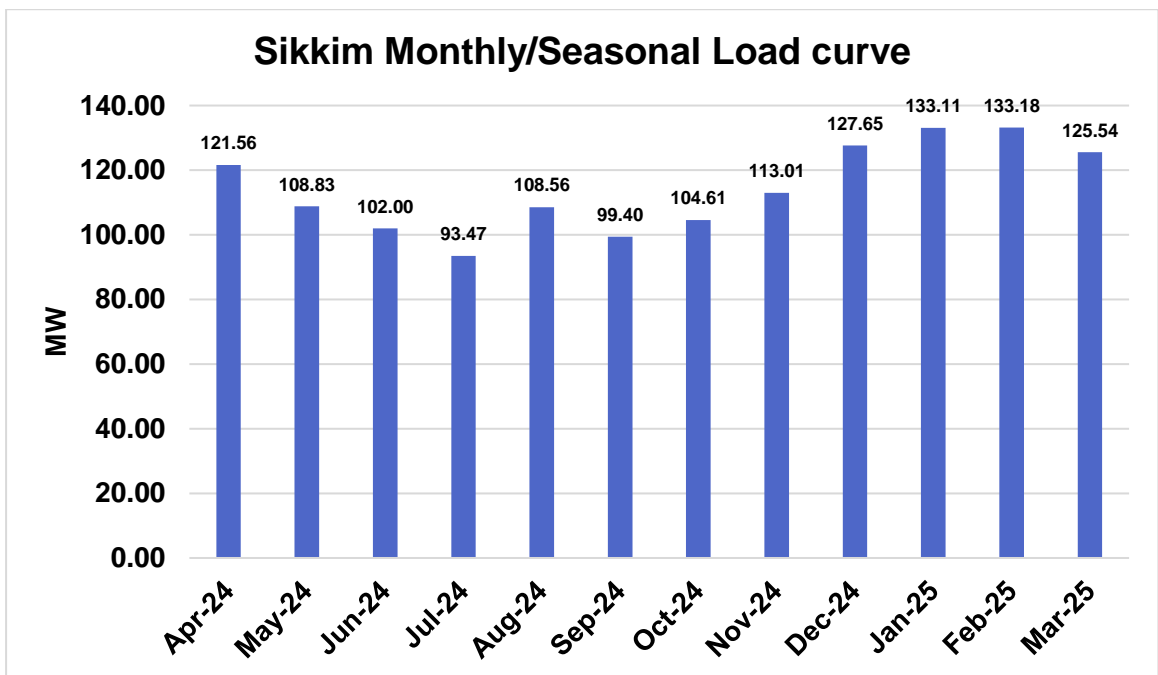


Figure 2-2 Seasonal Load Curve

2.1.4. The graph indicating of Hourly Load variation for four months in the FY 2024-25 is given at Figure 2-3 below. It indicated that peak demand generally occurs in the evening hours of the day.

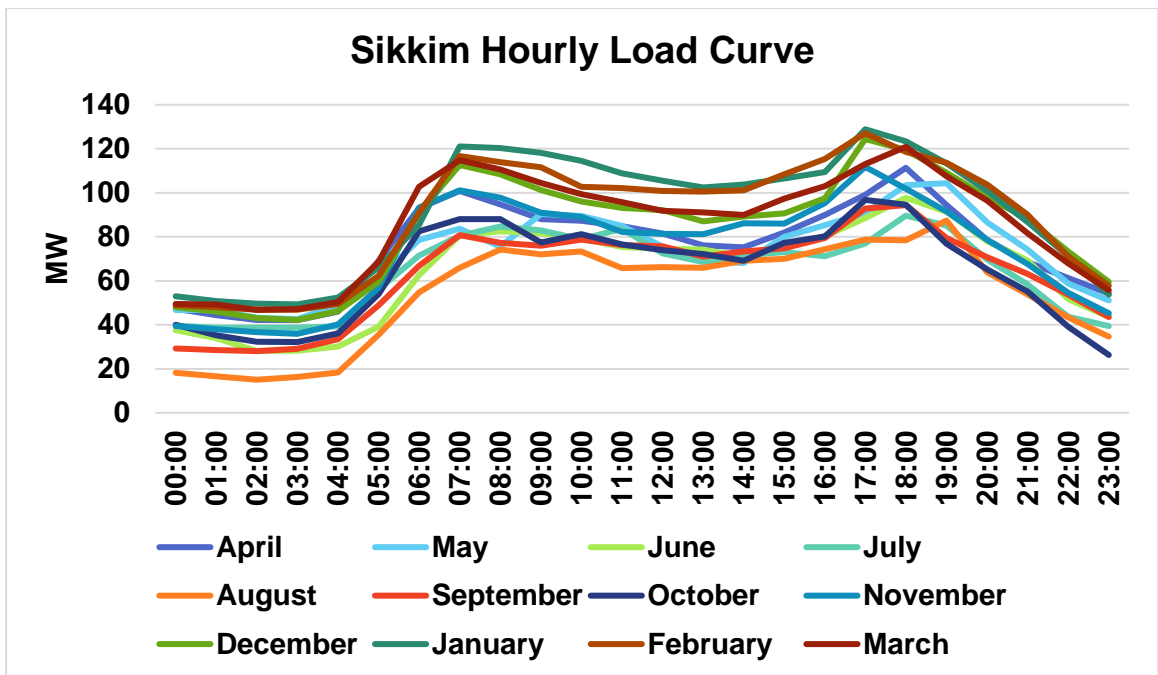


Figure 2-3 Hourly Load Curve

2.1.5. The projected peak electricity demand as per 20th EPS report is 323 MW in the year 2036-37.

2.1.6. Contracted capacity(MW) by Sikkim as on Aug 2025 is given at Table 2-2 below:

Table 2-2 contracted and installed capacity

SECTOR	HYDR O	THERMAL					NUC L- EAR	R.E.S. (MNRE)	TOTAL
		COAL	LIGNITE	GAS	DIESEL	TOTAL			
State	360.00	0.00	0.00	0.00	0.00	0.00	0	55.11	415.11
Private	209.00	0.00	0.00	0.00	0.00	0.00	0	7.56	216.56
Central allocation	74.27	82.88	0.00	0.00	0.00	82.88	0	0.00	157.15
Total	643.27	82.88	0.00	0.00	0.00	82.88	0	62.67	788.82
%	81.55	10.51	0.00	0.00	0.00	10.51	0.00	7.94	100.00

Source: Installed Capacity Report, CEA

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

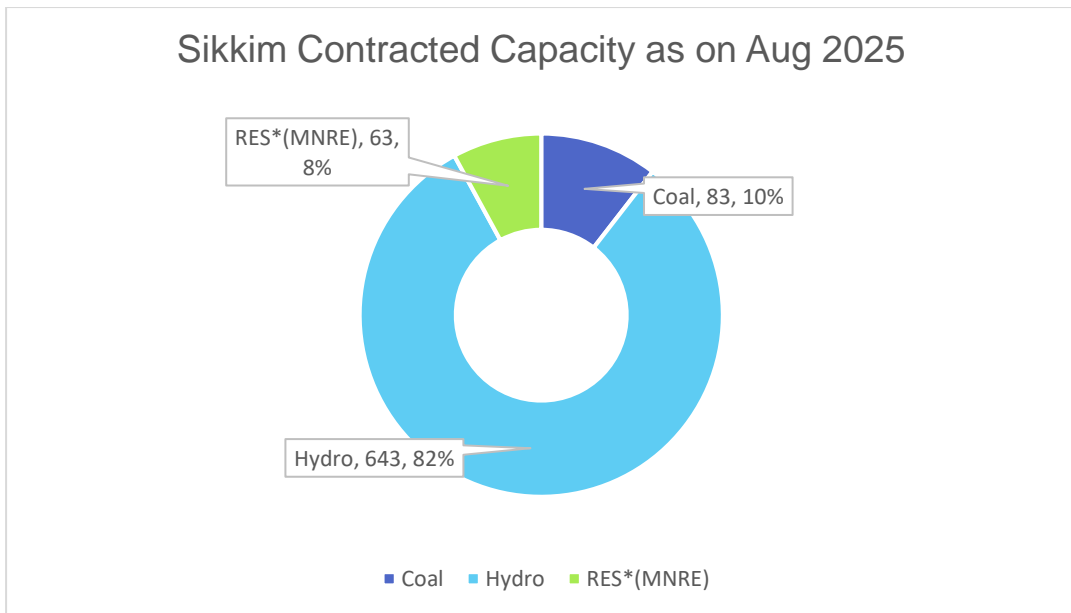


Figure 2-4 Contracted Capacity

2.1.8. As on Aug 2025, the General Network Access (GNA) quantum for ISTS drawal is 111 MW and Available Transfer Capability (ATC) of the state is 162 MW (Import ATC).

3. Existing Transmission System

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

3.1. Existing Intra State Transmission assets:

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

Table 3-1 Intra State Transmission assets in Sikkim

Financial Year	Voltage (kV)	Transmission lines (ckm)	Substations (MVA)
2018-19	66	405	386
	132	69	25
	220	20	200
	Total	494	611
2019-20	66	405	386
	132	69	25
	220	20	200
	Total	494	611
2020-21	66	405	386
	132	69	25
	220	20	200

	Total	494	611
2021-22	66	405	386
	132	69	25
	220	20	200
	Total	494	611
2022-23	66	405	386
	132	69	25
	220	20	200
	Total	494	611
2023-24	66	405	386
	132	69	25
	220	20	200
	Total	494	611
2024-25	66	405	386
	132	69	225
	220	20	200
	Total	494	811
2025-26 (Upto October 2025)	66	469.4	440.5
	132	106.5	245
	220	20	200
	Total	595.9	885.5

*Source: State data

- 3.1.2. As on October 2025, Sikkim state has total 595.9 ckm transmission lines and 885.5 MVA sub-station MVA capacity which includes 469.4 ckm of 66 kV, 106.5 ckm of 132 kV, 20 ckm of 220 kV transmission line and 440.5 MVA of 66 kV, 245 MVA of 132 kV and 200 MVA of 220 kV Substation capacity in Intra-state transmission system.
- 3.1.3. The graph indicating of year on year growth of Transmission lines is given at Figure 3-1 below.

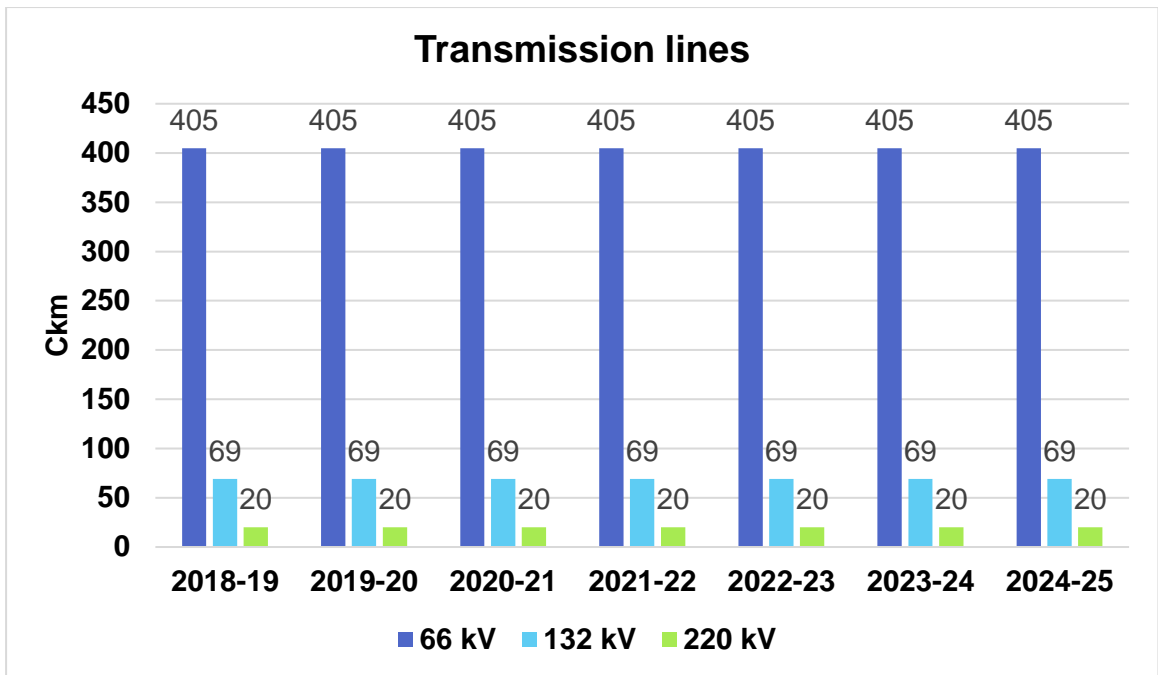


Figure 3-1 Existing Intra-state Transmission Line

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

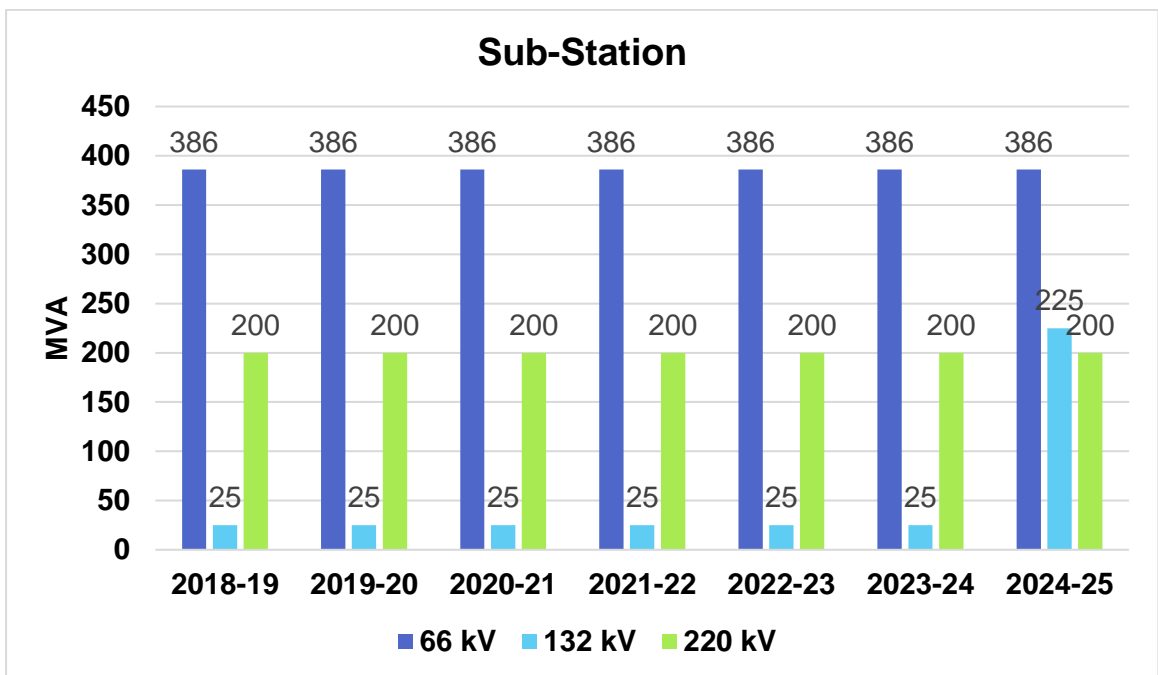


Figure 3-2 Existing Substations

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

3.2.1. The State has 3 nos. (2125 MVA) existing substation capacity.

3.2.2. The State has a total of 1146 ckm of existing ISTS network. Brief details of the ISTS network (including ISTS lines owned by states) are given at Table 3-2 below:

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

Transmission lines	Existing	Under Construction
66 kV	37 ckm	-
132 kV	326 ckm	-
220 kV	52 ckm	-
400 kV	731 ckm	-
Total	1146 ckm	
Substations	Existing	Under Construction
132/66 kV	1 (150 MVA) Gangtok	-
400/220/132 kV	1 (1575 MVA+400 MVA) Rangpo	
220 kV Switching	1 (Switching) New Melli	
Total	3 nos. (2125 MVA)	-

4. Under Implementation Transmission System

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

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

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

Voltage (kV)	Transmission lines (ckm)	Substations (MVA)
66	191	70
132	73.5	330
220	0	0

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

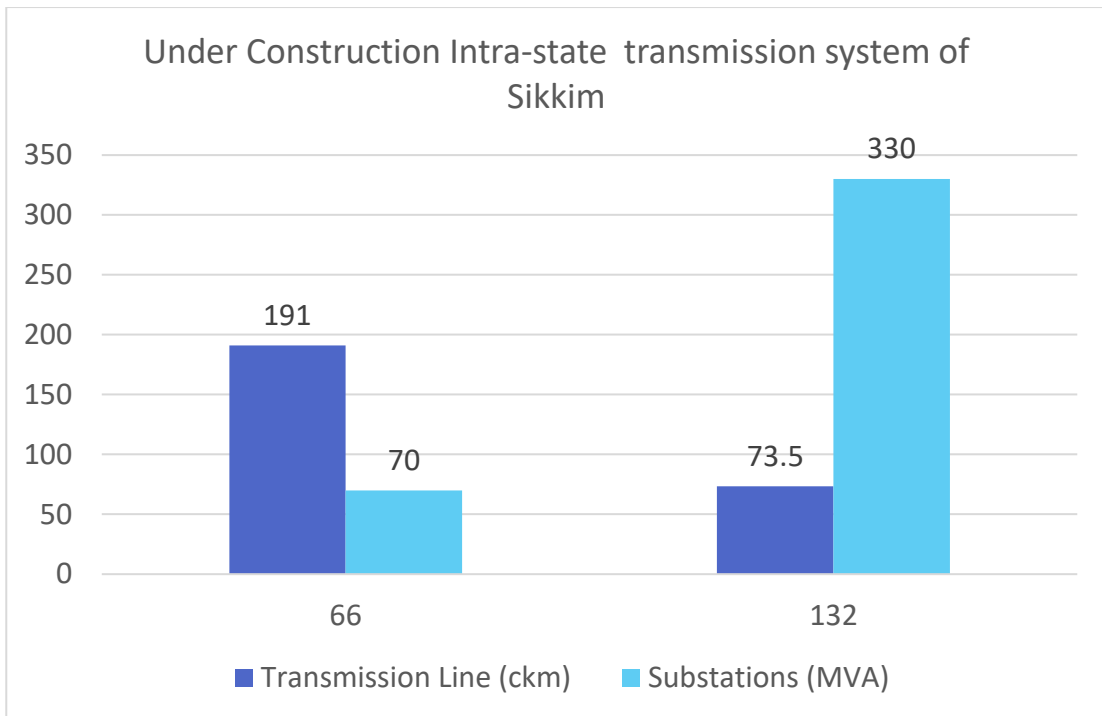


Figure 4-1 Under Construction Intra-state transmission system as on March 2025

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

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

4.2.1. Under Construction ISTS (RTM mode)

i. ERBS-II: July 2026

- Extension at Rangpo 400/220/132 kV GIS substation
 - 132 kV GIS Line bays: 2 nos. (bay no. 117 & 118) [for termination of Rammam – Rangpo (POWERGRID) 132kV D/c (minimum 680 A per circuit) dedicated transmission line (line under the scope of NTPC Ltd.)]
 - 145 kV GIB: 150m approx.

Note: ISTS licensee should build the 132 kV line bays of rating commensurate with rating of the dedicated transmission line

5. System operator feedback

5.1. The operational constraint faced in the Intra-state transmission network by Sikkim 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 Sikkim according to the 20th EPS Report and as estimated by the state are given at Table 6-1 below:

Table 6-1 Peak electricity demand

Reference↓ / Parameter→	Year	Peak Demand (MW)	CAGR
Actual Peak	2024-25	138	
As per 20 th EPS	2025-26	169	22.46
	2026-27	179	13.89
	2027-28	190	11.25
	2028-29	201	9.86
	2029-30	214	9.17
	2030-31	227	8.65
State Estimated Peak electricity demand	2031-32	290	11.19
	2034-35	324	8.91
As per 20 th EPS	2036-37	323	7.34

**including upcoming industrial demand.*

6.2. Industrial Demand:

The details of major upcoming Industries are as under.

6.2.1. The total existing industrial demand of the state is 45 MW and upcoming industrial demand of intra-state system is 152.78 MW which is expected by 2034-35 at following locations.

S. No.	NAME OF THE SUB-STATION	Demand by 2031-32 (in MW)	Demand by 2034-35 (in MW)
1	MELLI	5	8.5
2	LLHP	5	6
3	PAKYONG	8	9
4	MACLEODS IND. AREA	5.05	5.05
5	TOPAKHANI	10	11
6	KUMREK	3	3.5
7	RORATHANG	3	3.91
8	MAMRING	20	22
9	BURUL INDUSTRIAL COMPLEX 66 KV (PROPOSED)	40	40
10	RONGLI	5.04	6
11	NHPC BALUTAR	4.22	4.89

S. No.	NAME OF THE SUB-STATION	Demand by 2031-32 (in MW)	Demand by 2034-35 (in MW)
12	MARCHAK	1	1.1
13	JORETHANG	1.5	1.95
14	CHAKUNG	5	6.58
15	KHANIKHOLA	20	20
16	ASSAM LINGZEE	1.43	1.6
17	NAMTHANG	1.52	1.7
TOTAL		138.76	152.78

6.3. Existing generation capacity

The details of existing generation system given in **Annexure - III**

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

The additional generation capacity expected in the state by 2031-32 is 1,124 MW.

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

Table 6-2 Upcoming generation by 2034-35

Sl. No	Technology	Place	Capacity	Capacity in Intra-STS (MW)	Considered in Study Time Frame
1.	Hydro	Rangit Stage-IV HEP	120	14.4	2026-27
2.	Hydro	Relli Chu HEP	32	3.84	2026-27
3.	Hydro	Relli Chu-II HEP	34	4.08	2027-28
4.	Hydro	Teesta Stage-VI HEP	500	60	2028-29
5.	Hydro	Rolep HEP	80	9.6	2029-30
6.	Hydro	Bhasmey HEP	62	7.44	2029-30
7.	Hydro	Ralong HEP	100	12	2029-30
8.	Hydro	Chakungchu HEP	90	10.8	2029-30
9.	Hydro	Rangit Stage-II HEP	66	7.92	2030-31
10.	Hydro	Suntaleytar HEP	40	4.8	2031-32

Sl. No	Technology	Place	Capacity	Capacity in Intra-STS (MW)	Considered in Study Time Frame
11.	Hydro	SadaMangder HEP	71	8.52	2032-33
12.	Hydro	Ting-Ting HEP	99	11.88	2034-35
Total			1294	155.28	

6.4.1. In addition to above 10 MW (50 MWh) BESS at Gangtok in the timeframe of 2026-27 and 3 MW (15 MWh) BESS each at Rabomchu (Chungthang) & Lachen in the timeframe of 2028-29 have also been considered.

6.4.2. The additional generation capacity expected in the state by 2034-35 is 1294 MW.

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

6.5. The following Parameters were considered during the study

- a) The total intra state generation installed capacity: 321 MW (entire generation is Hydro) including 16 MW BESS) by 2031-32 and 557 MW by 2034-35 (entire generation is Hydro) including 16 MW BESS).
- b) The Inter-state Generation capacity located in Sikkim has been considered as 3367 MW.
- c) Peak Demand 298 MW (including 153 MW non-scalable industrial demand) by the year 2031-32 and 326 MW (including 153 MW non-scalable industrial demand) by the year 2034-35.
- d) The demand pattern of the State such as seasonal and hourly variation are consistent, however to capture the load variations, and high solar injection from adjacent states, the scenarios considered for the study are mentioned at Table 6-3.

Table 6-3 Demand and dispatch of the study

S.No.	Scenario	Demand Factor	Dispatch Factors	
			Hydro	BESS ((+) discharging/ (-) charging)
1.	Peak Demand with Low hydro (Sc-8)	100%	30%	(+)100%
2.	High Hydro (Sc-2)	80%	90%	(-)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 Sikkim SLDC and ERLDC, as well as the provisions in the Manual on

Transmission Planning Criteria (with Amendment-I), 2025, studies were conducted to identify the state's transmission system requirements, which are detailed in Paragraph 8. Taking in account of identified system and related assumptions, the import/export on tie lines by the year 2031-32 are presented in Table 7-1 below:

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

Parameter↓ / Scenario→	Peak Demand with Low hydro (Sc-8)	High Hydro (Sc-2)
Generation despatch (intra-state + ISGS located in state) (in MW)	1028 (ISTS: 930 & In-STS: 98)	3019 (ISTS: 2750 & In-STS: 269)
Total load including losses (in MW)	298	240
Net interchange ((-) import / (+)export) at ISTS-STU periphery (in MW)	-200	29

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

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

Parameter↓ / Scenario→	Peak Demand with Low hydro (Sc-8)	High Hydro (Sc-2)
Generation despatch (intra-state + ISGS located in state) (in MW)	1098 (ISTS: 930 & In-STS: 168)	3231 (ISTS: 2750 & In-STS: 481)
Total load including losses (in MW)	326	260
Net interchange ((-) import / (+)export) at ISTS-STU periphery (in MW)	-158	221

- 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 Sikkim 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 Sikkim (2034-35) Sikkim is likely to have unserved energy in coming years and may need to contract capacities for meeting energy requirements other than the planned capacities. The additional quantum of capacities required (other than already planned) to be contracted is about 88 MW from Coal, 33 MW of DRE till 2034-35. Sikkim is surplus in fulfilment of its Renewable Purchase Obligations (RPO)

and need not contract renewable capacities for fulfilling them except DRE addition and needs to contract renewable capacities for fulfilling them. The projected capacity and generation mix fulfils the RPO by 2030 as per the Ministry of Power notification dated 20th October, 2023.

- 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 Sikkim 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 Sikkim

S.No	Name of the proposal	Justification	Estimated Cost (in Rs. Cr.)	Time Frame
1.	i. Establishment of Chakung 132/66/11 kV S/s with 2x20+3x5 MVA	To meet additional load requirement of the industrial area and upcoming University	76.84	2029-30
	ii. Legship Pool – Chakung 132 kV D/c line (40 ckm)		127	
	iii. LILO of Rohtak – Soreng 66 kV S/c line at Chakung (8 ckm loop in and 8 ckm loop out)		55	
2.	i. Establishment of Burul 66/11 kV S/s with 2x25 MVA	To meet additional load requirement of the industrial area in Burul	40	2027-28
	ii. Burul – Samardong 66 kV D/c line (12 ckm)		40.8	
	iii. LILO of Samardong – Namthang 66 kV S/c line at Burul(7 ckm)		24.96	
3.	i. Establishment of Rellichu PS (Kongri) 2x50 MVA, 220/66 kV S/s	Power evacuation of upcoming generating Station i.e. Sadamagdar (71 MW) and Ting-Ting (97 MW)	50.00	2026-27
	ii. Legship Pool – Rellichu PS		86.4	

S.No	Name of the proposal	Justification	Estimated Cost (in Rs. Cr.)	Time Frame
	(Kongri) 220 kV D/c line (25 ckm) alongwith 2 Nos. of 220 kV bay at Legship pool			
4.	i. Creation of 220 kV level at Dikchupool 132/66 kV S/s with 220/132 kV 2x200 MVA and associated bays	To evacuate power generated by HEPs under Gangtok, Pakyong and Mangan Districts. This may be considered as pooling Station under Intra-state.	160	2030-31 Transmission lines are already constructed on 220kV Voltage level. Only 220 kV system development are to be done at Dikchupool Substation.
	ii. Operation of Dikchu Pool – Singhik D/c line at rated capacity i.e. at 220kV		-	
5.	i. Creation of 220 kV level at existing Singhik 66/11 kV S/s with 220/66 kV, 2x50 MVA ICTs	To provide connectivity in north Sikkim area.	50.00	2030-31
	ii. Operation of lines at 220 kV level i.e. Dikchu Pool – Singhik D/c line		Mentioned at S.No. 4(ii)	
6.	i. Creation of 220 kV level at Chalamthang (Samardong) 132/66 kV S/s with 220/132 kV 2x200 MVA and associated bays	For Evacuation of share of power from Dikchu HEP this transmission system is proposed.	160	2030-31 Transmission lines are already constructed on 220kV Voltage level. Only 220 kV system development are to be done at Chalamthang GIS
	ii. Operation of existing line at 220 kV level i.e. Rangpo – Chalamthang 220kV D/c & Chalamthang – Dikchu Pool 220kV D/c line		-	
7.	i. Establishment of Assam Lingzey 2x10 MVA, 66/11kV S/s	To meet the future load demand and reliable power supply to the area the S/s is required.	33.15	2027-28
	ii. Assam Lingzey – LLHP 66 kV D/c line (10 ckm) alongwith 2 Nos. of bay at LLHP		34.52	

S.No	Name of the proposal	Justification	Estimated Cost (in Rs. Cr.)	Time Frame
8.	i. Establishment of Ingtang (Yuksom) 66/11 kV , 2x10 MVA S/s	Currently 11 kV fed through Gyalshing S/s. Nearest DT is 11 km and the farthest DT is 30 km.	33.15	2029-30
	ii. Relichu – Yuksom 66 kV S/c line (14 ckm) alongwith 01 No. of 66 kV bay at Relichu	Lowest recorded voltage is 9.0 kV.	49.92	
	iii. Pelling – Yuksom 66 kV S/c line (18 ckm) alongwith 01 No. of 66 kV bay at Pelling S/s	Further, the S/s is also required to supply the power to critical infrastructure in the area.	62.60	
9.	i. Establishment of Dentam 66/11 kV, 2X5 MVA S/s	Currently 11 kV fed through Gyalshing S/s. Nearest DT is 18 km and the farthest DT is 43 km.	31.23	2027 -28
	ii. Dentam – Pelling 66 kV S/c line (12 ckm) alongwith 01 No. of 66 kV bay at Pelling S/s	Lowest recorded voltage is 8.9 kV.	43.58	
	iii. Dentam – Rinchenpong 66 kV S/c line (16 ckm) alongwith 01 No. of 66 kV bay at Rinchenpong	Further, the S/s is also required to supply the power to critical infrastructure in the area.	56.26	
10.	i. Establishment of Rabomchu (New) (Chungthang), 66/11 kV, 2x15 MVA S/s	To meet the future load demand and reliable power supply to the area the S/s is required.	33.73	2028-29 LILO to be done from the junction point of 220 kV and 66 kV line.
	ii. LILO of Singhik – Lachen 66 kV Line at Rabomchu (New) from the junction point of 220 kV D/c (twin Moose) and 66 kV conductor with Singhik – Rabomchu (new) section with 220 kV D/c (twin moose) conductor and Rabomchu (new) – Lachen section with 66 kV D/c conductor - (7 km loop in and 7 km loop out)	The S/s is required for evacuation of power from 12 MW Robomchu hydro.	32.83	

S.No	Name of the proposal	Justification	Estimated Cost (in Rs. Cr.)	Time Frame
	ii. LILO of Rabom – Maltin 66 kV S/c line at Rabomchu (New) (9 km loop in and 9 km loop out)		53.28	

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 Sikkim

S.No	Transmission lines proposed	Brief Justification by State	Estimated Cost (in Rs. Cr.)	Time Frame
1.	Legship Pool – Rangit-II HEP 132 kV D/c line (10.50 ckm) alongwith 2 no of 132 kV bays at Legship pool	Power evacuation of upcoming generation Rangit-II HEP	33.53	2033-34
2.	Rangpo(POWERGRID) GIS – Rolep HEP 220 kV D/c line (30 ckm) alongwith 2 Nos. of GIS bays at Rangpo (PG)	Power evacuation of upcoming generation Rolep HEP	103.6	2029-30
3.	LILO of one ckt of Rangpo (POWERGRID) GIS – Rolep HEP 220 kV D/c line at Bhasmey HEP (4 ckm)	Power evacuation of upcoming generation Bhasmey HEP	13.82	2029-30
4.	LILO of 2 nd ckt of Rangpo (POWERGRID) GIS – Rolep HEP 220 kV D/c line at SuntaleytarHEP (10 ckm)	Power evacuation of upcoming generation Suntaleytar HEP	34.55	2031-32
5.	Rorathong – Rhenock 66 kV S/c on D/c line (5.4 ckm)alongwith associated bay at both end	Rhenock is currently connected with 66 kV network of long lines from LLHP-Pakyong-Rongli-Rhenock. Further, Rhenock is not compliant to N-1 contingency	47.47	2027-28
6.	Topakhani – Samardung 66 kV S/c line (5.1 ckm) alongwith associated bay at both end	To cater the increased load and enhance reliability of power supply in the area.	27.24	2027-28 In view of space constraint at Topakhani, only 1 bay can be

S.No	Transmission lines proposed	Brief Justification by State	Estimated Cost (in Rs. Cr.)	Time Frame
				accommodated, therefore this line is proposed as S/c line.
7.	Melli (132/66 kV S/s) – Melli (66/11 kV S/s) D/c 66 kV line (0.2 ckm) alongwith associated bays at both end	For N-1 compliant of 66/11KV Melli S/s and to cater the load of entire 03 districts.	23.08	2027-28 Presently Gantry of Melli (132/66 kV) – Melli (66/11 kV) are connected. Now it is would be connected through tower and bay arrangement.
8.	LILO of Perbing (Old) – Phodong 66kV S/c line at Perbing GIS S/s along with associated line bays at Perbing GIS S/s (LILO section: 1ckm)	For N-1 complaint of 66/11kV Perbing Substation.	13.78	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 lines of Sikkim

S.No	Transmission lines proposed	Brief Justification by State	Estimated Cost (in Rs. Cr.)	Time Frame
1.	Sichey – Tadong 66 kV S/c Line (4.411 kms)	The transmission line is more than 40 years old and the conductor need to be replaced with similar ampacity conductor. <ul style="list-style-type: none"> • Ampacity of Existing conductor- 360 A • Year of commissioning 1978 	4.4	2026-27
2.	LLHP – Pakyong 66 kV S/c Line (7 kms)	The transmission line is more than 30 years old and the conductor need to be replaced with similar ampacity conductor. <ul style="list-style-type: none"> • Ampacity of Existing conductor- 360 A • Year of commissioning 1993 	7	2026-27

S.No	Transmission lines proposed	Brief Justification by State	Estimated Cost (in Rs. Cr.)	Time Frame
3.	Pakyong – Rorathang 66 kV S/c line (18 ckm)	The transmission line is more than 30 years old and the conductor need to be replaced with similar ampacity conductor. <ul style="list-style-type: none"> • Ampacity of Existing conductor- 360 A • Year of commissioning 1993 	18	2026-27
4.	Gangtok (PG) – LLHP 66kV D/c line (1 ckm)	The transmission line is more than 40 years old and the conductor need to be replaced with similar ampacity conductor. <ul style="list-style-type: none"> • Ampacity of Existing conductor- 360 A • Year of commissioning 1978 	1	2026-27

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

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 Sikkim

Sl. No.	Details of the Proposed transformation Capacity	Justification	Estimated Cost (in Rs. Cr.)	Remarks
1.	Augmentation of transformer capacity by additional 1x50 MVA 132/66 kV ICT along with one No. 132/66 kV ICT bay at Melli 132/66 kV S/s.	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. Existing ICT Capacity: 132/66 kV : 2x50 MVA	11.09	Time frame: 2026-27 After augmentation Total ICT capacity: 132/66 kV, 3x50 MVA Space for 2 no 66 kV line bays each at Melli 132/66 kV and 66/11 kV S/s for 66 kV D/c line.
2.	Augmentation of transformer capacity by replacement of 2x5 MVA, 66/11 kV with 2x15 MVA 66/11 kV ICT at Phodong 66/11 kV S/s	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required Existing ICT Capacity: 66/11 kV : 2x5 MVA	15.83	Time frame: 2027-28 After augmentation Total ICT capacity: 66/11 kV 2x15 MVA

Sl. No.	Details of the Proposed transformation Capacity	Justification	Estimated Cost (in Rs. Cr.)	Remarks
3.	Augmentation of transformer capacity by replacement of 2x2.5 MVA, 66/11 kV transformer with 2x15 MVA ICTs at Namchi 66/11 kV S/s	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required Existing ICT Capacity: 66/11 kV : 2x2.5 MVA	15.83	Time frame: 2027-28 After augmentation Total ICT capacity: 66/11 kV 2x15 MVA
4.	Augmentation of transformer capacity by replacement 1x5 MVA and 1x10 MVA, 66/11 kV transformer S/s with 2x15 MVA ICTs at Melli 66/11 kV S/s	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required Existing ICT Capacity: 66/11 kV : 1x5 MVA + 2x10 MVA	15.83	Time frame: 2027-28 After augmentation Total ICT capacity: 66/11 kV 1x10 MVA + 2x15 MVA
5.	Augmentation of transformer capacity with additional 132/66 kV, 2x50 MVA ICT alongwith extension of 132 kV Bay at Gyalshing 132/66 kV S/s	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required. And for evacuation of generation from Rellichu-I and Rellichu-II HEPs Existing ICT Capacity: 132/66 kV : 1x20 MVA	39.78	Time frame: 2026-27 After augmentation Total ICT capacity: 1x20+2x50 MVA
6.	Augmentation of transformer capacity with additional 66/11 kV, 1x5 MVA ICT alongwith extension of 66 kV Bay at Pelling 66/11 kV S/s	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required Existing ICT Capacity: 66/11 kV: 1x5 MVA	10.81	Time frame: 2027-28 After augmentation Total ICT capacity: 66/11 kV 1x5 MVA + 1x5 MVA
7.	Augmentation of transformer capacity by replacement 1x6 MVA and 1x7.5 MVA, 66/11 kV transformer S/s with 2x15 MVA ICTs at LLHP 66/11 kV S/s	To cater the future load demand and to satisfy N-1 contingency criteria the Augmentation is required Existing ICT Capacity: 66/11 kV : 1x6 MVA + 1x7.5 MVA	15.83	Time frame: 2027-28 After augmentation Total ICT capacity: 66/11 kV 2x15 MVA

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

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

9.1. Options being explored in ISTS

- 9.1.1. The requirement of Inter-state transmission system (ISTS) in Sikkim would be identified after the study of complete transmission system including neighbouring states.

10. Reactive compensation:

- 10.1. The system studies of the State has not identified the Reactive power compensation requirement by 2034-35 at transmission level (132 kV and above voltage level).

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

- 11.1. A total of 1460 MVA transformation capacity addition/augmentation and 298.61 ckm of new transmission lines/reconductoring of old lines at an estimated cost of Rs 1787.72 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. 220 kV Transmission system

S.No	Transmission system	No.	Length (in ckm)	Capacity (in MVA)	Estimated Cost (Rs. Cr.)*
1.	New substation	4		1000	420
2.	Augmentation of existing substation				
3.	New transmission line including LILO and 2 nd Ckt Stringing	4	69		238.37
4.	Reconductoring of transmission line				

11.1.2. 132 kV Transmission system

S.No	Transmission system	No.	Length (in ckm)	Capacity (in MVA)	Estimated Cost (Rs. Cr.)*
1.	New substation	1		55	76.84
2.	Augmentation of existing substation	2		150	50.87
3.	New transmission line including LILO and 2 nd Ckt Stringing	2	50.5		160.53
4.	Reconductoring of transmission line				

11.1.3. 66 kV Transmission system

S.No	Transmission system	No.	Length (in ckm)	Capacity (in MVA)	Estimated Cost (Rs. Cr.)*

1.	New substation	5		130	171.26
2.	Augmentation of existing substation	5		125	74.13
3.	New transmission line including LILO and 2 nd Ckt Stringing	14	148.7		565.32
4.	Reconductoring of transmission line	4	30.41		30.4

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.)
	66 kV	132 kV	220 kV	66 kV	132 kV	220 kV	66 kV	
2026-27	-	150	100	-	-	25	30.4	217.67
2027-28	205	-	-	68.7	-	-	-	490.2
2028-29	30	-	-	32	-	-	-	119.84
2029-30	20	55		48	40	34	-	521.93
2030-31	-	-	900	-	-	-	-	370
2031-32	-	-	-	-	-	10	-	34.55
2032-33	-	-	-	-	-	-	-	-
2033-34	-	-	-	-	10.5	-	-	33.53
2034-35	-	-	-	-	-		-	-
Total	255	205	1000	148.7	50.5	69	30.4	1787.72

12. Conclusion

12.1. By the year 2034-35, the power demand of Sikkim would be increasing significantly. Total expected demand of Sikkim by the year 2034-35 is around 324 MW. This anticipated increase in demand includes the expected industrial load coming progressively from 2024-25 to 2034-35.

12.2. About 12 Nos. of hydro power projects connected with Intra-state transmission network are expected to be commissioned by 2034-35.

- 12.3. 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.
- 12.4. It is recommended that Sikkim shall update their intra-state transmission systems on the PM GatiShakti (PMGS) National Master Plan on regular basis.
- 12.5. The quantum of GNA is nearing the ATC of the Sikkim 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.
- 12.6. A total of 1460 MVA transformation capacity addition/augmentation and 333.11 ckm of new transmission lines/reconductoring/underground cabling at an estimated cost of ₹ 1754.19 cr. would be required for implementing the intra-state transmission proposals for meeting the electricity demand of the state by the year 2031-32.
- 12.7. Further, a total of 1460 MVA transformation capacity addition/augmentation and 288.11 ckm of new transmission lines/reconductoring/underground cabling at an estimated cost of ₹ 1787.72 cr. would be required for implementing the intra-state transmission proposals for meeting the electricity demand of the state by the year 2034-35.
- 12.8. To ensure reliable and adequate power supply in Sikkim 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 Sikkim SLDC.

TRANSMISSION LINE CONSTRAINTS OF SIKKIM POWER DEPARTMENT				
Sl.No	Corridor	Season/Antecedent Constraints	Description of Constraints	Has the Constraints occurred in earlier quarter? Details thereof
1	66 KV PGCIL GTK_TADONG TRANSMISSION LINE	WINTER SEASON/ HIGH DEMAND IN SIKKIM /CAPITAL AREA OF SIKKIM	The Peak Load of Sikkim has crossed the Mark of 150 MW during the Winter period for the FY 2024-25. Out of this peak Load, Gangtok Itself has a load of 40 MW which shall increase inevitably in the coming years. The transmission lines which cater the Gangtok Capital and the whole of North District are these 3 Transmission lines. Since the conductors used in these transmission lines are of ACSR DOG Conductor, having a maximum load carrying capacity of 30 MW. Hence, N-1 Criterion is not satisfied during tripping of any of these transmission lines.	YES
2	66 KV PGCIL GTK_BULBULAY TRANSMISSION LINE		Measures: Considering the aged transmission lines as well the towers, installing HTLS Dog instead of ACSR Dog transmission line with some retrofitting of the existing Towers, the load carrying capacity can be increased to around 45 MW. Also, with commissioning of bays new bays being	
3	66 KV LLHP_SICHEY TRANSMISSION LINE			

			constructed under CSSTDS at Tadong 66/11 kV S/s and Sichey S/s and its connectivity to Perbing 132/66 kV S/s at 66 kV transmission lines shall fulfill N-1 Criterion.	
--	--	--	---	--

Annexure-II

Operational feedback from ERLDC/NLDC

Sl. No	Corridor	Season/ Antecedent Conditions	Description of the constraints
SIKKIM			
1	Gangtok Power supply		<p>Single main and transfer scheme at 132 kV Gangtok (PG) S/s and Low voltage issues at 66 kV system in the downstream of Gangtok. In case of outage (planned/forced) of main bus the power of capital city Gangtok may be put under threat.</p> <p>Short-term measure: Network re-arrangement</p> <p>Long-term measure:</p> <ul style="list-style-type: none">• 132/66 kV Perbing S/S is under execution. May be commissioned at the earliest.• Possibilities of Double bus scheme and transfer at Gangtok SS.

Annexure-III

List of Existing Plant in Sikkim

Sl. No	Capacity (MW) and Name of Project	Implementing Agency / Project Developer	Location	Year of Commissioning	Remarks
1	60 MW Rangit-III HEP	NHPC Ltd.	Hingdam, Soreng District	15.2.2000	Operational
2	510 MW Teesta-V HEP	NHPC Ltd.	Balutar, Gangtok Sikkim	Apr-08	Non-operational since 4 th Oct2023 due to flash flood. Repair and Restoration under progress. Tentatively operational by APRIL 2025
3	1200 MW Teesta III	Sikkim Urja Limited	Singhik, Mangan District	Feb-17	Non-operational since 4 th Oct2023 due to flash flood. No restoration work commenced as on date
4	110 MW Chuzachen HEP	Gati Infrastructure Ltd.	Chujachen, Pakyong Sikkim	Jun-13	Operational
5	96 MW Jorethang Loop	DANS Energy Pvt. Ltd.	Majitar, Namchi Sikkim	Sep-15	Operational
6	97 MW Tashiding HEP	Shiga Energy Pvt. Ltd.	Tashiding, Gyalsing Sikkim	Oct-17	Operational
7	113 MW Rongnichu HEP	Madhya Bharat Power Corp. Ltd.	Kumrek, Pakyong District	Jun-21	Operational

8	96 MW Dikchu HEP	Sneha Kinetic Power Projects Ltd.	Dikchu, Gangtok District	Apr-17	Non- operational since 4th Oct. 23 due to flash flood. Repair and restoration work under progress. Tentatively operational by Nov 24
9	3 MW Lachung Stage II Hydel Project	Sikkim Power Development Power Corporation Limited (SPDCL)	Lachung, Mangan District	Jan-09	Operational but in isolation mode.
10	2 MW Mangley Hydel Project	Sikkim Power Development Power Corporation Limited (SPDCL)	Mangley, Namchi District	Jul-08	Non- Operational. Intake washed away due to recent flashflood
11	5 MW Rongli Hydel Project	Sikkim Power Development Power Corporation Limited (SPDCL)	Rongli, Pakyong District	Oct-13	Operational
12	3 MW Chatten Hydel Project	Sikkim Power Development Power Corporation Limited	Lachen, Mangan District	Sep-22	Operational in isolation mode.
13	18 MW Lower Lagyap Hydel Project	M/S Kundan Hydro (Gangtok) Private Limited	Lagyap, Gangtok District	May-23	Operational
14	4 MW Meyong chu Hydel Project	M/S Kundan Hydro (Gangtok) Private Limited	Meyong, Mangan District	May-23	Operational
15				Jun-22	Operational

	3 MW Rabom chu Hydel Project	M/S Kundan Hydro (Gangtok) Private Limited	Rabom, Mangan District		
16	2 MW KalezKhola Hydel Project	M/S Kundan Hydro (Gangtok) Private Limited	Kalez, Gyalsing district	May-23	Operation.
17	0.6 MW Rimbi Stage I Hydel Project	M/S Kundan Hydro (Gangtok) Private Limited	Rimbi, Gylasing District		Under Examination
18	2.1 MW Jali Power House	M/S Kundan Hydro (Gangtok) Private Limited	Jali HEP, Gangtok District		Under Examination
19	2.5 MW Rongnichu Hydel Project	M/S Kundan Hydro (Gangtok) Private Limited	Topa, Gangtok District		Under Examination
20	8 MW Upper Rongnichu	Rongni Chu Hydro Power Limited (RHPPL)	URHP, (36 mile), Gangtok District		Non-operational because of no discharge

Annexure-IV

Power Map of Sikkim including planned system by 2034-35

