



MASTER PLAN FOR EVACUATION OF POWER FROM HYDROELECTRIC PLANTS IN BRAHMAPUTRA BASIN

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CENTRAL ELECTRICITY AUTHORITY
MINISTRY OF POWER
GOVERNMENT OF INDIA



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FOR EVACUATION OF POWER
FROM HYDROELECTRIC
PLANTS
IN BRAHMAPUTRA BASIN**

October, 2025

**Central Electricity Authority
PSPA-II Division**

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Foreword

India, being one of the world's fastest-growing economies, to meet the rising demand and ensure long-term energy security, must develop energy sources that are sustainable, economical and reliable. Harnessing hydro power is critical—not only as a key source of renewable electricity but also as a highly flexible resource that supports the optimal integration of both renewable and conventional energy sources.

To facilitate the systematic development and evacuation of power from the country's significant hydro potential, the Central Electricity Authority (CEA) has prepared a Master Plan for Evacuation of Power from Hydroelectric Plants in the Brahmaputra Basin.

This comprehensive study covers the transmission system required to evacuate power from the hydroelectric potential identified in all twelve sub-basins of the Brahmaputra Basin. The document outlines the phased transmission infrastructure needed to support the evacuation of approximately 65 GW of hydroelectric capacity. It is intended to serve as a roadmap for the planning and implementation of hydroelectric projects in the region.

I am confident that this document will prove valuable in supporting effective hydro power planning and accelerating the development of hydroelectric projects across the country.

Pankaj

(Pankaj Agarwal)





P R E F A C E

In this era of rapid development, the demand for energy is both essential and ever-increasing. India's journey from a developing nation to an emerging developed economy reflects its dynamic and sustained economic progress. In this context, the planning of power generation and transmission systems plays a crucial role in shaping the future of the energy sector.

The Central Electricity Authority (CEA) had previously undertaken the Reassessment of Hydroelectric Potential study during 1978–1987. To systematically identify and facilitate the development of India's exploitable hydro resources, CEA revisited this effort through a comprehensive study titled "Reassessment of Hydroelectric Potential in the Country", which was published in November 2022.

In view of the substantial hydroelectric potential identified within the Brahmaputra basin, it was felt to have a comprehensive transmission system plan for evacuation of power from this assessed potential. Consequently, a transmission system master plan has been formulated for the evacuation of 65 GW of hydro-electric generation capacity from 12 sub-basins of the Brahmaputra basin.

I am confident that this Master Plan will serve as a valuable guide for hydro power developers in planning and phasing their projects. It will also instill greater confidence among stakeholders, enabling well-informed and judicious decisions that support the expansion and strengthening of the nation's transmission infrastructure.

I commend the efforts of Shri Bhagwan Sahay Bairwa, Chief Engineer (PSPA-II Division) and his dedicated team of officers for formulation of the master plan.


(Ghanshyam Prasad)



विजय कुमार सिंह
सदस्य (विजली प्रणाली) और भारत
सरकार के पदेन अतिरिक्त सचिव

Vijay Kumar Singh
Member (Power Systems) and
Ex-Officio Additional Secretary
to the Government of India

INTRODUCTION

India is richly endowed with substantial, economically viable hydroelectric potential. The first systematic assessment of this potential was carried out by the erstwhile Central Water & Power Commission (CW&PC) between 1953 and 1959. According to that survey, the country's hydroelectric potential was estimated at approximately 42 million kW, based on about 250 identified projects. Later, from 1978–1987, the CEA reassessed India's hydro potential at ~149 GW, with 592 large projects across major river basins contributing 145 GW.

To further support the systematic development of this potential, CEA undertook another study titled "Reassessment of Hydroelectric Potential in the Country", which culminated in a report published in November 2022.

Previously, in 2011, CEA developed a master plan for the evacuation of power from hydro projects in Arunachal Pradesh. Subsequently, the Ministry of Power (MoP), through an order dated 22.12.2021, issued basin-wise identification of hydro projects (above 25 MW) in Arunachal Pradesh.

Given the vast hydro potential to the tune of 65 GW in 12 sub-basins of the Brahmaputra Basin, the need for a comprehensive transmission system to evacuate power from these hydroelectric projects became critical. In response, a Master Plan for Evacuation of Power from Hydroelectric Plants in the Brahmaputra Basin has been developed.

The plan proposes the development of 10 thousand ckm of transmission lines, 30 GVA of transformation capacity, and 12 GW of HVDC by the year 2035. Beyond 2035, an additional 21 thousand ckm of transmission lines, 38 GVA of transformation capacity, and 30 GW of HVDC will be required. In total, the plan outlines the addition of 31 thousand ckm of transmission lines, 68 GVA of transformation capacity, and 42 GW of HVDC. The subsequent chapters of this report provide detailed elaboration of this comprehensive plan.

I believe this Master Plan will serve as a valuable resource for all stakeholders by aiding the development of a reliable and resilient transmission infrastructure, ensuring the efficient evacuation of hydro power, and delivering reliable electricity to consumers across the country.

(Vijay Kumar Singh)



भगवान सहाय बैरवा
मुख्य अभियंता
केंद्रीय विद्युत प्राधिकरण

Bhagwan Sahay Bairwa
Chief Engineer
Central Electricity Authority

ACKNOWLEDGEMENT

The Master Plan for Evacuation of Power from Hydroelectric Plants in the Brahmaputra Basin has been prepared. This Master Plan is divided into two timeframes: up to the year 2035, and beyond 2035.

The proposed transmission system details the transmission system envisaged under the Inter-State Transmission System (ISTS) and dedicated transmission lines. To refine and finalize the transmission framework, multiple consultations were held with CTUIL, Grid-India, North Eastern Region (NER) states, NHPC, SJVNL, THDCIL and NEEPCO.

I extend my sincere thanks to the officers of CTUIL, especially Shri Rajesh Kumar, Senior GM; Shri Manish Ranjan Keshari, Chief Manager; Shri Anupam Kumar, Chief Manager; Shri Divesh Kamdar, Engineer; and Ayush Das, Engineer Trainee, for their significant contributions during the preparation of this Master Plan. I gratefully acknowledge the valuable suggestions, assistance, and cooperation received from the officers of Grid-India, particularly Shri Sachin Kumar Singh, Manager (NERLDC).

My gratitude is also due to Shri Balwan Kumar, Director, CEA and to Shri T.K. Tara, Chief Engineer (TP&MZ), Department of Power, Arunachal Pradesh, for their valuable inputs.

The exceptional dedication and efforts of the officers from the PSPA-II Division, CEA namely Shri Manish Maurya, Deputy Director; and Shri Bhanwar Singh Choudhary, Assistant Director are deeply appreciated and gratefully acknowledged.

I am thankful to Shri Ghanshyam Prasad, Chairperson, CEA and Shri V.K. Singh, Member (Power Systems), CEA for their encouragement, motivation, and invaluable guidance in preparation of this master plan.

(Bhagwan Sahay Bairwa)
PSPA-II Division

Contents

Executive Summary	i
1. Introduction	1
2. Hydroelectric Power Potential in Brahmaputra Basin	7
3. Planning of Evacuation System	19
4. Lohit Sub-basin	22
5. Dibang Sub-basin	27
6. Siang Sub-basin	33
7. Subansiri Sub-basin	40
8. Pare (Dikrong) Sub-basin	47
9. Kameng Sub-basin	50
10. Tawang Sub-basin	56
11. Upper Brahmaputra Sub-basin	60
12. Lower Brahmaputra Sub-basin	63
13. Kalang (Kopili) Sub-basin	65
14. Teesta Sub-basin	70
15. Barak Sub-basin	78
16. Pumped Storage Plants	87
17. Conclusion	91
Annexure-I	100
Annexure-II	105

List of Tables

Table 1-1 Region-wise installed capacity of India as on 31.03.2025	1
Table 1-2 Region-wise anticipated Energy requirement and Peak Demand (20th EPS)	2
Table 1-3 Hydroelectric potential of sub-basins of Brahmaputra basin as per CEA report (November 2022)	4
Table 1-4 List of HEPs with capacity less than or equal to 25 MW (as per CEA's November 2022 report)	5
Table 2-1 State- wise hydroelectric potential of Brahmaputra Basin	7
Table 2-2 List of unexploitable hydro-electric potential.....	9
Table 2-3 List of HEPs in Brahmaputra Basin.....	9
Table 2-4 Sub-Basin wise Exploitable Hydroelectric Potential (>25 MW) (excluding PSPs)	15
Table 2-5 Summary of exploitable hydroelectric potential (>25 MW) (excluding PSPs)	15
Table 2-6 List of Small HEPs with revised hydroelectric potential.....	17
Table 2-7 List of HEPs in Arunachal Pradesh allocated to agencies by MoP.....	17
Table 2-8 Potential of PSPs	18
Table 4-1 List of HEPs in Lohit sub-basin.....	22
Table 4-2 Transmission evacuation system in Lohit sub-basin by 2035	23
Table 4-3 Transmission evacuation system in Lohit sub-basin beyond 2035	25
Table 4-4 Timeframe vis-a-vis pooling station wise capacity.....	26
Table 5-1 List of HEPs in Dibang sub-basin	27
Table 5-2 Transmission evacuation system in Dibang sub-basin by 2035.....	28
Table 5-3 Transmission evacuation system in Dibang sub-basin beyond 2035.....	30
Table 5-4 Timeframe vis-a-vis pooling station wise capacity.....	32
Table 6-1 List of HEPs in Siang sub-basin.....	33
Table 6-2 Transmission evacuation system in Siang sub-basin by 2035.....	34
Table 6-3 Transmission evacuation system in Siang sub-basin beyond 2035.....	36
Table 6-4 Timeframe vis-a-vis pooling station wise capacity.....	39
Table 7-1 List of HEPs in Subansiri sub-basin.....	40
Table 7-2 Transmission evacuation system in Subansiri sub-basin by 2035.....	42
Table 7-3 Transmission evacuation system in Subansiri sub-basin beyond 2035.....	44
Table 7-4 Timeframe vis-a-vis pooling station wise capacity.....	46
Table 8-1 List of HEPs in Pare (Dikrong) sub-basin.....	47
Table 8-2 Transmission evacuation system in Pare (Dikrong) sub-basin beyond 2035	48
Table 8-3 Timeframe vis-a-vis pooling station wise capacity.....	49
Table 9-1 List of HEPs in Kameng sub-basin.....	50
Table 9-2 Transmission evacuation system in Kameng sub-basin beyond 2035.....	52
Table 9-3 Timeframe vis-a-vis pooling station wise capacity.....	54
Table 10-1 List of HEPs in Tawang sub-basin	56
Table 10-2 Transmission evacuation system in Tawang sub-basin beyond 2035.....	57
Table 10-3 Timeframe vis-a-vis pooling station wise capacity	59

Table 11-1 List of HEPs in Upper Brahmaputra sub-basin	60
Table 11-2 Transmission evacuation system in Upper Brahmaputra sub-basin beyond 2035.....	61
Table 11-3 Timeframe vis-a-vis pooling station wise capacity	62
Table 12-1 List of HEPs in Lower Brahmaputra sub-basin.....	63
Table 13-1 List of HEPs in Kalang (Kopili) sub-basin	65
Table 13-2 Transmission evacuation system in Kalang (Kopili) sub-basin by 2035.....	66
Table 13-3 Transmission evacuation system in Kalang (Kopili) sub-basin beyond 2035.....	68
Table 13-4 Timeframe vis-a-vis pooling station wise capacity	69
Table 14-1 List of HEPs in Teesta sub-basin	70
Table 14-2 Transmission evacuation system in Teesta sub-basin by 2035.....	72
Table 14-3 Transmission evacuation system in Teesta sub-basin beyond 2035.....	73
Table 14-4 Timeframe vis-a-vis pooling station wise capacity	77
Table 15-1 List of HEPs in Barak sub-basin.....	78
Table 15-2 Transmission evacuation system in Barak sub-basin by 2035	80
Table 15-3 Transmission evacuation system in Barak sub-basin beyond 2035	82
Table 15-4 Timeframe vis-a-vis pooling station wise capacity	86
Table 16-1 Potential of PSPs in Brahmaputra Basin	87
Table 16-2 Transmission evacuation system of PSPs by 2035	88
Table 16-3 Transmission evacuation system of PSPs beyond 2035	89
Table 16-4 Timeframe vis-a-vis pooling station wise capacity	90
Table 17-1 Sub-Basin wise Exploitable Hydroelectric Potential (>25 MW).....	91
Table 17-2 Transmission lines planned in the Brahmaputra Basin.....	92
Table 17-3 Pooling sub-stations planned in the Brahmaputra Basin	94
Table 17-4 Bay extension required at existing sub-stations	95

List of Figures

Figure 1-1 Region-wise installed capacity of India as on 31.03.2025	2
Figure 1-2 Projected Regional Peak Demand as per 20th EPS	2
Figure 1-3 Sub-basin-wise potential (>25 MW) as per CEA report (November 2022)	5
Figure 1-4 Sub-basin wise Nos. of projects (>25 MW) as per CEA report (November 2022)	5
Figure 2-1 Sub-basins of the Brahmaputra Basin	7
Figure 2-2 State-wise hydroelectric potential (>25 MW)	8
Figure 2-3 State-wise Nos. of hydroelectric projects (>25 MW)	8
Figure 2-4 State-wise Exploitable hydroelectric potential (>25 MW) (excluding PSPs)	16
Figure 2-5 State-wise Nos. of exploitable hydroelectric potential (>25 MW) (excluding PSPs)	16
Figure 2-6 State-wise potential of PSP in Brahmaputra Basin	18
Figure 4-1 Transmission System of Lohit Sub-basin by 2035	24
Figure 4-2 Transmission System of Lohit Sub-basin beyond 2035	26
Figure 5-1 Transmission System of Dibang Sub-basin by 2035	29

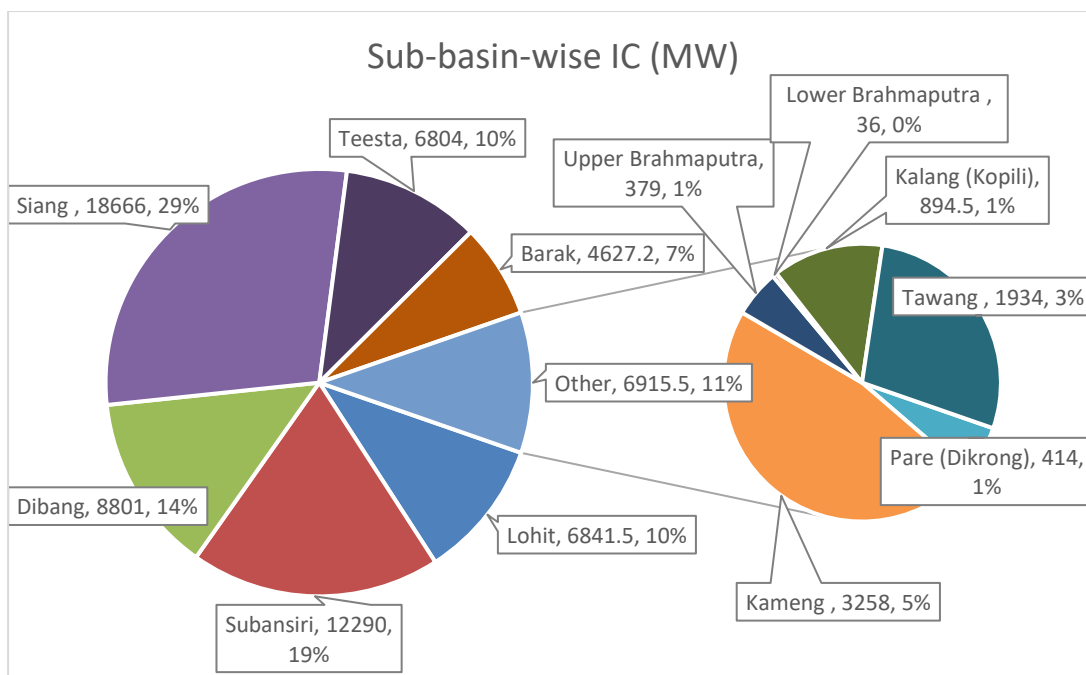
Figure 5-2 Transmission System of Dibang Sub-basin beyond 2035	31
Figure 6-1 Transmission System of Siang Sub-basin by 2035	35
Figure 6-2 Transmission System of Siang Sub-basin beyond 2035	39
Figure 7-1 Transmission System of Subansiri Sub-basin by 2035	43
Figure 7-2 Transmission System of Subansiri Sub-basin beyond 2035	46
Figure 8-1 Transmission System of Pare (Dikrong) Sub-basin beyond 2035	49
Figure 9-1 Transmission System of Kameng Sub-basin beyond 2035	54
Figure 10-1 Transmission System of Tawang Sub-basin beyond 2035	59
Figure 11-1 Transmission System of Upper Brahmaputra Sub-basin beyond 2035	62
Figure 12-1 Transmission System of Lower Brahmaputra Sub-basin	64
Figure 13-1 Transmission System of Kalang (Kopili) Sub-basin by 2035	68
Figure 13-2 Transmission System of Kalang (Kopili) Sub-basin beyond 2035	69
Figure 14-1 Transmission System of Teesta Sub-basin by 2035	73
Figure 14-2 Transmission System of Teesta Sub-basin beyond 2035	77
Figure 15-1 Transmission System of Barak Sub-basin by 2035	81
Figure 15-2 Transmission System of Barak Sub-basin beyond 2035	86
Figure 16-1 Transmission System of PSPs in Brahmaputra	90
Figure 17-1 Hydroelectric Capacity (MW) to be pooled at ISTS and Intra-STs	96
Figure 17-2 PSP Capacity (MW) to be pooled at ISTS and Intra-STs	96
Figure 17-3 ckm addition upto 2035 and beyond 2035	97
Figure 17-4 MVA addition upto 2035 and beyond 2035	97
Figure 17-5 Estimated cost (Rs. cr.) upto 2035 and beyond 2035	97
Figure 17-6 ckm addition (upto 2035)	98
Figure 17-7 ckm addition (beyond 2035)	98
Figure 17-8 MVA addition (upto 2035)	98
Figure 17-9 MVA addition (beyond 2035)	98
Figure 17-10 Basin wise estimated cost (Rs. cr.) upto 2035	98
Figure 17-11 Basin wise total estimated cost (Rs. cr.)	99

Executive Summary

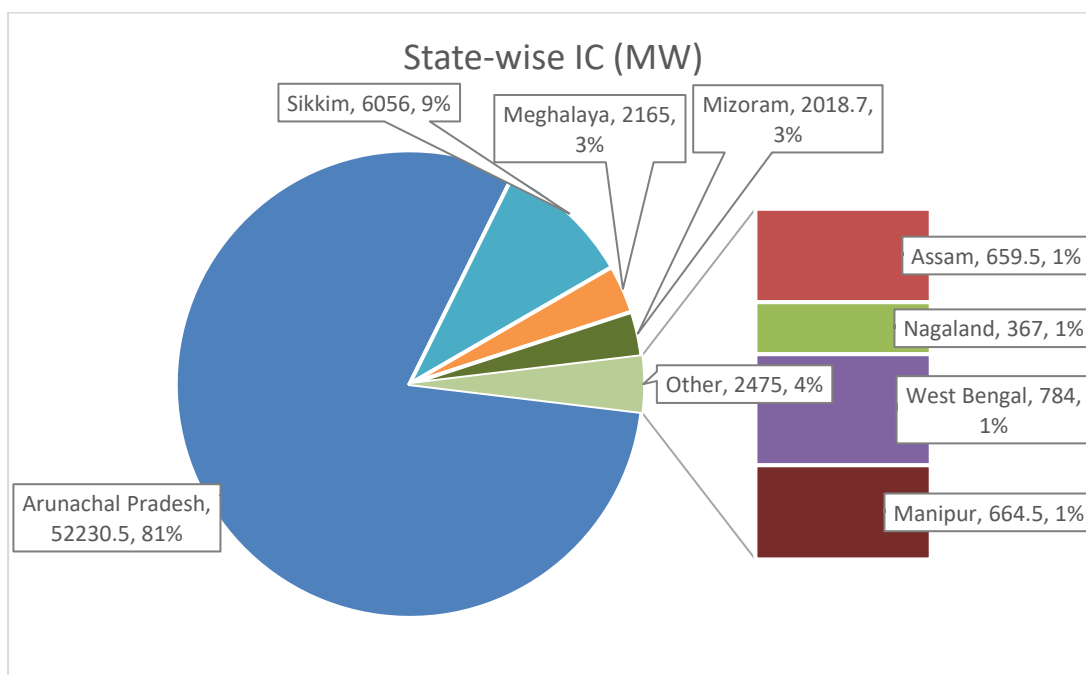
1. CEA took up the study namely “Reassessment of Hydroelectric Potential in the Country” and published a report in November 2022. The report mentioned that there was total 69135.7 MW of Hydro Potential (including projects < 25 MW) available in the Brahmaputra Basin comprising of 224 Nos. of projects above 25 MW with cumulative installed capacity of 68734.2 MW. The Brahmaputra basin is divided into 12 Nos. of sub-basins out of which Dibang, Siang, Lohit, Subansiri, Kameng, Teesta and Barak are considered as major sub-basins.
2. After due consultation with States and Project developers it was emerged that the hydro-electric potential of some of the projects got modified and some are non-exploitable. The state-wise list of exploitable hydro potential (IC>25 MW) is given below:

S.No.	Sub-basin	State	No. of Projects	IC (MW)
1.	Lohit	Arunachal Pradesh	12	6841.5
2.	Subansiri	Arunachal Pradesh	20	12290
3.	Dibang	Arunachal Pradesh	14	8801
4.	Siang	Arunachal Pradesh	25	18666
5.	Pare (Dikrong)	Arunachal Pradesh	5	414
6.	Kameng	Arunachal Pradesh	24	3258
7.	Upper Brahmaputra	Arunachal Pradesh	1	26
		Assam	1	28
		Nagaland	4	325
8.	Lower Brahmaputra	West Bengal	1	36
9.	Kalang (Kopili)	Assam	7	631.5
		Meghalaya	6	263
10.	Teesta	Sikkim	34	6056
		West Bengal	8	748
11.	Tawang	Arunachal Pradesh	8	1934
12.	Barak	Meghalaya	16	1902
		Manipur	10	664.5
		Mizoram	11	2018.7
		Nagaland	1	42
Total			208	64945.2

3. The figure of 64945.2 MW includes 4807 MW existing and 2000 MW under-construction capacity. The sub-basin wise exploitable hydroelectric potential (>25 MW) (excluding PSPs) is given at figures below.



4. Statewise exploitable hydroelectric potential is as under:



5. In addition to the above, following Pumped Storage Plants (PSPs) in the Brahmaputra basin have been considered:

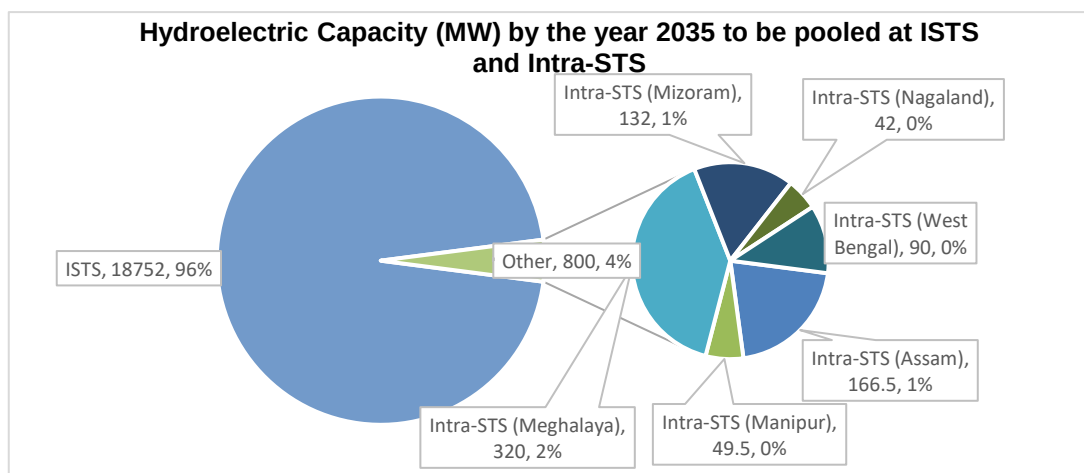
S.No.	Name of PSP	I.C. (MW)	State	Sub-basin
1.	Panyor	660	Arunachal Pradesh	Subansiri
2.	Wah Umiam	800	Meghalaya	Barak
3.	Longtharai PSP	800	Tripura	Barak
4.	Kopili	320	Assam	Kalang (Kopili)
5.	Ouguri PSP	900	Assam	Kalang (Kopili)

S.No.	Name of PSP	I.C. (MW)	State	Sub-basin
6.	Tharakunji PSP	900	Assam	Kalang (Kopili)
7.	Karbi Langpi PSP	800	Assam	Kalang (Kopili)
8.	Leiva Lui	1500	Mizoram	Barak
9.	Tuiphai Lui	1650	Mizoram	Barak
10.	Nghasih	400	Mizoram	Barak
11.	Daizo Lui	2400	Mizoram	Barak
Total		11130		

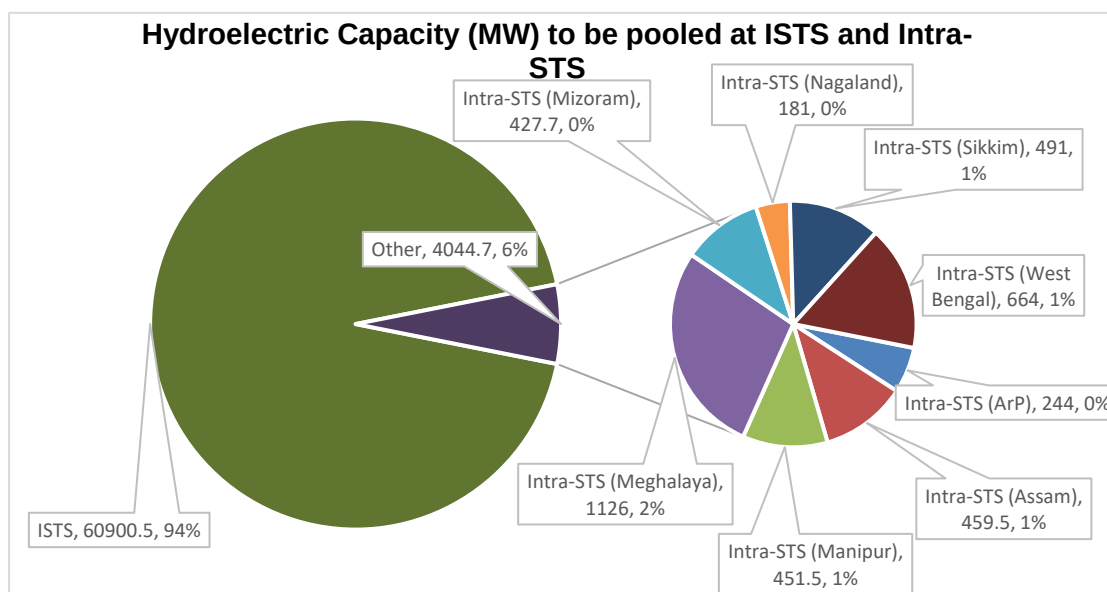
6. In view of the availability of large hydro potential in the Brahmaputra basin, there was a requirement to have a comprehensive plan on transmission system for evacuation of power from this assessed potential. Therefore, this transmission system master plan for the evacuation of power from the hydro projects in the Brahmaputra Basin has been prepared.
7. During planning of the transmission system for evacuation of power from HEPs, the limits and criteria defined in the CEA (Manual on Transmission Planning Criteria) have been considered.
8. Keeping in view the implementation time frame of hydroelectric plants in the Brahmaputra Basin, the phasing of transmission system has been done in two time frames i.e. upto 2035 and beyond 2035. Accordingly, system studies were carried out in the time-frame of 2035 and beyond 2035 for the potential given below:

S.No.	Capacity Type	Existing / Under-construction capacity (MW)	Additional capacity by 2035 (MW)	Additional capacity beyond 2035 (MW)	Total (MW)
1.	HEPs (IC>25 MW)	6807	19552	38586.2	64945.2
2.	PSPs	0	3720	7410	11130
Total (MW)		6807	23272	45996.2	76075.2

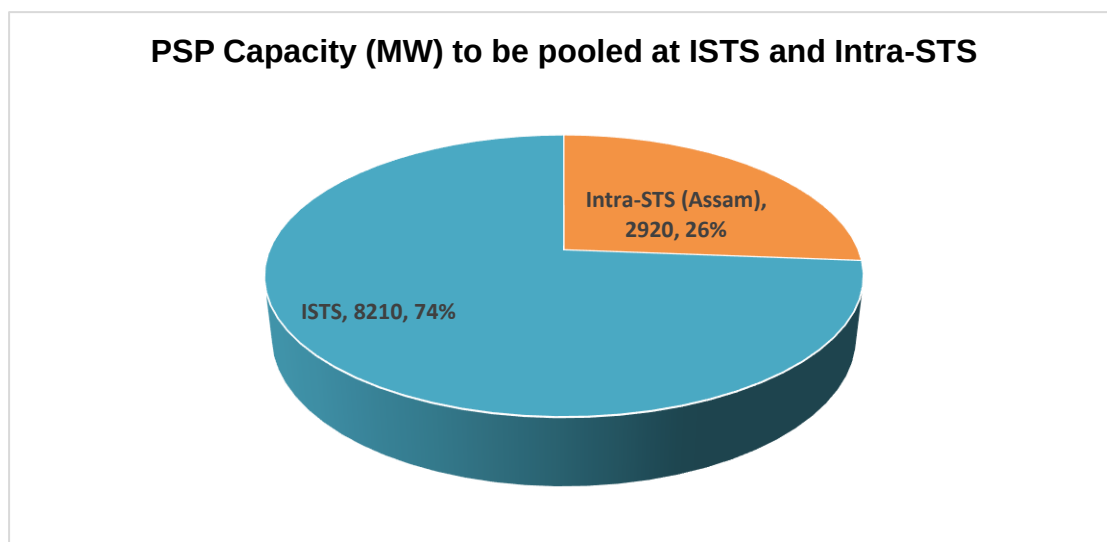
9. The additional exploitable hydroelectric capacity by the year 2035 (i.e. 19,552 MW for HEPs >25 MW) planned to be pooled at ISTS and Intra-State transmission system are as under:



10. Total exploitable hydroelectric capacity (i.e. 64945.2 MW including 6807 MW existing and under construction HEPs) planned to be pooled at ISTS and Intra-State transmission system is as under.



11. In addition to above, 11,130 MW of hydroelectric potential of Pumped Storage Plants (PSPs) have been envisaged in the planned capacity (MW) to be pooled at ISTS and Intra-State transmission system as detailed below :



12. Following transmission lines as common system for evacuation of power from HEPs in Brahmaputra basin have been envisaged under ISTS in this master plan:

S.No.	Sub-basin	Time frame	Transmission line	ckm
1.	Lohit	Upto 2035	Kherang Camp PS – Namsai PS 400 kV D/c line (Quad)	216
2.			Namsai PS – Naharkatia 765 kV D/c line	166
3.		Beyond 2035	Kherang Camp PS – Namsai PS 400 kV 2 nd D/c (Quad) line	216
4.			HVDC Bi-pole line from Namsai to Outside NER	3000

S.No.	Sub-basin	Time frame	Transmission line	ckm
5.	Dibang	Upto 2035	Etalin PS – Roing (New) 400 kV 2xD/c (Quad) line	182
6.			Roing (New) – Naharkatia 765 kV D/c line	223
7.			Naharkatia – Mariani 400 kV D/c (Quad) line	310
8.			Naharkatia – Khumtai 765 kV D/c line	401
9.			Khumtai – Bornagar 765 kV D/c line	670
10.			Khumtai – Khumtai (AEGCL) 400 kV D/c (Quad) line	0
11.			HVDC Bi-pole line from Roing (New) to Outside NER	3000
12.	Siang	Upto 2035	Kaying PS – Niglok PS 400 kV D/c (Quad) line	221
13.			Niglok PS – Gogamukh 400 kV D/c (Quad) line	240
14.		Beyond 2035	HVDC Bi-pole line from Niglok to Outside NER	3000
15.			Tuting PS – Niglok 220 kV D/c (High Capacity) Line	312
16.			Kaying PS – Niglok PS 2 nd 400 kV D/c (Quad) line	221
17.			Niglok PS – Gogamukh (new) 400 kV D/c (Quad) line	240
18.			Pangin PS – Niglok 220 kV D/c (Twin) line	72
19.			Mehcuka PS – Kaying PS 220 kV D/c (Twin) line	139
20.			LILO of Niglok – Gogamukh (new) 400 kV (Quad) D/c at Silapathar PS	120
21.			2xHVDC Bi-pole line from Silapathar to Outside NER	6000
22.	Subansiri	Upto 2035	Daporijo PS – Gogamukh (new) 400 kV 2xD/c (Quad) line	293
23.			Gogamukh– BNC 400 kV D/c (Quad) Line	324
24.			LILO of Gogamukh– Niglok 400 kV D/c (Quad) line at Gogamukh (new)	29
25.			Tezpur – Gogamukh (new) 765 kV D/c line	432
26.			Tezpur – Bornagar 765 kV D/c line	216
27.			HVDC Bi-pole line from Gogamukh (new) to Outside NER	3000
28.		Beyond 2035	Daporijo PS – Gogamukh 400 kV 3 rd D/c (Quad) line	146
29.			Itanagar (New) – Itanagar (DoP, Arunachal Pradesh) 132 kV D/c (High Capacity) line	24
30.			Koloriang PS – Itanagar (New) 400 kV D/c (Quad) line	24
31.			LILO of Gogamukh – BNC 400 kV D/c (Quad) line at Itanagar (New)	120
32.			LILO of both ckt of Rangandi (Panyor HEP) – BNC 400 kV D/c line at Panyor PS	120

S.No.	Sub-basin	Time frame	Transmission line	ckm
33.			Reconductoring of Panyor PS – BNC 400 kV D/c line with Twin HTLS (1600 A single HTLS)	432
34.	Kameng	Beyond 2035	Rowta – Rowta (AEGCL) 220 kV D/c line	24
35.			Pakke PS – Talong PS 220 kV D/c (Twin) line	24
36.			Talong PS – Rowta 400 kV D/c line	300
37.			Gongri PS – Rowta 400 kV D/c (Quad) line	180
38.			Rowta – Bornagar 400 kV D/c (Quad) line	276
39.			HVDC Bi-pole line from Rowta to Outside NER	3000
40.	Tawang	Beyond 2035	Tawang PS – Gongri PS 400 kV D/c (Quad) line	98
41.			Gongri PS – Bornagar 400 kV D/c (Quad) line	336
42.			LILO of both ckt of Gongri – Bornagar 400 kV (Quad) line at Rowta PS	120
43.	Teesta	Beyond 2035	Yumthang – Siliguri 400 kV D/c (Quad) line	336
44.			Siliguri – Katihar 400 kV D/c (Quad) line	348
45.	Barak	Beyond 2035	Melriat-II – Silchar 400 kV D/c (high capacity) line	389
46.			Khawiva PS – Aizawl 400kV D/c (Quad) line	216
47.			Aizawl – Silchar 400kV D/c (Quad) line	300
48.			Melriat-II – Imphal (New) 765 kV D/c line	408
49.			Imphal (New) – Khumtai 765 kV D/c line	487
50.			Melriat-II – Aizawl 400 kV D/c (Quad) line	24
51.			Mawlai PS – Nangalbibra 400 kV D/c line	254
52.			Mawlai PS – Killing (ISTS) 400 kV D/c line	120
53.			Mawlai PS – New Shillong 220 kV D/c line	24
54.			LILO of Byrnihat (MePTCL) – Bongaigaon 400 kV S/c line at Killing (ISTS)	24
Total				31397

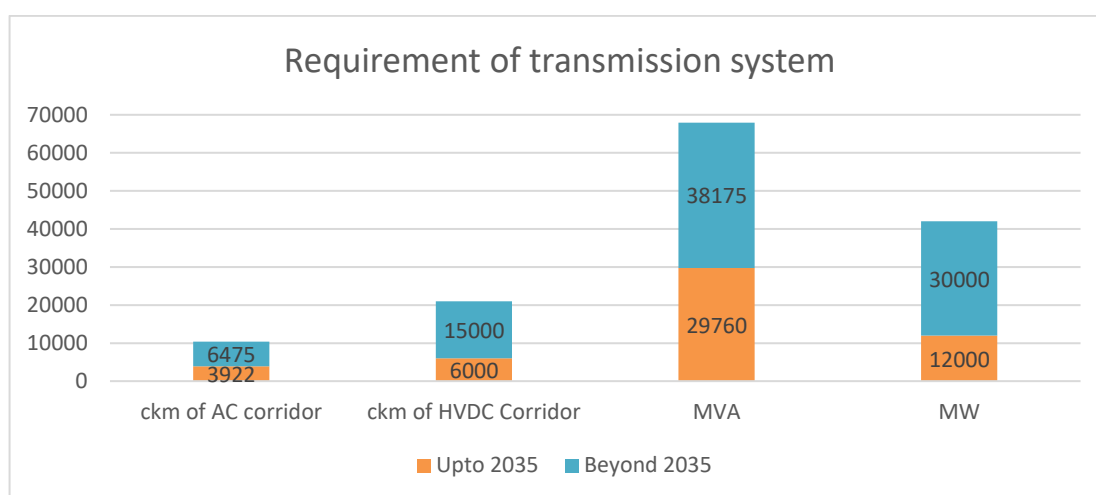
13. Further, following major pooling stations/sub-stations and HVDC stations have been envisaged as common transmission system under ISTS:

S.No.	Sub-Basin	Pooling Station	Transformation Capacity	
			upto 2035	beyond 2035
1.	Lohit	Kherang Camp 400/220/132 kV GIS	3x500 MVA	1x500+2x200 MVA (additional)
2.		Namsai 765/400 kV GIS	3x1500 MVA	1x1500 MVA (additional)
3.		Namsai HVDC ±800 kV	-	6000 MW
4.	Dibang	Etalin 400/220 kV GIS	2x500 MVA	3x500 MVA

S.No.	Sub-Basin	Pooling Station	Transformation Capacity	
			upto 2035	beyond 2035
5.		Roing (New) 765/400 kV	3x1500 MVA	2x1500 MVA
6.		Roing (New) ±800 kV HVDC	6000	-
7.		Naharkatia 765/400 kV GIS	3x1500 MVA	-
8.		Khumtai 765/400 kV GIS	2x1500 MVA	-
9.	Siang	Kaying 400/220 kV	2x500 MVA	2x500 MVA (additional)
10.		Niglok 400/220 kV GIS	2x500 MVA	1x500 MVA (additional)
11.		Mechuka 220/132 kV	-	3x200 MVA
12.		Tuting 220/132 kV	-	4x200 MVA
13.		Pangin 220/132 kV	-	3x200 MVA
14.		Niglok ±800 kV		6000 MW
15.		Silapathar ±800 kV	-	2x6000 MW
16.	Subansiri	Gogamukh (new) 765/400 kV	5x1500 MVA	-
17.		Daporijo 400 kV	Switching S/s	Switching S/s
18.		Tezpur 765 kV	Switching S/s	Switching S/s
19.		Gogamukh (new) ±800 kV	6000	-
20.		Panyor 400/132 kV	-	3x200 MVA
21.		Koloriang 400/220 kV	-	3x500 MVA
22.		Itanagar (New) 400/132 kV	-	2x200 MVA
23.	Pare (Dikrong)	Itanagar (New) 400/132 kV	-	2x200 MVA (additional)
24.	Kameng	Pakke PS 220/132 kV	-	4x200 MVA
25.		Talong 400/220/132 kV	-	3x500 MVA + 4x200 MVA
26.		Gongri 400/220/132 kV	-	5x500 MVA + 5x160 MVA
27.		Rowta 400/220 kV	-	2x500 MVA
28.		Rowta ±800 kV	-	6000 MW
29.	Tawang	Tawang 400/220 kV	-	3x500 MVA
30.	Upper Brahamaputra	Mokokchung (PG) 220/132 kV S/s (Existing)	-	-
31.	Kalang (Kopili)	Misa (PG) 400/220 kV (Existing)	-	-
32.	Teesta	Yumthang 400/220 kV	-	4x500 MVA
33.	Barak	PK Bari 400/132 kV S/s	4x315 MVA (additional)	-
34.		Khawiva 400/132 kV	-	2x200 MVA
35.		Aizawl 400/132 kV	-	2x315 MVA
36.		Melriat-II 765/400 kV	-	3x1500 MVA

S.No.	Sub-Basin	Pooling Station	Transformation Capacity	
			upto 2035	beyond 2035
37.		Imphal (New) 765/400 kV	-	2x1500 MVA
38.		Mawlai 400/220 kV	-	3x500 MVA
39.		Nangalbibra (ISTS) 400/220/132 kV	-	3x315 MVA
40.		Killing (ISTS) 400/220 kV S/s	-	6x500 MVA
Total			41760	68175

14. The plan envisage the addition of 31,397 ckm transmission lines (including 21,000 ckm HVDC corridor) and 109935 MVA+MW capacity (including 42,000 MW HVDC). Upto the year 2035, addition of 9,922 ckm transmission lines (including 6,000 ckm HVDC corridor) and 41,760 MVA capacity (including 12,000 MW HVDC) and beyond 2035, addition of 21,475 ckm transmission lines (including 15,000 ckm HVDC corridor) and 68,175 MVA capacity (including 30,000 MW HVDC) would be required. The required capacity addition is shown in figure below:



15. Basin-wise ckm and MVA addition is tabulated below:

S. No	Sub-Basin	Upto 2035		Beyond 2035		Total	
		Transm ission line (ckm)	Transformati on Capacity + HVDC capacity (MVA+MW)	Transmi ssion line (ckm)	Transformati on Capacity + HVDC capacity (MVA+MW)	Transmissi on line (ckm)	Transformati on Capacity + HVDC capacity (MVA+MW)
1.	Lohit	382	6000	3216	8400	3598	14400
2.	Dibang	4786	19000	0	4500	4786	23500
3.	Siang	461	2000	10104	21500	10565	23500
4.	Subansiri	4294	13500	866	2500	5160	16000
5.	Pare (Dikrong)	0	0	0	400	0	400
6.	Kameng	0	0	3804	13400	3804	13400
7.	Tawang	0	0	554	1500	554	1500
8.	Kalang (Kopili)	0	0	0	0	0	0
9.	Teesta	0	0	684	2000	684	2000
10.	Barak	0	1260	2246	13975	2246	15235
Total		9923	41760	21474	68175	31397	109935

16. Total expected expenditure on the required transmission system i.e. new and augmentation at existing substations, will be about Rs. 6,42,944 cr. as given below:

Timeframe	Transmission lines (ckm)	Transformation Capacity + HVDC capacity (MVA+MW)	Estimated Cost (Rs. Cr.)
Upto 2035	9922	41760	191009
Beyond 2035	21475	68175	451935
Grand Total	31397	109935	642944

17. The master plan will provide visibility to developers of the hydroelectric projects in Brahmaputra Basin regarding evacuation of power. Although the transmission system has been planned, transmission elements would be taken up for implementation based on the applications received by the nodal agencies as per regulations. Further, the proposed HVDC links may be considered at higher capacity or high-capacity AC links may be planned, depending on the requirement and technology available at the time of implementation.

1. Introduction

1.1. Power position in India

1.1.1. Power sector is one of the critical elements of any nation's economic development and it will play an important role to make India a developed nation. Universal access to affordable power in a sustainable manner has been the guiding principle for the Power sector. Power sector will play a key role to address the challenges related to climate change and meet the various commitments made by India at the global forum. India is reducing its dependence on fossil-based energy and shifting to cleaner and renewable energy sources at fast pace.

1.1.2. The country has significant potential of generation from renewable energy sources. All efforts are being made by Government of India to harness this potential. The Installed capacity as on 31st March, 2025 from renewable energy sources was 172.37 GW. The total renewable installed capacity comprises of 50 GW of wind, 105.65 GW of solar, and 11.58 GW of bio-power & waste power and 5.1 GW of small hydro plants. Region-wise and fuel-wise Installed generating capacity (in MW) of India as on 31.03.2025 is given at Table 1-1 below:

Table 1-1 Region-wise installed capacity of India as on 31.03.2025

REGION	HYDRO	THERMAL					NUCLEAR	R.E.S	TOTAL
		COAL	LIGNITE	GAS	DIESEL	TOTAL			
NORTHERN	21426	59298	1580	5995	0	66873	1620	47057	136975
WESTERN	7593	75323	1400	10151	0	86874	3240	61169	158876
SOUTHERN	11927	50456	3640	6642	434	61171	3320	61072	137490
EASTERN	4838	28875	0	80	0	28955	0	2401	36194
N.EASTERN	1944	1242	0	1665	36	2943	0	629	5516
ISLANDS	0	0	0	0	120	120	0	40	160
ALL-INDIA	47728	215193	6620	24533	589	246935	8180	172368	475212
%	10.04	45.28	1.39	5.16	0.12	51.96	1.72	36.27	100.00

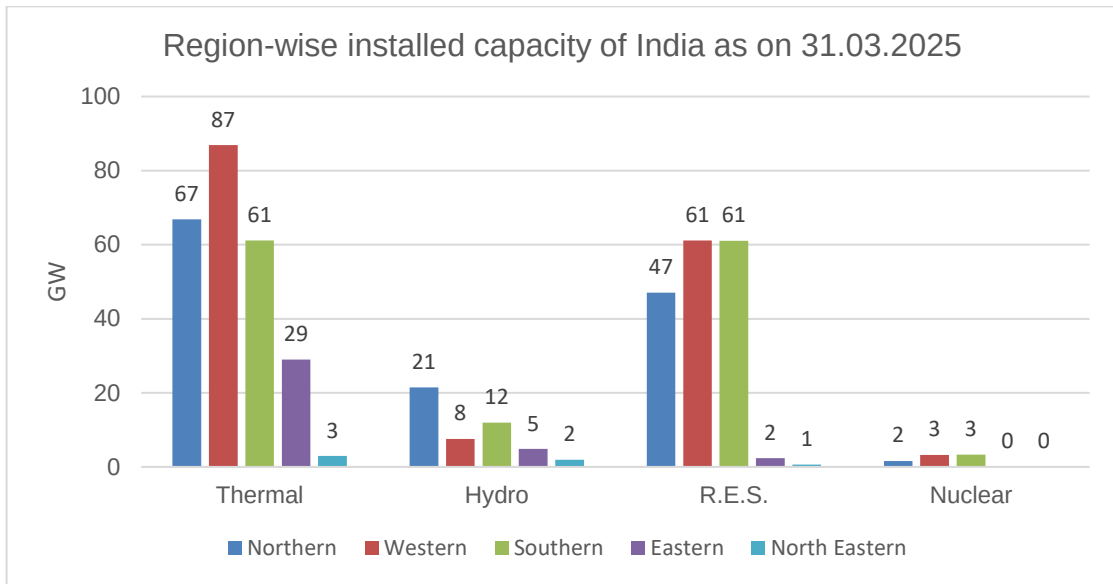


Figure 1-1 Region-wise installed capacity of India as on 31.03.2025

1.1.3. Electricity demand projection as per 20th Electric Power Survey (EPS) report of CEA is given at Table 1-2 and Figure 1-2 below:

Table 1-2 Region-wise anticipated Energy requirement and Peak Demand (20th EPS)

Region	Energy Requirement (MU)			Peak Demand (MW)		
	2031-32	2036-37	2041-42	2031-32	2036-37	2041-42
Northern	7,73,545	9,68,339	11,80,168	1,27,553	1,59,205	1,93,381
Western	7,63,198	9,48,220	11,52,344	1,14,766	1,43,122	1,74,716
Southern	5,96,557	7,42,266	8,98,048	1,07,259	1,36,946	1,67,392
Eastern	3,08,103	3,95,351	4,93,973	50,420	66,296	84,276
North Eastern	32,373	41,312	51,788	6,519	8,608	10,937
All India	24,73,776	30,95,487	37,76,321	3,66,393	4,65,531	5,74,689

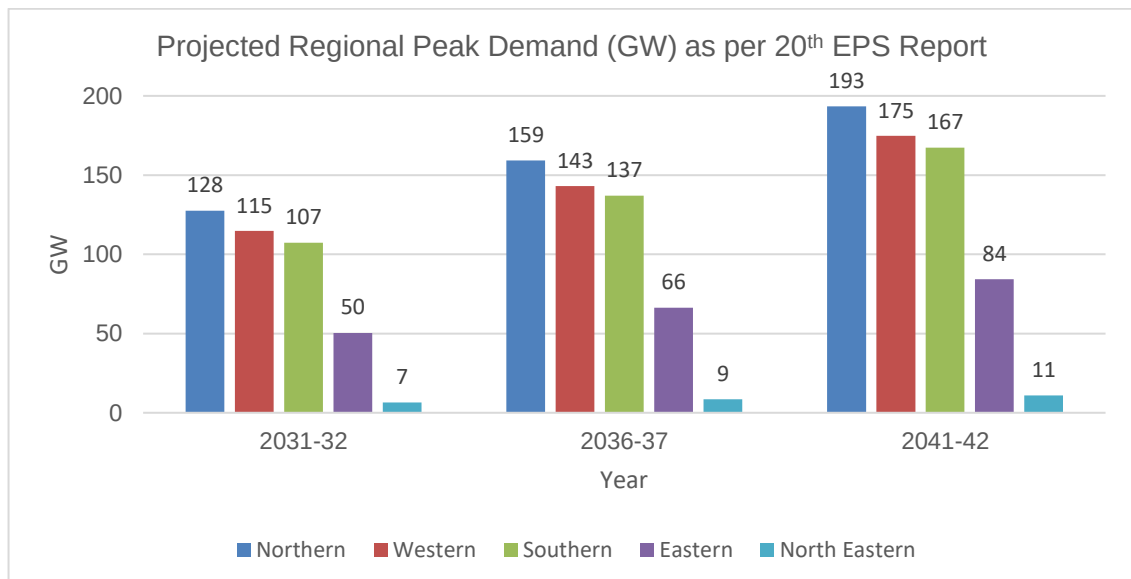


Figure 1-2 Projected Regional Peak Demand as per 20th EPS

1.1.4. India is endowed with enormous, economically exploitable and viable hydroelectric potential. The first systematic hydroelectric potential Survey of India was undertaken by erstwhile Central Water & Power Commission (CW&PC) during 1953-59. According to this survey, Hydroelectric potential of the country was assessed as about 42 Million kW from a total of about 250 Projects. Subsequently, the studies for Reassessment of Hydroelectric Potential (1978-87) were undertaken by the Central Electricity Authority (CEA). As per the Reassessment study completed by Central Electricity Authority in 1987, the Hydroelectric Power Potential of the country was estimated as about 84 million KW at 60% load factor (with probable installed capacity of 1,48,701 MW) from a total of 845 Nos. of projects. Out of these, 592 Hydroelectric Projects (above 25 MW) in various river basins of country like Indus, Brahmaputra, Ganga, Central Indian River system, East and West Flowing Rivers of Southern India etc. aggregated to a total of 1,45,320 MW. With the objective of identification of exploitable Hydro Potential and taking up their development in a systematic manner.

1.2. Power Potential in North-Eastern Region (NER)

- 1.2.1. North East Regional Electricity Grid covers the state of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura. Peak electricity demand (in MW) of NER States by the year 2036-37 is expected to be 9 GW..
- 1.2.2. Total Installed generating capacity in NER was 5516 MW, as on 31st March, 2025. Most of the generation comes from Hydro and gas plants. Installed Generating capacity of NER vis-à-vis other regions is given at Figure1-2.
- 1.2.3. CEA took up the study namely “Reassessment of Hydroelectric Potential in the Country” and published a report in November 2022. According to the study, in Brahmaputra Basin, there is exploitable potential for 206 Nos. of large Hydroelectric Projects with a total Exploitable Hydro Potential of 62726.7 MW. Further, 18 Nos. of projects (>25 MW capacity) having total capacity 6007.5 MW are presently unexploitable.

1.3. Brahmaputra Basin:

- 1.3.1. The Brahmaputra River rises in the Kailash Mountain ranges of the Himalayas, east of Lake Mansarovar and is known under its Tibetan name Tsangpo. It is known by different names in different reaches. After traversing for about 300 km. in Tibet, it enters India under the name of Siang near a place called Shirang. As it flows downstream, it is known as Dihang. A number of tributaries join it in addition to Dibang, a major tributary. Just downstream of Dibang another tributary called Lohit meets the River. Downstream of this confluence, the River is known as Brahmaputra River and flows through the state of Arunachal Pradesh and Assam before entering Bangladesh. In Bangladesh, it joins the Ganga at Goland. Near Goland the Brahmaputra is known as Jamuna upto Goland and thereafter Padma. From its origin in Tibet upto its confluence with

the Ganga (Padma) in Bangladesh, the River traverses a total distance of about 2900 kms.

- 1.3.2. The Brahmaputra basin spreads over 580,000 Sq.km having its spread share in China (50.5%), India (33.6%), Bangladesh (8.1%) and Bhutan (7.8%). Although the main River does not flow through the Bhutan, 96 % of Bhutan's area falls under this Basin. In India, the catchment area spreads over states of Arunachal Pradesh, Assam, West Bengal, Meghalaya, Nagaland and Sikkim covering 1,94,413 Sq. km., which is nearly 5.9 % of the total geographical area of the country. Most portion of the basin lying in Assam and Meghalaya consists of hills, forests and the wide Brahmaputra valley about 80 km wide on the average.
- 1.3.3. A major portion of the catchment of the Great Brahmaputra basin, mainly lying in Tibet, is above snow line, which receives heavy snowfall during the winter. The catchment of the basin located in India and Bangladesh receives heavy rainfall mainly during rainy season and also during the summer due to melting of snow in its upper catchment in Himalayas and Tibet.
- 1.3.4. The sub-basin wise hydroelectric potential of Brahmaputra River System according to the CEA's Report on "Basin Wise Reassessment of Hydroelectric Potential in Brahmaputra Basin" published in November 2022 is given at Table 1-3 and Figure 1-3 and Figure 1-4 below.

Table 1-3 Hydroelectric potential of sub-basins of Brahmaputra basin as per CEA report (November 2022)

SI No.	Sub-Basin	Projects with Capacity >25MW		Projects with Capacity <25MW	
		No. of Projects	Total Capacity	No. of Projects	Total Capacity
1.	Lohit	13	6954		
2.	Dibang	15	9070	1	25
3.	Siang	29	18326		
4.	Subansiri	21	11581		
5.	Pare (Dikrong)	5	406		
6.	Kameng	30	5558	4	92
7.	Tawang	10	2917.5		
8.	Upper Brahmaputra	6	379	3	39
9.	Lower Brahmaputra	1	36		
10.	Kalang (Kopili)	15	933	1	12
11.	Teesta	42	6766	1	21
12.	Barak and Neighboring	37	5804.7	12	212.5
Total		224	68731.2	22	401.5

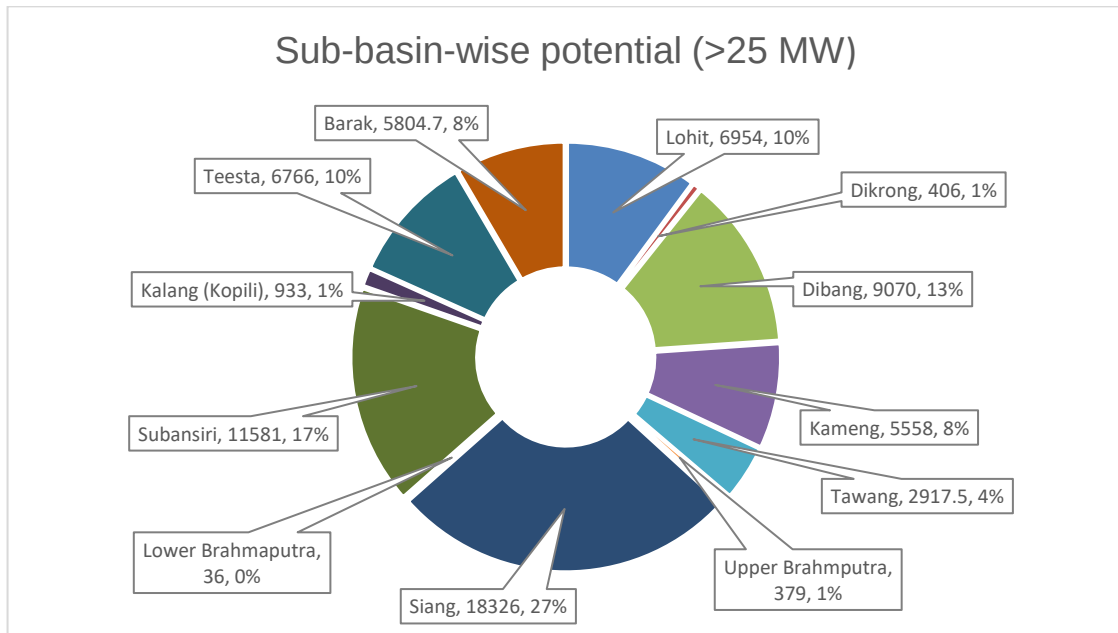


Figure 1-3 Sub-basin-wise potential (>25 MW) as per CEA report (November 2022)

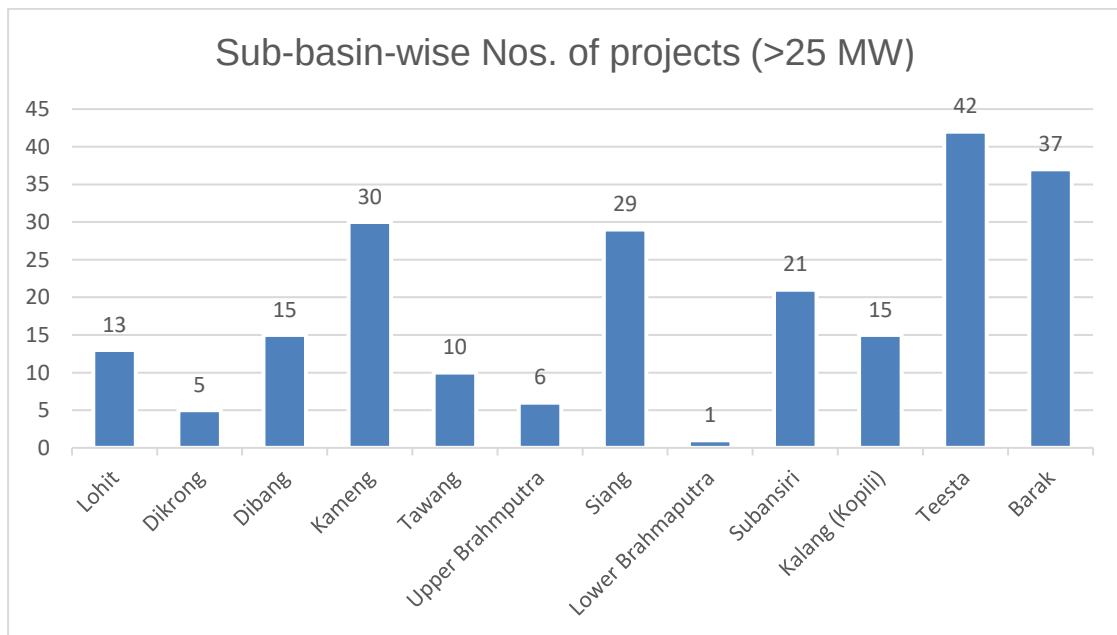


Figure 1-4 Sub-basin wise Nos. of projects (>25 MW) as per CEA report (November 2022)

1.3.5. For the projects with install capacity less than 25 MW, it is assumed that such Small HEPs would be connected to the intra state transmission system. Therefore, the capacity of the same has not been considered while studying the transmission system requirement. The list of hydroelectric plants with capacity less than or equal to 25 MW is given at Table 1-4 below:

Table 1-4 List of HEPs with capacity less than or equal to 25 MW (as per CEA's November 2022 report)

S.No.	Sub- basin	State	Project	I.C (MW)
1.	Kalang (kopili)	Assam	Langey	12
2.	Upper Brahmaputra	Arunachal Pradesh	Yangman	14
3.		Nagaland	Tirap	9
4.		Sikkim	Dikhu Lift Dam	16
5.	Teesta	Sikkim	Lingza	21

S.No.	Sub- basin	State	Project	I.C (MW)
6.	Barak	Nagaland	Rurrur	20
7.			Zungki	10.5
8.			Sakhai II	18
9.			Khuzami	21
10.			Lower Tizu	19
11.			Laniye II	11
12.		Manipur	Nunglieban (Nungliban)	14
13.			Laniye I	25
14.			Sinjal	20
15.			Mizoram	Deh
16.		Meghalaya	Sushen	22
17.		Meghalaya	Nongkolait	12
18.	Dibang	Arunachal Pradesh	Ashupani	25
19.	Kameng	Arunachal Pradesh	Lachung	20
20.			Tarang Warang	25
21.			Saskangrong	25
22.			Digin	22
Total				401.5

- 1.3.6. Further, MoP vide order dated 22.12.2021 (copy enclosed at **Annexure I**) provided basin-wise identification of projects (above 25 MW) in Arunachal Pradesh.
- 1.3.7. In view of such a large hydro potential in Brahmaputra basin, it was important to make a comprehensive transmission system for evacuation of power from HEPs. Accordingly, a Master Plan for Evacuation of Power from Hydroelectric Plants in the Brahmaputra Basin has been prepared. The details of this comprehensive plan have been discussed in subsequent chapters of the report.

2. Hydroelectric Power Potential in the Brahmaputra Basin

- 2.1. The Brahmaputra Basin lies between East Longitudes 82°-0' to 97°-50' and North Latitude 22°-10' to 31°-30' and is bounded on the North and West by high ranges of Himalayas, on the east by the Patkai range of Purvanchal hills running along Assam-Myanmar border and by the Khasi and Jaintia ranges of Assam hills on the south. The Brahmaputra Basin has been divided into Twelve (12) sub- basins namely Lohit, Subansiri, Dibang, Siang, Pare (Dikrong), Kameng, Upper Brahmaputra, Lower Brahmaputra, Kalang (Kopili), Teesta, Tawang and Barak. These sub-basins are shown in the Figure 2-1 below:

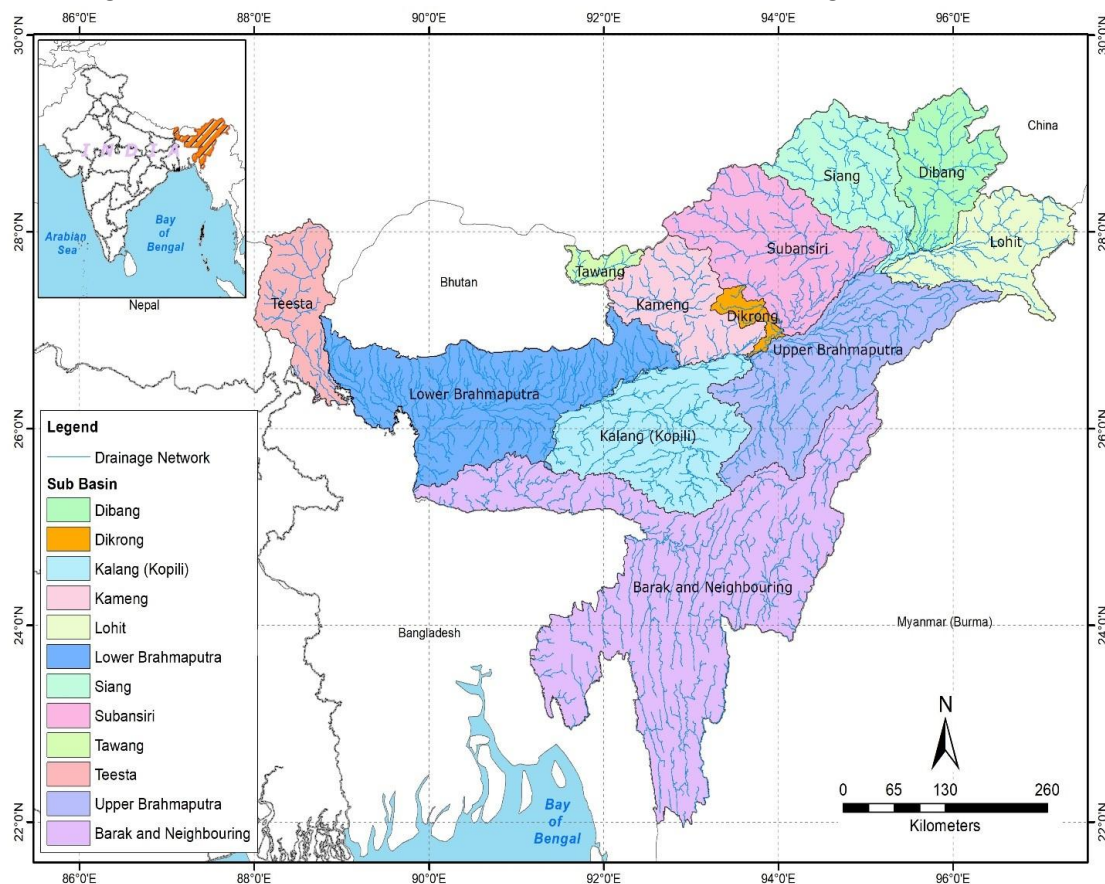


Figure 2-1 Sub-basins of the Brahmaputra Basin

- 2.2. CEA report of November 2022 mentions that 68.7 GW hydro potential have been identified in the Brahmaputra Basin out of which Arunachal Pradesh's share is 54.8 GW. The basin-wise details are shown at Table 1-3. The state wise hydroelectric potential of the Brahmaputra Basin is given at Table 2-1, Figure 2-2 and Figure 2-3 below.

Table 2-1 State- wise hydroelectric potential of Brahmaputra Basin

S.No.	State	No. of Projects	Capacity (>25 MW)
1.	Arunachal Pradesh	124	54838.5
2.	Assam	9	671
3.	Meghalaya	23	2053
4.	Sikkim	34	6056
5.	West Bengal	9	746

6.	Nagaland	4	325
7.	Manipur	10	2115
8.	Mizoram	11	1926.7
Total		224	68731.2

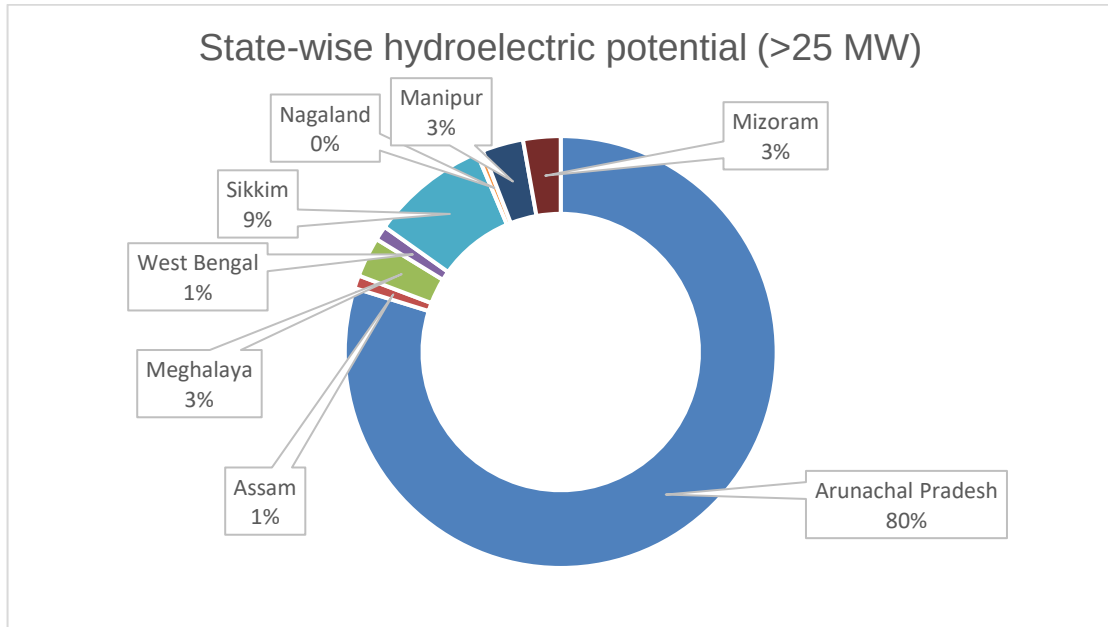


Figure 2-2 State-wise hydroelectric potential (>25 MW)

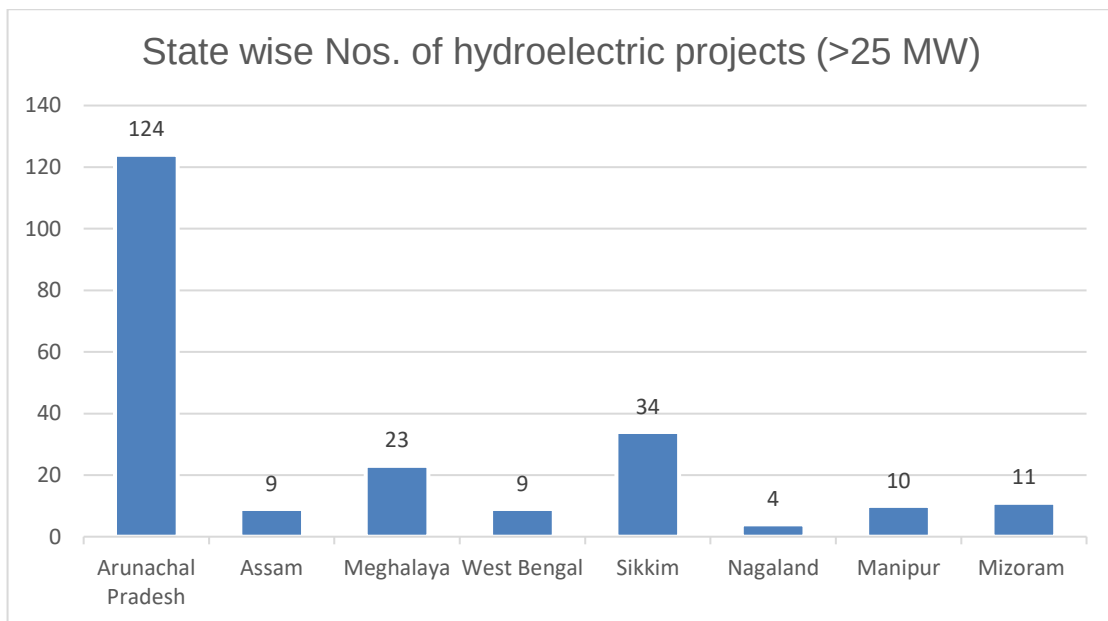


Figure 2-3 State-wise Nos. of hydroelectric projects (>25 MW)

- 2.3. After discussion with representatives of Hydro Developers, the States and within CEA, the hydroelectric potential capacity of a few HEPs, as identified in the report of CEA published in November 2022, have been revised. Further, a total of 6157.5 MW hydro electric potential is suggested as unexploitable. The list of unexploitable projects is given at Table 2-2 below.

Table 2-2 List of unexploitable hydro-electric potential

S.No.	Name of Project	I.C (MW)	Sub-Basin	State
1.	Hutong (Hutong -I)	900	Lohit	Arunachal Pradesh
2.	Tsa chu I	43.5	Tawang	Arunachal Pradesh
3.	Nyamjang Chhu	780	Tawang	Arunachal Pradesh
4.	Mulinye	335	Dibang	Arunachal Pradesh
5.	Kameng Dam	300	Kameng	Arunachal Pradesh
6.	Kameng-I (Bhareli Lift dam I)	1120	Kameng	Arunachal Pradesh
7.	Bhareli-II (Kameng-II)	600	Kameng	Arunachal Pradesh
8.	Nazong	60	Kameng	Arunachal Pradesh
9.	Pasar	32	Kameng	Arunachal Pradesh
10.	Pakke	110	Kameng	Arunachal Pradesh
11.	Seba	80	Kameng	Arunachal Pradesh
12.	Jarong	90	Siang	Arunachal Pradesh
13.	Gameng	37	Siang	Arunachal Pradesh
14.	Pengging	60	Siang	Arunachal Pradesh
15.	Tammu	55	Subansiri	Arunachal Pradesh
16.	Jamuna Dam P/H	28	Kalang Kopili	Assam
17.	Umium-Ummtru V	27	Kalang Kopili	Meghalaya
18.	Tipaimukh	1500	Barak	Manipur
	Total	6157.5		

- 2.4. The list of projects with revised identified hydroelectric potential having capacity greater than 25 MW is given at Table 2-3 below:

Table 2-3 List of HEPs in Brahmaputra Basin

S.No.	Name of Project	Capacity (MW)	River
Arunachal Pradesh			
Lohit Sub-basin			
1.	Kalai (Kalai-I)*	1304	Lohit
2.	Kalai II	1200	Lohit
3.	Hutong (Hutong -II)*	1200	Lohit
4.	Anjaw*	270	Lohit
5.	Demwe Upper St-III (Demwe)*	202.5	Lohit
6.	Demwe Upper St-II (Demwe)*	270	Lohit
7.	Demwe Upper St-I (Demwe)*	270	Lohit
8.	Demwe Lower (Demwe)	1750	Lohit
9.	Gimliang	82	Dau
10.	Raigam*	141	Delai
11.	Tidding -I	82	Tidding
12.	Tidding -II	70	Tidding
Tawang Sub- basin			
13.	New Melling	48	Mago Chu
14.	Magochu	48	Mago Chu
15.	Rho	145	Tawang Chu
16.	Tawang St-I	600	Tawang Chu
17.	Tawang St-II*	640	Tawang Chu

S.No.	Name of Project	Capacity (MW)	River
18.	Tsa Chu - I Lower	145	Nykrong Chu
19.	Tsa Chu - II	148	Nykrong Chu
20.	Nyukcharong Chu	160	Nykrong Chu
Pare (Dikrong) Sub- basin			
21.	Par	85	Pare (Dikrong)
22.	Turu	100	Pare (Dikrong)
23.	Dardu	85	Pare (Dikrong)
24.	Pare	110	Pare (Dikrong)
25.	Doimukh (Duimukh Storage)*	34	Pare (Dikrong)
Dibang Sub- basin			
26.	Mihundon*	255	Dri
27.	Agoline	220	Dri
28.	Etalin	3097	Dri& Tangon
29.	Dibang (Dibang Storage)	2880	Dibang
30.	Amulin*	210	Matun
31.	Emini*	260	Matun
32.	Etabue	122	Ange Pani
33.	Attunli	680	Tangon
34.	Emra-I	450	Emra
35.	Emra-II	315	Emra
36.	Elango	128	Ahi
37.	Ithun II	48	Ithun
38.	Ithun I	76	Ithun
39.	Sissiri	60	Sesseri
Kameng Sub- basin			
40.	Chanda	115	Kameng
41.	Badao	94	Kameng
42.	Marjingla	38	Kameng
43.	Marijingla Lower	44	Kameng
44.	Talong Londa (Talong)	225	Kameng
45.	Para	144	Para
46.	Phanchung	36	Pachi
47.	Pakke Bung I	48	Pakke Bung
48.	Pachuk II (Satuk)	54	Pachuk
49.	Pachuk II Lower (Kapak Leyak)	62	Pachuk
50.	Pachuk I	95	Pachuk
51.	Utung	76	Bichom
52.	Dibbin	120	Bichom
53.	Nafra	120	Bichom (Kameng)
54.	Kameng HEP (Bichom1 & Bichom 2)	600	Bichom/ Tenga
55.	Kimi	535	Bichom
56.	Saskangrong*	45	Saskangrong
57.	Meyong	32	Tim Kong Rong

S.No.	Name of Project	Capacity (MW)	River
58.	Gongri	144	Gongri
59.	Khuitam	62	Digo/Digen
60.	Dinchang (BUT & Maithing)*	252	Digo/Digen
61.	Jameri (Tenga)	172	Tenga
62.	Papu Valley	45	Papu
63.	Papu	100	Papu
Siang Sub- basin			
64.	Saing Upper Stage-I (Parong)*	5600	Siang
65.	Siang Upper Stage-II (Parong)*	5600	Siang
66.	Lower Siang (Passighat)	2700	Siang
67.	Siyom (Middle) (Passighat)	1000	Siyom
68.	Sippi	75	Ringong
69.	Rigong (Ringong)	85	Ringong
70.	Jidu (Yangsang)	90	Yangsang
71.	Pango (Minnying)	72	Sirapatang/ Sigong
72.	Mirak	78	Sigong
73.	Hirong*	320	Siyom
74.	Tato-II	700	Siyom
75.	Naying	1000	Siyom
76.	Pemashelphu	78	Yargyap Chu
77.	Kangtangshri	68	Siyom
78.	Rego	63	Siyom
79.	Rapum	60	Siyom
80.	Pauk*	145	Yarjep
81.	Heo	240	Yarjep
82.	Tato-I	186	Yarjep
83.	Tagurshit	52	Tagurshit
84.	Simang- II (Simang)*	66	Simang
85.	Simang I*	67	Simang
86.	Yamne-I *	111	Yamne
87.	Yamne St II	70	Yamne
88.	Lower Yamne-I (Jaru)	66	Yamne
89.	Lower Yamne St-II (Yapin)	74	Yamne
Subansiri Sub- basin			
90.	Oju (Oju 1 & Oju 2)*	2220	Subansiri / Si Nigit
91.	Niare*	909	Subansiri
92.	Naba	905	Subansiri/ Si Ngit
93.	Nalo	372	Subansiri
94.	Dengser	545	Subansiri
95.	Subansiri Upper*	1605	Subansiri
96.	Subansiri Lower (Subansiri Dam)	2000	Subansiri
97.	Milli	138	Kurung

S.No.	Name of Project	Capacity (MW)	River
98.	Sape	65	Kurung
99.	Chomi	165	Kurung
100.	Chela	180	Kurung
101.	Kurung Dam (I & II)*	320	Kurung
102.	Hegio	320	Kurung
103.	Nyepin	48	Payam
104.	Hiya	65	Payam
105.	Subansiri Middle (Kamala) (Tamen)*	1720	Kamala
106.	Tago I	48	Kale
107.	Panyor	130	Panyor (Ranganadi)
108.	Panyor (Ranganadi) St II (Yazali Storage)*	130	Panyor (Ranganadi)
109.	Panyor (Ranganadi) St-I (Yazali Div II)	405	Panyor (Ranganadi)
Upper Brahmaputra Sub-basin			
110.	Tipang	26	Tirap
ASSAM			
Kalang kopili Sub-basin			
1.	Khandong	50	Kopili
2.	Lower Kopili	120	Kopili
3.	Diyung Dam P/H	45	Diyung
4.	Kopili	200	Umrang
5.	Amring	70	Amring
6.	Karbi Langpi (Upper Borpani) (Middle Stage)*	46.5	Borpani
7.	Karbi Langpi (Lower Borpani)	100	Borpani
Upper Brahmaputra Sub-basin			
8.	Dilli (Dilli Dam P.H.)	28	Disang
MEGHALAYA			
Kalang Kopili Sub-basin			
1.	Umiam Stage -I	36	Umiam
2.	Umlamphang	28	Umiam
3.	Kyrdamkulai (Umium Umtru III)	60	Umtru
4.	Umiam (Umtru) St IV	60	Umtru
5.	Umium-Ummtru VI	39	Umtru
6.	New Umtru	40	Umtru
Barak Sub-basin			
7.	Selim	54	Myntdu
8.	Myntdu Leshka stage I	126	Myntdu
9.	Myntdu Leshka St-II*	210	Myntdu
10.	Umanghot (Umngot storage)	220	Umngot
11.	Umjaut	72	Umiew

S.No.	Name of Project	Capacity (MW)	River
12.	Umduna (Umduma)	60	Umiam
13.	Wah Umium St-III	85	Umiew
14.	Umngi Stage-I (Umngi Storage-PFR) & (Rangmaw- PFR)	30	Umngi
15.	Nongam	165	Umngi
16.	Mawpat	30	Umngi
17.	Kynshi I (Mawsyrpat)	270	Kynshi
18.	Nangmawlar	106	Kynshi
19.	Kynshi II (Mawthaba)	278	Kynshi
20.	Mawblei Storage	110	Wahblei
21.	Amagam Storage	26	Rongdi
22.	Simsang Dam P/H*	60	Someshri
SIKKIM			
Teesta Sub-basin			
1.	Kalep	54	Teesta
2.	Talem	44	Teesta
3.	Teesta-I (Zema)	320	Teesta
4.	Lachen (Chunthang)	165	Teesta
5.	Teesta-II	410	Teesta
6.	Teesta-III (Singhik)	1200	Teesta
7.	Teesta St-IV (Mangan)	520	Teesta
8.	Teesta- V (Samdong)	510	Teesta
9.	Teesta-VI	500	Teesta
10.	Jedang	160	Lhonak
11.	Serum	115	Sebokung
12.	Lachung	75	Lachung
13.	Bimkyong	66	Lachung Chu
14.	BOP	75	Lachung Chu
15.	Rukel	26	Rongni chu
16.	Rangyong	248	Rongni chu
17.	Panan	300	Toulng
18.	Ringpi	120	Ringpi
19.	Dikchu	96	Dikchu
20.	Lower lagyap	26	Rongni
21.	Rongnichu (Rongni Storage)	113	Rangpo
22.	Chhot pathing	55	Rangpo
23.	Chujachen	110	Rangpo
24.	Suntaleytar	32	Rangpo
25.	Bhasmey	51	Rangpo
26.	Mana	44	G. Rangit
27.	Rangit-III (Ligship) (Gompa)	60	Teesta
28.	Jorethang Loop	96	Rangit
29.	Namlum	50	G. Rangit

S.No.	Name of Project	Capacity (MW)	River
30.	Lethang (Yoksam)	98	Ranhang chu
31.	Tashiding	97	Ranhang chu
32.	Rangit-II	66	Rimbi
33.	Kalez Khola	34	KalezKhola
34.	Rangit-IV	120	Rangit
WEST BENGAL			
Teesta Sub-basin			
1.	Teesta Intermediate*	90	Teesta
2.	Teesta Low Dam III	132	Teesta
3.	Tessta Low dam -IV (Tista High Dam)	160	Teesta
4.	Teesta Low Dam Project V	80	Teesta
5.	TLDP- I&II	56	Great Rangit
6.	Rammam I	60	Rammam
7.	Rammam II	50	Rammam
8.	Rammam III	120	Rammam
Lower Brahmaputra Sub-basin			
9.	Jaldhaka I	36	Jaldhaka
NAGALAND			
Upper Brahmaputra Sub-basin			
1.	Yangnyu	36	Burhi Dihing
2.	Dikhu (Dikhu Dam P/H)	186	Dikhu
3.	Jhanzi Storage	28	Jhanzi
4.	Doyang (Doyang V)	75	Doyang
Barak Sub-basin			
5.	Lower Tizu*	42	Tizu
MANIPUR			
Barak Sub-basin			
1.	Khongem Chakha II	40	Barak
2.	Khongem Chakha III	28	Barak
3.	Pabaram	213	Barak
4.	Maklang - Tuyungbi	30	Maklang & Tuyungbi
5.	Irang	60	Irang
6.	Nungnag	28	Irang
7.	Loktak D/s (Khunou)	66	Leimatek
8.	Loktak	105	Imphal
9.	Thinghat	45	Tuival
10.	Barak 4*	49.5	
MIZORAM			
Barak Sub-basin			
1.	Tuivai (Bungpuilong)*	132	Tuival
2.	Tuirial (Sonai)	60	Tuirial
3.	Tuivawl	50	Tuivawl

S.No.	Name of Project	Capacity (MW)	River
4.	Bhairabi	50	Dhaleshwari
5.	Tlawng	37	Dhaleshwari/ Tlawng
6.	Lunglang	474	Tyao
7.	Tuichang	57	Tuichang
8.	Mat	41.7	Mat
9.	Boinu	498	Kaldan
10.	Kaldan	159	Kaldan
11.	Kolodyne Stage –II*	460	Kolodyne
Total		64945.2	

* Note: The MW capacity of the HEPs has been revised with respect to report on “Reassessment of Hydroelectric Potential in the Country” published in November 2022.

- 2.5. The state-wise vis-à-vis sub-basin-wise exploitable hydroelectric potential (>25 MW) (excluding PSPs) is given at Table 2-4 below:

Table 2-4 Sub-Basin wise Exploitable Hydroelectric Potential (>25 MW) (excluding PSPs)

S.No.	Sub-basin	State	No. of Projects	IC (MW)
1.	Lohit	Arunachal Pradesh	12	6841.5
2.	Subansiri	Arunachal Pradesh	20	12290
3.	Dibang	Arunachal Pradesh	14	8801
4.	Siang	Arunachal Pradesh	25	18666
5.	Pare (Dikrong)	Arunachal Pradesh	5	414
6.	Kameng	Arunachal Pradesh	24	3258
7.	Upper Brahmaputra	Arunachal Pradesh	1	26
		Assam	1	28
		Nagaland	4	325
8.	Lower Brahmaputra	West Bengal	1	36
9.	Kalang (Kopili)	Assam	7	631.5
		Meghalaya	6	263
10.	Teesta	Sikkim	34	6056
		West Bengal	8	748
11.	Tawang	Arunachal Pradesh	8	1934
12.	Barak	Meghalaya	16	1902
		Manipur	10	664.5
		Mizoram	11	2018.7
		Nagaland	1	42
Total			208	64945.2

- 2.6. The state-wise summary of exploitable hydroelectric potential (>25 MW) is as given at table 2-5 below.

Table 2-5 Summary of exploitable hydroelectric potential (>25 MW) (excluding PSPs)

S.No.	State	No. of Projects	IC (MW) (>25 MW)
1.	Arunachal Pradesh	109	52230.5
2.	Assam	8	659.5
3.	Meghalaya	22	2165
4.	Sikkim	34	6056
5.	West Bengal	9	784
6.	Nagaland	5	367

7.	Manipur	10	664.5
8.	Mizoram	11	2018.7
Total		208	64945.2

2.7. The state-wise percentage and number of exploitable hydroelectric potential (>25 MW) projects are depicted in Figure 2-4 and Figure 2-5 below:

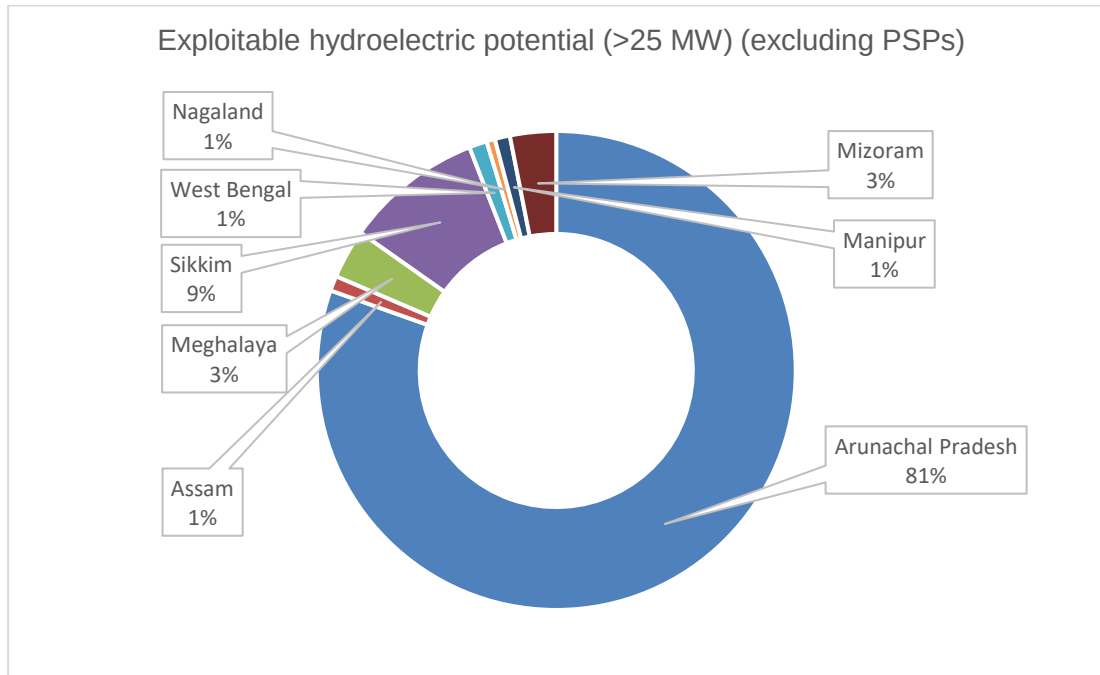


Figure 2-4 State-wise Exploitable hydroelectric potential (>25 MW) (excluding PSPs)

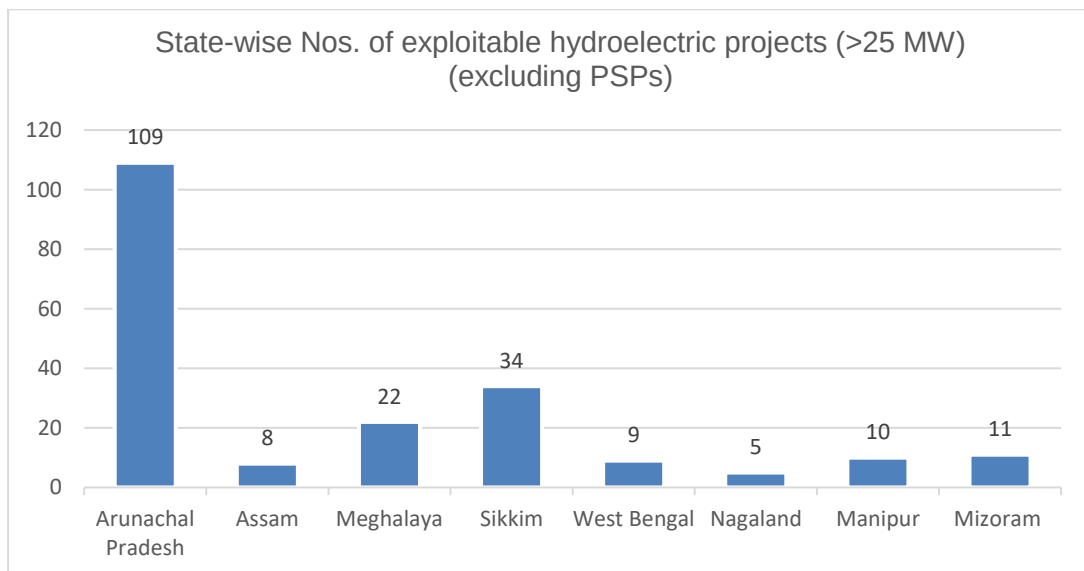


Figure 2-5 State-wise Nos. of exploitable hydroelectric potential (>25 MW) (excluding PSPs)

2.8. For the projects with install capacity less than or equal to 25 MW, it is assumed that such Small HEPs would be connected in the intra-state transmission system. Therefore, the capacity of the same has not been considered while studying the transmission system requirement. The list of Small HEPs with revised hydroelectric potential is given below:

Table 2-6 List of Small HEPs with revised hydroelectric potential

S.No.	Sub- basin	State	Project	I.C (MW)
1.	Kalang (kopili)	Assam	Langey	12
2.	Upper Brahmaputra	Arunachal Pradesh	Yangman	14
3.			Tirap	9
4.		Nagaland	Dikhu Lift Dam	16
5.	Teesta	Sikkim	Lingza	21
6.	Barak	Nagaland	Rurrur	20
7.			Zungki	24
8.			Sakhai II	18
9.			Khuzami	21
10.			Laniye II	11
11.		Manipur	Nunglieban (Nungliban)	14
12.			Laniye I	25
13.			Barak 3	24
14.			IMPHAL HEP	22.5
15.			IRANG 3	24
16.			Sinjal	20
17.			Mizoram	Deh
18.		Meghalaya	Sushen	22
19.		Meghalaya	Nongkolait	12
20.	Dibang	Arunachal Pradesh	Ashupani	25
21.	Kameng	Arunachal Pradesh	Lachung	20
22.			Tarang Warang	25
23.			Digin	20
Total				439.5

- 2.9. MoP vide order dated 22.12.2021 allocated some of the projects to hydro CPSUs of Ministry of Power. The list of the allocated projects is given at Table 2-7 below. The IC (MW) has been updated based on discussion with States and Project Developers:

Table 2-7 List of HEPs in Arunachal Pradesh allocated to agencies by MoP

SI No	Name of Project	IC (MW)	Allotted to Agency	Sub Basin
1.	Kalai II	1200	THDCIL	Lohit
2.	Demwe Lower	1750		
3.	Attunli	680	SJVN	Dibang
4.	Etalin	3097		
5.	Mihundon	255		
6.	Amulin	210		
7.	Emini	260		
8.	Dibang	2880	NHPC	
9.	Upper Siang	11200	JV of NHPC and NEEPCO	Siang
10.	Lower Siang	2700	NHPC/NEEPCO	
11.	Hirong	320	NEEPCO	
12.	Tato I	186		
13.	Tato II	700		
14.	Naying	1000		
15.	Heo	240		

16.	Pauk	145		
17.	Simang I	67		
18.	Simang II	66		
19.	Subansiri (Upper)	1605		
20.	Subansiri Middle	1720	NHPC	Subansiri
21.	Par	85	NEEPCO	Pare (Dikrong)
22.	Talong Londa	225	NEEPCO	Kameng
23.	Phanchung	36		
24.	Dibbin	120		
25.	Nafra	120		
26.	Saskangrong	45		
27.	Khuitam	62	NEEPCO	Tawang
28.	Tawang -I	600		
29.	Tawang -II	640		
TOTAL		32214		

2.10. The sub-basin-wise hydroelectric potential of Brahmaputra Basin and study of transmission system for evacuation power from HEPs is detailed in subsequent chapters of this report.

2.11. Potential of Pumped Storage Plants (PSPs) in the Brahmaputra Basin

2.11.1. In addition to the hydroelectric potential mentioned at Table 2-3 the potential of Pumped Storage Plants (PSPs) in the Brahmaputra Basin has also been identified and is given at Table 2-8 and Figure 2-6.

Table 2-8 Potential of PSPs

S.No.	Name of PSP	IC (MW)	State	Sub-basin
1.	Panyor	660	Arunachal Pradesh	Subansiri
2.	Kopili	320	Assam	Kalang (Kopili)
3.	Ouguri PSP	900	Assam	Kalang (Kopili)
4.	Tharakunji PSP	900	Assam	Kalang (Kopili)
5.	Karbi Anglong PSP	800	Assam	Kalang (Kopili)
6.	Leiva Lui	1500	Mizoram	Barak
7.	Tuiphai Lui	1650	Mizoram	Barak
8.	Nghasih	400	Mizoram	Barak
9.	Daizo Lui	2400	Mizoram	Barak
10.	Wah Umiam	800	Meghalaya	Barak
11.	Longtharai PSP	800	Tripura	Barak
Total		11130		

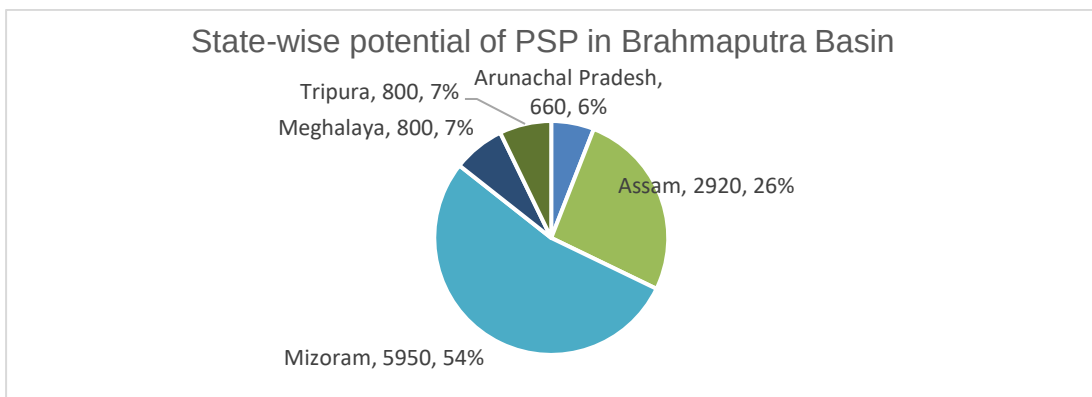


Figure 2-6 State-wise potential of PSP in Brahmaputra Basin

3. Planning of Evacuation System

- 3.1. The Central Electricity Authority is responsible for preparation of perspective generation and transmission plans and for coordinating the activities of planning agencies as envisaged under Section 73(a) of the Electricity Act 2003. The Central Transmission Utility (CTU) is responsible for development of an efficient and coordinated inter-state transmission system (ISTS). Similarly, the State Transmission Utility (STU) is responsible for development of an efficient and coordinated intra-state transmission system (Intra-STU). The ISTS and Intra-STU are interconnected and together constitute the electricity grid.
- 3.2. Ministry of Power have notified Electricity (Transmission System Planning, Development and Recovery of Inter-State Transmission Charges) Rules, 2021 in Gazette of India on 01.10.2021 paving the way for complete overhauling of transmission system planning to give power sector utilities easier access to electricity transmission network across the country. These Rules underpin that electricity transmission planning shall be done in such way that the lack of availability of the transmission system does not act as a barrier on the growth of different regions and the transmission system shall, as far as possible, be planned and developed matching with growth of generation and load. While doing the transmission planning, care shall be taken that there is no wasteful investment.
- 3.3. To achieve the transmission system capacity, especially in context with anticipated large scale renewable generation capacity addition, growth of load, increasing fault level, right of way issues, technological advancement and notification of Transmission Rules 2021, CEA has been made a comprehensive document to provide the details of transmission planning in the form of "Manual of Transmission Planning Criteria, 2023".
- 3.4. The Manual recommends that planning of transmission system for evacuation of power from hydro projects shall be done river basin wise considering the identified generation projects and their power potential.
- 3.5. The Manual also provides for the maximum transformation capacity of a generation pooling sub-station at different voltage levels. During the planning of pooling station for evacuation of power from HEPs, the limits defined in the Criteria have been considered.
- 3.6. Keeping in view the implementation time frame of hydroelectric plants in the Brahmaputra Basin, the phasing of transmission system has been done in two time frames i.e. upto 2035 and beyond 2035.
- 3.7. While preparing the master plan, following assumptions have been considered:
 - (i) Detailed system studies have been carried out with the projects anticipated upto 2035. For the projects expected beyond 2035, technical requirements have been assessed.

- (ii) Different demand generation scenarios like high demand/generation, low demand/generation, state specific scenario, seasonal demand etc. have been simulated in the studies.
- (iii) The ambient temperature in the hilly terrain of Arunachal Pradesh and adjoining States is less than that in plain areas, therefore while determining the thermal capacity of the transmission lines, ambient temperature has been considered as 40°C.
- (iv) The capacity of Dedicate Transmission Line (DTL) has been assessed considering 0.90 power factor and 10% overload capacity of Hydro Electric Projects.
- (v) For reactive power support, suitable Bus Reactors have been planned at switchyard of the HEPs.
- (vi) Considering the vicinity of HEPs, common pooling station are planned to evacuate the power from HEPs.
- (vii) Wherever requirement arises the switchyard of generating station can also be planned to implement as pooling station.
- (viii) In NER, since load demand is less as compared to power potential and load centre are situated at a far distance, the requirement of HVDC is envisaged.
- (ix) The location of pooling station/sub-station indicated in the maps of this report are tentative. Implementation of the pooling sub-station in that location is subject to availability of suitable space for substation.
- (x) The transformer and reactor ratings proposed in the Master Plan align with the Central Electricity Authority's (CEA) publication titled "Standard Specifications and Technical Parameters for Transformers and Reactors (66 kV & Above Voltage Class)".
- (xi) Capacity of HVDC terminals has been considered as 3000 MW (6000 MW for Bipole). Higher capacity, if available at the time of implementation, may be considered to optimize right of way.
- (xii) The length of HVDC corridor identified in this Master Plan is considered as 1500 km.
- (xiii) The cost estimates are based on the CTUIL cost matrix of September 2024 price levels. Due to tough and hilly terrain in NER, timeframe and project cost may be on the higher side as compared to that in plain areas.
- (xiv) A factor of 12.7% has been considered for taking into account the impact of IDC, IEDC and Contingency etc.

3.8. System Studies

- i. Concept to commissioning of transmission elements generally takes about three to five years; about two to three years for augmentation of

capacitors, reactors, transformers etc., and about four to five years for new transmission lines or substations. Therefore, system studies for firming up the transmission plans may be carried out with 3-5 years time horizon on rolling basis every year. Considering the terrain of Arunachal Pradesh construction of transmission evacuation system may take 4-6 years.

- ii. In order to study and plan the system requirement, modelling of the power system is a prerequisite for which accuracy of data is very important, as the same can have considerable impact on the outcome of the system studies and ultimately on the system planning.
- iii. The system is planned predominantly based on Load flow study which is a steady state analysis of the power system network. It determines the operating state of the system for a given load generation balance in the system. It helps in determination of loading on transmission elements and helps in planning and operation of power systems from steady state point of view. Further, short circuit studies shall also be carried out using the classical method with flat pre-fault voltages and sub-transient reactance of the synchronous machines.
- iv. Requirement of reactive power compensation through shunt capacitors, shunt reactors (bus reactors or line reactors), static VAr compensators, fixed series capacitor, variable series capacitor (thyristor controlled) or other FACTS devices is assessed through appropriate studies.

3.9. PM Gati Shakti portal: The location of pooling station and feasibility of implementation of transmission line in view of Right of Way (RoW) is a critical information and certainly helpful at planning stage. In this regard, PM Gati Shakti National Master Plan (PMGS-NMP) was launched on 13th October 2021 for providing multimodal connectivity infrastructure to various economic zones have been used to identify the prima facia feasible location of pooling stations.

3.10. The requirement of transmission system for evacuation of power from the exploitable hydro electric projects in various sub-basins of Brahmaputra basin in two timeframes i.e. upto 2035 and beyond 2035 is given in subsequent chapters.

4. Lohit Sub-basin

4.1. General

4.1.1. The Lohit Basin is the eastern most river basin of India forming part of Brahmaputra basin, with its catchment spreading across international border covering part of Tibet. River Lohit is a tributary of river Brahmaputra and originates at an EL 6190 m above mean sea level from the snow-clad peaks in Eastern Tibet and enters India through Kibithoo area of the district. Lohit River enters the state of Arunachal Pradesh after traversing through Tibet, and generally flows through Mishmi hills. River Lohit joins with Dibang River, another important tributary of river Brahmaputra on its right bank and combined flow confluences with river Dihang near Kobo.

4.2. Hydroelectric Project in Lohit Sub-Basin

4.2.1. List of Hydroelectric Project in Lohit River is given at Table 4-1 below:

Table 4-1 List of HEPs in Lohit sub-basin

S.No.	Name of Project	IC (MW)	Expected time frame
1.	Kalai II	1200	2032-33
2.	Anjaw	270	2034-35
3.	Demwe Upper St-I (Demwe)	270	2034-35
Sub-Total (upto 2035)		1740	
4.	Kalai (Kalai-I)	1304	Beyond 2035
5.	Hutong (Hutong -II)	1200	Beyond 2035
6.	Demwe Lower (Demwe)	1750	Beyond 2035
7.	Demwe Upper St-III (Demwe)	202.5	Beyond 2035
8.	Demwe Upper St-II (Demwe)	270	Beyond 2035
9.	Gimliang	82	Beyond 2035
10.	Raigam	141	Beyond 2035
11.	Tidding –II	70	Beyond 2035
12.	Tidding –I	82	Beyond 2035
Sub Total (beyond 2035)		5101.5	
Grand Total		6841.5	

4.3. Transmission System

4.3.1. The hydroelectric potential of Lohit sub-basin is 6841.5 MW and Demwe Lower (1750 MW) & Kalai-II (1200 MW), Kalai-I (1304 MW) and Hutong (1200 MW) are the major generating station in this sub-basin.

4.3.2. For reactive power support, suitable Bus Reactor has been planned at switchyard of the HEPs and it is also suggested to have provision for future space for additional reactor.

4.3.3. The total potential expected by the year 2035 is 1740 MW and remaining 5101.5 MW is expected beyond the year 2035. The planned Dedicated Transmission system and Common transmission system for the project expected by the year 2035 and beyond 2035 are mentioned in the subsequent paragraphs.

4.4. Common Transmission System by 2035

4.4.1. For evacuation of 1740 MW of power in Lohit sub-basin by 2035 timeframe, the following common transmission system would be required:

- (i) Establishment of Kherang Camp 400/220 kV GIS Pooling station with 3x500 MVA ICTs and 2x80 MVar bus reactor
- (ii) Establishment of Namsai 765/400 kV GIS Pooling station with 3x1500 MVA ICTs and 2x240 MVar, 2x125 MVar bus reactor
- (iii) Kherang Camp PS – Namsai PS 400 kV D/c line (Quad)
- (iv) Namsai PS – Naharkatia 765 kV D/c line

Note: Naharkatia 765/400 kV Substation and associated transmission lines are included in Dibang sub-basin Transmission system.

4.5. Dedicated Transmission System by 2035

4.5.1. The required dedicated lines from the switchyard of the HEPs to the pooling stations is given at table below:

Table 4-2 Transmission evacuation system in Lohit sub-basin by 2035

S.No.	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of Pooling sub-station	Transmission System	Bus Reactor at Switchyard (MVar)
1.	Kalai II	1200	400 kV	Kherang Camp PS	Kalai-II – Kherang Camp PS 400 kV D/c line (Ampacity: 2150 A or more per ckt)	2x80 MVar along with associated bay
2.	Anjaw	270	220 kV	Kherang Camp PS	Anjaw - Kherang Camp PS 220 kV D/c line (Ampacity: 870 A or more per ckt)	Space for 1x50 MVar along with associated bay
3.	Demwe Upper St-I	270	220 kV	Kherang Camp PS	Demwe Upper St-I – Kherang Camp PS 220 kV D/c line (Ampacity: 1740 A or more per ckt)	Space for 1x50 MVar along with associated bay
Total		1740				

4.5.2. The Map indicating the hydroelectric project expected by the year 2035 in the Lohit sub-basin along with their transmission system is given at Figure 4-1 below.

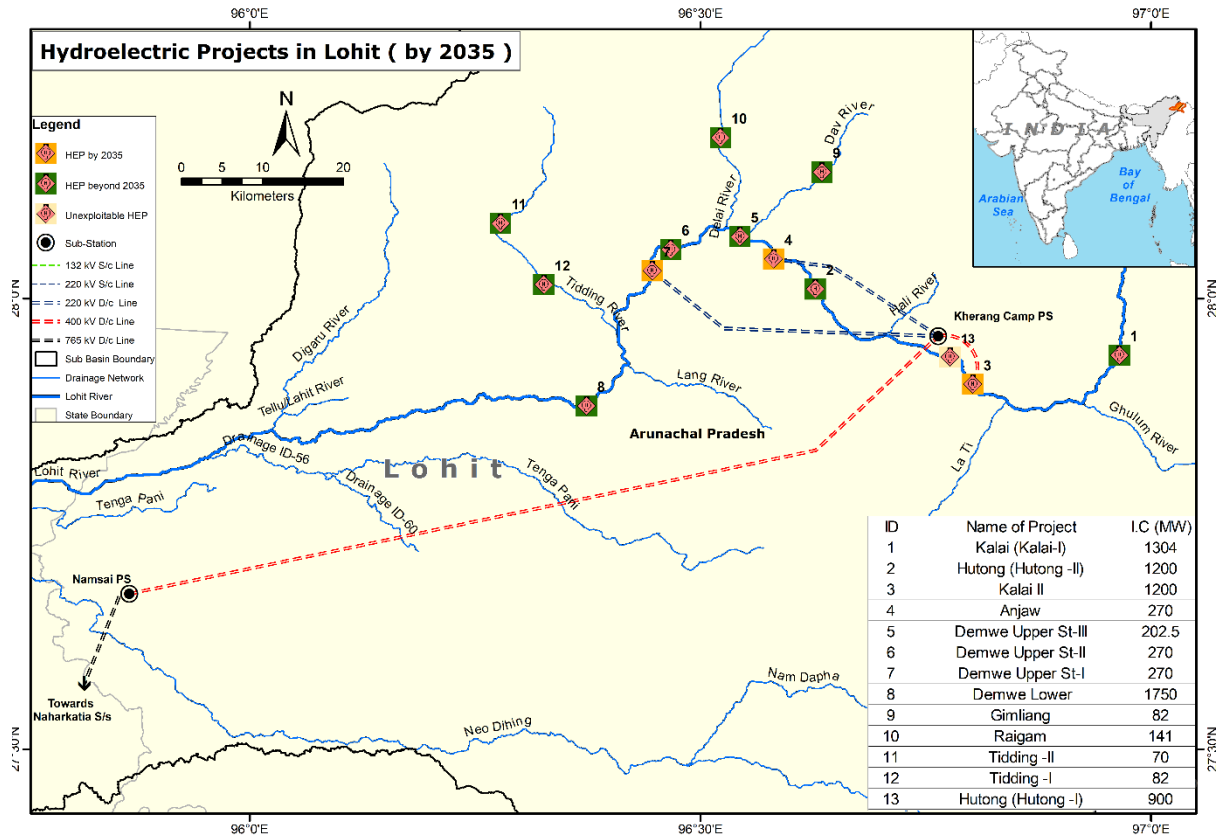


Figure 4-1 Transmission System of Lohit Sub-basin by 2035

4.6. Common Transmission System beyond 2035

4.6.1. For evacuation of 5101.5 MW of power from Lohit sub-basin in beyond 2035 timeframe, following common transmission system would be required:

- (i) Augmentation of Kherang Camp 400/220 kV PS with 1x500 MVA ICT
- (ii) Augmentation of Namsai 765/400 kV PS with 1x1500 MVA ICT
- (iii) Creation of 132 kV level at Kherang Camp 400/220 kV GIS Pooling station with 4x500+2x200 MVA ICTs and 2x80 MVar bus reactor
- (iv) Kherang Camp PS – Namsai PS 400 kV 2nd D/c (Quad) line
- (v) Establishment of 6000 MW HVDC station at Namsai with HVDC Bi-pole line terminating outside NER.

4.7. Dedicated Transmission System beyond 2035

4.7.1. The required dedicated lines from the switchyard of the HEPs to the pooling stations is given at table below:

Table 4-3 Transmission evacuation system in Lohit sub-basin beyond 2035

S.N o.	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of Pooling sub-station	Transmission System	Bus Reactor at Switchyard (MVAR)
1.	Demwe Lower	1750	400 kV	Namsai PS	Demwe Lower - Namsai PS 400 kV D/c Line (Ampacity: 3100 A or more per ckt)	2x80 MVAR along with associated bay
2.	Hutong	1200	400 kV	Kherang Camp PS	Hutong - Kherang Camp PS 400 kV D/c Line (Ampacity: 2120 A or more per ckt)	2x80 MVAR along with associated bay
3.	Gimliang	82	220 kV	Kherang Camp PS	LILO of one ckt of Demwe Upper St-III – Kherang Camp PS 220 kV S/c at Gimliang Switchyard (Ampacity: 920 A or more per ckt)	Space for 1x50 MVAR along with associated bay
4.	Tidding -II	70	132 kV	Kherang Camp PS	Tidding-II – Kherang Camp PS 132 kV D/c Line (Ampacity: 820 A or more per ckt)	-
5.	Tidding -I	82	132 kV	Kherang Camp PS	LILO of one ckt of Tidding-II – Kherang Camp PS 132 kV D/c Line at Tidding-I switchyard (Ampacity: 820 A or more per ckt)	-
6.	Kalai (Kalai-I)	1304	400 kV	Kherang Camp PS	Kalai-I – Kherang Camp PS 400 kV D/c Line (Ampacity: 2300 A or more per ckt)	2x80 MVAR along with associated bay
7.	Demwe Upper St-III	202.5	220 kV	Kherang Camp PS	Demwe Upper St-III – Kherang Camp PS 220 kV D/c line (Ampacity: 920 A or more per ckt)	Space for 1x50 MVAR along with associated bay
8.	Demwe Upper St-II	270	220 kV	Kherang Camp PS	LILO of one ckt of Demwe Upper St-I – Kherang Camp PS 220 kV D/c line at Demwe Upper St-II Switchyards (Ampacity: 1740 A or more per ckt)	Space for 1x50 MVAR along with associated bay
9.	Raigam	141	220 kV	Kherang Camp PS	Raigam – Kherang Camp PS 220 kV D/c Line (Ampacity: 460 A or more per ckt)	Space for 1x50 MVAR along with associated bay
Total		5101.5				

4.7.2. The Map indicating the hydroelectric projects in the Lohit sub-basin along with their transmission system is given at Figure 4-2 below.

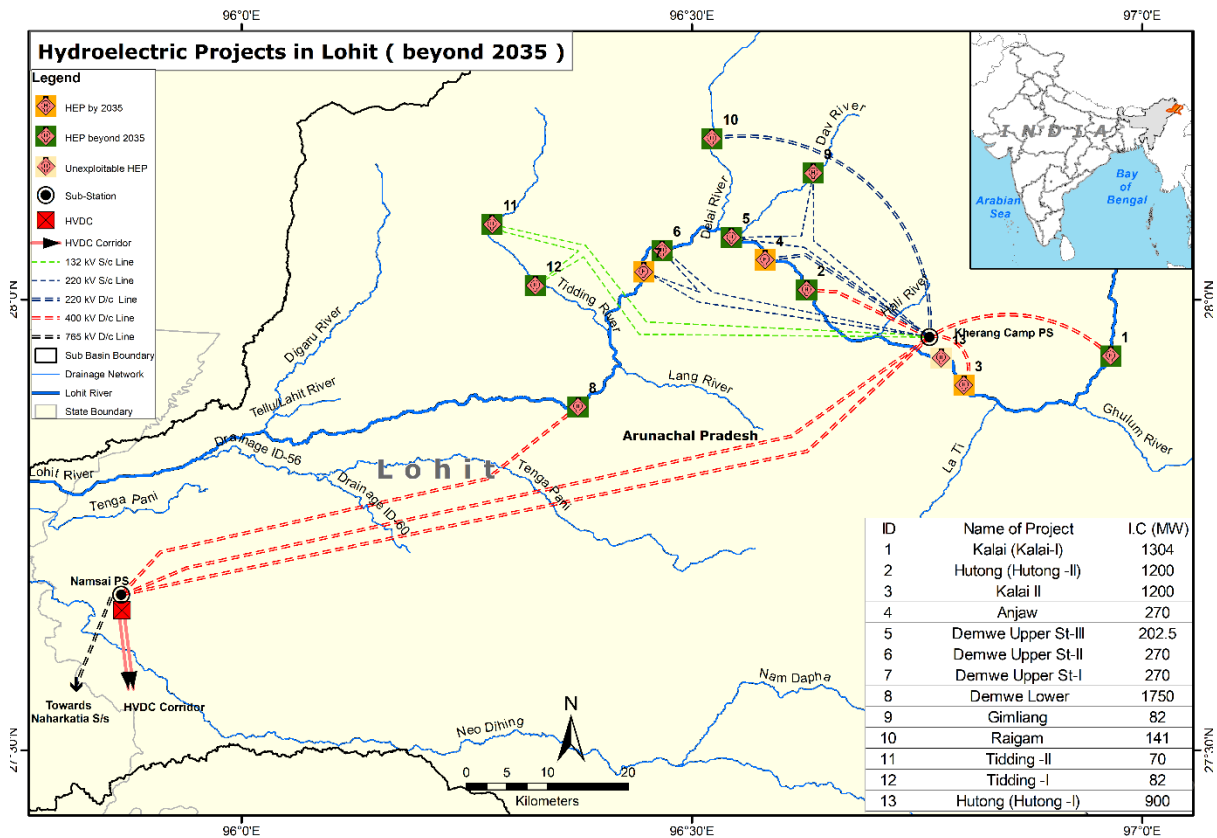


Figure 4-2 Transmission System of Lohit Sub-basin beyond 2035

4.7.3. The Block Map of Lohit Sub-basin indicating hydroelectric project and transmission system is given at Annexure-II.

4.8. Summary of pooled capacity

4.8.1. The time-frame vis-à-vis pooling station wise capacity in this sub-basin is given at Table 4-4 below:

Table 4-4 Timeframe vis-a-vis pooling station wise capacity

S. No.	Time frame	Capacity to be pooled	Pooling Station	Transformation Capacity
1.	Upto 2035	1740 MW	Kherang Camp 400/220 kV	3x500 MVA
2.			Namsai 765/400 kV	3x1500 MVA
3.	Beyond 2035	5101.5 MW	Kherang Camp 400/220/132 kV	1x500+2x200 MVA (additional)
4.			Augmentation of Namsai 765/400 kV	1x1500 MVA (additional)
5.			Namsai HVDC ± 800 kV	6000 MW

5. Dibang Sub-basin

5.1. General

5.1.1. The Dibang river basin is a part of Brahmaputra River System and is one of the major rivers traversing through Arunachal Pradesh. The Dibang originates from the snow-covered southern flank of the Himalaya/Trans Himalaya close to the Tibet border at an elevation of more than 5000 m. It cuts through deep gorges and difficult terrain in its upper reach through the Great Himalayan range in Dibang Valley and Lower Dibang Valley districts of Arunachal Pradesh and finally meets the river Lohit near Sadia in Assam. The total length of Dibang from its source to its confluence with Lohit River is about 223 km and the catchment area is about 13,933 sq km. The combined flow meets Brahmaputra near Kobo Chapori.

5.1.2. The boundary of Dibang river basin in Arunachal Pradesh in general coincides with boundaries of two districts viz. Lower Dibang Valley and Dibang Valley, however it includes entire catchment of Sissiri river, main right bank tributary of Dibang river in sloping plains and another left bank tributary i.e. Deopani. After entering state of Assam, it is joined by off-shoots of Sissiri river on its right bank and those of Deopani and Kundli rivers like Emme and Difu rivers on the left bank. Thereafter Dibang is joined by Lohit to form Brahmaputra River.

5.2. Hydroelectric Project in Dibang Sub-Basin

5.2.1. List of exploitable Hydroelectric Projects in Dibang River is given at Table 5-1 below:

Table 5-1 List of HEPs in Dibang sub-basin

S.No.	Name of Project	I.C. (MW)	Expected time frame
1.	Etalin	3097	2033-34
2.	Dibang	2880	2031-32
3.	Emra-II	315	2035
4.	Attunli	680	2031
Sub-Total (upto 2035)		6972	
5.	Mihundon	255	Beyond 2035
6.	Emini	260	Beyond 2035
7.	Amulin	210	Beyond 2035
8.	Etabue	122	Beyond 2035
9.	Agoline	220	Beyond 2035
10.	Emra-I	450	Beyond 2035
11.	Elango	128	Beyond 2035
12.	Ithun-II	48	Beyond 2035
13.	Ithun-I	76	Beyond 2035
14.	Sissiri	60	Beyond 2035
Sub Total (beyond 2035)		1829	
Grand Total		8801	

5.3. Transmission System

5.3.1. The hydroelectric potential of Dibang sub-basin is 8801 MW and Etalin (3097 MW) and Dibang (2880 MW) are the major exploitable projects in this sub-basin.

5.3.2. The total potential expected by the year 2035 is 6972 MW and remaining 1829 MW is expected beyond the year 2035. The planned Dedicated Transmission lines and Common transmission system for the project expected by the year 2035 and beyond 2035 are mentioned in the sub-sequent paragraphs.

5.4. Common Transmission System by 2035

5.4.1. For evacuation of 6972 MW of power by 2035 timeframe, following common transmission system would be required:

- (i) Establishment of Etalin 400/220 kV GIS Pooling station with 2x500 MVA ICTs and provision for three additional 500 MVA ICTs in future.
- (ii) Establishment of Roing (New) 765/400 kV substation with 3x1500 MVA ICTs and provision for two additional 1500 MVA ICTs in future
- (iii) Establishment of 6000 MW HVDC station at Roing (New) with HVDC Bi-pole line terminating outside NER.
- (iv) Establishment of Naharkatia 765/400 kV GIS Pooling station with 3x1500 MVA ICTs and 2x240 MVar, 2x125 MVar bus reactors
- (v) Establishment of Khumtai 765/400 kV GIS Pooling station with 2x1500 MVA ICTs and 2x240 MVar, 2x125 MVar bus reactors
- (vi) Etalin PS – Roing (New) 400 kV 2xD/c (Quad) line
- (vii) Roing (New) – Naharkatia 765 kV D/c line
- (viii) Naharkatia – Mariani 400 kV D/c (Quad) line
- (ix) Naharkatia – Khumtai 765 kV D/c line
- (x) Khumtai – Bornagar 765 kV D/c line
- (xi) Khumtai – Khumtai (AEGCL) 400 kV D/c (Quad) line

5.5. Dedicated Transmission system by 2035

5.5.1. The required dedicated lines from the switchyard of the HEPs expected by 2035 to the pooling stations is given at Table 5-2 below:

Table 5-2 Transmission evacuation system in Dibang sub-basin by 2035

S. No	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of Pooling Sub-Station	Transmission System	Bus Reactor at Switchyard (MVar)

1.	Etalin	3097	400 kV	Etalin PS	Etalin (Power House) – Etalin PS 400 kV 2xD/c line (Ampacity: 1820 A or more per ckt)	3x80 MVAR along with associated bay
2.	Dibang Multipurpose Project	2880	400 kV	Roing (New) PS	Dibang – Roing (New) PS 400 kV 2xD/c Line (Ampacity: 1700 A or more per ckt)	2x80 MVAR along with associated bay
3.	Attunli	680	400 kV	Etalin PS	Attunli - Etalin PS 400 kV D/c Line (Ampacity: 1200 A or more per ckt)	2x80 MVAR along with associated bay
4.	Emra-II	315	220 kV	Etalin PS	Emra-II - Etalin PS 220 kV D/c Line (Ampacity: 1450 A or more per ckt)	Space for 1x50 MVAR along with associated bay
Total		6972				

5.5.2. The Map indicating the hydroelectric project expected by the year 2035 in the Dibang sub-basin along with their transmission system is given at Figure 5-1 below.

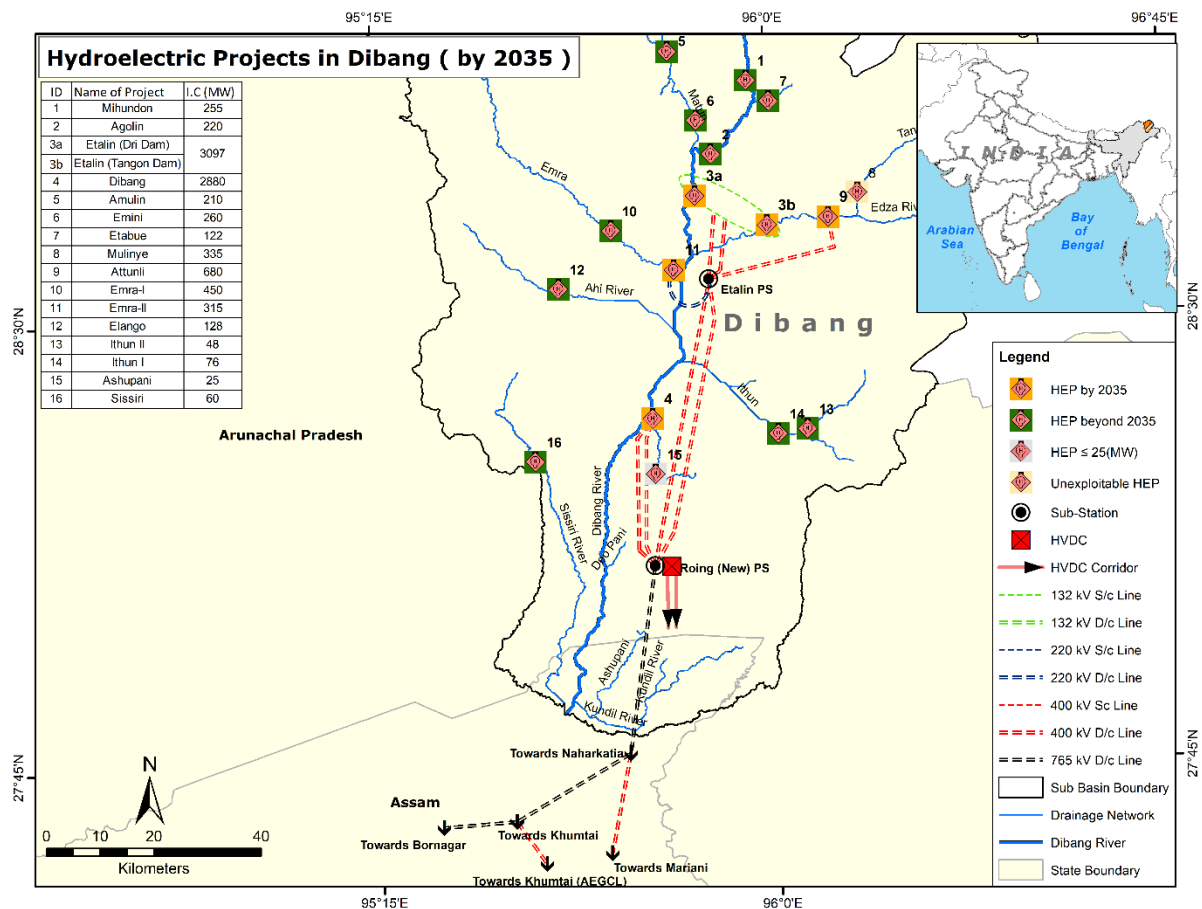


Figure 5-1 Transmission System of Dibang Sub-basin by 2035

5.6. Common Transmission System beyond 2035

5.6.1. Out of 1829 MW for evacuation of 1769 MW beyond 2035 timeframe, the following transmission system would be required:

- (i) Augmentation of Etalin 400/220 kV PS with 3x500 MVA ICT
- (ii) Augmentation of Roing (New) 765/400 kV PS with 2x1500 MVA ICT

5.6.2. The balance 60 MW (i.e. Sissiri HEP) is planned to be evacuated through intra-state transmission system of Arunachal Pradesh.

5.7. Dedicated Transmission System beyond 2035

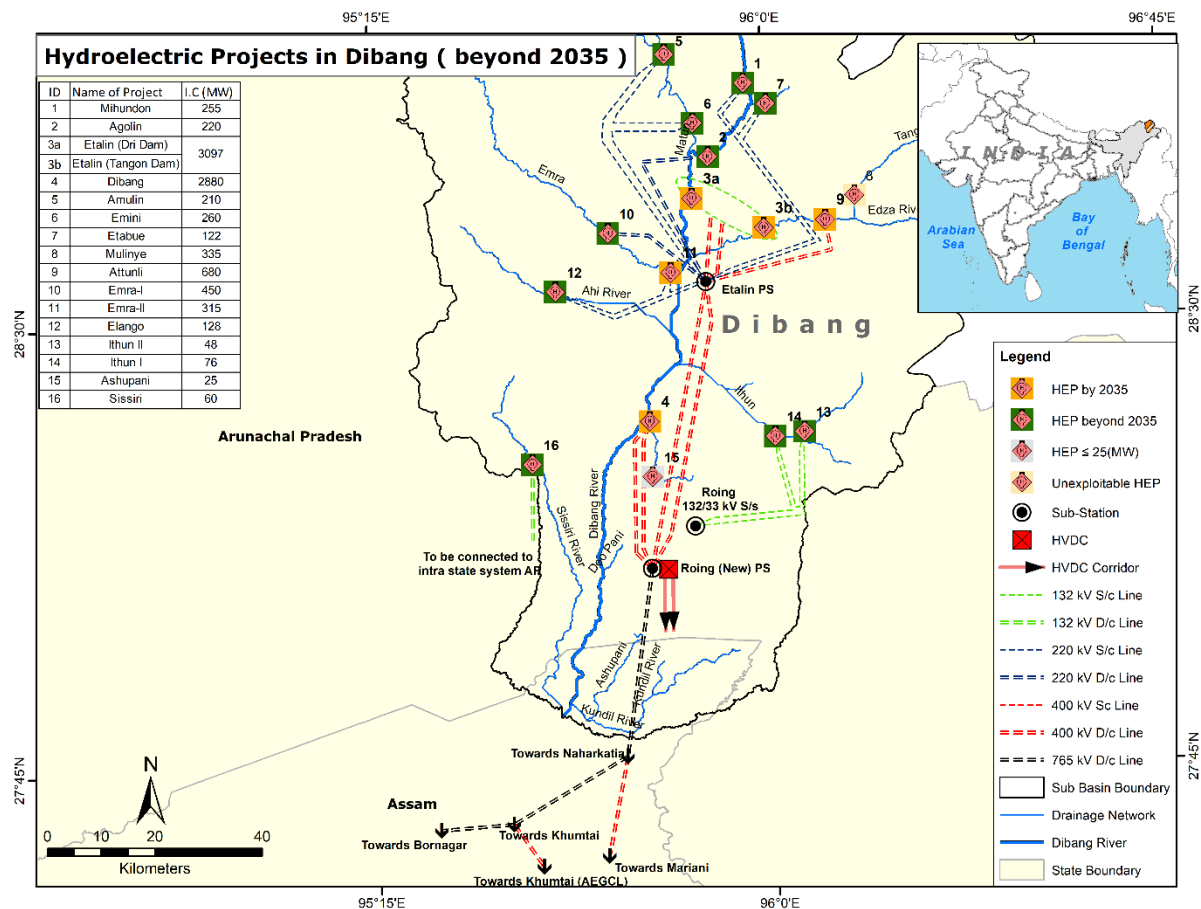
5.7.1. The required dedicated lines from the switchyard of the HEPs expected beyond 2035 to the pooling stations is given in table below:

Table 5-3 Transmission evacuation system in Dibang sub-basin beyond 2035

S. No	Name of HEP	I.C. (MW)	Switchyard Evacuation Voltage	Name of Pooling Sub-Station	Transmission System	Bus Reactor at Switchyard (MVA)
1.	Agoline	220	220 kV	Etalin PS	Agoline - Etalin PS 220 kV D/c Line (Ampacity: 710 A or more per ckt)	Space for 1x50 MVA along with associated bay
2.	Mihundon	255	220 kV	Etalin PS	Mihundon - Etalin PS 220 kV D/c Line (Ampacity: 1210 A or more per ckt) Note: Ampacity considering Etabue (122 MW) HEP	Space for 1x50 MVA along with associated bay
3.	Amulin	210	220 kV	Etalin PS	Amulin - Etalin PS 220 kV D/c Line (Ampacity: 1510 A or more per ckt)	Space for 1x50 MVA along with associated bay
4.	Emini	260	220 kV	Etalin PS	LILO of one ckt of Amulin - Etalin PS 220 kV D/c Line at Emini Switchyard (Ampacity: 1510 A or more per ckt)	Space for 1x50 MVA along with associated bay
5.	Etabue	122	220 kV	Etalin PS	LILO of one ckt of Mihundon - Etalin PS 220 kV D/c Line at Etabue switchyard (Ampacity: 1210 A or more per ckt)	Space for 1x50 MVA along with associated bay
6.	Elango	128	220 kV	Etalin PS	LILO of one ckt of Emra-II - Etalin PS 220 kV D/c Line at Elango switchyard (Ampacity: 1450 A or more per ckt)	Space for 1x50 MVA along with associated bay
7.	Ithun-II	48	132 kV	Roing 132/33 kV S/s	LILO of one ckt of Ithun-I – Roing (Existing) 132 kV D/c Line at Ithun-II	

S. No	Name of HEP	I.C. (MW)	Switchyard Evacuation Voltage	Name of Pooling Sub-Station	Transmission System	Bus Reactor at Switchyard (MVar)
					switchyard (Ampacity: 670 A or more per ckt)	
8.	Ithun-I	76	132 kV	Roing 132/33 kV S/s	Ithun-I – Roing (Existing) 132 kV D/c Line (Ampacity: 670 A or more per ckt)	
9.	Sissiri	60	132 kV	Intra-state system of DoP, Arunachal Pradesh	Through 132 kV D/c Line (Ampacity: 320 A or more per ckt)	
10.	Emra-I	450	220 kV	Etalin PS	Emra-I – Etalin PS 220 kV D/c Line (Ampacity: 1450 A or more per ckt)	Space for 1x50 MVar along with associated bay
Total		1829				

5.7.2. The Map indicating the hydroelectric projects in Dibang basin alongwith transmission system for power evacuation is depicted in Figure 5-2 below:



5.7.3. The Block Map of Dibang Sub-basin indicating hydroelectric project and transmission system is given at Annexure-II.

5.8. Summary of pooled capacity

5.8.1. The time-frame vis-à-vis pooling station wise capacity in Dibang sub-basin is given at Table 5-4 below:

Table 5-4 Timeframe vis-a-vis pooling station wise capacity

S. No.	Time frame	Capacity to be pooled	Pooling Station	Transformation Capacity
1.	Upto 2035	6972 MW	Etalin 400/220 kV	2x500 MVA
2.			Roing (New) 765/400 kV	3x1500 MVA
3.			Roing (New) ± 800 kV HVDC	6000 MW
4.			Naharkatia 765/400 kV	3x1500 MVA
5.			Khumtai 765/400 kV	2x1500 MVA
6.	Beyond 2035	1829 MW	Augmentation of Etalin 400/220 kV	3x500 MVA (additional)
7.			Augmentation of Roing (New) 765/400 kV	2x1500 MVA (additional)
8.			Intra-state System of Arunachal Pradesh	-

6. Siang Sub-basin

6.1. General

6.1.1. Siang River originates as Tsangpo River from Mansarovar near Mt. Kailash in the Himalaya, flows via Tibet, China, India and Bangladesh into Bay of Bengal. The total length of the river is 2900 km. The three headstreams that arise are the Kubi, the Angsi, and the Chemayungdung. From its source, the river runs for nearly 1,100 km in a generally easterly direction between the main range of the Himalaya to the south and the Mt. Kailash Range to the north.

6.1.2. Throughout its upper course, the river is commonly known as the Tsangpo. It is also known by its Chinese name Yarlung Zangbo and by several other local Tibetan names. The upper catchment area of Siang is mountainous with deep and narrow valleys. The part of Siang basin in India is bounded on the north by eastern Himalaya, on west by Subansiri basin and on east by Dibang basin

6.2. Hydroelectric Project in Siang Sub-Basin

6.2.1. List of exploitable Hydroelectric Projects in Siang sub-basin is given in Table 6-1 below:

Table 6-1 List of HEPs in Siang sub-basin

S.No.	Name of Project	IC (MW)	Expected time frame
1.	Tato-II	700	2031-32
2.	Naying	1000	2032-33
3.	Heo	240	2029-30
4.	Tato-I	186	2029-30
Sub-Total (upto 2035)		2126	
5.	Upper Siang Stage - I	11200	Beyond 2035
	Upper Siang Stage - II		
6.	Lower Siang	2700	Beyond 2035
7.	Hirong	320	Beyond 2035
8.	Pauk	145	Beyond 2035
9.	Sippi	75	Beyond 2035
10.	Rigong (Ringong)	85	Beyond 2035
11.	Jidu (Yangsang)	90	Beyond 2035
12.	Pango (Minnying)	72	Beyond 2035
13.	Mirak	78	Beyond 2035
14.	Siyom (Middle)	1000	Beyond 2035
15.	Pemashelphu	78	Beyond 2035
16.	Kangtangshri	68	Beyond 2035
17.	Rego	63	Beyond 2035
18.	Rapum	60	Beyond 2035
19.	Tagurshit	52	Beyond 2035
20.	Simang- II (Simang)	66	Beyond 2035

S.No.	Name of Project	IC (MW)	Expected time frame
21.	Simang I	67	Beyond 2035
22.	Yamne-I	111	Beyond 2035
23.	Yamne St II	70	Beyond 2035
24.	Lower Yamne-I	66	Beyond 2035
25.	Lower Yamne St-II	74	Beyond 2035
Sub-Total (beyond 2035)		16540	
Grand Total		18666	

6.3. Transmission System

6.3.1. The hydroelectric potential in Siang sub-basin is 18666 MW and Upper Siang (11200 MW) is the major generating project in this sub-basin.

6.3.2. Total potential expected by the year 2035 is 2126 MW and remaining 16540 MW is expected beyond the year 2035. The planned Dedicated Transmission lines and Common transmission system for the projects expected by the year 2035 and beyond 2035 are mentioned in the sub-sequent paragraphs.

6.4. Common Transmission System by 2035

6.4.1. For evacuation of 2126 MW of power from Siang sub-basin by 2035 timeframe, following common transmission system would be required:

- (i) Establishment of Kaying 400/220 kV GIS pooling station with 2x500 MVA ICTs and 2x80 MVar Bus reactors
- (ii) Establishment of Niglok 400/220 kV sub-station with 2x500 MVA ICTs (provision for additional 1x500 MVA ICTs shall be kept for future expansion) *(The 220 kV level at Niglok will be used for connecting the Intra-state transmission system of Arunachal Pradesh)*
- (iii) Niglok PS – Gogamukh 400 kV D/c (Quad) line.
- (iv) Kaying PS – Niglok PS 400 kV D/c (Quad) line

Note: Niglok PS – Gogamukh 400 kV D/c (Quad) line would be made LILO at Gogamukh (new) 765/400 kV S/s; which is mentioned in the transmission system of Subansiri sub-basin.

6.5. Dedicated Transmission system by 2035

6.5.1. The required dedicated lines from the switchyard of the HEPs expected by 2035 to the pooling stations is given in table below:

Table 6-2 Transmission evacuation system in Siang sub-basin by 2035

S. No	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of Pooling Sub-Station	Transmission System	Bus Reactor at Switchyard (MVar)
1.	Tato-II	700	400 kV	Kaying PS	Tato-II - Kaying PS 400 kV D/c Line (Ampacity: 1800 A or more per ckt)	1x80 MVar along with associated bay and Space for 1x80 MVar

S. No	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of Pooling Sub-Station	Transmission System	Bus Reactor at Switchyard (MVar)
						along with associated bay
2.	Naying	1000	400 kV	Kaying PS	Naying – Kaying PS 400 kV D/c Line (Ampacity: 1770 A or more per ckt)	2x80 MVar along with associated bay
3.	Heo	240	220 kV	Kaying PS	LILO of one circuit of Tato-I - Kaying PS 220 kV D/c Line at Heo switchyard (Ampacity: 1840 A or more per ckt)	Space for 1x50 MVar along with associated bay
4.	Tato-I	186	220 kV	Kaying PS	Tato-I - Kaying PS 220 kV D/c Line (Ampacity: 1840 A or more per ckt)	Space for 1x50 MVar along with associated bay
Total		2126				

6.5.2. The Map indicating the hydroelectric project expected by the year 2035 in the Siang sub-basin along with their transmission system is given at Figure 6-1 below.

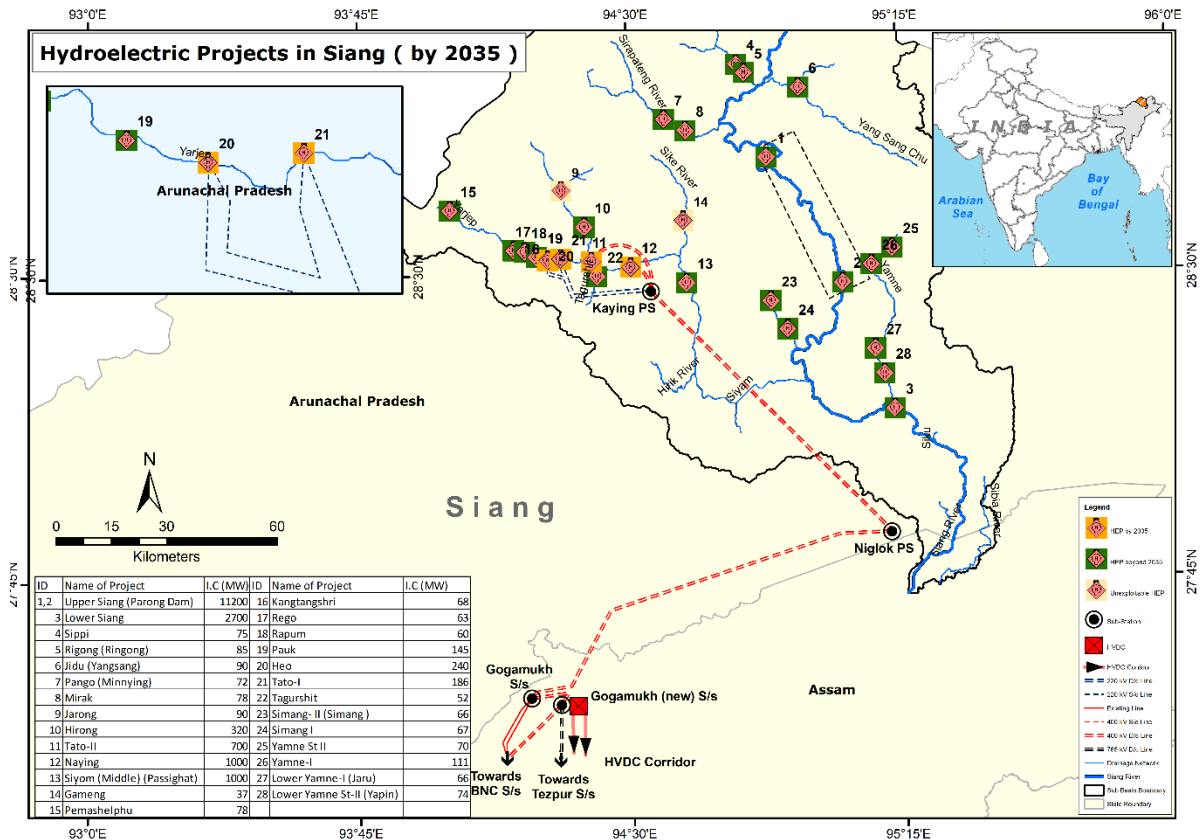


Figure 6-1 Transmission System of Siang Sub-basin by 2035

6.6. Common Transmission System beyond 2035

6.6.1. For evacuation of 16540 MW of power from the projects in Siang sub-basin beyond 2035 timeframe, following common transmission system would be required:

- (i) Establishment of Mechuka 220/132 kV GIS pooling station with 3x200 MVA ICTs and 2x50 MVar Bus reactors
- (ii) Establishment of Tuting 220/132 kV GIS pooling station with 4x200 MVA ICTs and 2x50 MVar Bus reactors
- (iii) Establishment of Pangin PS 220/132 kV GIS pooling station with 3x200 MVA ICTs and 2x50 MVar Bus reactors
- (iv) Establishment of 6000 MW HVDC station at Niglok with HVDC Bi-pole line terminating outside NER.
- (v) Augmentation of Niglok 400/220 kV PS with additional 1x500 MVA ICT
- (vi) Augmentation of Kaying 400/220 kV PS with additional 2x500 MVA ICTs
- (vii) Kaying PS – Niglok PS 400 kV 2nd D/c (Quad) line
- (viii) Tuting PS – Niglok 220 kV D/c (Twin) Line
- (ix) Pangin PS – Niglok 220 kV D/c (Twin) line
- (x) Mehcuca PS – Kaying PS 220 kV D/c (Twin) line
- (xi) Niglok PS – Gogamukh (new) PS 400 kV D/c (Quad) line
- (xii) LILO of Niglok – Gogamukh (new) 400 kV (Quad) D/c at Silapathar PS
- (xiii) Establishment of 2x6000 MW HVDC station at Silapathar with HVDC Bi-pole line terminating outside NER.

Note: Establishment of Gogamukh (new) 765/400 kV PS has been mentioned in Subansiri sub-basin

6.7. Dedicated Transmission System beyond 2035

6.7.1. The required dedicated lines from the switchyard of the HEPs expected beyond 2035 to the pooling stations is given in table below:

Table 6-3 Transmission evacuation system in Siang sub-basin beyond 2035

S.No	Name of HEP	I.C. (MW)	Switchyard Evacuation Voltage	Name of Pooling Sub-Station	Transmission System	Bus Reactor at Switchyard (MVar)
1.	Upper Siang	11200	765 kV	Silapathar PS	Upper Siang – Silapathar 765 kV 3xD/c line (Ampacity: 2080 A or more per ckt)	2x240 MVar along with associated bay

S.No	Name of HEP	I.C. (MW)	Switchyard Evacuation Voltage	Name of Pooling Sub-Station	Transmission System	Bus Reactor at Switchyard (MVar)
2.	Lower Siang	2700	400 kV	Niglok PS	Lower Siang - Niglok PS 400 kV D/c Line (1 st corridor) (Ampacity: 1590 A or more per ckt)	2x80 MVar along with associated bay
					Lower Siang - Niglok PS 400 kV D/c Line (2 nd corridor) (Ampacity: 1590 A or more per ckt)	
3.	Hirong	320	400 kV	Kaying PS	LILO of one circuit of Tato-II - Kaying PS 400 kV D/c Line at Hirong switchyard (Ampacity: 1800 A or more per ckt)	1x80 MVar along with associated bay and Space for 1x80 MVar along with associated bay
4.	Pauk	145	220 kV	Kaying PS	LILO of Heo – Naying 220 kV S/c line at Pauk switchyard (Ampacity: 1840 A or more per ckt)	Space for 1x50 MVar along with associated bay
5.	Siyom (Middle) (Passighat)	1000	400 kV	Kaying PS	Siyom – Kaying PS 400 kV D/c Line (Ampacity: 1770 A or more per ckt)	2x80 MVar along with associated bay
6.	Sippi	75	132 kV	Tuting PS	Sippi – Tuting PS 132 kV D/c Line (Ampacity: 400 A or more per ckt)	-
7.	Rigong (Ringong)	85	132 kV	Tuting PS	Rigong – Tuting PS 132 kV D/c Line (Ampacity: 460 A or more per ckt)	-
8.	Jidu (Yangsang)	90	132 kV	Tuting PS	Jidu – Tuting PS 132 kV D/c Line (Ampacity: 490 A or more per ckt)	-
9.	Pango (Minnying)	72	132 kV	Tuting PS	Pango – Tuting PS 132 kV D/c Line (Ampacity: 390 A or more per ckt)	-
10.	Mirak	78	132 kV	Tuting PS	Mirak – Tuting PS 132 kV D/c Line (Ampacity: 420 A or more per ckt)	-
11.	Pemashelp hu	78	132 kV	Mechuka PS	Pemashelp hu – Mechuka PS 132 kV D/c Line (Ampacity: 420 A or more per ckt)	-
12.	Kangtangshri	68	132 kV	Mechuka PS	Kangtangshri – Mechuka PS 132 kV D/c Line (Ampacity: 370 A or more per ckt)	-
13.	Rego	63	132 kV	Mechuka PS	Rego – Mechuka PS 132 kV D/c Line	-

S.No	Name of HEP	I.C. (MW)	Switchyard Evacuation Voltage	Name of Pooling Sub-Station	Transmission System	Bus Reactor at Switchyard (MVar)
					(Ampacity: 340 A or more per ckt)	
14.	Rapum	60	132 kV	Mechuka PS	Rapum – Mechuka PS 132 kV D/c Line (Ampacity: 320 A or more per ckt)	-
15.	Tagurshit	52	132 kV	Mechuka PS	Tagurshit – Mechuka PS 132 kV D/c Line (Ampacity: 280 A or more per ckt)	-
16.	Yamne-I	111	132 kV	Pangin PS	Yamne-I – Pangin PS 132 kV D/c Line (Ampacity: 600 A or more per ckt)	-
17.	Yamne St II	70	132 kV	Pangin PS	Yamne-St II – Pangin PS 132 kV D/c Line (Ampacity: 380 A or more per ckt)	-
18.	Lower Yamne-I (Jaru)	66	132 kV	Pangin PS	Lower Yamne-I – Pangin PS 132 kV D/c Line (Ampacity: 360 A or more per ckt)	-
19.	Lower Yamne St-II (Yapin)	74	132 kV	Pangin PS	Lower Yamne-St-II – Pangin PS 132 kV D/c Line (Ampacity: 400 A or more per ckt)	-
20.	Simang- II	66	220 kV	Kaying PS	Simang-II – Kaying PS 220 kV D/c Line (Ampacity: 430 A or more per ckt)	Space for 1x50 MVar along with associated bay
21.	Simang I	67	220 kV	Kaying PS	LLO of one circuit of Simang-II – Kaying PS 220 kV D/c Line at Simang-I switchyard (Ampacity: 430 A or more per ckt)	Space for 1x50 MVar along with associated bay
Total		16540				

6.7.2. The Map indicating the hydroelectric projects and their transmission system is given at Figure 6-2 below.

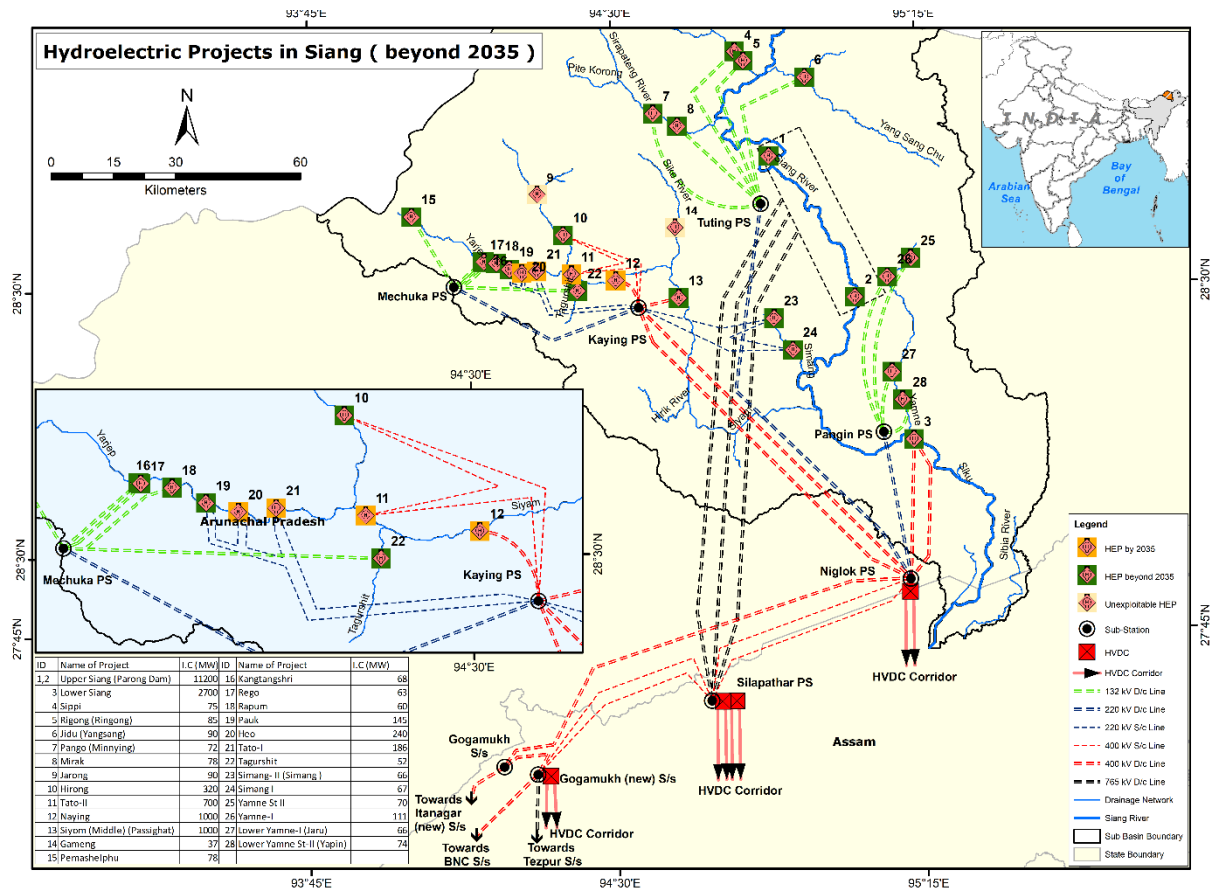


Figure 6-2 Transmission System of Siang Sub-basin beyond 2035

6.7.3. The Block Map of Siang Sub-basin indicating hydroelectric project and transmission system is given at Annexure-II.

6.8. Summary of pooled capacity

6.8.1. The time frame vis-à-vis pooling station wise capacity in this sub-basin is given at Table 6-4 below.

Table 6-4 Timeframe vis-a-vis pooling station wise capacity

S. No.	Time frame	Capacity to be pooled	Pooling Station	Transformation Capacity
1.	Upto 2035	2126 MW	Kaying 400/220 kV	2x500 MVA
2.			Niglok 400/220 kV	2x500 MVA
3.	Beyond 2035	16540 MW	Mechuka 220/132 kV	3x200 MVA
4.			Tuting 220/132 kV	4x200 MVA
5.			Pangin 220/132 kV	3x200 MVA
6.			Augmentation of Kaying 400/220 kV	2x500 MVA (additional)
7.			Augmentation of Niglok 400/220 kV	1x500 MVA (additional)
8.			Niglok HVDC ± 800 kV	6000 MW
9.			Silapathar HVDC ± 800 kV	2x6000 MW

7. Subansiri Sub-basin

7.1. General

- 7.1.1. Subansiri River originates in Tibet and is the major right bank tributary of Brahmaputra traversing through Arunachal Pradesh. In Subansiri basin Subansiri River offers phenomenal hydropower potential due to topographical conditions accompanied with rainfall in its catchment ensuring significant discharge in the river throughout the year.
- 7.1.2. The Subansiri basin can be divided into four parts viz.; A) Chinese / Tibetan high elevation stretch till the international border; B) the stretch lying between the international boundary and upper reaches of Arunachal Pradesh; C) the Arunachal Pradesh stretch upto the inter- state boundary of Assam and Arunachal Pradesh and D) the plains of Assam. The first two belong to the Great Himalayan range, the third belonging to the Sub-Himalayas and the fourth in the fertile plains of Assam.

7.2. Hydroelectric Project in Subansiri Sub-Basin

- 7.2.1. List of exploitable Hydroelectric Projects in Subansiri River is given at Table 7-1 below

Table 7-1 List of HEPs in Subansiri sub-basin

S.No.	Name of Project	I.C. (MW)	Expected time frame
1.	Panyor Lower (erstwhile Ranganadi St-I (Yazali Div II))	405	Existing
2.	Subansiri Lower	2000	Under Construction
Sub-Total (existing)		2405	
3.	Oju	2220	2035
4.	Subansiri Upper	1605	2034-35
5.	Niare	909	2034-35
6.	Kurung Dam (I & II)	320	2035
7.	Subansiri Middle (Kamala)	1720	2033-34
Sub-Total (upto 2035)		6774	
8.	Naba	905	Beyond 2035
9.	Nalo	372	Beyond 2035
10.	Dengser	545	Beyond 2035
11.	Milli	138	Beyond 2035
12.	Sape	65	Beyond 2035
13.	Chomi	165	Beyond 2035
14.	Chela	180	Beyond 2035
15.	Hegio	320	Beyond 2035
16.	Nyepin	48	Beyond 2035
17.	Hiya	65	Beyond 2035
18.	Tago I	48	Beyond 2035

S.No.	Name of Project	I.C. (MW)	Expected time frame
19.	Panyor	130	Beyond 2035
20.	Panyor (Ranganadi) St II (Yazali Storage)	130	Beyond 2035
21.	Panyor PSP	660	Beyond 2035
Sub-Total (beyond 2035)		3771	
Grand Total (MW)		12950	

7.3. Pumped Storage Projects in Subansiri Sub-Basin

7.3.1. 660 MW Panyor PSP, in the State of Arunachal Pradesh, has been allocated to NEEPCO. The Power of this PSP would be pooled at Panyor 400/132 kV PS.

7.4. Transmission System

7.4.1. The hydroelectric potential of Subansiri sub-basin is 12950 MW and Oju (2220 MW) is the major generating station in this sub-basin.

7.4.2. Total capacity expected by the year 2035 is 9179 MW (including existing and under construction) and remaining 3771 MW is expected beyond the year 2035. Transmission system for 2405 MW capacity has already been implemented. Dedicated Transmission Lines and Common transmission system required for the projects expected by the year 2035 and beyond 2035 are mentioned in the sub-sequent paragraphs.

7.5. Common Transmission System by 2035

7.5.1. Transmission system for existing and underconstruction capacity of 2405 MW has already been implemented. For evacuation of 6774 MW of power by 2035 timeframe, following common transmission system would be required:

- (i) Establishment of Daporijo 400 kV Pooling station (Switching sub-station)
- (ii) Establishment of Gogamukh (new) 765/400 kV substation with 5x1500 MVA ICTs
- (iii) Establishment of Tezpur 765 kV switching substation along with space for creation of 400 kV level in future.
- (iv) Gogamukh (new) – BNC 400 kV D/c (Quad) line
- (v) Gogamukh (new) – Tezpur 765 kV D/c line
- (vi) Tezpur – Bornagar 765 kV D/c line
- (vii) Daporijo PS – Gogamukh (new) 400 kV 2xD/c (Quad) line
- (viii) LILO of Gogamukh– Niglok 400 kV D/c (Quad) line at Gogamukh (new)

- (ix) Establishment of 6000 MW HVDC station at Gogamukh (New) with HVDC Bi-pole line terminating outside NER.

Note: Beyond Bornagar substation i.e. Bornagar-Parbotipur-Katihar 765 kV link has already been planned.

Gogamukh – Niglok 400 kV D/c (Quad) line has been planned under Siang basin. The same is to be made LILO for Subansiri basin HEPs.

7.6. Dedicated Transmission system by 2035

- 7.6.1. The required dedicated lines from the switchyard of the HEPs expected by 2035 to the pooling stations is given in table below.

Table 7-2 Transmission evacuation system in Subansiri sub-basin by 2035

S. No	Name of HEP	I.C. (MW)	Switchyard Evacuation Voltage	Name of Pooling Sub-Station	Transmission System	Bus Reactor at Switchyard (MVar)
1.	Oju	2220	400 kV	Daporijo PS	Oju - Daporijo PS 400 kV D/c Line (Ampacity: 3920 A or more per ckt)	2x80 MVar along with associated bay
2.	Subansiri Upper	1605	400 kV	Daporijo PS	Subansiri Upper - Daporijo PS 400 kV D/c Line (Ampacity: 2840 A or more per ckt)	3x41.6 (1ph units) MVar along with associated bay
3.	Subansiri Middle (Kamla) (Tamen)	1720	400 kV	Daporijo PS	Subansiri Middle - Daporijo PS 400 kV D/c Line (Ampacity: 3040 A or more per ckt)	2x80 MVar along with associated bay
4.	Niare	909	400 kV	Daporijo PS	Niare - Daporijo PS 400 kV D/c Line (Ampacity: 3210 A or more per ckt)	1x80 MVar along with associated bay and Space for 1x80 MVar along with associated bay
5.	Kurung Dam (I & II)	320	400 kV	Daporijo PS	Kurung Dam - Daporijo PS 400 kV D/c Line (Ampacity: 1130 A or more per ckt)	1x80 MVar along with associated bay
Total		6774				

- 7.6.2. The Map indicating the hydroelectric project expected by the year 2035 in the Subansiri sub-basin along with their transmission system is given at Figure 7-1 below.

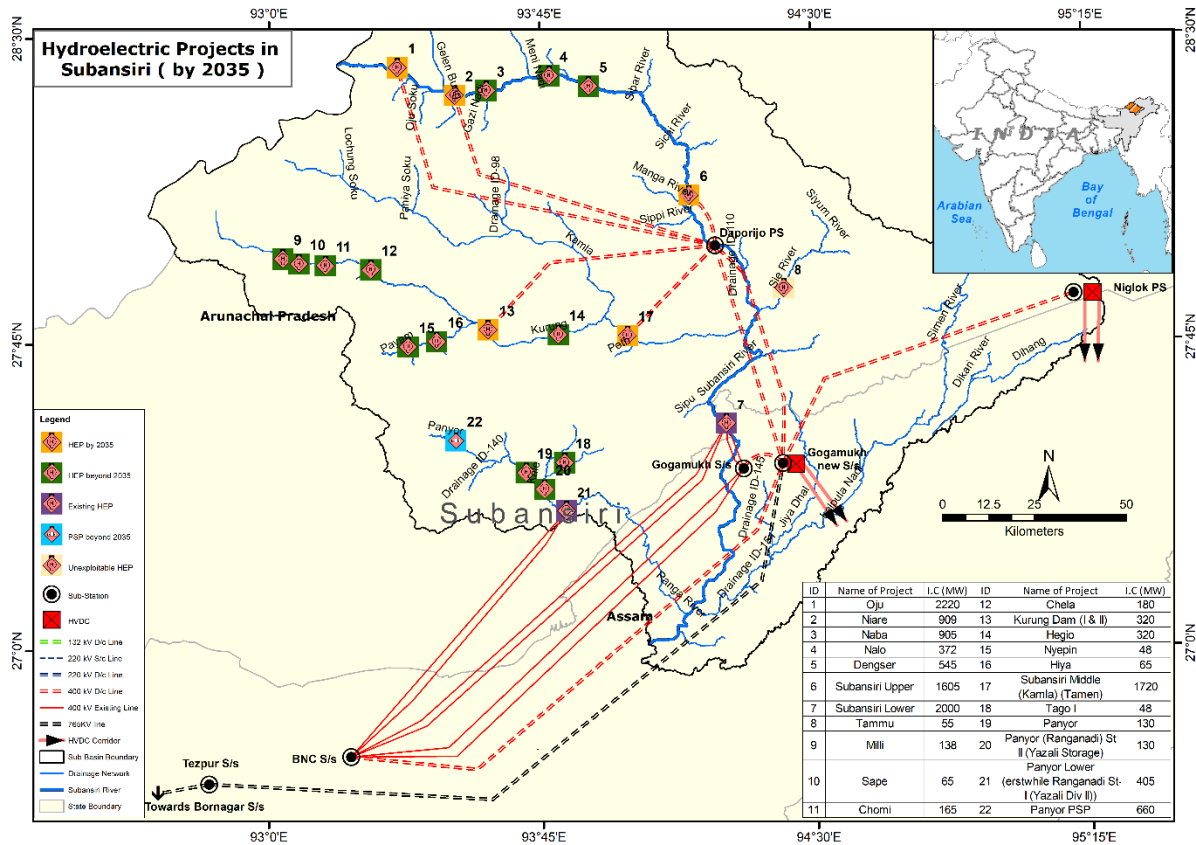


Figure 7-1 Transmission System of Subansiri Sub-basin by 2035

7.7. Common Transmission System beyond 2035

7.7.1. For evacuation of 3771 MW of power beyond 2035 timeframe, following common transmission system would be required:

- Establishment of Panyor 400/132 kV Pooling station with 3x200 MVA ICTs and 2x80 MVar Bus reactors
- Establishment of Koloriang 400/220 kV GIS pooling station with 3x500 MVA ICTs and 2x80 MVar Bus reactors
- Establishment of Itanagar (New) 400/132 kV new GIS pooling station with 2x200 MVA ICTs and 2x80 MVar Bus reactors
- Daporijo PS – Gogamukh (new) 400 kV 3rd D/c (Quad) line
- Itanagar (New) – Itanagar (DoP, Arunachal Pradesh) 132 kV D/c (High Capacity) line
- Koloriang PS – Itanagar (New) 400 kV D/c (Quad) line
- LILO of Gogamukh – BNC 400 kV D/c (Quad) line at Itanagar (New)
- LILO of both ckt of Rangandi (Panyor HEP) – BNC 400 kV D/c line at Panyor PS
- Reconductoring of Panyor PS – BNC 400 kV D/c line with Twin HTLS (1600 A single HTLS)

7.8. Dedicated Transmission System beyond 2035

7.8.1. The required dedicated lines from the switchyard of the HEPs expected beyond 2035 to the pooling stations is given in table below.

Table 7-3 Transmission evacuation system in Subansiri sub-basin beyond 2035

S. No	Name of HEP	I.C. (MW)	Switchyard Evacuation Voltage	Name of Pooling Sub-Station	Transmission System	Bus Reactor at Switchyard (MVAR)
1.	Naba	905	400 kV	Daporijo PS	Naba – Daporijo PS 400 kV D/c Line (Ampacity: 3120 A or more per ckt)	1x80 MVAR along with associated bay and Space for 1x80 MVAR along with associated bay
2.	Nalo	372	400 kV	Daporijo PS	LILO of one ckt of Dengser – Daporijo PS 400 kV D/c Line at Nalo switchyard (Ampacity: 1620 A or more per ckt)	1x80 MVAR along with associated bay
3.	Dengser	545	400 kV	Daporijo PS	Dengser – Daporijo PS 400 kV D/c Line (Ampacity: 1620 A or more per ckt)	1x80 MVAR along with associated bay and Space for 1x80 MVAR along with associated bay
4.	Milli	138	220 kV	Koloriang PS	LILO of Sape – Koloriang PS 220 kV S/c Line at Mili switchyard (Ampacity: 1760 A or more per ckt)	Space for 1x50 MVAR along with associated bay
5.	Sape	65	220 kV	Koloriang PS	LILO of Chomi – Koloriang PS 220 kV S/c Line at Sape switchyard (Ampacity: 1760 A or more per ckt)	Space for 1x50 MVAR along with associated bay
6.	Chomi	165	220 kV	Koloriang PS	LILO of one ckt of Chela – Koloriang PS 220 kV D/c Line at Chomi switchyard (Ampacity: 1760 A or more per ckt)	Space for 1x50 MVAR along with associated bay
7.	Chela	180	220 kV	Koloriang PS	Chela – Koloriang PS 220 kV D/c Line (Ampacity: 1760 A or more per ckt)	2x80 MVAR along with associated bay
8.	Hegio	320	400 kV	Daporijo PS	LILO of one ckt of Kurung Dam - Daporijo PS 400 kV D/c Line at Hegio Switchyard (Ampacity: 1130 A or more per ckt)	1x80 MVAR along with associated bay
9.	Nyepin	48	220 kV	Koloriang PS	LILO of one ckt of Hiya – Koloriang PS 220 kV D/c	

S. No	Name of HEP	I.C. (MW)	Switchyard Evacuation Voltage	Name of Pooling Sub-Station	Transmission System	Bus Reactor at Switchyard (MVar)
					Line at Nyepin Switchyard (Ampacity: 370 A or more per ckt)	
10.	Hiya	65	220 kV	Koloriang PS	Hiya – Koloriang PS 220 kV D/c Line (Ampacity: 370 A or more per ckt)	Space for 1x50 MVar along with associated bay
11.	Tago-I	48	132 kV	Panyor PS	LILO of one ckt of Panyor (Ranganadi) St II – Panyor PS 132 kV D/c Line at Tago-I Switchyard (Ampacity: 960 A or more per ckt)	
12.	Panyor	130	132 kV	Panyor PS	Panyor – Panyor PS 132 kV D/c Line (Ampacity: 700 A or more per ckt)	
13.	Panyor (Ranganadi) St-II (Yazali Storage)	130	132 kV	Panyor PS	Panyor (Ranganadi) St II – Panyor PS 132 kV D/c Line (Ampacity: 960 A or more per ckt)	
14.	Panyor PSP	660	400 kV	Panyor PS	Panyor PSP – Panyor PS 400 kV D/c Line (Ampacity: 1170 A or more per ckt)	1x80 MVar along with associated bay and Space for 1x80 MVar along with associated bay
Total		3771				

7.8.2. The Map indicating the hydroelectric projects and transmission system is given at Figure 7-2 below.

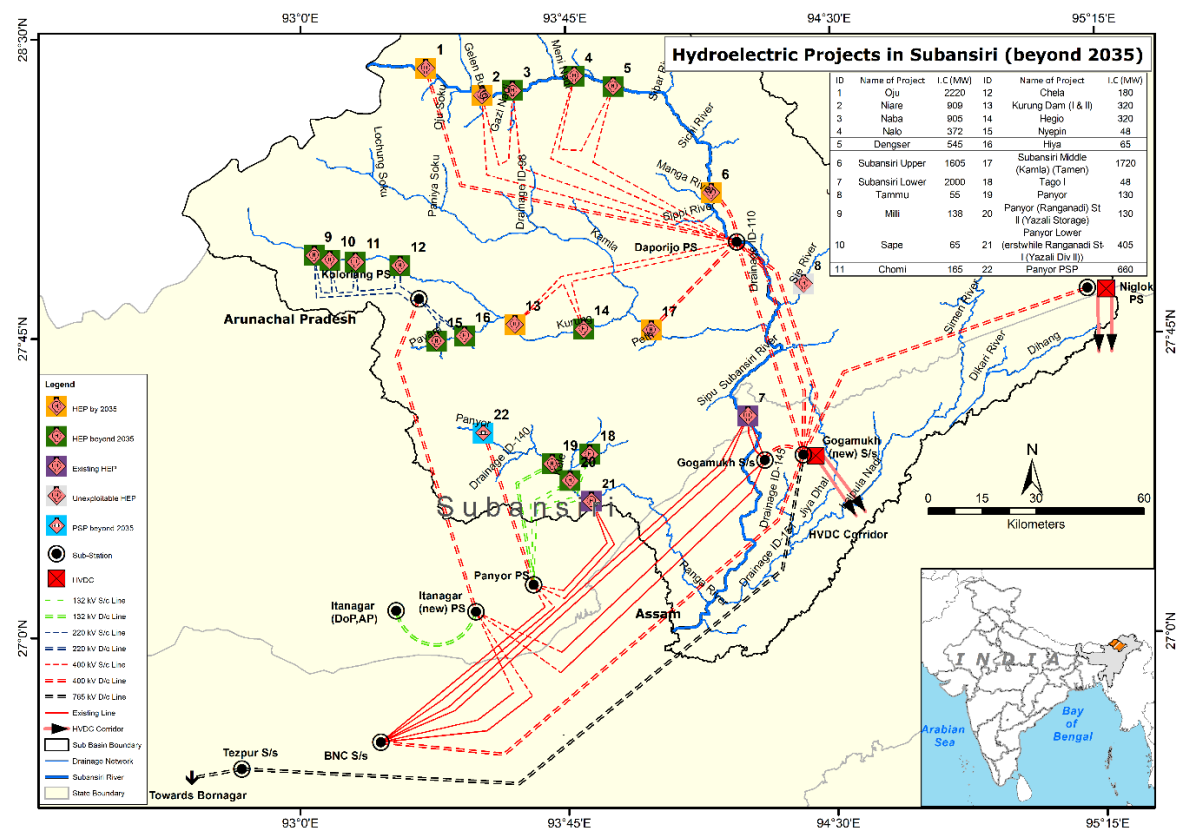


Figure 7-2 Transmission System of Subansiri Sub-basin beyond 2035

7.8.3. The Block Map of Subansiri Sub-basin indicating hydroelectric project and transmission system is given at Annexure-II.

7.9. Summary of pooled capacity

7.9.1. The time frame vis-à-vis pooling station wise capacity in this sub-basin is given at Table 7-4 below.

Table 7-4 Timeframe vis-a-vis pooling station wise capacity

S. No.	Time frame	Capacity to be pooled	Pooling Station	Transformation Capacity
1.	Upto 2035	6774 MW	Daporijo 400 kV	Switching S/s
2.			Tezpur 765 kV	Switching S/s
3.			Gogamukh (new) 765/400 kV	5x1500 MVA
4.			Gogamukh (new) HVDC ± 800 kV	6000 MW
5.	Beyond 2035	3771 MW	Panyor 400/132 kV	3x200 MVA
6.			Koloriang 400/220 kV	3x500 MVA
7.			Itanagar (New) 400/132 kV	2x200 MVA

8. Pare (Dikrong) Sub-basin

8.1. General

8.1.1. The Subansiri River meets Brahmaputra about 25 km downstream of Jorhat. Previously Pare (Dikrong) sub basin was a part of Subansiri river basin but for the detailed analysis, it has been considered as a separate sub-basin.

8.1.2. The drainage network of this catchment is represented by a combination of rectangular & dendritic pattern. The upper part of the catchment is covered with snow clad mountains & glaciers, barren rocky, waste land. Most part of the catchment is covered with semi-dense, mixed subtropical & semi evergreen forest

8.2. Hydroelectric Projects in Pare (Dikrong) Sub-Basin

8.2.1. List of Hydroelectric Project in Pare (Dikrong) River is given at Table 8-1 below

Table 8-1 List of HEPs in Pare (Dikrong) sub-basin

S.No.	Name of Project	I.C. (MW)	Expected time frame
1.	Pare	110	Existing
Sub-Total (existing)		110	
2.	Par	85	Beyond 2035
3.	Turu	100	Beyond 2035
4.	Dardu	85	Beyond 2035
5.	Doimukh (Duimukh Storage)	34	Beyond 2035
Sub-Total (beyond 2035)		304	
Grand Total (MW)		414	

8.3. Transmission System

8.3.1. The hydroelectric potential of Pare (Dikrong) sub-basin is 414 MW and Turu (100 MW) is the major generating station in this sub-basin.

8.3.2. The total potential 304 MW is expected beyond the year 2035. The planned Dedicated Transmission lines and Common transmission system for the projects expected beyond the year 2035 are mentioned in the sub-sequent paragraphs.

8.4. Common and Dedicated Transmission System by 2035

8.4.1. As there is no HEP expected by the year 2035 hence no common or dedicated transmission system has been envisaged by the year 2035.

8.5. Common Transmission System beyond 2035

8.5.1. For evacuation of 304 MW of power beyond 2035 timeframe, following common transmission system would be required.

- (i) Augmentation of Itanagar (New) 400/132 kV Pooling station with 2x200 MVA ICTs

8.6. Dedicated Transmission System beyond 2035

8.6.1. Following dedicated lines would be required from the HEPs switchyard to the pooling stations:

Table 8-2 Transmission evacuation system in Pare (Dikrong) sub-basin beyond 2035

S.No.	Name of HEP	I.C. (MW)	Switchyard Evacuation Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVar)
1.	Par	85	132 kV	Itanagar (New) PS (in Subansiri sub-basin)	LILO of one ckt of Turu – Itanagar (New) PS 132 kV D/c Line at Par Switchyard (Ampacity: 1000 A or more per ckt)	-
2.	Turu	100	132 kV	Itanagar (New) PS (in Subansiri sub-basin)	Turu – Itanagar (New) PS 132 kV D/c Line (Ampacity: 1000 A or more per ckt)	-
3.	Dardu	85	132 kV	Itanagar (New) PS (in Subansiri sub-basin)	Dardu – Itanagar (New) PS 132 kV D/c Line (Ampacity: 460 A or more per ckt)	-
4.	Doimukh (Duimukh Storage)	34	132 kV	To be connected to intra state system (DoP, AP)	Through 132 kV D/c Line (Ampacity: 190 A or more per ckt)	-
Total		304				

8.6.2. The Map indicating the hydroelectric projects and transmission system in Pare (Dikrong) sub-basin is given at Figure 8-1 below.

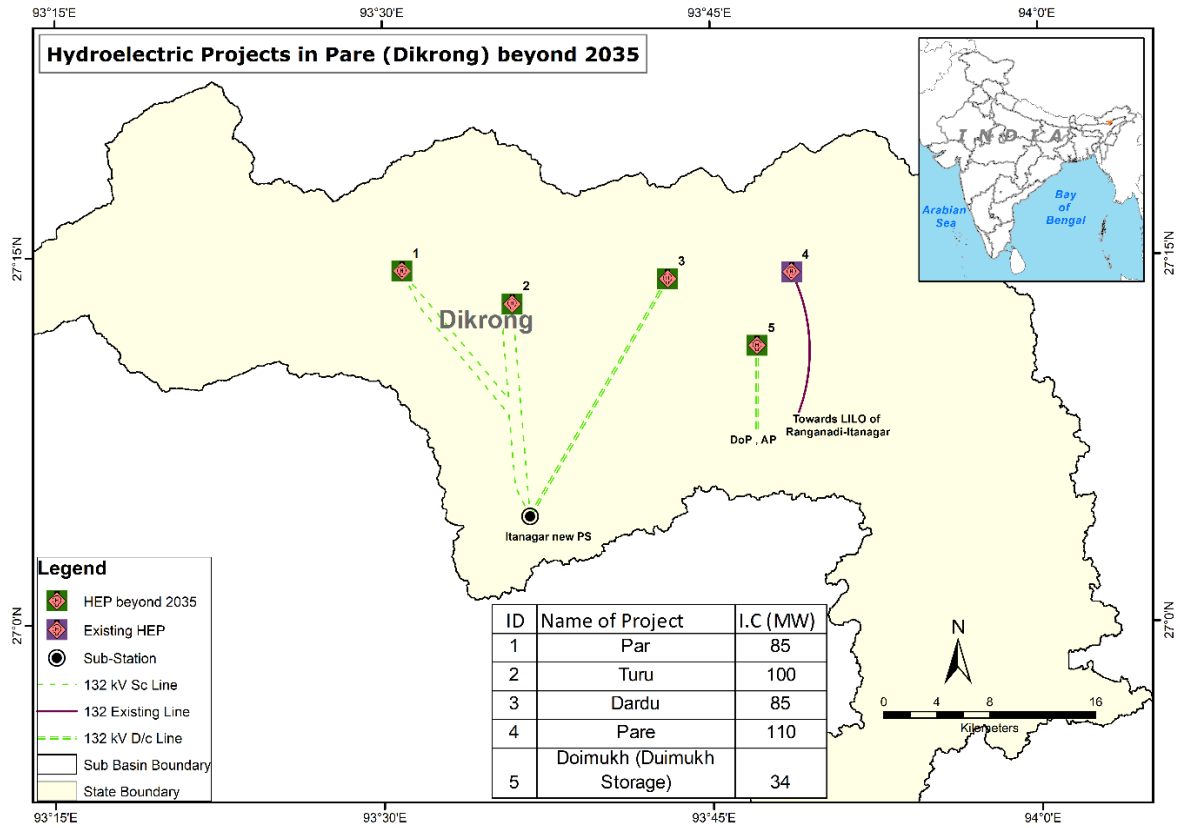


Figure 8-1 Transmission System of Pare (Dikrong) Sub-basin beyond 2035

8.6.3. The Block Map of Pare (Dikrong) Sub-basin indicating hydroelectric project and transmission system is given at Annexure-II.

8.7. Summary of pooled capacity

8.7.1. The time frame vis-à-vis pooling station wise capacity in this sub-basin is given at Table 8-3 below.

Table 8-3 Timeframe vis-a-vis pooling station wise capacity

S. No.	Time frame	Capacity to be pooled	Pooling Station	Transformation Capacity
1.	Beyond 2035	304 MW	Augmentation of Itanagar (New) 400/132 kV	2x200 MVA (additional)

9. Kameng Sub-basin

9.1. General

9.1.1. Kameng river basin covers almost the entire West Kameng and East Kameng districts and also a part of Lower Subansiri district. A number of tributaries like Bichom, Tenga, Pachi, Papu and Pachuk contribute to River Kameng before it joins River Brahmaputra about 10 kms upstream of Tezpur. The river acquires the name Jia-Bhareli in the last 50 km before it joins River Brahmaputra. The catchment is covered by thick forest which gives the advantage of maximum runoff of the rain water into the river and also ensures minimum inflow of silt. The Kameng river system passes through a thick forest cover having rich bio-diversity. The area has a number of species of flora and fauna and abundant aquatic life in the river

9.1.2. The Kameng in its upper reaches generally flows in north-south direction. Taking large turns in its course, Kameng River flows in narrow valleys upto Seppa town, the headquarters of East Kameng District after which it widens out. In the reach upto Seppa town, the river is joined by a number of tributaries viz Para, Pachi, Pache, Pachuk etc. About 18 km downstream of Seppa town, the river is joined by one of its major tributaries, the Bichom.

9.2. Hydroelectric Project in Kameng Sub-Basin

9.2.1. List of exploitable Hydroelectric Projects in Kameng sub-basin is given at Table 9-1 below

Table 9-1 List of HEPs in Kameng sub-basin

S.No.	Name of Project	I.C. (MW)	Expected time frame
1.	Kameng HEP	600	Existing
Sub-Total (existing)		600	
2.	Chanda	115	Beyond 2035
3.	Badao	94	Beyond 2035
4.	Marjingla	38	Beyond 2035
5.	Marjingla Lower	44	Beyond 2035
6.	Talong Londa	225	Beyond 2035
7.	Para	144	Beyond 2035
8.	Phanchung	36	Beyond 2035
9.	Pakke Bung-I	48	Beyond 2035
10.	Pachuk- II	54	Beyond 2035
11.	Pachuk- II Lower	62	Beyond 2035
12.	Pachuk-I	95	Beyond 2035
13.	Utung	76	Beyond 2035
14.	Dibbin	120	Beyond 2035
15.	Nafra	120	Beyond 2035
16.	Kimi	535	Beyond 2035
17.	Saskangrong	45	Beyond 2035
18.	Meyong	32	Beyond 2035

S.No.	Name of Project	I.C. (MW)	Expected time frame
19.	Gongri	144	Beyond 2035
20.	Khuitam	62	Beyond 2035
21.	Dinchang	252	Beyond 2035
22.	Jameri	172	Beyond 2035
23.	Papu Valley	45	Beyond 2035
24.	Papu	100	Beyond 2035
Sub-Total (beyond 2035)		2658	
Grand Total (MW)		3258	

9.3. Transmission System

9.3.1. Total hydroelectric potential in Kameng sub-basin is 3258 MW and Kameng HEP (600 MW) is the major generating station in this sub-basin.

9.3.2. Total potential of 2658 MW is expected beyond the year 2035. The planned Dedicated Transmission system and Common transmission system for the project expected beyond the year 2035 are mentioned in the sub-sequent paragraphs.

9.4. Common and Dedicated Transmission System by 2035

9.4.1. There is one HEP (Kameng, 600 MW) existing in the sub-basin for which transmission system already in place. Further, no HEP is expected by the year 2035 hence no transmission system has been envisaged by the year 2035.

9.5. Common Transmission System beyond 2035

9.5.1. For evacuation of 2658 MW of power beyond 2035 timeframe, following common transmission system would be required:

- (i) Establishment of Pakke 220/132 kV GIS pooling station with 4x200 MVA ICTs
- (ii) Establishment of Talong 400/220/132 kV GIS pooling station with 3x500 MVA + 4x200 MVA ICTs and 2x80 MVar Bus reactors
- (iii) Establishment of Gongri 400/220/132 kV GIS pooling station with 5x500 MVA + 5x160 MVA ICTs and 2x80 MVar Bus reactors
- (iv) Establishment of Rowta 400/220 kV GIS S/s with 2x500 MVA ICTs and 2x80 MVar Bus reactors
- (v) Rowta – Rowta (AEGCL) 220 kV D/c line
- (vi) Establishment of 6000 MW HVDC station at Rowta with HVDC Bi-pole line terminating outside NER (*to be used for evacuation of surplus power from Tawang & Kameng Sub-basin*)
- (vii) Pakke PS – Talong PS 220 kV D/c (Twin) line
- (viii) Talong PS – Rowta 400 kV D/c (Twin) line
- (ix) Gongri PS – Rowta 400 kV D/c (Quad) line

(x) Rowta – Bornagar 400 kV D/c (Quad) line

9.6. Dedicated Transmission System beyond 2035

9.6.1. Dedicated transmission lines from the switchyard of the HEPs expected after 2035 to the pooling stations is given at table below:

Table 9-2 Transmission evacuation system in Kameng sub-basin beyond 2035

S.No.	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVar)
1.	Chanda	115	132 kV	Pakke PS	Chanda - Pakke PS 132 kV D/c Line (Ampacity: 620 A or more per ckt)	
2.	Badao	94	132 kV	Pakke PS	Badao - Pakke PS 132 kV D/c Line (Ampacity: 510 A or more per ckt)	
3.	Marjingla	38	132 kV	Pakke PS	LILO of one ckt of Marijingla Lower – Pakke PS 132 kV D/c Line at Marjingla Switchyard (Ampacity: 440 A or more per ckt)	
4.	Marijingla Lower	44	132 kV	Pakke PS	Marijingla Lower – Pakke PS 132 kV D/c Line (Ampacity: 440 A or more per ckt)	
5.	Talong Londa (Talong)	225	220 kV	Talong PS	Talong Londa – Talong PS 220 kV D/c line (Ampacity: 725 A or more per ckt)	Space for 1x50 MVar along with associated bay
6.	Para	144	132 kV	Pakke PS	Para – Pakke PS 132 kV D/c Line (Ampacity: 770 A or more per ckt)	
7.	Phanchung	36	132 kV	Talong PS	Phanchung – Talong PS 132 kV D/c Line (Ampacity: 200 A or more per ckt)	
8.	Pakke Bung I	48	132 kV	Pakke PS	Pakke Bung I – Pakke PS 132 kV D/c Line (Ampacity: 260 A or more per ckt)	
9.	Pachuk II (Satuk)	54	132 kV	Talong PS	LILO of Pachuk II lower – Talong PS 132 kV S/c Line at Pachuk II switchyard (Ampacity: 1130 A or more per ckt)	
10.	Pachuk II Lower (Kapak Leyak)	62	132 kV	Talong PS	LILO of one ckt of Pachuk I – Talong PS 132 kV D/c Line at Pachuk II lower	

S.No.	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVar)
					switchyard (Ampacity: 1130 A or more per ckt)	
11.	Pachuk I	95	132 kV	Talong PS	Pachuk I – Talong PS 132 kV D/c Line (Ampacity: 1130 A or more per ckt)	
12.	Utung	76	132 kV	Gongri PS	Utung – Gongri PS 132 kV D/c Line (Ampacity: 410 A or more per ckt)	
13.	Dibbin	120	132 kV	Gongri PS	Dibbin – Gongri PS 132 kV D/c Line (Ampacity: 650 A or more per ckt)	
14.	Nafra	120	132 kV	Gongri PS	Nafra – Gongri PS 132 kV D/c Line (Ampacity: 650 A or more per ckt)	
15.	Kimi	535	220 kV	Gongri PS	Kimi – Gongri PS 220 kV D/c Line (Ampacity: 1720 A or more per ckt)	Space for 1x50 MVar along with associated bay
16.	Saskangrong	45	132 kV	Gongri PS	LILO of one circuit of Meyong – Gongri PS 132 kV D/c Line at Saskangrong switchyard (Ampacity: 420 A or more per ckt)	
17.	Meyong	32	132 kV	Gongri PS	Meyong – Gongri PS 132 kV D/c Line (Ampacity: 420 A or more per ckt)	
18.	Gongri	144	132 kV	Gongri PS	Gongri – Gongri PS 132 kV D/c Line (Ampacity: 770 A or more per ckt)	
19.	Khuitam	62	132 kV	Gongri PS	Khuitam – Gongri PS 132 kV D/c Line (Ampacity: 340 A or more per ckt)	
20.	Dinchang (BUT & Maithing)	252	220 kV	Gongri PS	Dinchang – Gongri PS 220 kV D/c Line (Ampacity: 810 A or more per ckt)	Space for 1x50 MVar along with associated bay
21.	Jameri (Tenga)	172	220 kV	Gongri PS	Jameri – Gongri PS 220 kV D/c Line (Ampacity: 560 A or more per ckt)	Space for 1x50 MVar along with associated bay
22.	Papu Valley	45	132 kV	Talong PS	LILO of one circuit of Papu – Talong PS 132kV D/c Line at Papu Valley	

S.No.	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVar)
					Switchyard (Ampacity: 780 A or more per ckt)	
23.	Papu	100	132 kV	Talong PS	Papu – Talong PS 132kV D/c Line (Ampacity: 780 A or more per ckt)	
Total		2711				

9.6.2. The Map indicating the hydroelectric projects and transmission system in Kameng sub-basin is given at Figure 9-1 below.

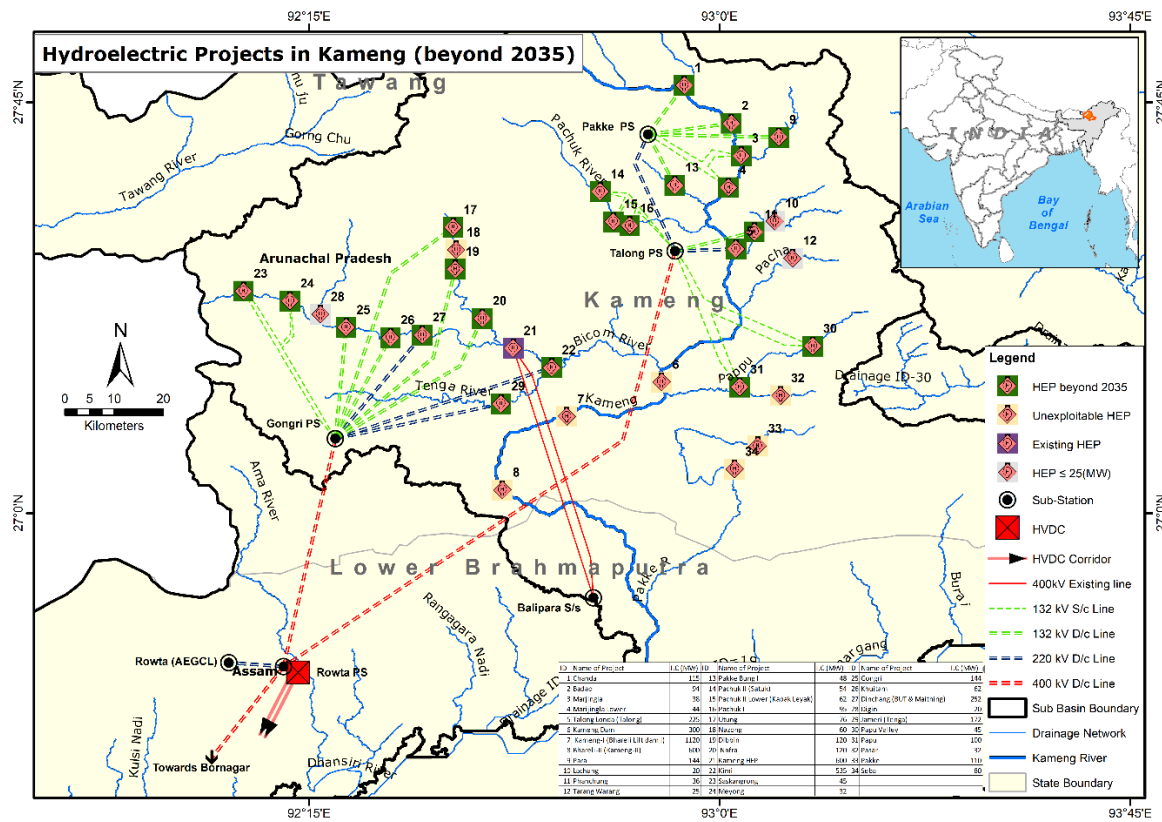


Figure 9-1 Transmission System of Kameng Sub-basin beyond 2035

9.6.3. The Block Map of Kameng Sub-basin indicating hydroelectric project and transmission system is given at Annexure-II.

9.7. Summary of pooled capacity

9.7.1. The time frame vis-à-vis pooling station wise capacity in this sub-basin is given at Table 9-3 below.

Table 9-3 Timeframe vis-a-vis pooling station wise capacity

S. No.	Time frame	Capacity to be pooled	Pooling Station	Transformation Capacity
1.		2658 MW	Pakke PS 220/132 kV	4x200 MVA

2.	Beyond 2035		Talong 400/220/132 kV	3x500 MVA + 4x200 MVA
3.			Gongri 400/220/132 kV	5x500 MVA + 5x160 MVA
4.			Rowta 400/220 kV	2x500 MVA
5.			Rowta HVDC ± 800 kV	6000 MW

10. Tawang Sub-basin

10.1. General

- 10.1.1. The boundary of Tawang River Basin (TRB) more or less matches with the Tawang district administrative boundary in Arunachal Pradesh. Tawang, one of the 16 districts of the state is located in the extreme western corner of Arunachal Pradesh. It lies between 27°25' N and 27°45' N latitude and 91°42' E and 92°39' E longitude covering an area of 2,172 sq km. Some portions of the basin boundary lie in Bhutan in the west and south and in China in the north.
- 10.1.2. The entire Tawang district is hilly and mountainous. Two third area of the district falls in the higher Himalayan zone and is covered by hard rock terrain. The annual rainfall in the district during the year 2012 was 1782 mm most of which was received during April-May to September. The district has fascinating landscape with picturesque snow-covered peaks of Himalayan ranges up to 6,500 m asl. Because of its beautiful landscape, Tawang is popularly known as 'The Hidden Paradise' or 'The Land of dawn-lit Mountains'. The Gudpi and Chong-chugmi mountain ranges, the Tawangchu River and the Tawang valley are indeed mesmerizing.

10.2. Hydroelectric Project in Tawang Sub-Basin

- 10.2.1. List of Hydroelectric Project in Tawang River is given at Table 10-1 below.

Table 10-1 List of HEPs in Tawang sub-basin

S.No.	Name of Project	I.C. (MW)	Expected time frame
1.	Tawang st-I	600	Beyond 2035
2.	Tawang st-II	640	Beyond 2035
3.	New Melling	48	Beyond 2035
4.	Magochu	48	Beyond 2035
5.	Rho	145	Beyond 2035
6.	Tsa Chu-I Lower	145	Beyond 2035
7.	Tsa Chu-II	148	Beyond 2035
8.	Nyukcharong Chu	160	Beyond 2035
Sub-Total (beyond 2035)		1934	
Grand Total (MW)		1934	

10.3. Transmission System

- 10.3.1. The hydroelectric potential of Tawang sub-basin is 1934 MW and Tawang st-II (640 MW) and Tawang st-I (600 MW) are the major exploitable generating projects in this sub-basin.
- 10.3.2. The planned Dedicated Transmission system and Common transmission system for the projects are mentioned in the sub-subsequent paragraphs.

10.4. Common and Dedicated Transmission System by 2035

10.4.1. As there is no HEP expected by the year 2035, no transmission system has been envisaged by the year 2035.

10.5. Common Transmission System beyond 2035

10.5.1. For evacuation of 826 MW of power, following common transmission system would be required beyond 2035 timeframe:

- (i) Establishment of Tawang 400/220 kV Pooling station with 3x500 MVA ICTs
- (ii) Establishment of Gongri PS 400 kV GIS switching station
- (iii) Tawang PS – Gongri PS 400 kV D/c (Quad) line
- (iv) Gongri PS – Bornagar 400 kV D/c (Quad) line
- (v) LILO of both ckt of Gongri – Bornagar 400kV (Quad) line at Rowta PS

Note: Establishment of 6000 MW HVDC station at Rowta considered in Kameng sub-basin, shall be used for evacuation of surplus power from Tawang and Kameng Sub-basin

10.6. Dedicated Transmission System beyond 2035

10.6.1. Dedicated lines from the switchyard of the HEPs to the pooling stations is given at table below:

Table 10-2 Transmission evacuation system in Tawang sub-basin beyond 2035

S.N o.	Name of HEP	IC (MW)	Switchy ard Evacuati on Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVar)
1.	Tawang St-I	600	400 kV	Tawang PS	Tawang St-I – Tawang PS 400 kV D/c (Twin Moose) Line (Ampacity: 1060 A or more per ckt)	1x80 MVar along with associated bay and Space for 1x80 MVar along with associated bay
2.	Tawang St-II	640	400 kV	Tawang PS	Tawang St-II - Tawang PS 400 kV D/c (Twin Moose) Line (Ampacity: 1130 A or more per ckt)	1x80 MVar along with associated bay and Space for 1x80 MVar along with associated bay
3.	New Melling	48	220 kV	Tawang PS	LILO of one circuit of Rho - Tawang PS 220 kV D/c Line at New Melling switchyard (Ampacity: 780 A or more per ckt)	Space for 1x50 MVar along with associated bay
4.	Magochu	48	220 kV	Tawang PS	LILO of second circuit of Rho - Tawang PS 220 kV D/c Line at	Space for 1x50 MVar along with associated bay

S.No.	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVar)
					Magochu switchyard (Ampacity: 780 A or more per ckt)	
5.	Rho	145	220 kV	Tawang PS	Rho - Tawang PS 220 kV D/c Line (Ampacity: 780 A or more per ckt)	Space for 1x50 MVar along with associated bay
6.	Tsa Chu - I Lower	145	220 kV	Tawang PS	LILo of one circuit of Tsa Chu - II – Tawang PS 220 kV D/c Line at Tsa Chu - I Lower Switchyard (Ampacity: 940 A or more per ckt)	Space for 1x50 MVar along with associated bay
7.	Tsa Chu - II	148	220 kV	Tawang PS	Tsa Chu - II – Tawang PS 220 kV D/c Line (Ampacity: 940 A or more per ckt)	Space for 1x50 MVar along with associated bay
8.	Nyukcharong Chu	160	220 kV	Tawang PS	Nyukcharong Chu - Tawang PS 220 kV D/c Line (Ampacity: 520 A or more per ckt)	Space for 1x50 MVar along with associated bay
Total		1934				

10.6.2. The Map indicating the hydroelectric projects and transmission system is given at Figure 10-1 below.

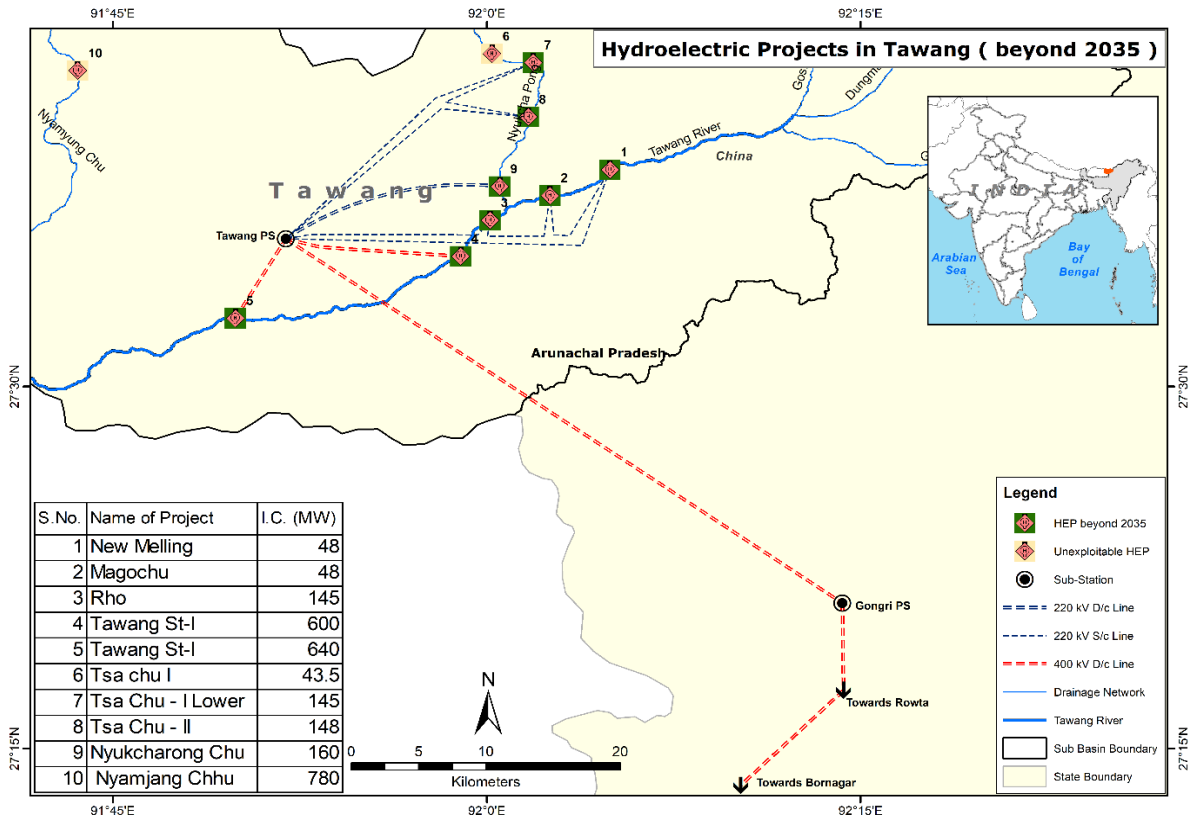


Figure 10-1 Transmission System of Tawang Sub-basin beyond 2035

10.6.3. The Block Map of Tawang Sub-basin indicating hydroelectric project and transmission system is given at Annexure-II.

10.7. Summary of pooled capacity

10.7.1. The time frame vis-à-vis pooling station wise capacity in this sub-basin is given at Table 10-3 below.

Table 10-3 Timeframe vis-a-vis pooling station wise capacity

S. No.	Time frame	Capacity to be pooled	Pooling Station	Transformation Capacity
1.	Beyond 2035	1934 MW	Tawang 400/220 kV	3x500 MVA

11. Upper Brahmaputra Sub-basin

11.1. General

11.1.1. The Brahmaputra River as it flows downstream of the confluence of Dibang and Lohit, almost entirely flows in the plains of Assam. The portion of Brahmaputra between the confluence of Dibang and Lohit upto confluence of Kameng River together with the tributaries joining in this reach has been considered as a separate basin, called the Upper Brahmaputra. In the river stretch of 260 kms. of Upper Brahmaputra, a larger number of rivers and stretches join the main river at different elevation. Most of these rivers originate in lesser Himalayan range and flow down into the plains of Assam after traversing some of initial river course in the hills and losing most of their elevation.

11.2. Hydroelectric Project in Upper Brahmaputra Sub-Basin

11.2.1. List of exploitable Hydroelectric Projects in Upper Brahmaputra Sub-Basin is given at Table 11-1 below

Table 11-1 List of HEPs in Upper Brahmaputra sub-basin

S.No.	Name of Project	I.C. (MW)	Expected time frame
1.	Doyang (Doyang V)	75	Existing
Sub-Total (upto 2035)		75	
2.	Tipang	26	Beyond 2035
3.	Dilli (Dilli Dam P/H)	28	Beyond 2035
4.	Yangnyu	36	Beyond 2035
5.	Dikhu (Dikhu Dam P/H)	186	Beyond 2035
6.	Jhanzi Storage	28	Beyond 2035
Sub-Total (beyond 2035)		304	
Grand Total (MW)		379	

11.3. Transmission System

11.3.1. The hydroelectric potential of Upper Brahmaputra sub-basin is 379 MW and Dikhu (Dikhu Dam P/H) (186 MW) is the major generating station in this sub-basin.

11.3.2. There is one existing generating station (Doyang V, 75 MW), which is already connected with Nagaland intra-state transmission system. The total potential expected beyond the year 2035 is 304 MW. The planned Dedicated Transmission system and Common transmission system for the project expected beyond the year 2035 are mentioned in the sub-subsequent paragraphs.

11.4. Common and Dedicated Transmission System by 2035

11.4.1. As there is no HEP expected by the year 2035, no transmission system has been envisaged by the year 2035.

11.5. Common Transmission System beyond 2035

11.5.1. For evacuation of 304 MW beyond 2035 timeframe, no additional transmission system would be required. The power can be evacuated through existing intra-state and inter-state transmission system.

11.6. Dedicated Transmission System beyond 2035

11.6.1. Dedicated transmission lines from the switchyard of the HEPs to the pooling stations is given at table below:

Table 11-2 Transmission evacuation system in Upper Brahmaputra sub-basin beyond 2035

S.No	Name of HEP	I.C. (MW)	Switchyard Evacuation Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVAR)
1.	Tipang	26	132 kV	To be connected to intra state system (DoP, AP)	Through 132 kV D/c Line (Ampacity: 140 A or more per ckt)	-
2.	Dilli (Dilli Dam P.H.)	28	132 kV	To be connected to intra state system (AEGCL)	Through 132 kV D/c Line (Ampacity: 150 A or more per ckt)	-
3.	Yangnyu	36	132 kV	To be connected to intra state system (DoP, Nagaland)	Through 132 kV D/c Line (Ampacity: 200 A or more per ckt)	-
4.	Jhanzi Storage	28	132 kV	To be connected to intra state system (DoP, Nagaland)	Through 132 kV D/c Line (Ampacity: 150 A or more per ckt)	-
5.	Dikhu Dam P/H	186	220kV	Mokokchung (POWERGRID)	Dikhu – Mokokchung 220kV D/c line (Ampacity: 600 A or more per ckt)	1x50 MVAR along with associated bay
Total		304				

11.6.2. The Map indicating the hydroelectric projects and transmission system is given at Figure 11-1 below.

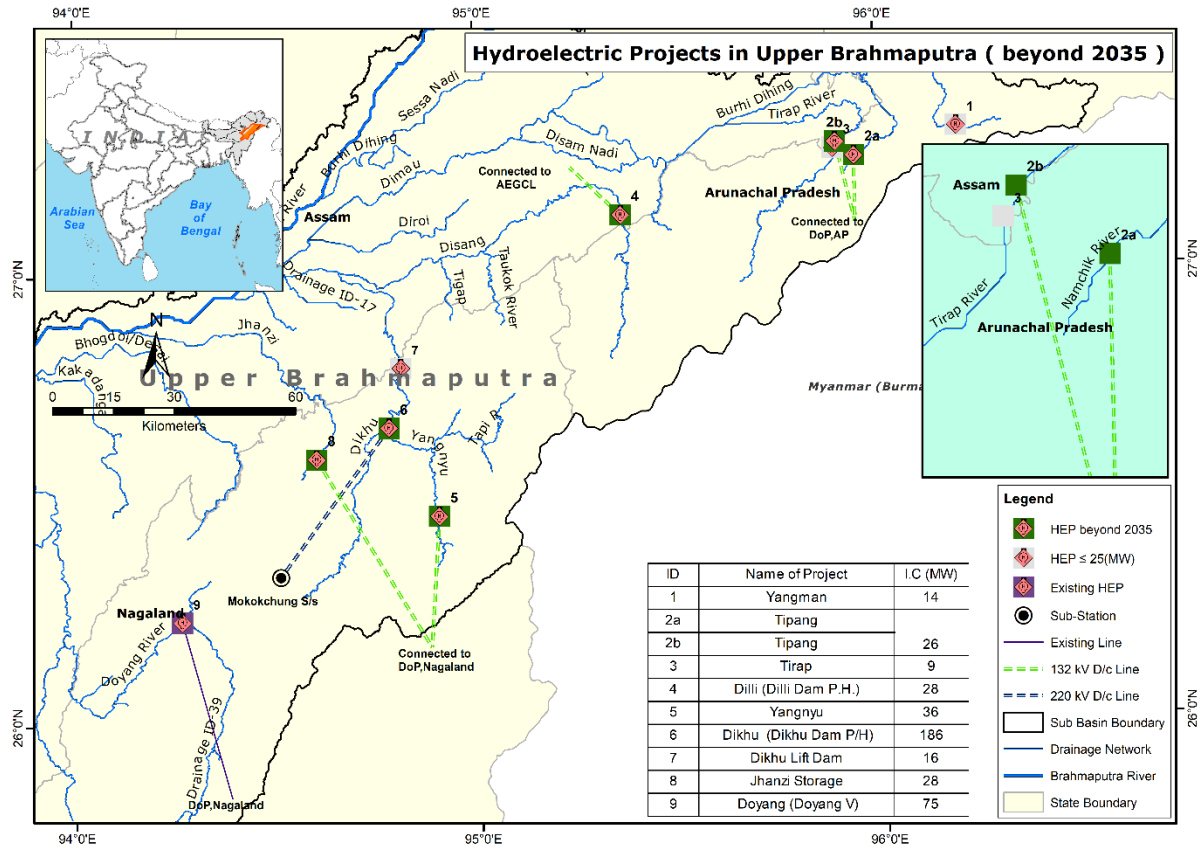


Figure 11-1 Transmission System of Upper Brahmaputra Sub-basin beyond 2035

11.6.3. The Block Map of Upper Brahmaputra Sub-basin indicating hydroelectric project and transmission system is given at Annexure-II.

11.7. Summary of pooled capacity

11.7.1. The time frame vis-à-vis pooling station wise capacity in this sub-basin is given Table 11-3 below.

Table 11-3 Timeframe vis-a-vis pooling station wise capacity

S. No.	Time frame	Capacity to be pooled	Pooling Stations	Transformation Capacity
1.	Beyond 2035	304 MW	Intra-state system of Nagaland, Assam and Existing Mokokchung (PG) 220/132 kV S/s	-

12. Lower Brahmaputra Sub-basin

12.1. General

12.1.1. The lower Brahmaputra River system, is the portion of the Brahmaputra River downstream of confluence of Kameng river and upto its entry into Bangladesh near Dhubri, including the rivers/streams of this basin joining the main river within this reach. The hydro potential in lower Brahmaputra river system comprises of the main Brahmaputra and of the rivers such as the Dhansiri (North), Kulsi, Dhudhnai and Krishnai, Jinari, Manas, Champamati, Gaurang, Tipkai, Sankosh, Raidak and Jaldhaka, Tipkai and Champamati are northern rivers and origins of all these rivers lie in Bhutan whereas the Kulsi, Dhudhnai-Krishna etc. are southern rivers and originate from the Northern slopes of Garo and Khasi hills of Assam. In addition to the above, rivers such as Torsa are other northern rivers of Brahmaputra which originate in Bhutan and finally drain into Raidak in Bangladesh. The entire lower Brahmaputra river system drains about 60,000 sq.kms. of area of which about 20,000 sq. kms. is contributed by the main Brahmaputra. The Manas and Sankosh river which originate in Bhutan drain large catchments viz 35,000 sq. kms. and 11,150 sq. kms. respectively although the catchment areas intercepted by these rivers in the Indian territory is only of the order of 12,000 sq. kms. and 4,600 sq. kms respectively.

12.2. Hydroelectric Project in Lower Brahmaputra Sub-Basin

12.2.1. There is only one existing hydroelectric plant in Lower Brahmaputra Sub-basin i.e. Jaldhaka-I (36 MW) in the state of West Bengal and given at Table 12-1 below.

Table 12-1 List of HEPs in Lower Brahmaputra sub-basin

S.No.	Name of Project	I.C. (MW)	Expected time frame
1.	Jaldhaka I	36	Existing
Total (MW)		36	

12.3. Transmission System

12.3.1. The Jaldhaka-I (36 MW) hydroelectric project is situated in Lower Brahmaputra sub-basin and already connected at Chalsa 66 kV sub-station (West Bengal) through Jaldhaka I – Chalsa 66 kV D/c line.

12.3.2. As there is no more potential identified, additional transmission system has not been envisaged.

12.3.3. The Map indicating the hydroelectric project is given at Figure 12-1 below.

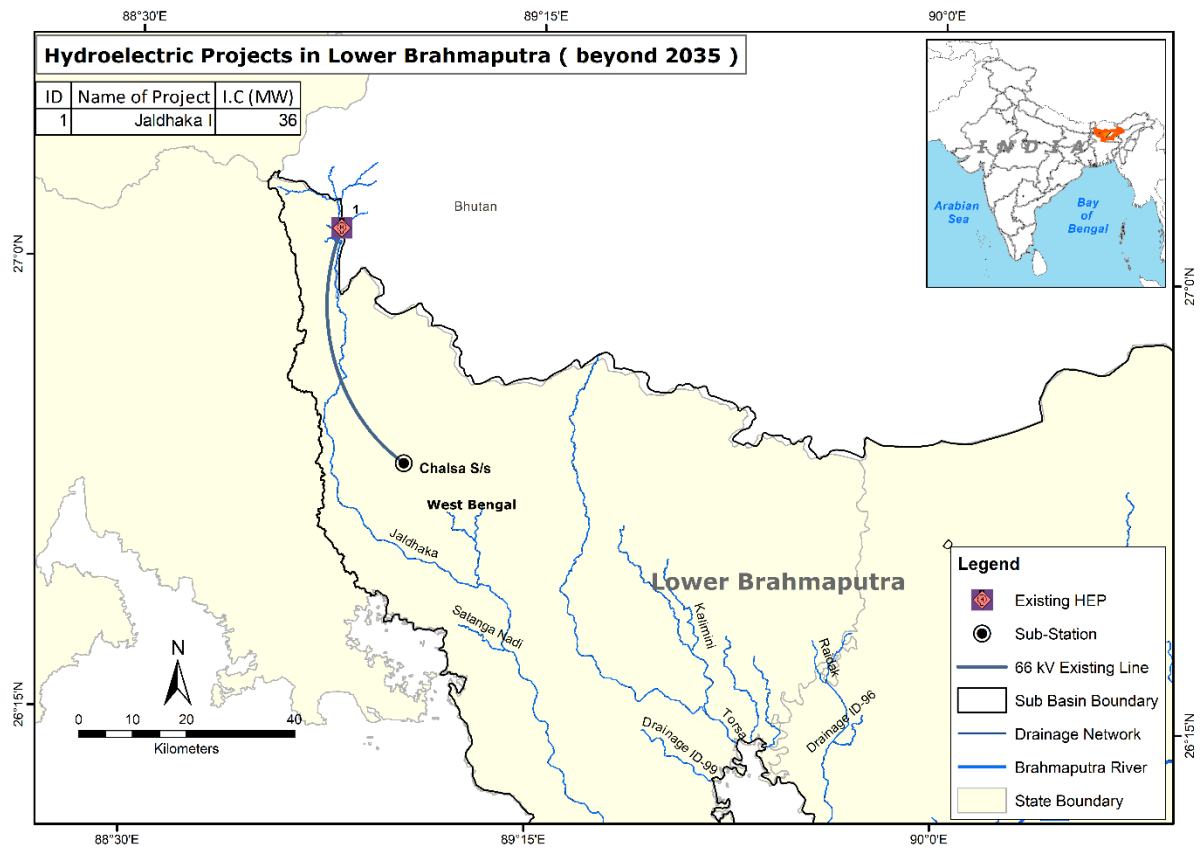


Figure 12-1 Transmission System of Lower Brahmaputra Sub-basin

13. Kalang (Kopili) Sub-basin

13.1. General

- 13.1.1. The Kalang is one of the northern rivers of the Brahmaputra but rises at a lower elevation. The river is about 215 km. long. The River flows are mainly on account of the rainfall in the catchment. The Kalang river has a major Tributary called the Kopili with a catchment area of about 15,900 sq.km. and meets the main Kalang river at an elevation of +52 m near Hathiarmukh. Out of total 18,988 sq.kms. of catchment area of Kalang (kopili) river system about 84% of catchment is drained by the Kopili River.
- 13.1.2. The Kopili River flows through the hilly terrain of the Khasi and Jaintia hills up to Panimur Township after which it enters into the plains. The various rivers of this basin have origins at elevations varying from 1372 m. to about 1860 m. and the rivers are perennial in nature. The entire river system receives heavy precipitation of water with most of it flowing in the monsoon period. From the pattern of rainfall it is evident that there is a large variations between the lean period flows to the flows during monsoon period. The Kopili - Kalang system has numerous possibilities of both the storage and run-of-river-type schemes.

13.2. Hydroelectric Project in Kalang (Kopili) Sub-Basin

- 13.2.1. List of exploitable Hydroelectric Projects in Kalang (Kopili) Sub-Basin is given at Table 13-1 below

Table 13-1 List of HEPs in Kalang (Kopili) sub-basin

S.No.	Name of Project	IC (MW)	Expected time frame
1.	Khandong	50	Existing
2.	Kopili	200	Existing
3.	Karbi Langpi (Lower Borpani)	100	Existing
4.	Umam Stage -I	36	Existing
5.	Kyrdamkulai (Umium Umtru III)	60	Existing
6.	Umiam (Umtru) St IV	60	Existing
7.	New Umtru	40	Existing
Sub-total (Existing)		546	
8.	Lower Kopili	120	2026 (Under Implementation)
9.	Karbi Langpi (Upper Borpani) (Middle Stage)	46.5	2035
10.	Kopili (Umrangso) PSP	320	2030-31
11.	Ouguri PSP	900	2028-29
12.	Tharakunji PSP	900	2028-29
13.	Karbi Langpi (Anglong) PSP	800	2028-29
Sub-Total (upto 2035)		3086.5	

S.No.	Name of Project	IC (MW)	Expected time frame
14.	Diyung Dam P/H	45	Beyond 2035
15.	Amring	70	Beyond 2035
16.	Umlamphang	28	Beyond 2035
17.	Umium-Ummtru VI	39	Beyond 2035
Sub-Total (beyond 2035)		182	
Grand Total (MW)		3814.5	

13.3. Pumped Storage Project in Kalang (Kopili) Sub-Basin

13.3.1. Kopili 320 MW PSP, in the State of Assam, has been allocated to NEEPCO. The Power of this PSP would be pooled at Umrangso 220 kV (AEGCL) Sub-station.

13.4. Transmission System

13.4.1. The hydroelectric potential of Kalang (Kopili) sub-basin is 3814.5 MW including 546 MW existing HEPs. Ouguri PSP (900 MW), Tharakunji PSP (900 MW) and Karbi Langpi PSP (800 MW) are the major generating station envisaged in this sub-basin.

13.4.2. The total additional potential expected by 2035 is 3086.5 MW and beyond the year 2035 it is 182 MW. Dedicated Transmission system and Common transmission system required for the projects are mentioned in the subsequent paragraphs.

13.5. Common Transmission System by 2035

13.5.1. Out of 3086.5 MW projects envisaged by 2035, transmission system for 320 MW is already planned to be evacuated through Misa (Existing) S/s and balance power is planned to be evacuated through Intra-State transmission network.

13.6. Dedicated Transmission system by 2035

13.6.1. Dedicated lines from the switchyard of the HEPs expected by 2035 to the pooling stations is given at Table 13-2 below:

Table 13-2 Transmission evacuation system in Kalang (Kopili) sub-basin by 2035

S.No.	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVar)
1.	Karbi Langpi (Upper Borpani) (Middle Stage)	46.5	132 kV	To be connected to intra state system (AEGCL)	Karbi Langpi Middle I - Karabi Langpi HEP (Existing) 33 kV D/c line on 132 kV Tower (20 ckm) Karbi Langpi Middle II - Karabi Langpi HEP (Existing) 33 kV D/c line on 132 kV Tower (24 ckm) (Ampacity: 250 A or more per ckt)	-

S.No.	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVar)
2.	Lower Kopili	120	220 kV	To be connected to intra state system (AEGCL)	Lower Kopili – Shankardevnagar 220kV D/c line	-
3.	Kopili (Umrangso) PSP	320	220 kV	Umrangso (AEGCL)	Kopli PSP (300 MW) – Umrangso 220 kV D/c line with AAAC Twin Zebra (60 ckm)	-
4.	Ouguri PSP	900	400 kV	Maikoram (AEGCL)	Ouguri PSP - Maikoram 400 kV D/c line (Ampacity: 1600 A or more per ckt)	1x80 MVar Bus Reactor along with associated bay
5.	Tharakunji PSP	900	400 kV	Maikoram (AEGCL)	Tharakunji PSP – Maikoram 400 kV D/c line Ampacity: 1600 A or more per ckt) (84 ckm)	1x80 MVar Bus Reactor along with associated bay
6.	Karbi Langpi (Anglong) PSP	800	400 kV	Maikoram (AEGCL)	Karbi Anglong PSP - Makoiram 400 kV D/c line Ampacity: 1420 A or more per ckt) (60 ckm)	1x80 MVar Bus Reactor along with associated bay
Total		3086.5				

13.6.2. The Map indicating the hydroelectric project expected by the year 2035 in the Kalang (Kopili) sub-basin along with their transmission system is given at Figure 13-1 below.

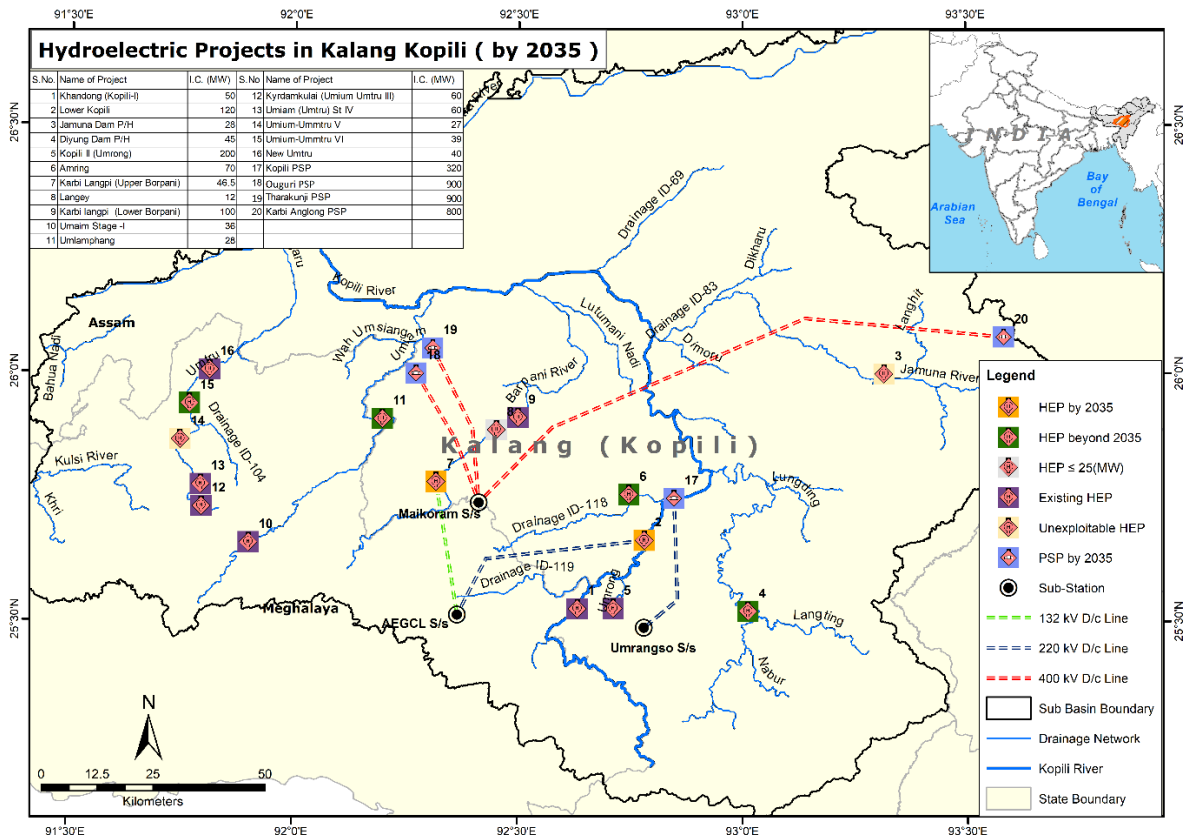


Figure 13-1 Transmission System of Kalang (Kopili) Sub-basin by 2035

13.7. Common and Dedicated Transmission System beyond 2035

13.7.1. For evacuation of 182 MW beyond 2035 timeframe, no additional transmission system would be required.

13.7.2. However, following dedicated transmission lines from the switchyard of the HEPs to the pooling stations would be required:

Table 13-3 Transmission evacuation system in Kalang (Kopili) sub-basin beyond 2035

S. No.	Name of HEP	I.C. (MW)	Switchyard Evacuation Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVA)
1.	Diyung Dam P/H	45	132kV	To be connected to intra state system (AEGCL)	Through 132 kV D/c Line (Ampacity: 240 A or more per ckt)	
2.	Amring	70	132kV	To be connected to intra state system (AEGCL)	Through 132 kV D/c Line (Ampacity: 380 A or more per ckt)	
3.	Umlang hang	28	132kV	To be connected to intra state system (MePTCL)	Through 132 kV D/c Line (Ampacity: 150 A or more per ckt)	
4.	Ummtru VI	39	132kV	To be connected to intra state system (MePTCL)	Through 132 kV D/c Line (Ampacity: 210 A or more per ckt)	
Total		182				

13.7.3. The Map indicating the hydroelectric projects and transmission system is given in Figure 13-2 below.

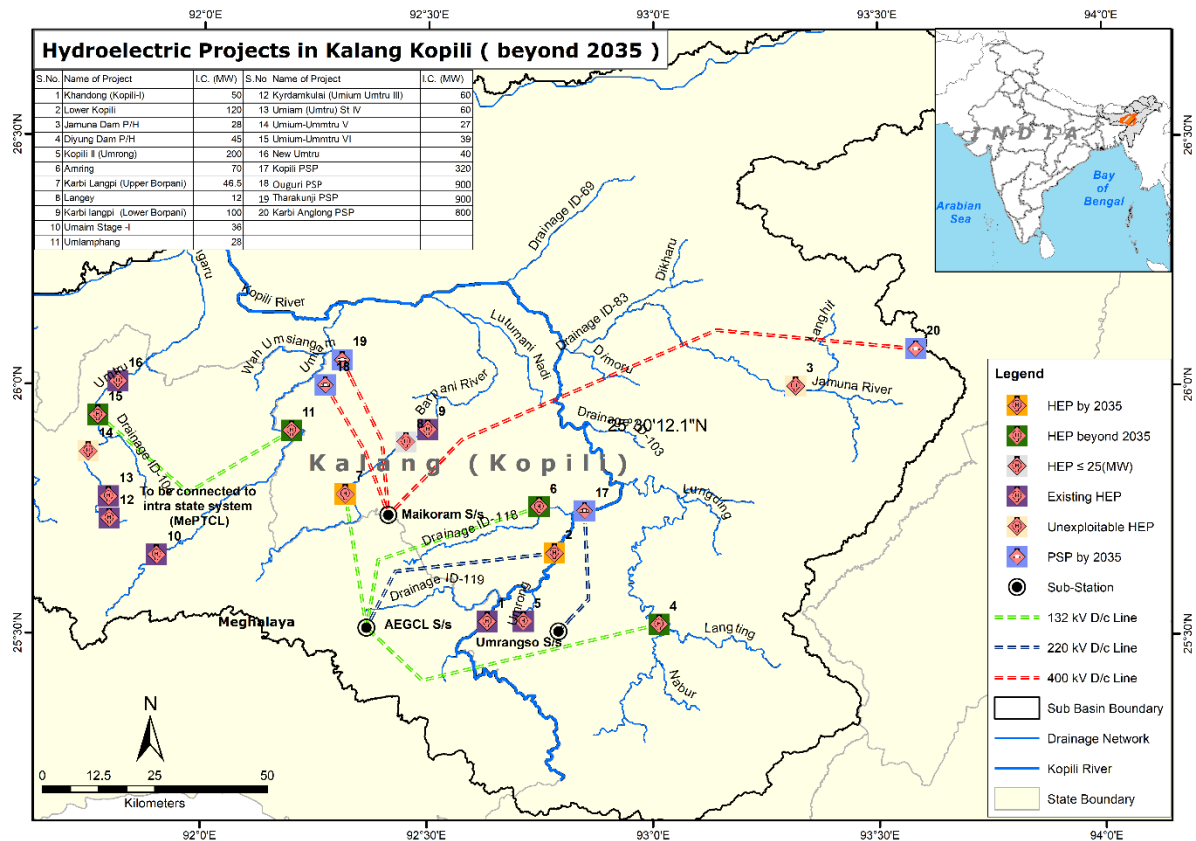


Figure 13-2 Transmission System of Kalang (Kopili) Sub-basin beyond 2035

13.7.4. The Block Map of Kalang (Kopili) Sub-basin indicating hydroelectric project and transmission system is given at Annexure-II.

13.8. Summary of pooled capacity

13.8.1. The time frame vis-à-vis pooling station wise capacity in this sub-basin is given at Table 13-4 below.

Table 13-4 Timeframe vis-a-vis pooling station wise capacity

S. No.	Time frame	Capacity to be pooled	Pooling Station	Transformation Capacity
1.	Upto 2035	3086.5 MW	Existing Misa (PG) 400/220 kV	-
2.			Intra-state system of Assam	-
3.	Beyond 2035	182 MW	Intra-state system of Assam and Meghalaya	-

14. Teesta Sub-basin

14.1. General

14.1.1. Teesta basin in West Bengal forms its boundary with Sikkim state in North through Ramam Khola, Rangit and Teesta rivers. It shares its border with Nepal and Mahananda river basin in West, Jaldhaka river basin in East and Bangladesh in south. The basin's relief varies nearly from 40 m to 3600 m. Teesta sub-basin in West Bengal covers an area of 3225 sq. Km. which comprises of hilly terrain of Darjeeling district (approximately 1121 sq. km) and plains of Jalpaiguri district (2104 sq. km). The hilly terrain especially in Sikkim and Darjeeling is highly prone to the landslides, flood and earthquakes. Throughout its course in the hilly terrain of West Bengal and Sikkim, it traverses through deep gorges and narrow valleys.

14.1.2. Sikkim state constitutes upper basin of Teesta river except for a small area of 75.62 sq km in extreme south-east of Jaldhaka river, which originates in East Sikkim and flows through West Bengal parallel to Teesta river to meet Brahmaputra river. In southernmost part of Sikkim, Teesta River flows in southwest direction and defines the inter-state boundary between Sikkim and West Bengal up to Melli Bazar where it is joined by Rangit River which drains West Sikkim district.

14.2. Hydroelectric Project in Teesta Sub-Basin

14.2.1. List of explorable Hydroelectric Projects in Teesta Sub-Basin is given at Table 14-1 below

Table 14-1 List of HEPs in Teesta sub-basin

S.No.	Name of Project	IC (MW)	Expected time frame
1.	Teesta-III (Singhik)	1200	Existing
2.	Teesta- V (Samdong)	510	Existing
3.	Teesta Low Dam III	132	Existing
4.	Tessta Low dam -IV (Tista High Dam)	160	Existing
5.	Dikchu	96	Existing
6.	Rongnichu (Rongni Storage)	113	Existing
7.	Chujachen	110	Existing
8.	Rangit-III (Ligship)	60	Existing
9.	Tashiding	97	Existing
10.	Jorethang Loop	96	Existing
11.	Rangit-IV	120	Existing
12.	Rammam II	50	Existing
Sub-Total (existing)		2744	
13.	Teesta St-IV (Mangan)	520	2032-33
14.	Teesta-VI	500	2027-28
15.	Teesta Intermediate	90	2035

S.No.	Name of Project	IC (MW)	Expected time frame
16.	Rammam III	120	2028-29
Sub-Total (upto 2035)		1230	
17.	Kalep	54	Beyond 2035
18.	Talem	44	Beyond 2035
19.	Teesta-I (Zema)	320	Beyond 2035
20.	Lachen (Chunthang)	165	Beyond 2035
21.	Teesta-II	410	Beyond 2035
22.	Teesta Low Dam Project V	80	Beyond 2035
23.	Jedang	160	Beyond 2035
24.	Serum	115	Beyond 2035
25.	Lachung	75	Beyond 2035
26.	Bimkyong	66	Beyond 2035
27.	BOP	75	Beyond 2035
28.	Rukel	26	Beyond 2035
29.	Rangyong	248	Beyond 2035
30.	Panan	300	Beyond 2035
31.	Ringpi	120	Beyond 2035
32.	Lower lagyap	26	Beyond 2035
33.	Chhot pathing	55	Beyond 2035
34.	Suntaleytar	32	Beyond 2035
35.	Bhasmey	51	Beyond 2035
36.	Mana	44	Beyond 2035
37.	TLDP- I&II	56	Beyond 2035
38.	Namlum	50	Beyond 2035
39.	Lethang (Yoksam)	98	Beyond 2035
40.	Rangit-II	66	Beyond 2035
41.	Kalez Khola	34	Beyond 2035
42.	Rammam I	60	Beyond 2035
Sub-Total (beyond 2035)		2830	
Grand Total (MW)		6804	

14.3. Transmission System

14.3.1. The hydroelectric potential of Teesta sub-basin is 6804 MW including 2744 MW existing HEPs. Teesta-III (Singhik) (1200 MW) is the major generating station in this sub-basin.

14.3.2. The total additional potential expected by the year 2035 is 1230 MW and remaining 2830 MW is expected beyond the year 2035. The planned Dedicated Transmission system and Common transmission system for the projects are mentioned in the sub-sequent paragraphs.

14.4. Common Transmission System by 2035

14.4.1. For evacuation of 1230 MW by 2035 timeframe, no additional transmission system under ISTS has been envisaged by the year 2035.

14.5. Dedicated Transmission system by 2035

14.5.1. Dedicated lines from the switchyard of the HEPs to the pooling stations is given at table below:

Table 14-2 Transmission evacuation system in Teesta sub-basin by 2035

S.No .	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVA)
1.	Teesta St-IV (Mangan)	520	220 kV	Rangpo (Powergrid) (Existing)	Teesta -IV – Rangpo (POWERGRID) 220 kV D/c (Twin Moose) line	1x50 MVA along with associated bay
2.	Teesta-VI	500	220 kV	Rangpo (Powergrid) (Existing)	Teesta VI HEP – Rangpo (POWERGRID) 220kV D/c (Twin Moose) line	1x50 MVA along with associated bay
3.	Rammam -III	120	132 kV	Rangpo (Powergrid) (Existing)	Rammam-III – Rangpo 132 kV D/c line (Ampacity: 680 A or more per ckt)	-
4.	Teesta Intermediate	90	132 kV	To be connected to intra state system (WBSETCL)	Through 132 kV D/c Line (Ampacity: 480 A or more per ckt)	-
Total		1230				

14.5.2. The Map indicating the hydroelectric project expected by the year 2035 in the Teesta sub-basin along with their transmission system is given at Figure 14-1 below.

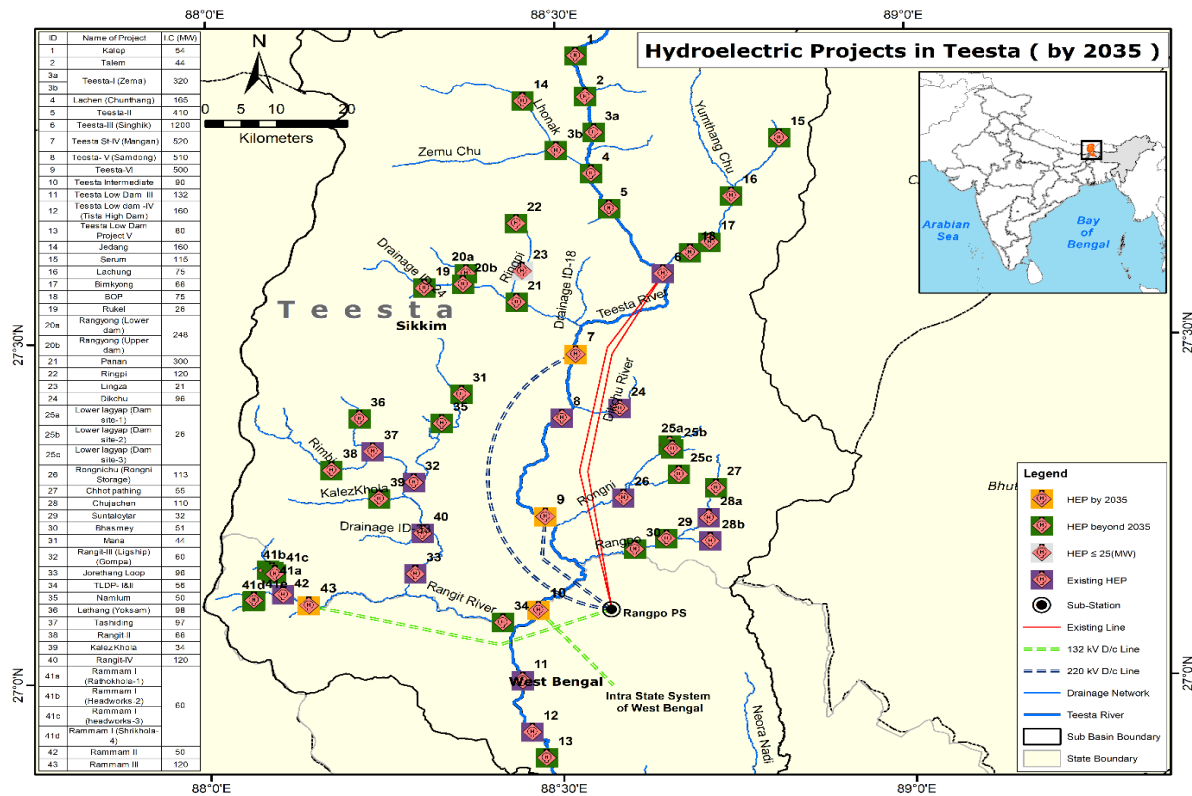


Figure 14-1 Transmission System of Teesta Sub-basin by 2035

14.6. Common Transmission System beyond 2035

14.6.1. Out of 2830 MW potential, power of 1346 MW is planned to be evacuated through Intra State transmission network of Sikkim and West Bengal. Further, for the balance 1484 MW quantum in the beyond 2035 timeframe, following transmission system would be required:

- Establishment of Yumthang 400/220 kV GIS pooling station with 4x500 MVA ICTs and 2x80 MVar Bus reactors
- Yumthang – Siliguri 400 kV D/c (Quad) line
- Siliguri – Katihar 400 kV D/c (Quad) line

14.7. Dedicated Transmission System beyond 2035

14.7.1. Dedicated transmission lines from the switchyard of the HEPs to the pooling stations is given at table below:

Table 14-3 Transmission evacuation system in Teesta sub-basin beyond 2035

S. No.	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVar)
1.	Kalep	54	220 kV	Yumthang PS	LILO of one circuit of Teesta-I (Power House)– Yumthang PS 220kV D/c line at kalep Switchyard	Space for 1x50 MVar along with associated bay

S. No.	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVar)
					(Ampacity: 1200 A or more per ckt)	
2.	Talem	44	220 kV	Yumthang PS	LILO of one circuit of Jedang – Yumthang PS 220kV D/c line at Talem switchyard (Ampacity: 1190 A or more per ckt)	Space for 1x50 MVar along with associated bay
3.	Teesta-I (Zema)	320	220 kV	Yumthang PS	Teesta-I (Power House)– Yumthang PS 220kV D/c line (Ampacity: 1200 A or more per ckt)	Space for 1x50 MVar along with associated bay
4.	Lachen (Chunthang)	165	220 kV	Yumthang PS	LILO of one circuit of Jedang – Yumthang PS 220kV D/c line at Lachen switchyard (Ampacity: 1190 A or more per ckt)	Space for 1x50 MVar along with associated bay
5.	Teesta-II	410	220 kV	Yumthang PS	Teesta-II – Yumthang PS 220kV D/c line (Ampacity: 1320 A or more per ckt)	Space for 1x50 MVar along with associated bay
6.	Jedang	160	220 kV	Yumthang PS	Jedang – Yumthang PS 220kV D/c line (Ampacity: 1190 A or more per ckt)	Space for 1x50 MVar along with associated bay
7.	Serum	115	220 kV	Yumthang PS	Serum – Yumthang PS 220kV D/c line (Ampacity: 580 A or more per ckt)	Space for 1x50 MVar along with associated bay
8.	Lachung	75	220 kV	Yumthang PS	Lachung – Yumthang PS 220kV D/c line (Ampacity: 490 A or more per ckt)	Space for 1x50 MVar along with associated bay
9.	Bimkyong	66	220 kV	Yumthang PS	LILO of one circuit of Serum – Yumthang PS 220kV D/c line at Bimkyong switchyard (Ampacity: 580 A or more per ckt)	Space for 1x50 MVar along with associated bay
10.	BOP	75	220 kV	Yumthang PS	LILO of one circuit of Lachung – Yumthang PS 220kV D/c line at BOP Switchyard (Ampacity: 490 A or more per ckt)	Space for 1x50 MVar along with associated bay
11.	Rukel	26	132 kV	To be connected to intra state	Through 132 kV D/c Line (Ampacity: 140 A or more per ckt)	-

S. No.	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVar)
				system (Govt of Sikkim)		
12.	Rangyong	248	220 kV	Yumthang PS	Rangyong – Yumthang PS 220kV D/c line (Ampacity: 800 A or more per ckt)	Space for 1x50 MVar along with associated bay
13.	Panan	300	220 kV	Yumthang PS	Panan – Yumthang PS 220kV D/c line (Ampacity: 970 A or more per ckt)	Space for 1x50 MVar along with associated bay
14.	Ringpi	120	220 kV	Yumthang PS	Ringpi – Yumthang PS 220kV D/c line (Ampacity: 390 A or more per ckt)	Space for 1x50 MVar along with associated bay
15.	Chhot pathing	55	132 kV	To be connected to intra state system (Govt of Sikkim)	Through 132 kV D/c Line common for Chhot Pathing and Suntaleytar HEPs (Ampacity: 470 A or more per ckt)	-
16.	Lower lagyap	26	132 kV	To be connected to intra state system (Govt of Sikkim)	Through 132 kV D/c Line (Ampacity: 140 A or more per ckt)	-
17.	Suntaleytar	32	132 kV	To be connected to intra state system (Govt of Sikkim)	Through 132 kV D/c Line common for Chhot Pathing and Suntaleytar HEPs (Ampacity: 470 A or more per ckt)	-
18.	Bhasmey	51	132 kV	Rangpo (POWERGRID) Existing	Bhasmay – Rangpo 132kV D/c line (Ampacity: 280 A or more per ckt)	-
19.	Mana	44	132 kV	To be connected to intra state system (Govt of Sikkim)	Through 132 kV D/c Line common for Mana and Namlum HEPs (Ampacity: 510 A or more per ckt)	-
20.	Namlum	50	132 kV	To be connected to intra state system (Govt of Sikkim)	Through 132 kV D/c Line common for Mana and Namlum HEPs (Ampacity: 510 A or more per ckt)	-
21.	Lethang (Yoksam)	98	132 kV	To be connected to intra state system (Govt of Sikkim)	Through 132 kV D/c Line (Ampacity: 530 A or more per ckt)	-
22.	Rangit-II	66	132 kV	To be connected to	Through 132 kV D/c Line common fro	-

S. No.	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVar)
				intra state system (Govt of Sikkim)	Rangit-II & Kalez Khola HEPs (Ampacity: 540 A or more per ckt)	
23.	Kalez Khola	34	132 kV	To be connected to intra state system (Govt of Sikkim)	Through 132 kV D/c Line common fro Rangit-II & Kalez Khola HEPs (Ampacity: 540 A or more per ckt)	-
24.	Teesta Low Dam Project V	80	132 kV	To be connected to intra state system (WBSETCL)	Through 132 kV D/c Line (Ampacity: 430 A or more per ckt)	-
25.	TLDP- I&II	56	132 kV	To be connected to intra state system (WBSETCL)	Through 132 kV D/c Line (Ampacity: 300 A or more per ckt)	-
26.	Rammam I	60	132 kV	To be connected to intra state system (WBSETCL)	Through 132 kV D/c Line (Ampacity: 320 A or more per ckt)	-
Total		2830				

14.7.2. The Map indicating the hydroelectric projects and transmission system is given at Figure 14-2 below.

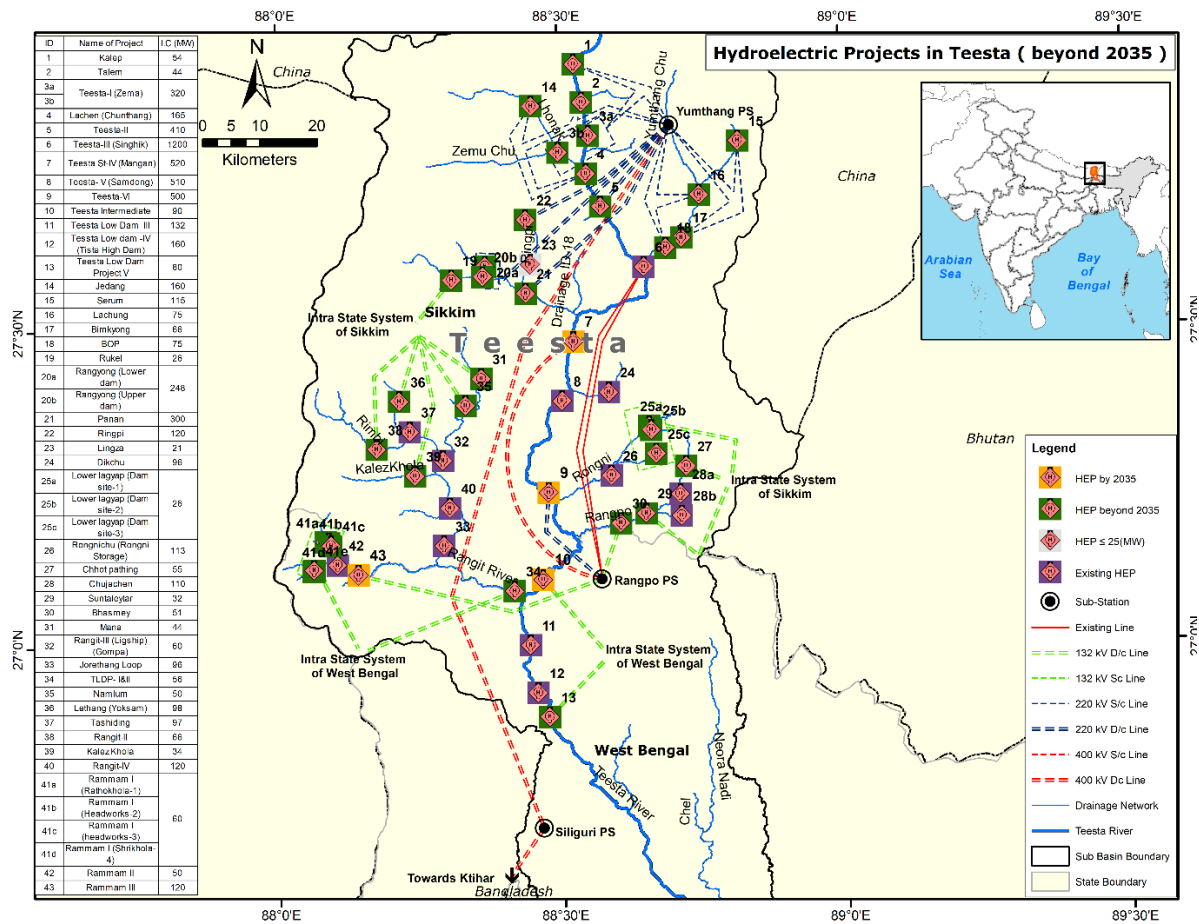


Figure 14-2 Transmission System of Teesta Sub-basin beyond 2035

14.7.3. The Block Map of Teesta Sub-basin indicating hydroelectric project and transmission system is given at Annexure-II.

14.8. Summary of pooled capacity

14.8.1. The time frame vis-à-vis pooling station wise capacity in this sub-basin is given at Table 14-4 below.

Table 14-4 Timeframe vis-a-vis pooling station wise capacity

S. No.	Time frame	Capacity to be pooled	Pooling Station	Transformation Capacity
1.	Upto 2035	1230 MW	Existing Rangpo (PG) 400/220 kV	-
2.			Intra-state system of West Bengal	-
3.	Beyond 2035	2830 MW	Yumthang 400/220 kV	4x500 MVA
4.			Intra-state system of Sikkim and West Bengal	-

15. Barak Sub-basin

15.1. General

15.1.1. The Barak and other neighbouring river constitute a large river system and intercept a total of 63,430 sq.kms. of catchment area. The Barak basin is bounded on the north by Barail hillrange separating it from the Brahmaputra basin, on the east by Naga and Lushai hills and on the south and west by Bangladesh. The Barak rises in the Manipur hills south-east of Kohima on the northern boundary of Kohima and flows in the westerly direction through a narrow valley upto Jiri ghat. The river then turns west and emerges out of the hills a few kms. upstream of Lakhipur town. It then flows in a westerly direction upto Bhanga where it bifurcates into two channels viz. Surma and the Kushiya. The Barak River has total river length of about 504 kms. upto the border of Assam from its origin about 900 kms. upto its out fall into the Meghna near Bharabazar in Bangladesh. The Barak is joined by tributaries both from the north and the south. The main tributaries joining from the north are Jiri, Chiri, Madhuri, Jatinga, Harang, Kaldan and Gumre. The main south bank tributaries of the Barak are Sonia, the Katashal, Dhaleshwari, Singla and Lengai and Tuivai.

15.2. Hydroelectric Project in Barak Sub-Basin

15.2.1. List of exploitable Hydroelectric Projects in Barak Sub-Basin is given at Table 15-1 below

Table 15-1 List of HEPs in Barak sub-basin

S.No.	Name of Project	IC (MW)	Expected time frame
1.	Loktak	105	Existing
2.	Tuiri (Sonai)	60	Existing
3.	Myntdu Leshka stage I	126	Existing
Sub-Total (existing)		291	
4.	Longtharai PSP	800	2035
5.	Lower Tizu	42	2035
6.	Tuivai (Bungpui long)	132	2035
7.	Mawblei Storage	110	2035
8.	Myntdu Leshka St-II	210	2035
9.	Barak 4	49.5	2031-32
Sub-Total (upto 2035)		1343.5	
10.	Tuichang	57	Beyond 2035
11.	Tuivawl	50	Beyond 2035
12.	Tlawng	37	Beyond 2035
13.	Khongem Chakha II	40	Beyond 2035
14.	Khongem Chakha III	28	Beyond 2035
15.	Pabaram	213	Beyond 2035
16.	Maklang - Tuyungbi	30	Beyond 2035

S.No.	Name of Project	IC (MW)	Expected time frame
17.	Irang	60	Beyond 2035
18.	Nunngag	28	Beyond 2035
19.	Loktak D/s (Khunou)	66	Beyond 2035
20.	Thinghat	45	Beyond 2035
21.	Bhairabi	50	Beyond 2035
22.	Lunglang	474	Beyond 2035
23.	Mat	41.7	Beyond 2035
24.	Boinu	498	Beyond 2035
25.	Kaldan	159	Beyond 2035
26.	Kolodyne Stage -II	460	Beyond 2035
27.	Selim	54	Beyond 2035
28.	Umanghot (Umngot storage)	220	Beyond 2035
29.	Umjaut	72	Beyond 2035
30.	Umduna (Umduma)	60	Beyond 2035
31.	Wah Umium St.-III	85	Beyond 2035
32.	Umngi Stage-I (Umngi Storage-PFR) & (Rangmaw- PFR)	30	Beyond 2035
33.	Nongam	165	Beyond 2035
34.	Mawpat	30	Beyond 2035
35.	Kynshi I (Mawsyrpat)	270	Beyond 2035
36.	Nangmawlar	106	Beyond 2035
37.	Kynshi II (Mawthaba)	278	Beyond 2035
38.	Amagam Storage	26	Beyond 2035
39.	Simsang Dam P/H	60	Beyond 2035
40.	Daizo Lui PSP	2400	Beyond 2035
41.	Leiva Lui PSP	1500	Beyond 2035
42.	Tuiphai Lui PSP	1650	Beyond 2035
43.	Nghasih PSP	400	Beyond 2035
44.	Wah Umiam PSP	800	Beyond 2035
Sub-Total (beyond 2035)		10542.7	
Grand Total (MW)		12177.2	

15.3. Pumped Storage Project in Barak Sub-Basin

15.3.1. Leiva Lui PSP (1500 MW), Tuiphai Lui PSP (1650 MW) and Nghasih PSP (400 MW) in the state of Mizoram have been allocated to NEEPCO. Further, Daizo Lui PSP (2400 MW) in Mizoram has been allocated to SJVNL.

15.4. Transmission System

15.4.1. The hydroelectric potential of Barak sub-basin is 12177.2 MW including 291 MW existing HEPs. Daizo Lui PSP (2400 MW), Leiva Lui PSP (1500 MW) and Tuiphai Lui PSP (1650 MW) are the major potential projects in this sub-basin.

15.4.2. The power of Daizo Lui PSP (2400 MW), Nghasih PSP (400 MW), Tuiphai Lui PSP (1650 MW), Longtharai PSP (800 MW), Wah Umiam PSP (800 MW) and Leiva Lui PSP (1500 MW) would be pooled at ISTS system and remaining potential in the Sub-basin would be pooled in the intra-state system of Meghalaya, Nagaland, Manipur and Mizoram.

15.4.3. Total potential expected by the year 2035 is 1343.5 MW and remaining 10542.7 MW is expected beyond the year 2035. The planned Dedicated Transmission system and Common transmission system for the projects are mentioned in the sub-sequent paragraphs

15.5. Common Transmission System by 2035

15.5.1. Out of 1343.5 MW potential, power of 543.5 MW is planned to be evacuated through Intra-state transmission network. For evacuation of balance 800 MW (i.e. Longtharai PSP), the following transmission system would be required.

- (i). Augmentation of PK Bari 400/132 kV sub-station with 4x315 MVA ICTs

15.6. Dedicated Transmission system by 2035

15.6.1. Dedicated transmission lines from the switchyard of the HEPs to the pooling stations is given at table below:

Table 15-2 Transmission evacuation system in Barak sub-basin by 2035

S.N o.	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVA)
1.	Myntdu Leshka St-II	210	220 kV	Sohra (MePTCL) 220 kV GIS	MLHEP-II – Sohra 220 kV D/c line (Ampacity: 680 A or more per ckt)	Space for 1x50 MVA along with associated bay
2.	Lower Tizu	42	132 kV	Kiphire (DoP, Nagaland) 132 kV S/s	Lower Tizu HEP - Kiphire 132 kV S/c on D/c line (Ampacity: 230 A or more per ckt)	-
3.	Tuivai (Bungpuilo ng)	132	132 kV	Saitual (P&D, Mizoram) 132 kV S/s	Tuivai HEP – Saitual S/s 132 kV D/c line (Ampacity: 710 A or more per ckt)	-
4.	Barak 4	49.5	132 kV	Tamenglong (MSPCL) 132 kV S/s	Barak-4 HEP – Tamenglong 132kV D/c line (Ampacity: 270 A or more per ckt)	-
5.	Mawblei Storage	110	132 kV	To be connected to intra state system (MePTCL)	Mawblei – Mawkyrwat/Jakrem 132 kV D/c line Mawblei – Nongstoin 132 kV S/c line (Ampacity: 590 A or more per ckt)	-
6.	Longtharai PSP	800	400 kV	PK Bari	Longtharai PSP – PK Bari 400 kV D/c (Ampacity: 1420A or more per ckt) line	1x80 MVA Bus Reactor along with associated bay
Total		1343.5				

15.6.2. The Map indicating the hydroelectric projects and their transmission system is given at Figure 15-1 below.

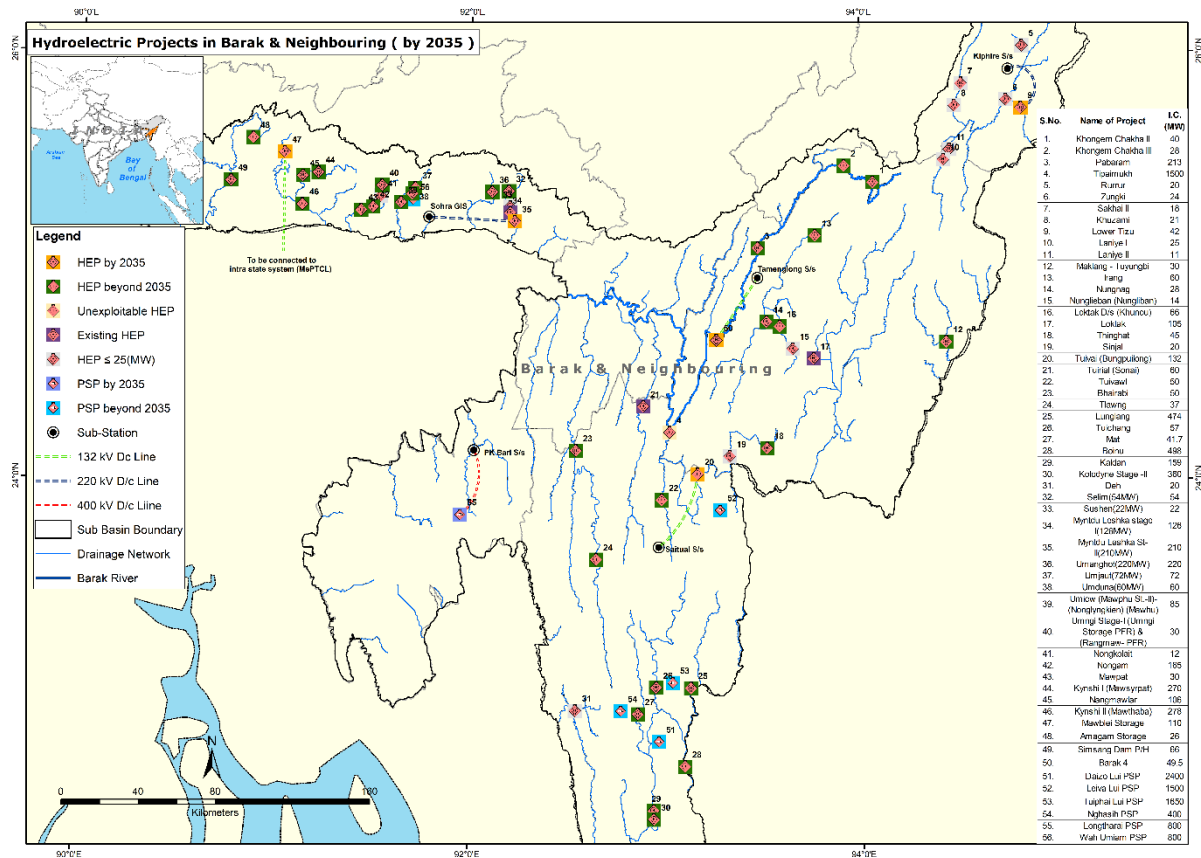


Figure 15-1 Transmission System of Barak Sub-basin by 2035

15.7. Common Transmission System beyond 2035

15.7.1. Out of 7998.7 MW potential, power of 3999 MW is planned to be evacuated through Intra State transmission network and for balance 3200 MW, following common transmission system would be required:

- Establishment of Melriat-II 765/400 kV sub-station with 3x1500 MVA ICTs and 2x240 MVar Bus reactors
- Establishment of Khawiva 400/132 kV Pooling station with 2x200 MVA ICTs and 2x80MVar Bus reactors
- Establishment of Aizawl 400/132 kV S/s with 2x315MVA ICTs and 2x80MVar Bus reactors
- Establishment of Imphal (New) 765/400 kV Substation with 2x1500 MVA ICTs and 2x240 MVar Bus reactors
- Establishment of Mawlai 400/220 kV S/s with 3x500 MVA ICTs and 2x80 MVar Bus reactors
- Creation of 400 kV level at existing Nangalbibra (ISTS) 220/132 kV S/s with 400/220 kV, 3x315 MVA ICTs
- Melriat-II – Silchar 400 kV D/c (high capacity) line

- (viii) Melriat-II – Imphal (New) 765 kV D/c line
- (ix) Khawiva PS – Aizawl 400kV D/c (Quad) line
- (x) Aizawl – Silchar 400kV D/c (Quad) line
- (xi) Imphal (New) – Khumtai 765 kV D/c line
- (xii) Melriat-II – Aizawl 400 kV D/c (Quad) line
- (xiii) Mawlai – Nangalbibra 400 kV D/c line
- (xiv) Mawlai – Killing (ISTS) 400 kV D/c line
- (xv) Mawlai – New Shillong 220 kV D/c line
- (xvi) Operation of Bongaigaon – Nangalbibra 400 kV line (currently operated at 220 kV) at its rated voltage of 400 kV alongwith upgradation of terminal bays at both ends.
- (xvii) Establishment of Killing (ISTS) 400/220 kV with 6x500 MVA ICTs
- (xviii) LILO of Byrnihat (MePTCL) – Bongaigaon 400 kV S/c line at Killing (ISTS)

15.8. Dedicated Transmission System beyond 2035

15.8.1. Dedicated transmission lines from the switchyard of the HEPs expected after 2035 to the pooling stations is given at table below:

Table 15-3 Transmission evacuation system in Barak sub-basin beyond 2035

S.N o.	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVAR)
1.	Selim	54	132 kV	To be connected to intra state system (MePTCL)	Through 132 kV D/c Line (Ampacity: 290 A or more per ckt)	-
2.	Tuivawl	50	132 kV	Darlawn (P&D, Mizoram) 132 kV S/S	Tuivawl HEP – Darlawn S/s 132 kV D/c line (Ampacity: 270 A or more per ckt)	-
3.	Tlawng	37	132 kV	Melriat (P&D, Mizoram) 132 kV S/s	Tlawng HEP – Melriat S/s 132 kV D/c line (Ampacity: 200 A or more per ckt)	-
4.	Tuichang	57	132 kV	Hnahthial (P&D, Mizoram) 132 kV S/s	Tuichang HEP – Hnahthial S/s 132 kV D/c line (Ampacity: 310 A or more per ckt)	-
5.	Umanghot (Umngot storage)	220	220 kV	Mawlai PS	Umanghot (Umngot storage) – Mawlai PS 220	Space for 1x50 MVAR along with

S.N o.	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of PS	Transmission System	Bus Reactor at Switchyar d (MVar)
					kV D/c Line (Ampacity: 710 A or more per ckt)	associated bay
6.	Umjaut	72	132 kV	To be connected to intra state system (MePTCL)	Through 132 kV D/c Line (Ampacity: 390 A or more per ckt)	-
7.	Umduna (Umduma)	60	132 kV	To be connected to intra state system (MePTCL)	Through 132 kV D/c Line (Ampacity: 320 A or more per ckt)	-
8.	Wah Umium St- III	85	132 kV	To be connected to intra state system (MePTCL)	Through 132 kV D/c Line (Ampacity: 460 A or more per ckt)	-
9.	Umngi Stage-I (Umngi Storage-PFR) & (Rangmaw- PFR)	30	132 kV	To be connected to intra state system (MePTCL)	Through 132 kV D/c Line (Ampacity: 160 A or more per ckt)	-
10.	Nongam	165	220 kV	Mawlai PS	Nongam – Mawlai PS 220 kV D/c Line (Ampacity: 530 A or more per ckt)	Space for 1x50 MVar along with associated bay
11.	Mawpat	30	132 kV	To be connected to intra state system (MePTCL)	Through 132 kV D/c Line (Ampacity: 160 A or more per ckt)	-
12.	Kynshi I (Mawsyrpat)	270	220 kV	Mawlai PS	Kynshi I – Mawlai PS 220 kV D/c Line (Ampacity: 870 A or more per ckt)	Space for 1x50 MVar along with associated bay
13.	Nangmawlar	106	220 kV	Mawlai PS	Nangmawlar – Mawlai PS 220 kV D/c Line (Ampacity: 340 A or more per ckt)	Space for 1x50 MVar along with associated bay
14.	Kynshi II (Mawthaba)	278	220 kV	Mawlai PS	Kynshi II – Mawlai PS 220 kV D/c Line (Ampacity: 900 A or more per ckt)	Space for 1x50 MVar along with associated bay
15.	Amagam Storage	26	132 kV	To be connected to intra state system (MePTCL)	Through 132 kV D/c Line (Ampacity: 140 A or more per ckt)	-
16.	Simsang Dam P/H	60	132 kV	To be connected to intra state	Through 132 kV D/c Line (Ampacity: 360 A or more per ckt)	-

S.N o.	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVAR)
				system (MePTCL)		
17.	Khongem Chakha II	40	132 kV	To be connected to intra state system (MSPCL)	Through 132 kV D/c Line (Ampacity: 220 A or more per ckt)	-
18.	Khongem Chakha III	28	132 kV	To be connected to intra state system (MSPCL)	Through 132 kV D/c Line (Ampacity: 150 A or more per ckt)	-
19.	Pabaram	213	132 kV	Imphal PS	Pabaram – Imphal PS 132 kV D/c Line (Ampacity: 1150 A or more per ckt)	-
20.	Maklang - Tuyungbi	30	132 kV	To be connected to intra state system (MSPCL)	Through 132 kV D/c Line (Ampacity: 160 A or more per ckt)	-
21.	Irang	60	132 kV	To be connected to intra state system (MSPCL)	Through 132 kV D/c Line (Ampacity: 320 A or more per ckt)	-
22.	Nunngag	28	132 kV	To be connected to intra state system (MSPCL)	Through 132 kV D/c Line (Ampacity: 150 A or more per ckt)	-
23.	Loktak D/s (Khunou)	66	132 kV	To be connected to intra state system (MSPCL)	Through 132 kV D/c Line (Ampacity: 360 A or more per ckt)	-
24.	Thinghat	45	132 kV	To be connected to intra state system (MSPCL)	Through 132 kV D/c Line (Ampacity: 240 A or more per ckt)	-
25.	Bhairabi	50	132 kV	To be connected to intra state system (DoP, Mizoram)	Through 132 kV D/c Line (Ampacity: 270 A or more per ckt)	-
26.	Lunglang	474	400 kV	Khawiva PS	Lunglang – Khawiva PS 400 kV D/c Line (Ampacity: 840 A or more per ckt)	1x80 MVAR along with associated bay
27.	Mat	41.7	132 kV	To be connected to intra state	Through 132 kV D/c Line (Ampacity: 230 A or more per ckt)	-

S.N o.	Name of HEP	IC (MW)	Switchyard Evacuation Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVar)
				system (DoP, Mizoram)		
28.	Boinu	498	400 kV	Khawiva PS	Boinu – Khawiva PS 400 kV D/c Line (Ampacity: 880 A or more per ckt)	1x80 MVar along with associated bay
29.	Kaldan	159	132 kV	Khawiva PS	Kaldan – Khawiva PS 132 kV D/c Line (Ampacity: 850 A or more per ckt)	-
30.	Kolodyne Stage -II	460	400 kV	Khawiva PS	Kolodyne Stage -II – Khawiva PS 400 kV D/c Line (Ampacity: 820 A or more per ckt)	1x80 MVar along with associated bay
31.	Leiva Lui	1500	400 kV	Melriat -II	Leiva Lui – Melriat-II 400kV D/c line (Ampacity: 2650 A or more per ckt)	2x80 MVar along with associated bay
32.	Tuiphai Lui	1650	400 kV	Melriat -II	Tuiphai Lui – Melriat-II 400kV D/c line (Ampacity: 2920 A or more per ckt)	2x80 MVar along with associated bay
33.	Nghasih	400	400 kV	Melriat -II	Nghasih – Melriat-II 400kV D/c line (Ampacity: 710 A or more per ckt)	1x80 MVar along with associated bay
34.	Daizo Lui PSP	2400	400 kV	Melriat-II	Daizo Lui PSP – Melriat-II 400kV D/c (Ampacity: 4240A or more per ckt) line	2x80 MVar Bus Reactor along with associated bay
35.	Wah Umiam PSP	800	400 kV	Killing (ISTS)	Wah Umiam PSP – Killing (ISTS) 400 kV D/c (Ampacity: 1420 A or more per ckt)	1x80 MVar along with associated bay
Total		10542.7				

15.8.2. The Map indicating the hydroelectric projects and their transmission system is given at Figure 15-2 below.

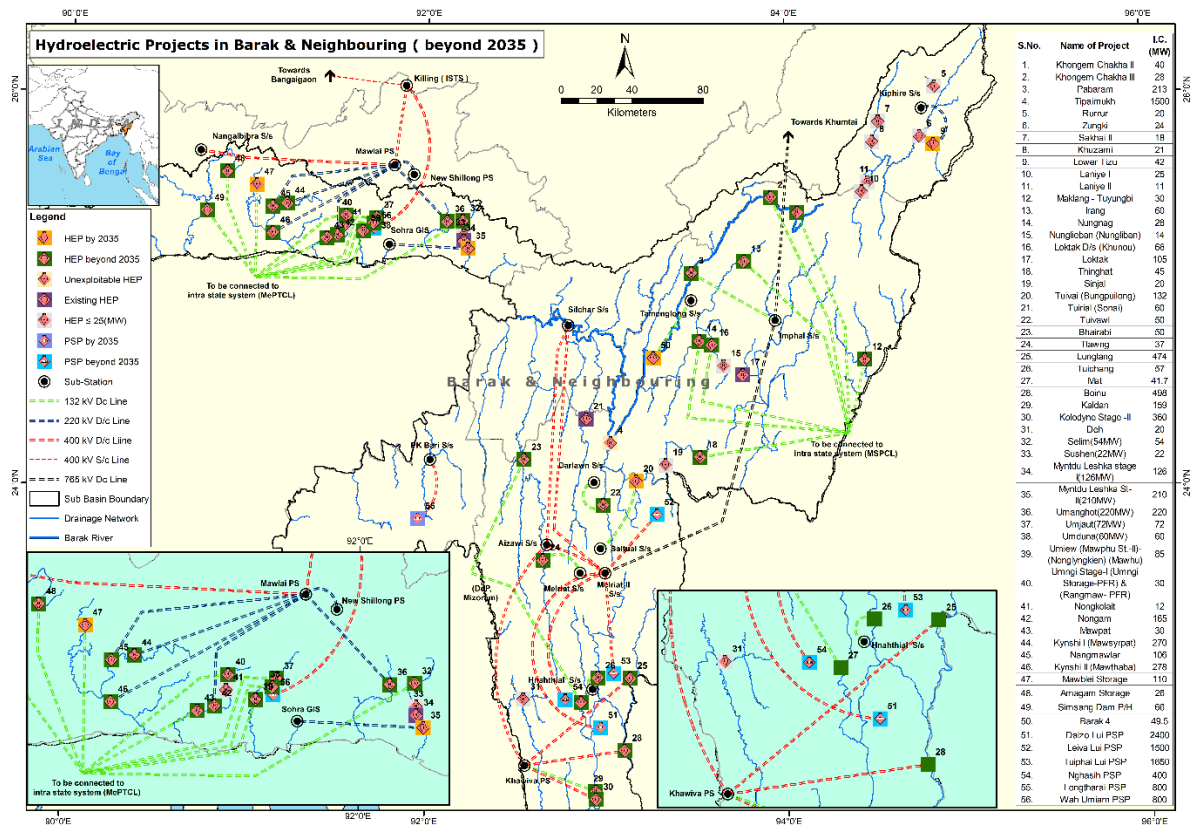


Figure 15-2 Transmission System of Barak Sub-basin beyond 2035

15.8.3. The Block Map of Barak Sub-basin indicating hydroelectric project and transmission system is given at Annexure-II.

15.9. Summary of pooled capacity

15.9.1. The time frame vis-à-vis pooling station wise capacity in this sub-basin is given at Table 15-4 below.

Table 15-4 Timeframe vis-a-vis pooling station wise capacity

S. No.	Time frame	Capacity to be pooled	Pooling Station	Transformation Capacity
1.	Upto 2035	1343.5 MW	Augmentation of PK Bari 400/132 kV S/s	4x315 MVA (additional)
2.	Beyond 2035	10542.7 MW	Khawiva 400/132 kV	2x200 MVA
3.			Aizawl 400/132kV	2x315 MVA
4.			Melriat-II 765/400 kV	3x1500 MVA
5.			Imphal (New) 765/400 kV	2x1500 MVA
6.			Mawlai 400/220 kV	3x500 MVA
7.			Nangalbibra (ISTS) 400/220/132kV	3x315 MVA
8.			Killing (ISTS) 400/220 kV S/s	6x500 MVA
9.			Intra-state system of Meghalaya, Manipur and Mizoram	-

16. Pumped Storage Plants

- 16.1. A Pumped Storage Project (PSP) is a type of hydroelectric energy storage system used to balance electricity supply and demand. There are two main reservoirs, Upper Reservoir and Lower Reservoir. It stores energy in the form of water, pumped from a lower elevation reservoir to a higher elevation one during times of low electricity demand (and low prices), and then generates electricity by releasing the same water back to the lower elevation reservoir through turbines when demand is high.
- 16.2. In addition to the hydroelectric potential mentioned at, Table 2-3 the potential of Pumped Storage Plants (PSPs) has also been identified. The potential of PSPs in the Brahmaputra Basin is given at Table 16-1.

Table 16-1 Potential of PSPs in Brahmaputra Basin

S.No.	Name of PSP	IC (MW)	State	Sub-basin	Time frame
1.	Kopili (Umrangso) PSP	320	Assam	Kalang (Kopili)	2030-31
2.	Ouguri PSP	900	Assam	Kalang (Kopili)	2028-29
3.	Longtharai PSP	800	Tripura	Barak	2035
4.	Tharakunji PSP	900	Assam	Kalang (Kopili)	2028-29
5.	Karbi Anglong PSP	800	Assam	Kalang (Kopili)	2028-29
Sub Total (upto 2035)		3720			
6.	Daizo Lui PSP	2400	Mizoram	Barak	Beyond 2035
7.	Leiva Lui PSP	1500	Mizoram	Barak	Beyond 2035
8.	Tuiphai Lui PSP	1650	Mizoram	Barak	Beyond 2035
9.	Nghasih PSP	400	Mizoram	Barak	Beyond 2035
10.	Wah Umiam PSP	800	Meghalaya	Barak	Beyond 2035
11.	Panyor PSP	660	Arunachal Pradesh	Subansiri	Beyond 2035
Sub Total (beyond 2035)		7410			
Grand Total (MW)		11130			

16.3. Transmission System

- 16.3.1. The Pumped Storage potential of Brahmaputra basin is 11,130 MW and Daizo Lui PSP (2400 MW), Leiva Lui PSP (1500 MW) and Tuiphai Lui PSP (1650 MW) are the major PSPs in the basin.
- 16.3.2. Although the transmission system identified for evacuation/drawal of power from/by these PSPs have been mentioned in respective chapters on river sub-basins, however, for providing transmission system for the PSPs at one place, the same has been consolidated in this chapter.
- 16.3.3. The total potential expected by the year 2035 is 3720 MW and remaining 7410 MW is expected beyond the year 2035. The planned Dedicated Transmission system and Common transmission system for the project are mentioned in the sub-sequent paragraphs.

16.4. Common Transmission System by 2035

16.4.1. Out of 3720 MW, 2920 MW is planned to be evacuated through Intra-state transmission network by 2035 timeframe. For evacuation of balance 800 MW (i.e. Longtharai PSP), the following transmission system would be required.

- (i). Augmentation of PK Bari 400/132 kV with 4x315 MVA ICTs

16.5. Dedicated Transmission system by 2035

16.5.1. Dedicated lines from the switchyard of the HEPs to the pooling stations is given at table below:

Table 16-2 Transmission evacuation system of PSPs by 2035

S.N o.	Name of PSP	IC (MW)	Switchy ard Evacuat ion Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVar)
1.	Longtharai PSP	800	400 kV	PK Bari	Longtharai PSP – PK Bari 400kV D/c (Ampacity: 1420A or more per ckt) line	1x80 MVar Bus Reactor along with associated bay
2.	Kopili (Umrangso) PSP	320	220 kV	Umrangso (AEGCL)	Kopli PSP (300 MW) – Umrangso 220 kV D/c line with AAAC Twin Zebra (60 ckm)	-
3.	Ouguri PSP	900	400 kV	Maikoram (AEGCL)	Ouguri PSP - Maikoram 400 kV D/c line (Ampacity: 1600 A or more per ckt)	1x80 MVar Bus Reactor along with associated bay
4.	Tharakunji PSP	900	400 kV	Maikoram (AEGCL)	Tharakunji PSP – Maikoram 400 kV D/c line Ampacity: 1600 A or more per ckt) (84 ckm)	1x80 MVar Bus Reactor along with associated bay
5.	Karbi Langpi (Anglong) PSP	800	400 kV	Maikoram (AEGCL)	Karbi Anglong PSP - Makoiram 400 kV D/c line Ampacity: 1420 A or more per ckt) (60 ckm)	1x80 MVar Bus Reactor along with associated bay
Total		3720				

16.6. Common Transmission System beyond 2035

16.6.1. The following transmission system would be required for evacuation of additional 7410 MW capacity beyond the 2035:

- (i) Establishment of Panyor 400/132 kV Pooling station with 5x200 MVA ICTs and 2x80 MVar Bus reactors (*Note: this pooling station is envisaged alongwith evacuation system of HEPs in Subansiri and Pare (Dikrong) sub-basins*).

- (ii) Establishment of Melriat-II 765/400 kV sub-station with 3x1500 MVA ICTs and 2x240 MVar Bus reactors. (Note: mentioned in chapter of Barak sub-basin)
- (iii) Establishment of Killing (ISTS) 400/220 kV with 6x500 MVA ICTs (Note: mentioned in chapter of Barak sub-basin)

16.7. Dedicated Transmission System beyond 2035

16.7.1. Dedicated lines from the switchyard of the PSPs to the pooling stations is given at table below:

Table 16-3 Transmission evacuation system of PSPs beyond 2035

S.N o.	Name of PSP	IC (MW)	Switchy ard Evacuati on Voltage	Name of PS	Transmission System	Bus Reactor at Switchyard (MVar)
1.	Leiva Lui	1500	400 kV	Melriat -II	Leiva Lui – Melriat-II 400kV D/c (Quad Moose) line	2x80 MVar along with associated bay
2.	Daizo Lui PSP	2400	400 kV	Melriat-II	Daizo Lui PSP – Melriat-II 400 kV D/c (Ampacity: 4240A or more per ckt) line	2x80 MVar Bus Reactor along with associated bay
3.	Tuiphai Lui	1650	400 kV	Melriat -II	Tuiphai Lui – Melriat-II 400kV D/c (Quad Moose) line	2x80 MVar along with associated bay
4.	Nghasih	400	400 kV	Melriat -II	Nghasih – Melriat-II 400kV D/c (twin Moose) line	1x80 MVar along with associated bay
5.	Wah Umiam PSP	800	400 kV	Killing (ISTS)	Wah Umiam PSP – Killing (ISTS) 400 kV D/c (Ampacity: 1420 A or more per ckt)	1x80 MVar along with associated bay
6.	Panyor PSP	660	400 kV	Panyor PS	Panyor PSP – Panyor PS 400 kV D/c Line (Ampacity: 1170 A or more per ckt)	1x80 MVar along with associated bay and Space for 1x80 MVar along with associated bay
Total		7410				

16.7.2. The Map indicating the the PSPs and their transmission system is given in Figure 16-1 below.

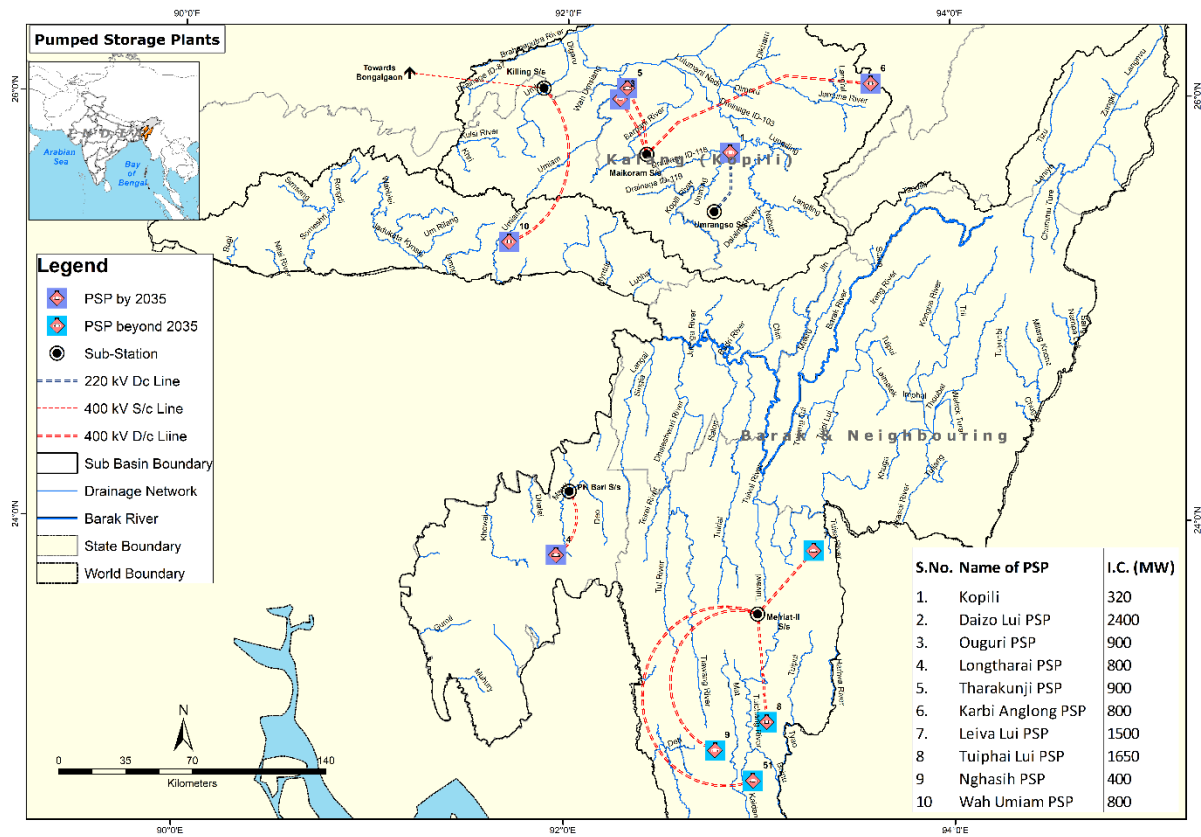


Figure 16-1 Transmission System of PSPs in Brahmaputra

16.8. Summary of pooled capacity

16.8.1. The time frame vis-à-vis pooling station wise capacity in this sub-basin is given at Table 16-4 below.

Table 16-4 Timeframe vis-a-vis pooling station wise capacity

S. No.	Time frame	Capacity to be pooled	Pooling Station	Transformation Capacity
1.	Upto 2035	3720 MW	Augmentation of PK Bari 400/132 kV S/s	4x315 MVA (additional)
2.			Intra-state system of Assam	-
3.	Beyond 2035	7410 MW	Panyor 400/132 kV	5x200 MVA
4.			Melriat-II 765/400 kV	3x1500 MVA
5.			Killing (ISTS) 400/220 kV S/s	6x500 MVA

17. Conclusion

- 17.1. The Brahmaputra basin is divided into 12 Nos. of sub-basins namely Lohit, Dibang, Siang, Subansiri, Pare (Dikrong), Kameng, Tawang, Upper Brahmaputra, Lower Brahmaputra, Kalang (Kopili), Teesta and Barak. The exploitable hydro electricity potential (capacity greater than 25 MW) in these sub-basins is 64,945.2 MW. Out of this 6,807 MW is existing and under-implementation, further, 19,552 MW additional capacity expected to be implemented by the year 2035. The remaining 38,586.2 MW is expected beyond 2035.
- 17.2. The sub-basin wise exploitable hydroelectric potential (>25 MW) (excluding PSPs) is given at Table 17-1 below.

Table 17-1 Sub-Basin wise Exploitable Hydroelectric Potential (>25 MW)

S.No.	Sub-basin	No. of Projects	Capacity (MW)
1.	Lohit	12	6841.5
2.	Subansiri	20	12290
3.	Dibang	14	8801
4.	Siang	25	18666
5.	Pare (Dikrong)	5	414
6.	Kameng	24	3258
7.	Upper Brahmaputra	6	379
8.	Lower Brahmaputra	1	36
9.	Kalang (Kopili)	13	894.5
10.	Teesta	42	6804
11.	Tawang	8	1934
12.	Barak	38	4627.2
Total		208	64945.2

- 17.3. There are 23 Nos. of small hydroelectric plants ($IC \leq 25$ MW) having total potential of 439.5 MW in Brahmaputra Basin. It is assumed that such Small HEPs would be connected in the intra-state transmission system.
- 17.4. In addition to the above, 11130 MW hydroelectric potential of Pumped Storage Plants (PSPs) have also been envisaged out of which 3,720 MW is anticipated by the year 2035.
- 17.5. The system studies has helped to identify the pooling station of the upcoming HEPs in Brahmaputra Basin. The preliminary location of pooling station has been selected based on the discussion with States, visibility at PM GatiShakti Portal and Google Maps.
- 17.6. In order to identify the transmission system for evacuation of power from HEPs in Brahmaputra Basin, system studies were carried out in the time-frame of 2035 and beyond 2035.
- 17.7. As the generation would be located very far from load centres, provision of switchable Bus Reactor has also been suggested at switchyard of HEPs. However exact requirement may only be identified through studies carried out after receipt of connectivity application by the Nodal agencies.

- 17.8. In this Master Plan, transmission system has been mentioned as Dedicated Transmission System and Common Transmission System. The dedicated system indicates the Dedicated Transmission Line (DTL) in the scope of Hydro Project Developers. The common transmission system indicates the Pooling sub-station / sub-station and transmission lines planned under ISTS to evacuate the power of HEPs in the Brahmaputra Basin. Further, Intra-state transmission system has also been indicated in this master plan, details of the same are available in the respective chapters of sub-basins.
- 17.9. Studies suggest that 7 Nos. of HVDC stations each of 6000 MW at 6 Nos. of location i.e. Namsai, Roing (New), Niglok, Gogamukh (new), Rowta and 2 Nos. of terminals at Silapathar in addition to BNC would be required. The power from these HVDC terminals would be taken away from NER to load centres towards ER/NR/WR. However, capacity of HVDC terminals or alternate technology can be reviewed at the time of implementation.
- 17.10. HEPs shall have capability to operate in Synchronous Condenser mode and shall also have Black Start facility in accordance with relevant standards/regulations/ guideline/ procedure.
- 17.11. In view of low inertia of North Eastern Regional Grid the synchronous condenser etc. may be planned at suitable location based on actual requirement.
- 17.12. The details of Common Transmission System identified under ISTS are tabulated in Table 17-2 (Transmission lines) and Table 17-3 (pooling stations including HVDC stations) below.

Table 17-2 Transmission lines planned in the Brahmaputra Basin

S.No.	Sub-basin	Time frame	Transmission line	ckm
1.	Lohit	Upto 2035	Kherang Camp PS – Namsai PS 400 kV D/c line (Quad)	216
2.			Namsai PS – Naharkatia 765 kV D/c line	166
3.		Beyond 2035	Kherang Camp PS – Namsai PS 400 kV 2 nd D/c (Quad) line	216
4.			HVDC Bi-pole line from Namsai to Outside NER	3000
5.	Dibang	Upto 2035	Etalin PS – Roing (New) 400 kV 2xD/c (Quad) line	182
6.			Roing (New) – Naharkatia 765 kV D/c line	223
7.			Naharkatia – Mariani 400 kV D/c (Quad) line	310
8.			Naharkatia – Khumtai 765 kV D/c line	401
9.			Khumtai – Bornagar 765 kV D/c line	670
10.			Khumtai – Khumtai (AEGCL) 400 kV D/c (Quad) line	0
11.			HVDC Bi-pole line from Roing (New) to Outside NER	3000
12.	Siang	Upto 2035	Kaying PS – Niglok PS 400 kV D/c (Quad) line	221
13.			Niglok PS – Gogamukh 400 kV D/c (Quad) line	240

S.No.	Sub-basin	Time frame	Transmission line	ckm
14.		Beyond 2035	HVDC Bi-pole line from Niglok to Outside NER	3000
15.			Tuting PS – Niglok 220 kV D/c (High Capacity) Line	312
16.			Kaying PS – Niglok PS 2 nd 400 kV D/c (Quad) line	221
17.			Niglok PS – Gogamukh (new) S/s 400 kV D/c (Quad) line	240
18.			Pangin PS – Niglok 220 kV D/c (Twin) line	72
19.			Mehcuka PS – Kaying PS 220 kV D/c (Twin) line	139
20.			LILO of Niglok – Gogamukh 400 kV (Quad) 2 nd D/c at Silapathar PS	120
21.			2xHVDC Bi-pole line from Silapathar to Outside NER	6000
22.	Subansiri	Upto 2035	Daporijo PS – Gogamukh (new) 400 kV 2xD/c (Quad) line	293
23.			Gogamukh– BNC 400 kV D/c (Quad) Line	324
24.			LILO of Gogamukh– Niglok 400 kV D/c (Quad) line at Gogamukh (new)	29
25.			Tezpur – Gogamukh (new) 765 kV D/c line	432
26.			Tezpur – Bornagar 765 kV D/c line	216
27.			HVDC Bi-pole line from Gogamukh (new) to Outside NER	3000
28.		Beyond 2035	Daporijo PS – Gogamukh 400 kV 3 rd D/c (Quad) line	146
29.			Itanagar (New) – Itanagar (DoP, Arunachal Pradesh) 132 kV D/c (High Capacity) line	24
30.			Koloriang PS – Itanagar (New) 400 kV D/c (Quad) line	24
31.			LILO of Gogamukh – BNC 400 kV D/c (Quad) line at Itanagar (New)	120
32.			LILO of both ckt of Rangandi (Panyor HEP) – BNC 400 kV D/c line at Panyor PS	120
33.			Reconductoring of Panyor PS – BNC 400 kV D/c line with Twin HTLS (1600 A single HTLS)	432
34.		Beyond 2035	Rowta – Rowta (AEGCL) 220 kV D/c line	24
35.			Pakke PS – Talong PS 220 kV D/c (Twin) line	24
36.			Talong PS – Rowta 400 kV D/c line	300
37.			Gongri PS – Rowta 400 kV D/c (Quad) line	180
38.			Rowta – Bornagar 400 kV D/c (Quad) line	276
39.			HVDC Bi-pole line from Rowta to Outside NER	3000
40.	Tawang	Beyond 2035	Tawang PS – Gongri PS 400 kV D/c (Quad) line	98
41.			Gongri PS – Bornagar 400 kV D/c (Quad) line	336
42.			LILO of both ckt of Gongri – Bornagar 400 kV (Quad) line at Rowta PS	120

S.No.	Sub-basin	Time frame	Transmission line	ckm
43.	Teesta	Beyond 2035	Yumthang – Siliguri 400 kV D/c (Quad) line	336
44.			Siliguri – Katihar 400 kV D/c (Quad) line	348
45.	Barak	Beyond 2035	Melriat-II – Silchar 400 kV D/c (high capacity) line	389
46.			Khawiva PS – Aizawl 400kV D/c (Quad) line	216
47.			Aizawl – Silchar 400kV D/c (Quad) line	300
48.			Melriat-II – Imphal (New) 765 kV D/c line	408
49.			Imphal (New) – Khumtai 765 kV D/c line	487
50.			Melriat-II – Aizawl 400 kV D/c (Quad) line	24
51.			Mawlai PS – Nangalbibra 400 kV D/c line	254
52.			Mawlai PS – Killing (ISTS) 400 kV D/c line	120
53.			Mawlai PS – New Shillong 220 kV D/c line	24
54.			LILO of Byrnihat (MePTCL) – Bongaigaon 400 kV S/c line at Killing (ISTS)	24
Total				31397

Table 17-3 Pooling sub-stations planned in the Brahmaputra Basin

S.No.	Sub-Basin	Pooling Station	Transformation Capacity	
			upto 2035	beyond 2035
1.	Lohit	Kherang Camp 400/220/132 kV GIS	3x500 MVA	1x500+2x200 MVA (additional)
2.		Namsai 765/400 kV GIS	3x1500 MVA	1x1500 MVA (additional)
3.		Namsai HVDC ±800 kV	-	6000 MW
4.	Dibang	Etalin 400/220 kV GIS	2x500 MVA	3x500 MVA
5.		Roing (New) 765/400 kV	3x1500 MVA	2x1500 MVA
6.		Roing (New) ±800 kV HVDC	6000	-
7.		Naharkatia 765/400 kV GIS	3x1500 MVA	-
8.		Khumtai 765/400 kV GIS	2x1500 MVA	-
9.	Siang	Kaying 400/220 kV	2x500 MVA	2x500 MVA (additional)
10.		Niglok 400/220 kV GIS	2x500 MVA	1x500 MVA (additional)
11.		Mechuka 220/132 kV	-	3x200 MVA
12.		Tuting 220/132 kV	-	4x200 MVA
13.		Pangin 220/132 kV	-	3x200 MVA
14.		Niglok ±800 kV	-	6000 MW
15.		Silapathar ±800 kV	-	2x6000 MW
16.		Gogamukh (new) 765/400 kV	5x1500 MVA	-
17.	Subansiri	Daporijo 400 kV	Switching S/s	Switching S/s
18.		Tezpur 765 kV	Switching S/s	Switching S/s
19.		Gogamukh (new) ±800 kV	6000	-
20.		Panyor 400/132 kV	-	3x200 MVA
21.		Koloriang 400/220 kV	-	3x500 MVA

S.No.	Sub-Basin	Pooling Station	Transformation Capacity	
			upto 2035	beyond 2035
22.	Pare (Dikrong)	Itanagar (New) 400/132 kV	-	2x200 MVA
23.		Itanagar (New) 400/132 kV	-	2x200 MVA (additional)
24.	Kameng	Pakke PS 220/132 kV	-	4x200 MVA
25.		Talong 400/220/132 kV	-	3x500 MVA + 4x200 MVA
26.		Gongri 400/220/132 kV	-	5x500 MVA + 5x160 MVA
27.		Rowta 400/220 kV	-	2x500 MVA
28.		Rowta ±800 kV	-	6000 MW
29.	Tawang	Tawang 400/220 kV	-	3x500 MVA
30.	Upper Brahamaputra	Mokokchung (PG) 220/132 kV S/s (Existing)	-	-
31.	Kalang (Kopili)	Misa (PG) 400/220 kV (Existing)	-	-
32.	Teesta	Yumthang 400/220 kV	-	4x500 MVA
33.	Barak	PK Bari 400/132 kV S/s	4x315 MVA (additional)	-
34.		Khawiva 400/132 kV	-	2x200 MVA
35.		Aizawl 400/132 kV	-	2x315 MVA
36.		Melriat-II 765/400 kV	-	3x1500 MVA
37.		Imphal (New) 765/400 kV	-	2x1500 MVA
38.		Mawlai 400/220 kV	-	3x500 MVA
39.		Nangalbibra (ISTS) 400/220/132 kV	-	3x315 MVA
40.		Killing (ISTS) 400/220 kV S/s	-	6x500 MVA
Total			41760	68175

17.13. Apart from above pooling stations, bay extension would also be required at following existing substations.

Table 17-4 Bay extension required at existing sub-stations

S.No.	Name of existing S/s	No. of Bays	
		Upto 2035	Beyond 2035
1	Mariani 400/220 kV	2 No. of 400 kV	-
2	Gogamukh 400/220 kV	2 No. of 400 kV	-
3	Khumtai (AEGCL) 400/220 kV	2 No. of 400 kV	-
4	Bornagar 765/400 kV	4 No. of 765 kV	4 No. of 400 kV
5	Silchar 400/220 kV	-	4 No. of 400 kV
6	Itanagar (DoP) 400/132 kV	-	2 No. of 132 kV
7	Rowta (AEGCL) 220/132 kV	-	2 No. of 220 kV
8	Siliguri 400/220 kV	-	2 No. of 400 kV
9	Katihar 400/220 kV	-	2 No. of 400 kV
10	Nangalbibra (ISTS) 400/220 kV	-	2 No. of 400 kV
11	New Shillong 220/132 kV	-	2 No. of 220 kV
12	Bongaigaon 400/220 kV	-	2 No. of 400 kV

17.14. The total exploitable hydroelectric potential in Brahmaputra Basin (i.e. 64945.2 MW) (excluding PSPs) planned to be pooled at ISTS (94%) and Intra-State

(6%) transmission system is shown at Figure 17-1.

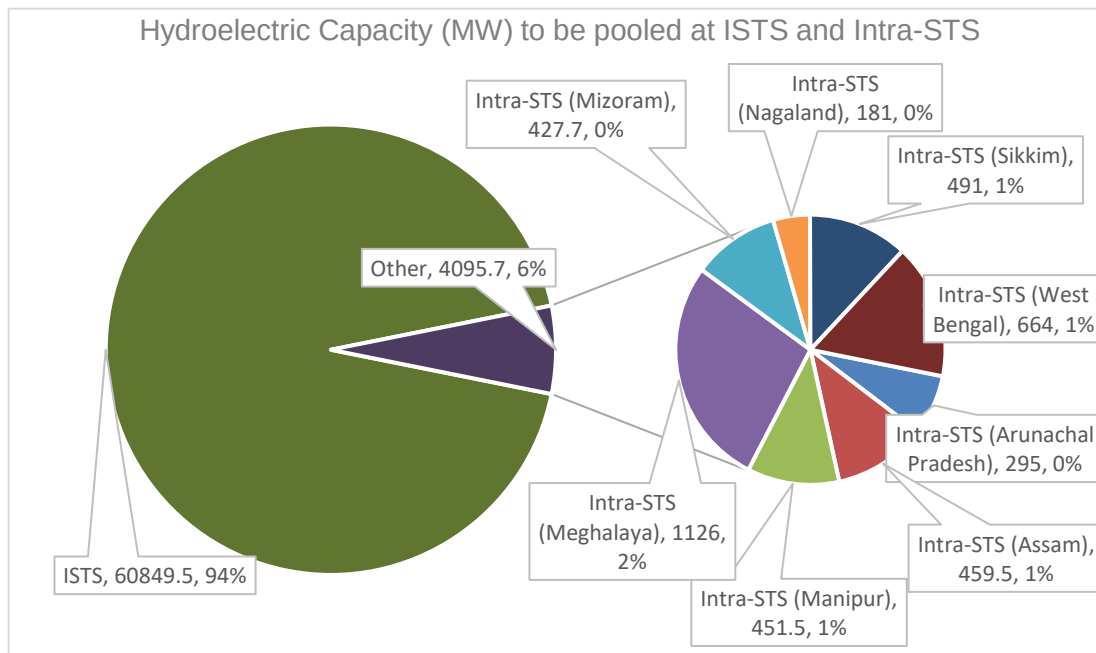


Figure 17-1 Hydroelectric Capacity (MW) to be pooled at ISTS and Intra-STs

17.15. In addition to above 11,130 MW hydroelectric potential of Pumped Storage Plants (PSPs) have also been envisaged. The planned capacity (MW) to be pooled at ISTS and Intra-State transmission system is as under.

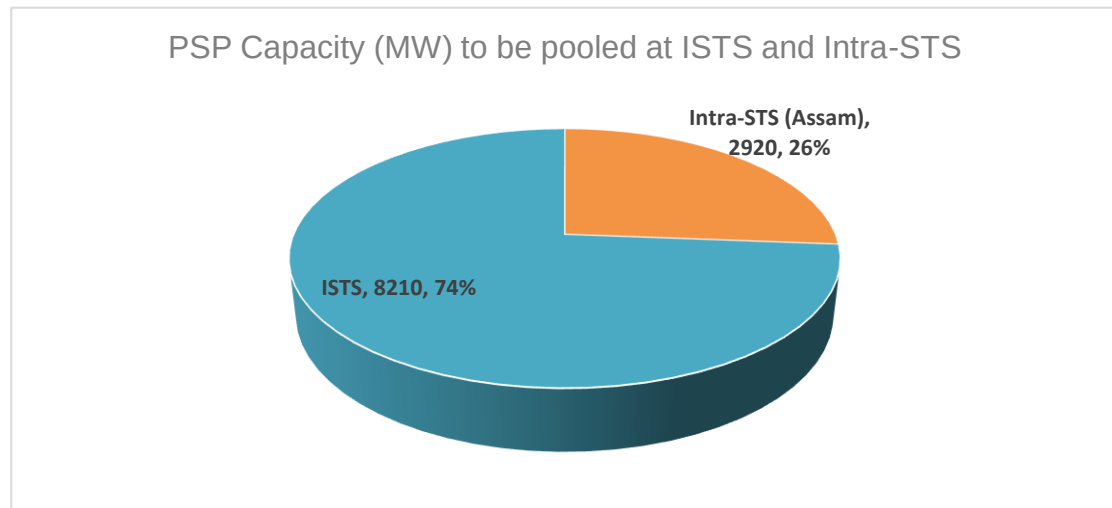


Figure 17-2 PSP Capacity (MW) to be pooled at ISTS and Intra-STs

17.16. By 2035, out of total potential of 19,552 MW (excluding PSPs), 18,752 MW (96%) of the capacity has been planned to be connected to ISTS. PSPs capacity of 800 MW (22%) is planned at ISTS.

17.17. Upto the year 2035, addition of 9,922 ckm transmission lines (including 6,000 ckm HVDC corridor) and 41,760 MVA capacity (including 12,000 MW HVDC) with estimated cost of Rs. 1,91,009 crore has been envisaged. Further, beyond 2035 addition of 21,475 ckm transmission lines (including 15,000 ckm HVDC

corridor) and 68,175 MVA capacity (including 30,000 MW HVDC) with estimated cost of Rs. 4,51,935 crore will be required.

17.18. Total 31,397 ckm and 1,09,935 MVA+MW addition and total Rs. 6,42,944 cr. (including extension at existing substations) have been envisaged in this master plan.

17.19. The graph indicating the ckm and MVA addition and estimated cost for the timeframe upto 2035 and beyond 2035 is shown at Figure 17-3, Figure 17-4 and Figure 17-5 below.

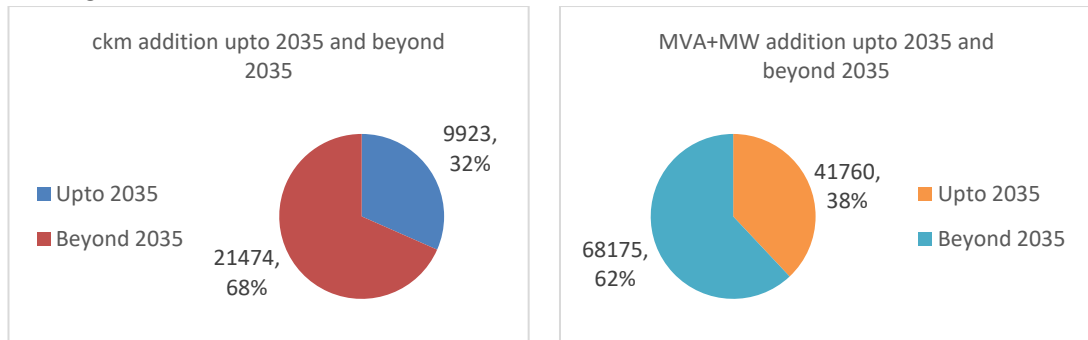


Figure 17-3 ckm addition upto 2035 and beyond 2035 Figure 17-4 MVA addition upto 2035 and beyond 2035

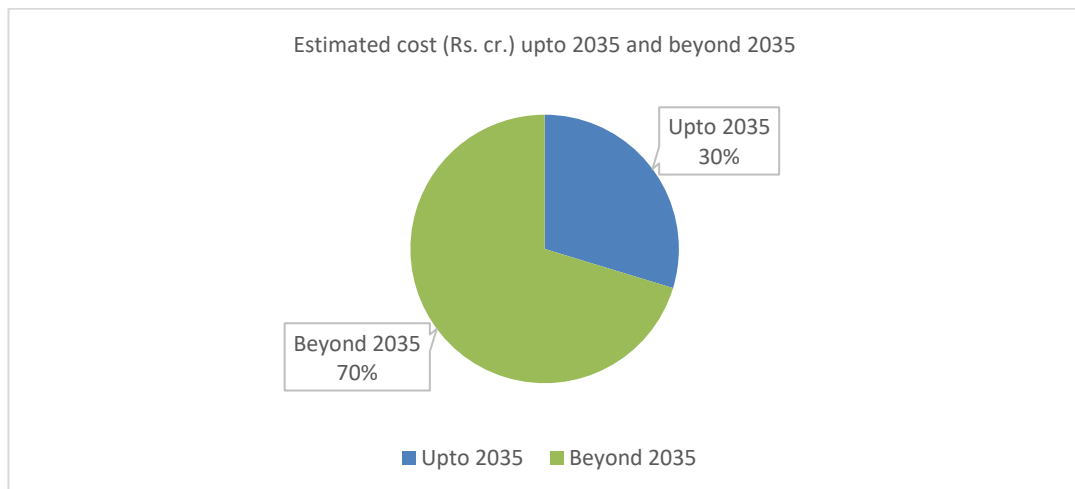


Figure 17-5 Estimated cost (Rs. cr.) upto 2035 and beyond 2035

17.20. Basin wise capacity and ckm addition and with estimated cost (in Rs. Cr.) (excluding bay extension) for the time frame of 2035 and beyond 2035 is shown at figures below.

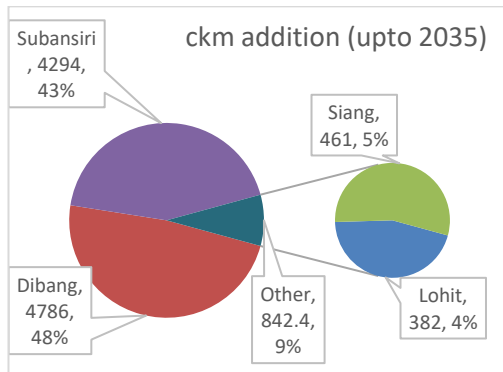


Figure 17-6 ckm addition (upto 2035)

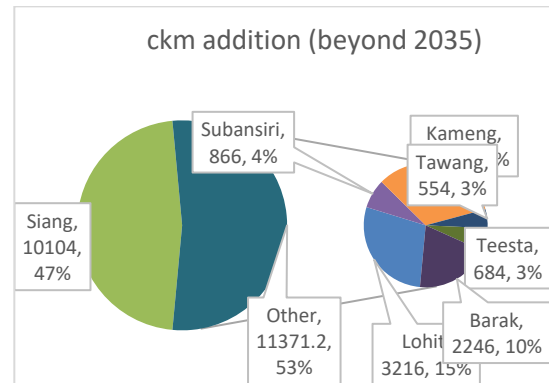


Figure 17-7 ckm addition (beyond 2035)

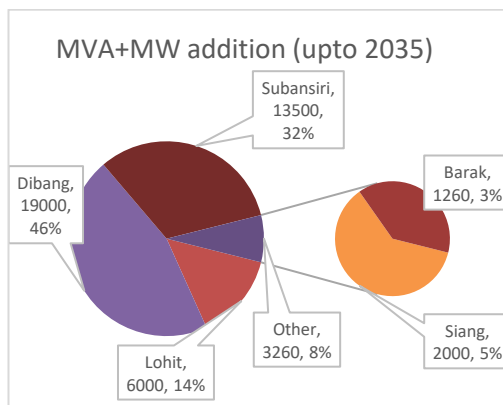


Figure 17-8 MVA addition (upto 2035)

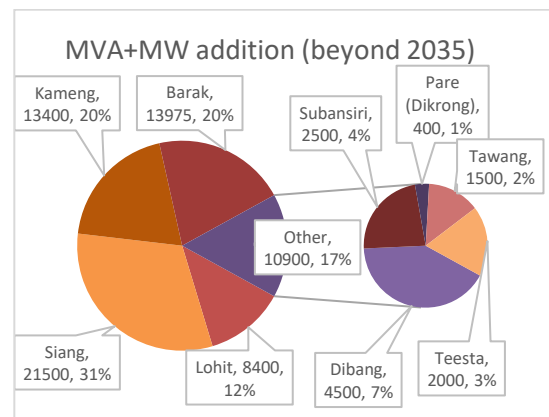


Figure 17-9 MVA addition (beyond 2035)

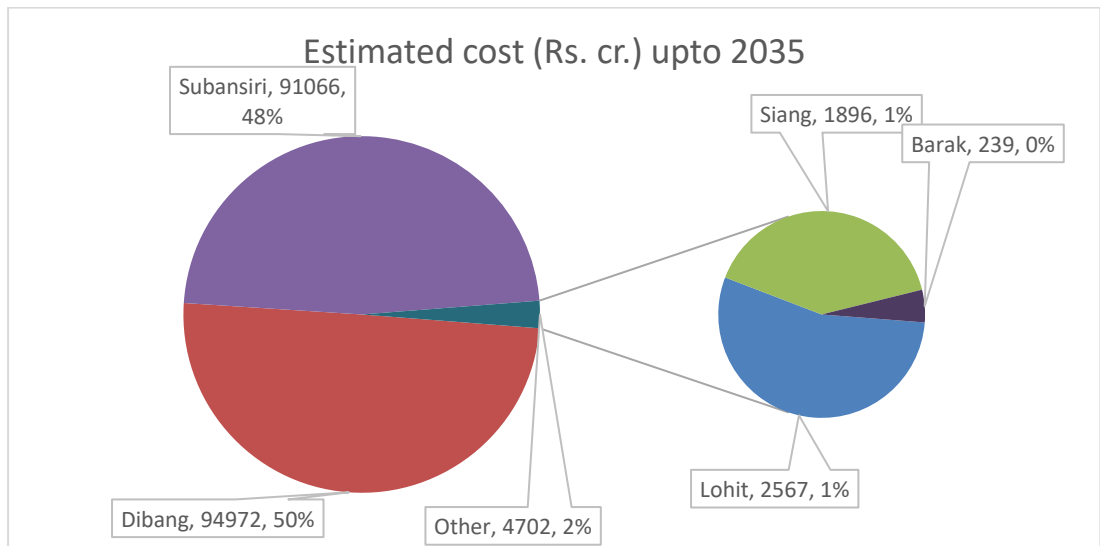


Figure 17-10 Basin wise estimated cost (Rs. cr.) upto 2035

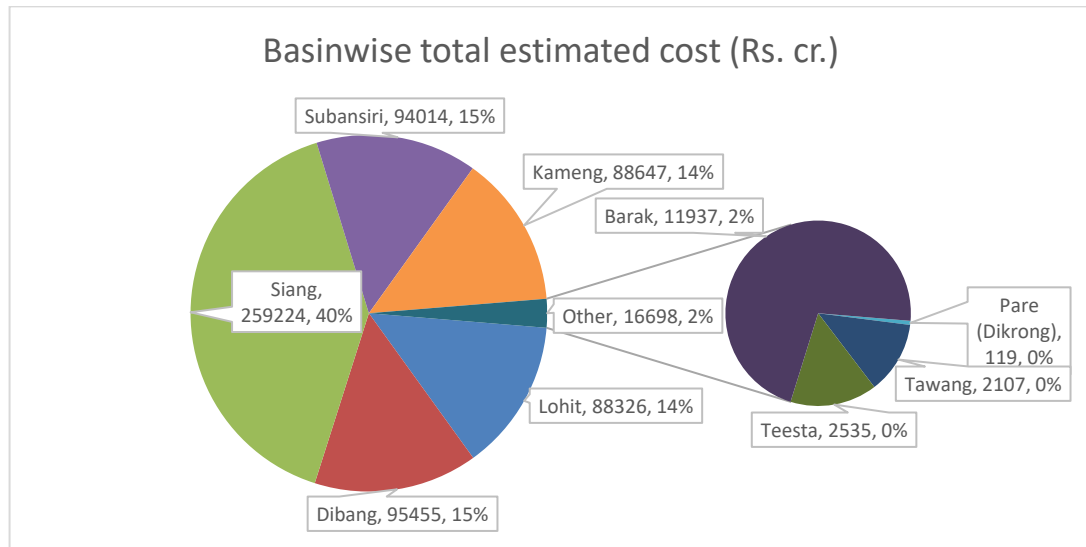


Figure 17-11 Basin wise total estimated cost (Rs. cr.)

- 17.21. The system identified for the HEPs are tentative, and final evacuation system for HEPs could only be ascertained after Connectivity application submitted by the Developer to CTUIL under Central Electricity Regulatory Commission (Connectivity and General Network Access to the inter-State Transmission System) Regulations, 2022 and amendments or re-enactment thereof or to STUs as per regulations of respective SERC.
- 17.22. The map showing the transmission system of evacuation of HEPs in Brahmaputra Basin is attached as Annexure-II.

Annexure-I

F.No.14-15/16/2021-H.I(259535)
Government of India
Ministry of Power

New Delhi, dated 22 December 2021.

To
The CMDs of NHPC/THDCIL/SJVNL/NEEPCO.

Subject:- Basin-wise indication of projects in NER to the Hydro CPSUs - reg.

Sir,

I am directed to refer to the meeting held under the Chairmanship of Hon'ble Minister of Power & NRE on the subject held on 12.11.2021. In the context of the energy transition goals set for the country it is imperative to enhance significantly the hydro power capacity in the country. Also the indicated hydro power projects at the already identified suitable sites need to be pursued by CPSUs with all earnestness.

2. In addition to the above, I am directed to forward herewith the basin-wise identification of projects in Arunachal Pradesh to the Hydro CPSUs of Ministry of Power (**copy enclosed**). As detailed in the above mentioned meeting, the following regions are identified to be pursued for Hydro Projects by the respective CPSUs.

Uttarakhand	-	THDCIL
Himachal Pradesh	-	SJVNL
UT of Jammu and Kashmir and Ladakh	-	NHPC, except Ujh HEP by NEEPCO

3. The concerned CPSUs will be responsible to take up the matter with the concerned State Government, carry suitable analysis and prepare expeditiously the evaluation reports on the project indicated. Progress made by CPSUs in this regard will be reviewed soon.

4. This issues with the approval of Hon'ble Minister of Power & NRE.

Encl: As above

Yours faithfully,


(Ashok Kumar)
Director(H.I)
Tele: 23723828.

Copy to:

- 1) Chief Secretaries of Government of Arunachal Pradesh/Himachal Pradesh/Uttarakhand/ UT of Jammu & Kashmir/ Advisor to Hon'ble Lt. Governor UT of Ladakh/ Commissioner (Power), Government of Arunachal Pradesh with a request extend all necessary support to the CPSUs.
- 2) PS to Hon'ble Minister of Power & NRE/PS to Hon'ble Minister of State for Power
- 3) PPS to Secretary (Power)/PPS to Addl. Secretary (Hydro)/PPS to Joint Secretary (Hydro)/PS to Director(H.I/H.II)/DD(NHPC/BBMB/SJVNL)

File No.14-15/16/2021-HYDEL-I(MoP)

BASIN WISE HEPs IN ARUNACHAL PRADESH (ABOVE 25 MW CAPACITY)

S. No.	Name of Project	Basin/ River	Agency	Possible Allotment to Agency	I.C. (MW)	Date of MOU	Status	Remarks
Tawang Basin								
1	Tawang-I	Tawang/ Tawangchu	NHPC	NEEPCO	600	24.06.2007	Concurred by CEA on 10.10.2011	There is significant feeling against NHPC at the ground level due to mishandling by earlier officers. The matter was discussed in the meeting on 12.11.21. The projects suggested to be allotted to NEEPCO
2	Tawang-II	Tawang/ Tawangchu	NHPC	NEEPCO	800	24.06.2007	Concurred by CEA on 22.09.2011	
Sub-total (Tawang Basin)					1400			
Kameng Basin								
3	Talong (Londa)	Kameng/ Kameng	GMR Energy Ltd.	NEEPCO	225	24-01-2007	Concurred by CEA on 16.08.2013	Kameng HEP (600 MW) of NEEPCO already in-operation in Kameng Basin.
4	Phanchung (Pachi)	Kameng	M/S CESC Ltd.(SPV-Pachi Hydro Power Projects Ltd.)	NEEPCO	56	25-10-2007 (Revised MOU on 16-05-2012)	Concurred by State Govt. on 23.09.2014.	
5	Dibbin	Kameng/ Bichom	JV of KSK Electricity Financing India Pvt. Ltd. & NEEPCO	NEEPCO	120	25-01-2007	Concurred by CEA on 04.12.2009.	
6	Nafra	Kameng/ Bichom	SEW Nafra Power Corporation Ltd.	NEEPCO	120	14/9/2007	Concurred by CEA on 11.02.2011. Terminated by State Govt. on 23.12.2019	
7	Khuitam	Kameng/ Bichom	Adishankar Power Pvt. Ltd.	NEEPCO	66	12/6/2007 (17.05.2010 for 66 MW)	Concurred by State Govt. on 24.12.2010.	
8	Saskangrong	Kameng/ Timkong Rong	Patel Engineering Ltd.	NEEPCO	45	18/5/2007	Concurred by State Govt. on 24.09.2012. Terminated by State Govt. on 09.11.2020.	
Sub-total (Kameng Basin)					632			
Dikrong Basin								

File No.14-15/16/2021-HYDEL-I(MoP)

Private			—	—				
9	Par	Dikrong	KVK Energy & Infrastructure Ltd. (M/s Mytrah Energy (India) Ltd.)	NEEPCO	52	26-12-2007	Concurred by State Govt. on 22.09.2015.	Ranganadi (405 MW) & Pare (110 MW) HEPs already in-operation by NEEPCO in Dikrong Basin.
Sub-total (Dikrong Basin)					52			
Siang Basin								
10	Simang-I	Siang	Adishankar Power Pvt. Ltd	NEEPCO	67	6/2/2008	Concurred by State Govt. on 28.06.2013.	Smaller projects on tributaries can be handled by NEEPCO.
11	Simang-II	Siang	Adishankar Power Pvt. Ltd	NEEPCO	66	6/2/2008 (Rev. 21.08.09)	Concurred by State Govt. on 10.06.2013.	
12	Siang Lower	Siang	Jaiprakash Associates Ltd.	NHPC/ NEEPCO	2700	22-02-2006 (Revised 8.12.2010)	Concurred by CEA on 16.02.2010.	Project on main stem and the bigger size projects on tributaries. Suggested to be handled by NHPC. May be NEEPCO can be a JV partner
13	Upper Siang	Siang		JV of NHPC and NEEPCO	10000		Proposed Project	Siang upper being of very big size could be handled by JV. Present suggestion is for a 10 percent share for NEEPCO
14	Pauk	Siang	Velcan Energy Ltd.	NEEPCO	145	30-06-2007 (rev MOA-31-07-09)	S&I held-up	These projects are in cascade and could be handled by one developer i.e.NEEPCO
15	Heo	Siang/ Yarjep	Velcan Energy Ltd.	NEEPCO	240	30-06-2007 (rev MOA-31-07-09)	Concurred by CEA on 28.07.2015.	
16	Tato-I	Siang/ Yarjep	Siyota HPPL (Velcan Energy Ltd.)	NEEPCO	186	30-06-2007 (rev MOA-31-07-09)	Concurred by CEA on 28.10.2015.	
17	Tato-II	Siang/ Siyom	Tato Hydro Power Pvt. Ltd. (Reliance Energy Ltd.)	NEEPCO	700	22-02-2006	Concurrence accorded by CEA on 22.05.2012.	Hirong, Naying and Tato-II would need to be optimised considering the views of MOEF hence could be better handled by single developer . NEEPCO suggested
18	Hirong	Siang	Jaiprakash Associates Ltd.	NEEPCO	500	22-02-2006	Concurred by State Govt. on 10.04.2013. Terminated by State Govt. on 21.04.2021.	
19	Naying	Siang/ Siyom	D.S. Construction Ltd	NEEPCO	1000	22-02-2006	Concurred by CEA on 11.09.2013.	

File No.14-15/16/2021-HYDEL-I(MoP)

							Terminated by State Govt. on 27.04.2021.	
Sub-total (Siang Basin)					15604.0			
Subansiri Basin								
20	Subansiri Middle (Kamala)	Subansiri/ Kamla	Kamala HECL (Jindal Power Ltd.)	NHPC	1800	28/08/2009	DPR submitted in CEA on Oct.2013. Returned on 29.01.2018.	Subansiri Basin already with NHPC. Project is of bigger size. May be given to NHPC
21	Subansiri Upper	Subansiri/ Subansiri	KSK Energy Ventures Pvt. Ltd.	NHPC	2000	18.03.2010	S&I held-up	NHPC is already developing Subansiri Lower (2000 MW) in this basin. Another project Kurung is in Subansiri Upper Basin, is reported to be allotted to NEEPCO already.
Sub-total (Subansiri Basin)					3800.0			
Dibang Basin								
22	Dibang	Dibang	NHPC	NHPC	2880	24.06.2007	Concurred by CEA on 18.09.2017.	NHPC is already developing Dibang (2880 MW) in this basin. It was discussed in the meeting of 12.11.21 that the capacity available in Arunachal Pradesh needs all the four PSUs to be present there. In the interest of having SJVN also in Ar. P the projects other than Dibang is sought to be indicated for SJVN
23	Etalini	Dibang/ Dri & Tangon	Jindal Power Ltd. (JV with HPDCAPL) - Etalini H.E. Power Co.Ltd.	SJVN	3097	8/12/2008	Concurred by CEA on 12.07.2013.	
24	Attunli	Dibang/ Tangon	Jindal Power Ltd. (JV with HPDCAPL) - Attunli H.E. Power Co.Ltd.	SJVN	680	8/12/2008	Concurred by CEA on 02.07.2018.	
25	Emini	Dibang/ Mathun	Emini Hydro Power Pvt. Ltd. (Reliance Energy Ltd.)	SJVN	500	2/3/2009	S&I held up. Terminated by State on 27.03.2019	
26	Mihumdon	Dibang/ Dri	Mihumdon Hydro Power Pvt. Ltd. (Reliance Energy Ltd.)	SJVN	400	2/3/2009	S&I held up.Terminated by State on 25.03.2019	
27	Amulin	Dibang/ Mathun	AMULIN Hydro Power Pvt. Ltd. (Reliance Energy Ltd.)	SJVN	420	2/3/2009	S&I held up. Terminated by State on 25.03.2019	
Sub-total (Dibang Basin)					7977			

File No.14-15/16/2021-HYDEL-I(MoP)

	Lohit Basin							
28	Kalai-II	Lohit/Lohit	Kalai Power Pvt. Ltd. (Reliance Power Ltd.)	THDC	1200	2/3/2009	Concurred by CEA on 27.03.2015.	Lohit basin projects could be done by THDC. As discussed in the meeting of 12.11.21, all four CPSUs need to be present in the state of Arunachal Pradesh given its potential.
29	Demwe(Lower)	Lohit	Athena Energy Venture (P) Ltd.	THDC	1750	9/7/2007	Concurred by CEA on 20.11.2009.	
	Sub-total (Lohit Basin)				2950.0			
	Total (Arunachal Pradesh)				32415			

Annexure-II

The diagram illustrates a power system with the following components and connections:

- Power Stations (PS) and Substations:**
 - Gongri PS (1006MW):** Located at the bottom left, connected to various stations via blue lines.
 - Pakke PS (476MW):** Located in the upper right, connected to Marjing, Chanda, Badok, Pakke Bung, and Talong Londa via red lines.
 - Talong PS (937MW):** Located in the upper right, connected to Marjing, Chanda, Badok, Pakke Bung, Talong Londa, Phaochung, Pao, Pao Valley, Nafra, Doh, Khuliam, Dirchang, Gongri, Sakaingrong, Meong, Pachuk I, Pachuk II Lower, Pachuk II (Satuk), Uung, Jamei, and Kmi via red lines.
 - Rowta PS/HVDC:** Located at the bottom center, connected to Gongri PS, Pakke PS, Talong PS, and other stations via green lines.
- Other Stations and Capacities:**
 - Marjing (38MW), Chanda (115MW), Badok (94MW), Pakke Bung I (48MW), Talong Londa (Takong) (223MW), Phaochung (36MW), Pao (100MW), Pao Valley (45MW), Nafra (120MW), Doh (120MW), Khuliam (62MW), Dirchang (BL/T & Maithing) (252MW), Gongri (144MW), Sakaingrong (45MW), Meong (32MW), Pachuk I (95MW), Pachuk II Lower (Kipak Loph) (62MW), Pachuk II (Satuk) (54MW), Uung (76MW), Jamei (Tangli) (172MW), and Kmi (535MW).
- Connections:**
 - Blue lines connect Gongri PS to Meong, Sakaingrong, Gongri, Dirchang, Khuliam, Pachuk I, Pachuk II Lower, Pachuk II (Satuk), Uung, Jamei, and Kmi.
 - Red lines connect Pakke PS and Talong PS to Marjing, Chanda, Badok, Pakke Bung, Talong Londa, Phaochung, Pao, Pao Valley, Nafra, Doh, Khuliam, Dirchang, Gongri, Sakaingrong, Meong, Pachuk I, Pachuk II Lower, Pachuk II (Satuk), Uung, Jamei, and Kmi.
 - Green lines connect Rowta PS/HVDC to Gongri PS, Pakke PS, Talong PS, and other stations.

[illegible][illegible]

6000 MW	Beyond 2035
3000 MW (Existing)	
6000 MW	By 2035
6000 MW	Beyond 2035
6000 MW	Beyond 2035
6000 MW	Beyond 2035
6000 MW	Beyond 2035
6000 MW	By 2035

[illegible]

The diagram illustrates the power grid structure. It shows a network of substations and transmission lines. The Tapang (20MW) and DB (20MW) substations are connected to the Intra state of Arunachal Pradesh. The Yangmou (30MW) and Jharu Storage (28MW) substations are connected to the Intra state of Nagaland. The Dikhu Garm PSH (18MW) is also connected to the network, and the Maitakchik (POWERGRID) substation is shown at the bottom.

The diagram illustrates a network of connections between various locations, categorized into two main groups: 'To Intra State of Meghalaya' and 'To Intra State of Assam'. The locations are represented by nodes, and the connections are represented by lines of different styles and colors.

- To Intra State of Meghalaya:**
 - Locations: Lunglees, Jowai, Shillong, and others.
 - Connections: Solid green lines, dashed green lines, and dotted green lines.
- To Intra State of Assam:**
 - Locations: Guwahati, Dibrugarh, Jorhat, and others.
 - Connections: Solid red lines, dashed red lines, and dotted red lines.

The diagram also shows connections between the two states, represented by solid black lines and dashed black lines.

LEGEND

EXISTING LINE
UNDER CONSTRUCTION/PLANNED

HYDRO TRANSMISSION LINE
750 KV TRANSMISSION LINE
400 KV QUAD TRANS. LINE
400 KV TRANSMISSION LINE
220 KV TRANSMISSION LINE
132 KV TRANSMISSION LINE
33 KV TRANSMISSION LINE

POOLING POINT
HYDRO ELECTRIC PLANT
PUMPED STORAGE PLANT

© E.ON UK plc. Currently operated at 220kV. Planned to be operated at 400 kV beyond 2035.

Hydropower, with its renewable and balancing capabilities, combined with an integrated transmission network, forms the cornerstone of India's strategy for a resilient and sustainable power system.

Central Electricity Authority

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