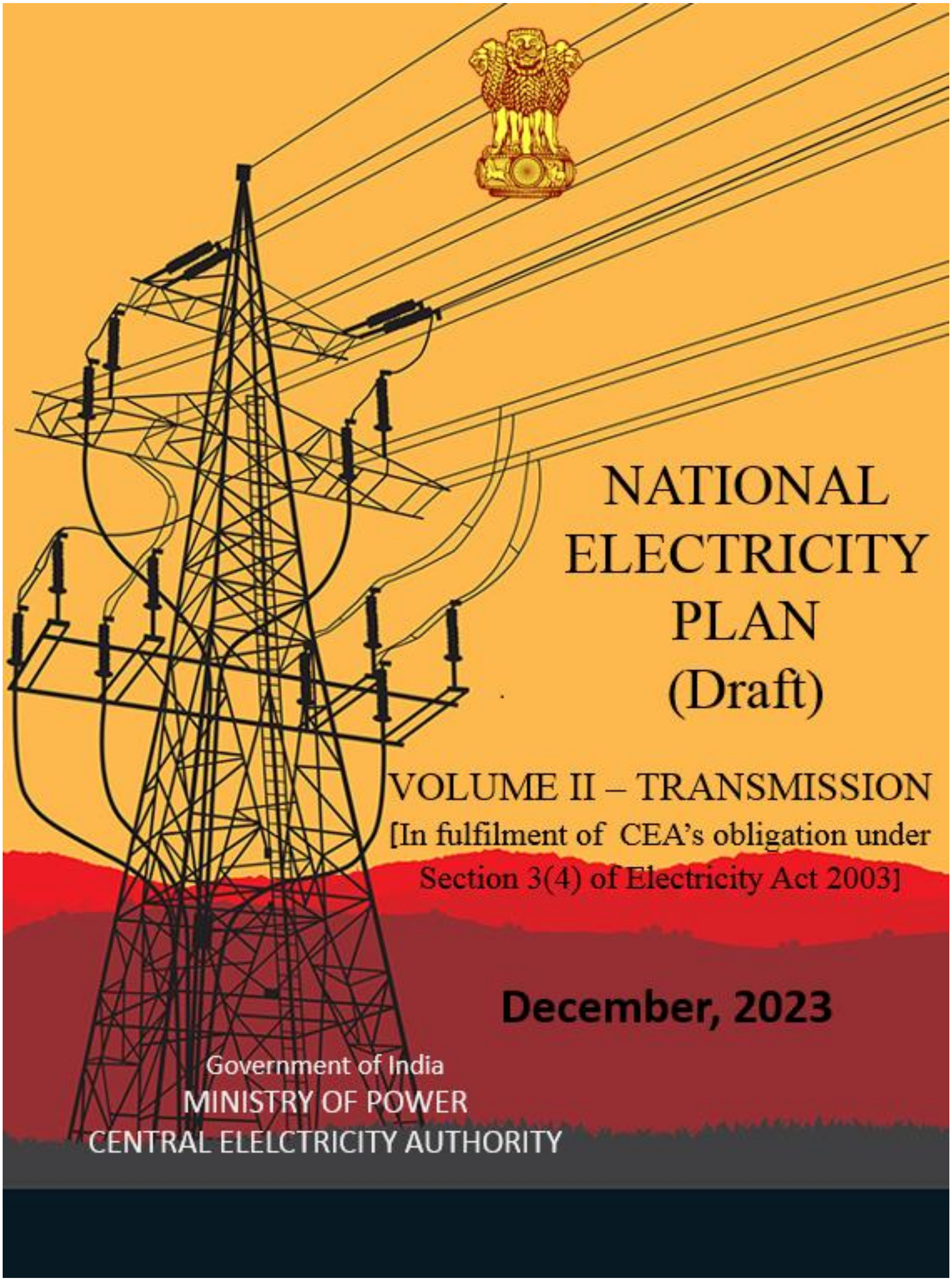

NATIONAL ELECTRICITY PLAN (Draft)

VOLUME II – TRANSMISSION

[In fulfilment of CEA's obligation under Section 3(4) of Electricity Act 2003]

December, 2023

Government of India
MINISTRY OF POWER
CENTRAL ELELCTRICITY AUTHORITY

Contents

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Executive Summary

India is now amongst the fastest developing countries in the world in terms of GDP as well as the electricity consumption. Electricity demand in the country has increased at a CAGR of about 5 % per annum during the period 2017-22. During the period 2022-27, electricity demand is projected to increase at a CAGR of about 6.4 % per annum. The development of an efficient, coordinated, economical and robust electricity system is essential for smooth flow of electricity from generating station to load centers and for optimum utilization of resources in the country in order to provide reliable, affordable, un-interruptible (24x7) and Quality Power for All.

Transmission system establishes the link between source of generation on one side and distribution system, which is connected to load / ultimate consumer, on the other side. Transmission planning is a continuous process of identification of transmission system addition requirements, their timing and need. Need for augmentation of transmission system could arise from the following:

a) new generation additions in the system,
b) increase in electricity demand,
c) system strengthening that may become necessary to achieve reliability.

The transmission systems that are in place in the country consist of Inter-State Transmission System (ISTS) and Intra State Transmission System (Intra-STS). ISTS is developed by the Inter-State Transmission Licensees. On the other hand, intra-state transmission system is developed by State Transmission Utilities / intra-state transmission licensees.

As per Section 3 of the Electricity Act 2003, Central Electricity Authority (CEA) has been entrusted with the responsibility of preparing the National Electricity Plan (NEP) in accordance with the National Electricity Policy and to notify such plan once in five years.

The National Electricity Plan (Volume I) on Generation Planning was published on 31.05.2023. Now, Draft National Electricity Plan, Volume II (Transmission), is hereby published for suggestions and comments from all stakeholders, including public. The National Electricity Plan (Volume II: Transmission) would be finalized considering relevant comments received from various stakeholders.

The draft National Electricity Plan (Volume II: Transmission), covers the review of development of transmission system during the period 2017-22, detailed planning for the period 2022-27, and perspective plan for the period 2027-32.

Review of Transmission System augmentation during the period 2017-22

1,10,281 ckm of transmission lines and 3,83,690 MVA of transformation capacity in sub-stations (at 220 kV and above voltage levels) was targeted to be added during the period 2017-22. Against this target, 88,865 ckm (about 80.6 % of the target) of transmission lines and 3,49,685 MVA (about 91% of the target) of transformation capacity addition (at 220 kV and above) have been achieved during the period 2017-22. In addition, 14,000 MW of HVDC bipole capacity as planned, has also been added during 2017-22 as detailed below:

Transmission System Type / Voltage Class	Unit	Target for 2017-22	Achievement during 2017-22	% achievement wrt target
Transmission Lines				

Transmission System Type / Voltage Class	Unit	Target for 2017-22	Achievement during 2017-22	% achievement wrt target
(a) HVDC ± 320 kV/ ± 800 kV Bipole	ckm	4040	3819	95%
(b) 765 kV	ckm	21603	19783	92%
(c) 400 kV	ckm	48092	36191	75%
(d) 230/220 kV	ckm	36546	29072	80%
Total-Transmission Lines	**ckm**	**110281**	**88865**	**81%**
Sub-stations- AC				
(a) 765 kV	MVA	109500	89700	82%
(b) 400 kV	MVA	178610	152306	85%
(c) 230/220 kV	MVA	95580	107679	113%
Total – AC Sub-stations	**MVA**	**383690**	**349685**	**91%**
HVDC				
(a) Bi-pole + Monopole	MW	14000	14000	100%
(b) Back-to-back capacity	MW	0	0	
Total - HVDC	**MW**	**14000**	**14000**	**100%**

The transmission network has increased to 4,56,716 ckm of transmission lines and 10,70,950 MVA of transformation capacity in substations by the end of 2021-22 (31.03.2022). There has been more increase in the transmission system at higher voltage levels (400 kV and 765 kV level). This aspect of growth in transmission system highlights the requirement of transmission network to carry bulk power over longer distances and at the same time optimize right of way, minimize losses and improve grid reliability.

Few of the planned transmission systems got delayed because of Right-of-Way (RoW) issues, non-availability/delay in getting forest clearance, contractual issues, delay in land acquisition for sub-stations, COVID-19 pandemic etc.

Transmission System requirement during the period 2022-27

The expansion of the transmission system depends on the projected electricity demand and the generation capacity addition during a particular time frame. As per the 20th Electric Power Survey (EPS) Report, the projected peak electricity demand during 2026-27 is 277.2 GW. The installed generation capacity likely at the end of 2026-27 is 609.6 GW on all-India basis (as per National Electricity Plan Vol I: Generation), the details are as given below.

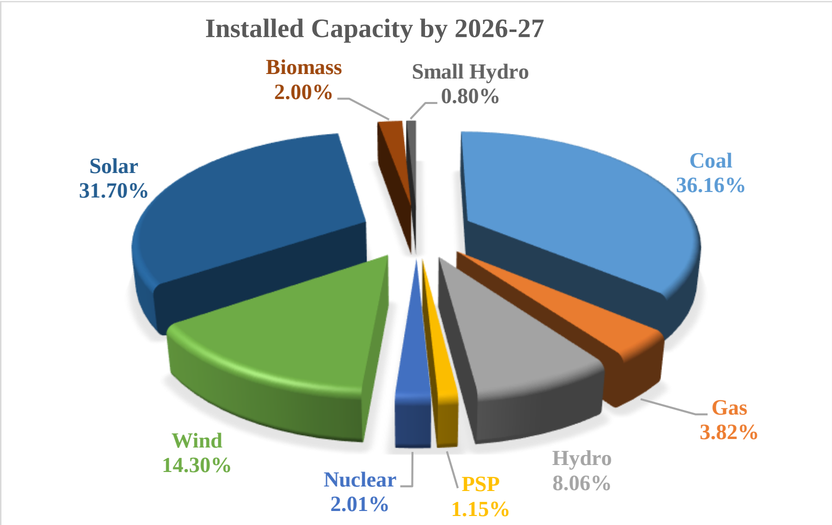
Installed Generation Capacity (MW) likely by 2026-27 as per NEP (Volume-I) Generation

Installed Generation Capacity projected at the end of 2026-27 (in MW)											
State	**Coal**	**Gas**	**Hydro**	**PSP**	**Nuclear**	**Wind**	**Solar**	**Biomass**	**Small Hydro**	**Total**	**BESS**
Total All India	235133	24824	52446	7446	13080	72896	185566	13000	5200	**609591**	8680

However, as per SECI/MNRE additional RE capacity is likely to be added by March, 2027. Some additional RE capacity addition has also been planned by States/UTs. To meet the requirement of RTC power, additional storage capacity is also planned along with the RE capacity. Hence, for the purpose of transmission planning, the additional wind and solar generation capacity (about 20 GW each wind and solar) as well as additional BESS have been considered. Details of the installed generating capacity considered by the year 2026-27 for the purpose of transmission planning, considering about 40 GW additional wind/solar generation capacity is given below.

Installed Generation Capacity (MW) likely by 2026-27 for the purpose of transmission planning

Installed Generation Capacity projected at the end of 2026-27 (in MW)											
State	**Coal**	**Gas**	**Hydro**	**PSP**	**Nuclear**	**Wind**	**Solar**	**Biomass**	**Small Hydro**	**Total**	**BESS**
Total All India	235133	24824	52446	7446	13080	92992	206146	13000	5200	**650267**	13500



The adequacy of existing and under construction transmission system and requirement of additional transmission system has been assessed based on the power system studies with representation of the power system network of the state as well as inter-state transmission system. The cross border power transfer with neighbouring countries have also been considered. The Load-generation balance scenarios have been worked out for nine scenarios (three scenarios each for February, June & August) in 2026-27 time frame. The existing transmission system and generation projects as well as those planned for the period 2022-27 have been considered in the study.

Transmission System augmentation required during the period 2022-27

Based on the studies, about 1,23,577 ckm of transmission lines and 7,10,940 MVA of transformation capacity in the substations (at 220 kV and above voltage levels) are required to be added during the period 2022-27. Likely growth of transmission system from 2016-17 to 2026-27 is given below:

Transmission System Type / Voltage Class	Unit	At the end of 2016-17 (31.03.2017)	Addition During 2017-22	At the end of 2021-22 (31.03.2022)	Likely addition during 2022-27	Likely at the end of 2026-27 (31.03.2027)
Transmission Lines						
(a) HVDC ± 320 kV/ 500 kV/800 kV Bipole	ckm	15556	3819	19375	4300	23675
(b) 765 kV	ckm	31240	19783	51023	35005	86028
(c) 400 kV	ckm	157787	36191	193978	38245	232223

Transmission System Type / Voltage Class	Unit	At the end of 2016-17 (31.03.2017)	Addition During 2017-22	At the end of 2021-22 (31.03.2022)	Likely addition during 2022-27	Likely at the end of 2026-27 (31.03.2027)
(d) 230/220 kV	ckm	163268	29072	192340	46027	238367
Total: Transmission Lines	**ckm**	**367851**	**88865**	**456716**	**123577**	**580293**
Sub-stations						
(a) 765 kV	MVA	167500	89700	257200	319500	576700
(b) 400 kV	MVA	240807	152306	393113	268135	661248
(c) 230/220 kV	MVA	312958	107679	420637	123305	543942
Total: Sub-stations	**MVA**	**721265**	**349685**	**1070950**	**710940**	**1781890**
HVDC						
(a) Bi-pole link capacity	MW	16500	14000	30500	12000	42500
(b) Back-to back capacity	MW	3000	0	3000	0	3000
Total- HVDC	**MW**	**19500**	**14000**	**33500**	**12000**	**45500**

14,625 ckm of transmission lines and 75,902 MVA of transformation capacity has been commissioned during 2022-23. 7,026 ckm of transmission lines and 29,521 MVA of transformation capacity has been commissioned during 2023-24 (till October, 2023).

Inter-Regional Transmission Links

There has been substantial growth in inter-regional power transmission capacity to facilitate smooth flow of power from surplus to deficit regions and for optimum utilization of the country's generation resources. Aggregate inter-regional transmission capacity by the end of 2021-22 was 1,12,250. The required aggregate inter-regional power transmission capacity by 2026-27 is 1,43,850 MW. Summary of inter-regional transmission capacity is given below:

Inter-regional Transmission Capacity (MW)			
	Capacity as on 31.03.2022 (MW)	**Likely addition during the period 2022-27 (MW)**	**Expected by the end of 2026-27 (31.03.2027) (MW)**
East-North	22530	0	22530
East-West	21190	1600	22790
West- North	36720	20000	56720
East- South	7830	0	7830
West- South	18120	10000	28120
East- North East	2860	0	2860
North East-North	3000	0	3000
TOTAL	**112,250**	**31,600**	**143,850**

Reactive Compensation

In order to provide reactive power support to the grid under steady state as well as under dynamic conditions, adequate reactive compensation in form of bus reactor & line reactors (765 kV & 400 kV) and Static Compensators (STATCOMs) have been planned. Further, it is also planned to keep the space for addition of STATCOMs and bus reactors at upcoming substations especially associated with RE generations.

Estimated Cost of Transmission System during the period 2022-27

An estimated expenditure of Rupees 4,75,804 crore would be required for implementation of additional transmission system in the country (transmission lines, sub-stations, reactive compensation etc.) during the period 2022-27.

Perspective Plan for the Period 2027-32

To provide broad information on transmission capacity requirement, perspective transmission plan for the period 2027-32 has been prepared based on peak electricity demand projections as per 20th EPS and expected generation capacity addition likely during the period. The projected installed generating capacity in the country at the end of 2031-32 would be about 900 GW. As per the 20th EPS Report, projected peak electricity demand in the country would be about 366 GW in 2031-32. Region-wise projected installed capacity is given below:

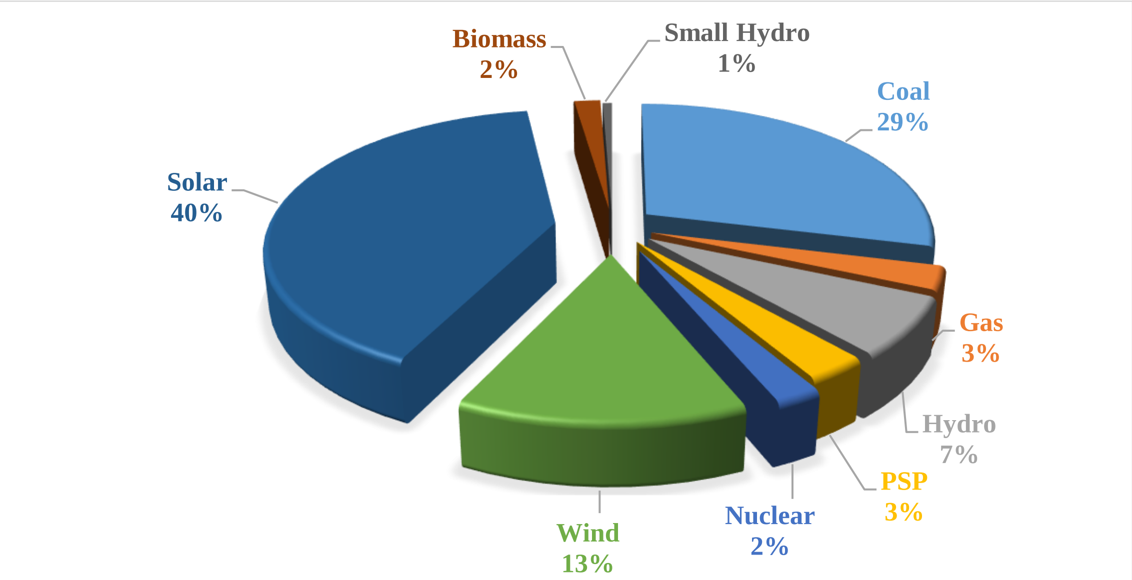
Likely Installed Generating Capacity in 2031-32

(fig. in MW)

Regions	Coal	Gas	Hydro	PSP	Nuclear	Wind	Solar[1]	Biomass	Small Hydro	Total[2]	BESS
Northern	54320	5781	28956	5360	6520	21327	168575	4758	1867	297464	27500
Western	93951	10806	5952	4780	3940	39842	69104	4569	742	233686	4000
Southern	54495	6492	10802	14646	9220	60726	125730	5407	2129	289646	20000
Eastern	56127	100	6765	1900	0	0	954	743	387	66975	0
North Eastern	750	1644	9704	0	0	0	203	23	326	12650	0
all India	259643	24824	62178	26686	19680	121895	364566	15500	5450	900422	51500

[1] Includes 60,207 MW of solar rooftop capacity

[2] BESS is not included in the total installed capacity



All India Installed generating capacity likely by 2031-32

Transmission system has been planned for wind, solar, hydro and nuclear capacity likely by March, 2032.

The transmission corridor capacity requirement during 2027-32 have been worked out broadly based on estimates of peak electricity demand and preliminary assessment of region-wise generation capacity addition possibility during 2027-32. As the demand/generation scenario evolves with passage of time, the transmission plan would be further firmed up.

Cross Border Power Transfer

At present, exchange of power between India and Neighbouring countries (Nepal, Bangladesh, Bhutan and Myanmar) is taking place in synchronous as well as asynchronous mode. Transmission links (at 11 kV, 33 kV, 132 kV and 400 kV levels) have been established between Border States (Bihar, UP, Uttarakhand, Tripura, West Bengal and Assam) of Indian Territory with neighbouring countries. Some interconnections are under construction and several cross border interconnections have been planned. At present about 4,100 MW of power is being exchanged with the neighbouring countries through cross border links and the same is likely to increase to about 7,000 MW by the end of 2026-27.

Interconnection between India and Sri Lanka is in advanced stage of discussion. Under One Sun One World One Grid (OSOWOG) initiative, interconnection of Indian Electricity Grid with Maldives, Singapore, UAE, Saudi Arabia etc. are under discussion.

Technology options for Transmission System

Indian power system is continuously expanding. Huge generation capacity addition and commensurate expansion & strengthening of the associated Transmission & Distribution network, operation of multiple agencies (State Utilities, Central Utilities, and Private players), expansion of electricity market, integration of huge quantum of generation from renewable sources and cross border interconnection have increased the complexity of Indian Power system.

In such an environment, adoption of right technological option, optimum utilization of transmission assets & transmission line corridors, balancing the variability in generation from Renewable Sources, improving quality during erection and commissioning / execution of the transmission system, increasing reliability and availability of the system etc. would play important role in smooth operation of power system.

Some of the technology options, which are considered to be beneficial for the overall development of the power system are : Hybrid sub-station; Digital Substation; Substation Automation System (SAS) with Process Bus; Multi Circuit / Multi circuit & multi voltage transmission line towers; Compact towers with insulated cross arms for optimum use of Right of Way (RoW); Extra High Voltage (EHV) XLPE Cable and Gas Insulated Lines (GIL) where overhead connection is not feasible; new generation High Temperature Low Sag (HTLS) conductors for enhancement of power flow per meter of Right of Way (RoW); Helicopter and UAV for route survey, erection and monitoring of transmission line; Phase Shifting Transformers (PST), Dynamic Line Rating/Loading; Voltage Sourced Converters (VSC) based HVDC, Grid Forming Inverters etc.

Cyber Security in Transmission

Cyber Security plays a very important role in smooth operation of the grid. To ensure that the electricity grid is resilient to cyber-attacks several steps have been taken like the CEA (Cyber Security in Power Sector) Guidelines 2021, formulation of Cyber Crisis Management Plan by power sector utilities, Establishment of National Critical Information Infrastructure Center, Notification of CSIRT-Power, Establishment of Security Operations Center and on boarding with Cyber Swachhta Kendra etc.

Transmission Plan for Renewable Energy Sources

The installed generating capacity from RE sources as on 31st March, 2022, was 157 GW (including large hydro), which was about 39% of the total installed capacity. As on 31st October 2023, the installed electricity generating capacity in the country from RE sources was 178.98 GW (including 46.85 GW large hydro), which is about 42% of the installed electricity generating capacity in the country. India has envisaged to increase the non-fossil fuel based installed electricity generation capacity to 500 GW by 2030. For enabling growth of Renewable Energy (RE) capacity, areas which have high solar and wind energy potential, needs to be connected to Inter-State Transmission System (ISTS), so that the power generated could be evacuated to the load centers. As a significant step towards successfully achieving the planned RE capacity by the year 2030, transmission system has been planned for about 537 GW of RE capacity by the year 2030.

Private Sector Participation in Transmission

Private sector has an important role to play in the development of power sector. Introducing competition in different segments of the electricity industry is one of the key features of the Electricity Act, 2003. The National Electricity Policy 2005, mentions about encouraging private investment in transmission sector. Tariff Policy mentions about tariff determination through competitive bidding. Government has taken a number of steps for creating an enabling framework for encouraging competition and private sector participation in transmission sector.

Till September 2023, 133 number of ISTS schemes have been identified for implementation through TBCB route. Out of these, 92 ISTS schemes with an estimated cost of Rs 1,23,725 Crores have already been awarded through Tariff Based Competitive Bidding (TBCB) route and 41 transmission schemes are currently under bidding. Out of the 92 ISTS Schemes awarded through TBCB route, four transmission schemes could not be implemented. The overall summary of 129 ISTS schemes (excluding four transmission schemes which could not be implemented) being implemented through TBCB route, in term of ckm and MVA capacity is summarized below:

Status of schemes recommended through TBCB route	No. of ISTS Schemes	765/400 kV transformation capacity (MVA)	400/220 kV transformation capacity (MVA)	HVDC ±800, ±500 kV (MW)	765 kV (ckm)	400 kV (ckm)	HVDC ±800, ±500 kV (ckm)
Commissioned	47	36500	19360	0	16400	13189	0
Under implementation	41	52500	25000	0	8547	5405	0
Under bidding	41	97500	32490	14500	12014	4456	5500
Total	**129**	**186500**	**76850**	**14500**	**36961**	**23050**	**5500**

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Chapter - 1

Introduction

1.1 National Electricity Plan

As per Section 3 of the Electricity Act 2003, Central Electricity Authority (CEA) has been entrusted with the responsibility of preparing the National Electricity Plan in accordance with the National Electricity Policy and notify such plan once in five years. The National Electricity Plan is brought out in two volumes i.e. Volume I (Generation) and Volume II (Transmission).

1.2 National Electricity Plan – Transmission

Transmission planning is a continuous process of identification of transmission system addition requirements, their timing and need. The transmission requirements could arise from the following:

(i) increase in generation capacity

(ii) increase in electricity demand

(iii) system strengthening that may become necessary to achieve reliability under changed load generation scenario.

These transmission addition requirements are identified, studied and firmed through transmission planning process.

1.3 Transmission System in India

The transmission system in the country consists of Inter-State Transmission System (ISTS) and Intra-State Transmission System (Intra-STS).

1.3.1 Inter-State Transmission System (ISTS)

ISTS serves the following purpose:

(i) Evacuation of power from Inter-State Generating Stations (ISGS) which have beneficiaries in more than one state.

(ii) Onwards transmission of power for delivery of power from inter-state generating stations up to the delivery point of the state grid.

(iii) Transfer of operational surpluses from surplus state(s) to deficit state(s) or from surplus region(s) to deficit region(s).

The Inter-State Transmission System (ISTS) are being built through Tariff Based Competitive Bidding (TBCB) route or Regulated Tariff Mechanism (RTM). Many private sector entities now Build Own and Operate the ISTS elements.

1.3.2 Intra State Transmission System (Intra-STS)

Intra-STS within the state are mainly owned and operated by the state transmission utilities of each state. The Intra-STS serves the following purpose:

(i) Evacuation of power from the state's generating (both under state and private sector) stations having beneficiaries in that State.

(ii) Onwards transmission within the State from ISTS boundary up to the various substations of the state grid network.

(iii) Transmission within the state grid for delivery of power to the load centres within the state.

1.4 Provisions in Electricity Act, 2003, related to Planning of Transmission System

As per Section 3, 38 and 39 of the Electricity Act 2003, transmission planning agencies in the country are CEA, CTUIL & STUs. CEA is coordinating transmission planning process under section 73(a) of the Electricity Act 2003.

Role of CEA in Transmission Planning

Role of CEA in transmission planning process as per Electricity Act 2003 is as follows:

(i) As per section 73 (a) of Electricity Act 2003, Central Electricity Authority (CEA) shall advise the central government on the matters relating to the National Electricity Policy, formulate short-term and perspective plans for development of the electricity system and co-ordinate the activities of the planning agencies for the optimal utilization of resources to subserve the interest of the national economy and to provide reliable and affordable electricity for all consumers.

(ii) As per section 3 (4) of Electricity Act 2003, CEA shall prepare National Electricity Plan in accordance with the National Electricity Policy and notify such plan once in five years.

(iii) As per section 3 (5) of Electricity Act 2003, CEA may review or revise the National Electricity Plan in accordance with the National Electricity Policy.

Role of CTUIL in Transmission Planning

Role of CTUIL in transmission planning process as per Electricity Act, 2003 is as under:

As per section 38 (2) of Electricity Act 2003, Central Transmission Utility of India Limited (CTUIL) performs the following functions:

a. To undertake transmission of electricity through Inter-State Transmission System.

b. To discharge all functions of planning and co-ordination relating to Inter-State Transmission System with State Transmission Utilities (STUs), Central Government, State Government, Generating Companies, Regional Power Committees (RPCs), Authorities, Licensees, any other person notified by the Central Government in this behalf.

c. To ensure development of an efficient, co-ordinated and economical system of Inter-State Transmission Lines for smooth flow of electricity from generating stations to the load centres.

d. To provide non-discriminatory open access to its transmission system for use by:

   (i) Any licensee and generating company on payment of the transmission charges; or

   (ii) Any consumer as and when such open access is provided by the State Commissions under sub-section (2) of section 42, on payment of the transmission charges and a surcharge thereon as may be specified by the Central Commission;

Role of State Transmission Utilities (STUs) in Transmission Planning

Role of STUs in transmission planning process as per Electricity Act, 2003 is as under:

As per section 39 (2) of Electricity Act 2003, STUs perform the following functions:

a. To undertake transmission of electricity through intra-State transmission system.

b. To discharge all functions of planning and co-ordination relating to intra-State transmission system with Central Transmission Utility, Central Government, State Government, Generating Companies, Regional

Power Committees (RPCs), Authorities, Licensees, any other person notified by the State Government in this behalf.

c. To ensure development of an efficient, co-ordinated and economical system of intra-State transmission lines for smooth flow of electricity from a generating station to the load centres.

d. To provide non-discriminatory open access to its transmission system for use by:

   (i) Any licensee or generating company on payment of the transmission charges.

   (ii) Any consumer as and when such open access is provided by the State Commission under sub-section (2) of section 42, on payment of the transmission charges and a surcharge thereon, as may be specified by the State Commission

1.5 Provisions in the National Electricity Policy related to Planning of Transmission System

Some of the transmission related provisions of the "National Electricity Policy" are given below:

"

(i) Adequate and timely investments and also efficient and coordinated action to develop a robust and integrated power system for the country.

(ii) While planning new generation capacities, requirement of associated transmission capacity would need to be worked out simultaneously in order to avoid mismatch between generation capacity and transmission facilities. The policy emphasizes the following to meet the above objective:

- *The Central Government would facilitate the continued development of the National Grid for providing adequate infrastructure for inter-state transmission of power and to ensure that underutilized generation capacity is facilitated to generate electricity for its transmission from surplus regions to deficit regions.*
- *The Central Transmission Utility of India Limited (CTUIL) and State Transmission Utility (STU) have the key responsibility of network planning and development based on the "National Electricity Plan" in coordination with all concerned agencies as provided in the Electricity Act. The CTUIL is responsible for the national and regional transmission system planning and development. The STU is responsible for planning and development of the intra-state transmission system. The CTUIL would need to coordinate with the STUs for achievement of the shared objective of eliminating transmission constraints in cost effective manner.*
- *Network expansion should be planned and implemented keeping in view the anticipated transmission needs that would be incident on the system in the open access regime. Prior agreement with the beneficiaries would not be a pre-condition for network expansion. CTUIL/STU should undertake network expansion after identifying the requirements in consultation with stakeholders and taking up the execution after due regulatory approvals.*
- *Structured information dissemination and disclosure procedures should be developed by the CTUIL and STUs to ensure that all stakeholders are aware of the status of generation and transmission projects and plans. These should form a part of the overall planning procedures.*

(iii) To facilitate orderly growth and development of the power sector and also for secure and reliable operation of the grid, adequate margins in transmission system should be created. The transmission capacity would be planned and built to cater to both the redundancy levels and margins keeping in view international standards and practices.

"

1.6 Provisions in Tariff Policy related to Planning of Transmission System

1.6.1 In compliance with Section 3 of the Electricity Act 2003, the Central Government notified the Tariff Policy on 6th January, 2006. Central Government notified the revised Tariff Policy to be effective from 28th January 2016. Some of related provisions of the Tariff Policy, which provide objective in development of transmission systems, are:

1.6.2 Objective (Section 7 of Tariff Policy)

- The tariff policy, insofar as transmission is concerned, seeks to achieve the following objectives:

  i. Ensuring optimal development of the transmission network ahead of generation with adequate margin for reliability and to promote efficient utilization of generation and transmission assets in the country;

  ii. Attracting the required investments in the transmission sector and providing adequate returns.

1.6.3 Implementation of the Transmission Schemes

Section 7.1 of Tariff Policy inter-alia states that

i. Investment by transmission developer including CTUIL/STUs would be invited through competitive bids in accordance with the guidelines issued by the Central Government from time to time.

ii. While all future inter-state transmission projects shall, ordinarily, be developed through competitive bidding process, the Central Government may give exemption from competitive bidding for (a) specific category of projects of strategic importance, technical upgradation etc. or (b) works required to be done to cater to an urgent situation on a case to case basis.

1.7 Provisions in CERC Regulations

CERC has issued Central Electricity Regulatory Commission (Connectivity and General Network Access to the inter-state Transmission System) Regulations, 2022, which covers Connectivity and General Network Access to the inter-state Transmission System. As per these regulations, access to General Network Access would be granted to State Transmission Utilities on behalf of intra-state entities, drawee entity connected to inter-state transmission system, distribution licensee or bulk consumer, trading licensees engaged in cross border trade of electricity and transmission licensee connected to ISTS for drawl of auxiliary power. Generating stations including renewable energy generating stations, captive generating plant, standalone energy storage systems and renewable power park developers have to apply for connectivity to inter-state transmission system.

1.8 Transmission Planning Methodology

1.8.1 Major inputs for carrying out planning of transmission system are as follows:

(i). Connectivity applications for evacuation of power from new generation projects as received by CTUIL/STUs as per appropriate regulation of CERC/SERC.

(ii). General Network Access applications from State Transmission Utilities, distribution licensee, bulk consumer etc. for drawl of power from inter-state transmission system as received by CTUIL.

(iii). Electricity demand projections, including projections from Electric Power Survey (EPS) Report of CEA.

(iv). Input from States regarding generating stations likely to be connected to the State Grid, transmission system requirement of the states etc.

(v). Operational Feedback viz. line overloading, high voltage/low voltage etc. in the system from Grid-India.

1.8.2 The studies have to be carried out for transmission system planning along with normative assumptions as specified in the "Manual on Transmission Planning Criteria" brought out by CEA. The manual includes general planning philosophy, reliability criteria, transmission equipment limits and their parameters, time horizon, load - generation scenarios, active and reactive power considerations etc.

1.9 Implementation of Transmission Schemes

1.9.1 Implementation of Inter-State transmission system (ISTS)

In respect of ISTS, the following structure for approval of ISTS scheme is being followed:

- CTUIL after consulting Regional Power Committee(s) [RPC(s)] shall submit the proposal for expansion of ISTS to the NCT (National Committee on Transmission) for their consideration. For proposal up to Rs.500 Crore, prior consultation with RPC would not be required. Schemes costing more than Rs. 500 Crore have to be recommended by NCT to MoP for approval.
- Schemes costing between Rs. 100 Crore to 500 Crore to be approved by NCT along with mode of implementation under intimation to MoP.
- Schemes costing less than or equal to Rs. 100 Crore to be approved by CTUIL along with mode of implementation under intimation to NCT & MoP.

The transmission schemes are implemented either through Tariff Based Competitive Bidding (TBCB) route or Regulated Tariff Mechanism (RTM), in accordance with provisions of the Tariff Policy.

1.9.2 Implementation of Intra- state transmission system (Intra-STS)

Intra-State Transmission system is implemented by the STUs. Tariff Policy, 2016, inter-alia states the following:

"*intra-state transmission projects shall be developed by State Government through competitive bidding process for projects costing above a threshold limit which shall be decided by the SERCs.*"

In line with the above provision, some States like Uttar Pradesh, Madhya Pradesh, Odisha etc. have initiated competitive bidding process for award of intra-state transmission schemes.

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Chapter - 2

Growth of Transmission System in India

2.1 Development of Transmission Systems in India

2.1.1 Formation of State Grids for Integrated Planning

At the time of independence, power systems in the country were essentially isolated systems developed in and around urban and industrial areas. The installed generating capacity in the country as on 31-12-1947 was 1362 MW and the power system consisted of small generating stations feeding power radially to load centres. The highest transmission voltage was 132 kV. The voltage level of state-sector network grew from 132 kV level during the 50s and 60s to 220 kV level during 60s and 70s. Subsequently, 400 kV network was also developed in many States (Utter Pradesh, Maharashtra, Madhya Pradesh, Gujarat, Odisha, Andhra Pradesh and Karnataka) for bulk power transfer over long distances. With the development of State Grids in most of the States of the country, stage was set for development of regional grids.

2.1.2 Concept of Regional Planning and Integration of State Grids

During the 3rd Five Year Plan (01-04-1961 to 31-03-1966), the concept of Regional planning in Power Sector was introduced. Accordingly, for the purpose of power system planning and development, the country was demarcated into five (5) Regions viz. Northern, Western, Southern, Eastern and North-Eastern. In 1964, the Regional Electricity Boards (REBs) were established in each of the Regions of the country for facilitating integrated operation of State Systems in the Region and encouraging exchange of power among the States. To encourage the States to build transmission infrastructure for exchange of power, Inter-State lines were treated as 'centrally sponsored' and the States were provided interest free loans. 55 Nos. of Inter-State lines were constructed under the programme out of which 13 lines were connecting the States located in different Regions and this created the initial set of inter-regional links. These lines facilitated exchange of power in radial mode among various Regions.

2.1.3 Evolution of Regional Grids

Till the year 1975, the development of transmission system was essentially by the State Electricity Boards (SEBs)/ Electricity Departments (EDs) in the States and Union Territories (UTs). In 1975, to supplement the efforts of the States in increasing generation capacities, Central Sector generation utilities viz. National Hydroelectric Power Corporation (NHPC) and National Thermal Power Corporation (NTPC) were created. These corporations established large generating stations for the benefit of States in a region. These corporations also undertook development of associated transmission lines for evacuation of power and delivery of power to the beneficiary States transcending State boundaries. This gave a fillip to the formation of Regional Grid Systems and by the end of 1980s, strong regional networks came into existence.

2.1.4 Development of Inter-Regional Links

In the year 1989, transmission wings of Central Generating Companies were separated to set up Power Grid Corporation of India (POWERGRID) to give thrust to implementation of transmission system associated with Central generating stations and inter-regional transmission programme based on perspective planning done by Central Electricity Authority (CEA). Till then, the generation and transmission systems in the country were planned and developed on the basis of regional self-sufficiency. The initial set of inter-regional links developed under the Centrally sponsored programme was utilized to facilitate exchange of operational surpluses among various Regions in a limited manner. It was mainly because the Regional Grids operated independently, experiencing different operating frequencies. The power exchanges on these inter-regional links could take place only in radial mode.

2.2 National Grid

The National Grid is a large, meshed transmission grid where all the regional and State grids are electrically connected (through AC and DC links) and operate at single frequency. The National Grid consists of the transmission system for evacuation of power from generating stations, the inter-regional links, Inter-State transmission system (ISTS) and Intra-State transmission system (InSTS) of the State Transmission Utilities (STUs). Thus, the development of national grid has been an evolutionary process**.**

2.2.1 Asynchronous Interconnections between Regional Grids

Considering the operational regime of the various Regional Grids, it was decided around 1990s to initially establish asynchronous connection between the Regional Grids to enable them to exchange large regulated quantum of power. Accordingly, the following High Voltage Direct Current (HVDC) back-to-back links were established:

- 500 MW HVDC link between the Northern Region (NR) and the Western Region (WR) at Vindhyachal
- 1000 MW HVDC link between Western Region and Southern Region (SR) at Bhadrawati
- 1000 MW HVDC link between Eastern Region (ER) and Southern Region at Gazuwaka
- 500 MW HVDC link between Eastern Region and Northern Region at Sasaram

2.2.2 Synchronization of Regional Grids

In 1992, Eastern Region (ER) and North-Eastern Region (NER) were synchronously interconnected through Birpara-Salakati 220 kV D/C (double circuit) transmission line and subsequently by 400 kV Bongaigaon - Malda D/C line. Western Region was interconnected to "ER-NER" system synchronously through 400 kV Rourkela-Raipur D/C line in 2003 and thus the Central India system consisting of ER-NER-WR came into operation. In 2006, with commissioning of Muzaffarpur-Gorakhpur 400 kV D/C line, Northern Region also got interconnected to this system. In 2007, Northern Region was also synchronously interconnected with WR through Agra-Gwalior 765 kV S/C line-1 (Charged at 400 kV level) leading to formation of NEW grid. The southern grid was synchronised with rest of all-India grid i.e. NEW grid in December, 2013, through the Raichur-Solapur 765 kV S/C line, thus leading to formation of one synchronous National Grid (one Nation-one Grid - one frequency).

2.2.3 All India Planning and Evolution of Integrated National Grid

Focus of planning the generation and the transmission system in the country has gradually shifted from the orientation of regional self-sufficiency to the concept of optimum utilization of resources on all-India basis. Generation planning studies carried out by CEA had indicated that the capacity addition required on all-India basis would be less than that required on regional basis on account of diversity in demand among the regions. Further, a strong all-India integrated national grid enables harnessing of unevenly distributed generation resources in the country.

Recognizing the need for development of National grid, thrust was given to enhance the capacity of inter-regional links in a phased manner. Total inter-regional transmission capacity by the end of 9th Plan (1997-2002) was 5,750 MW. During 10th Plan i.e. 2002-2007, a total of 8,300 MW of inter-regional capacity was added. In this effort, major achievements were - addition of Talcher-Kolar HVDC Bipole link, second module of HVDC back-to-back system between SR and ER at Gazuwaka, HVDC back-to-back system between NR and ER at Sasaram, synchronous inter-connection of NER/ER grid with WR grid by Rourkela-Raipur 400 kV D/C line, synchronous inter-connection of NER-ER-WR grid with NR grid by Muzaffarpur-Gorakhpur 400 kV D/C (quad) line and subsequently, one circuit of Patna-Balia 400 kV D/C (quad) line and Agra-Gwalior 765 kV transmission line. Total inter-regional transmission capacity by the end of 10th Plan was 14,050 MW which increased to 27,750 MW by the end of 11th Plan (2007-2012). This capacity increased to 75,050 MW by the end of 12th Plan, (2012-17). Inter-regional transmission capacity added during the period 2017-22 was 37,200 MW, taking the total inter-regional transmission capacity in the country to 112,250 MW (as on 31.03.2022). 132 kV Inter-Regional power transmission links of the capacity of 600 MW which are operated radially from time to time are not added in the total inter-regional transmission capacity. Details of inter-regional links that have been implemented till 2021-22 are given in Chapter-6, and those under-construction/ planned for period 2022-27 are given in Chapter-7.

2.3 Growth of Transmission System

There has been a consistent expansion in the transmission network and increase in transformation capacity in India. This increase is in consonance with increase in electricity generation and demand of electricity in the country. There has been more increase in the transmission system at higher voltage levels. This aspect of growth in transmission system highlights requirements of transmission network to carry bulk power over longer distances and at the same time optimize Right of Way (RoW), minimize transmission losses and improve grid reliability.

2.3.1 Growth in Transmission Lines

Cumulative growth in transmission lines of 220 kV and above voltage levels since end of 6th five-year plan (i.e. March 1985) to 2021-22 is given below:

Table-2.1: Growth of Transmission Lines (figs in ckm)

Voltage level	End of 6th Plan (31.03.1985)	End of 7th Plan (31.03.1990)	End of 8th Plan (31.03.1997)	End of 9th Plan (31.03.2002)	End of 10th Plan (31.03.2007)	End of 11th Plan (31.03.2012)	End of 12th Plan (31.03.2017)	End of 2021-22 (31.03.2022)
765 kV	0	0	0	971	2184	5250	31240	51023
HVDC	0	0	1634	3138	5872	9432	15556	19375
400 kV	6029	19824	36142	49378	75722	106819	157787	193978
230/220 kV	46005	59631	79600	96993	114629	135980	163268	192340
Total (ckm)	**52034**	**79455**	**117376**	**150480**	**198407**	**257481**	**367851**	**456716**

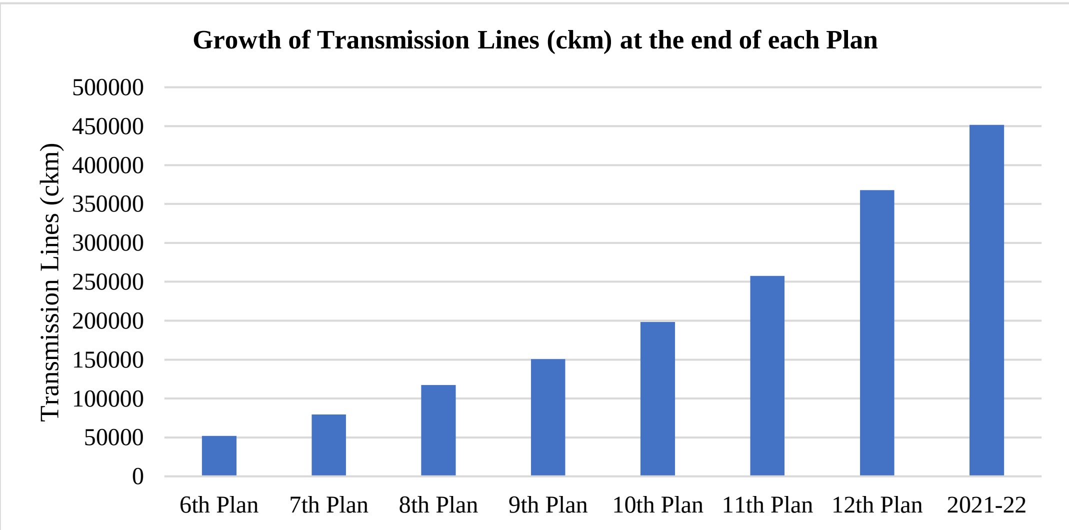

Figure 2.1: Growth of Transmission Lines (ckm)

2.3.2 Growth of Sub-stations

Cumulative growth in transformation capacity of sub-stations and HVDC terminals of 220 kV and above voltage levels since end of 6th five-year plan is given below:

Table-2.2: Growth of Sub-stations (MVA/ MW)

	End of 6th Plan	End of 7th Plan	End of 8th Plan	End of 9th Plan	End of 10th Plan	End of 11th Plan	End of 12th Plan	End of 2021-22
765 kV	0	0	0	0	0	25000	167500	257200
HVDC	0	0	0	5000	8000	9750	19500	33500
400 kV	9330	21580	40865	60380	92942	151027	240807	393113
230/220 kV	37291	53742	84177	116363	156497	223774	312958	420637
Total (MVA/MW)	**46621**	**75322**	**125042**	**181743**	**257439**	**409551**	**740765**	**1104450**

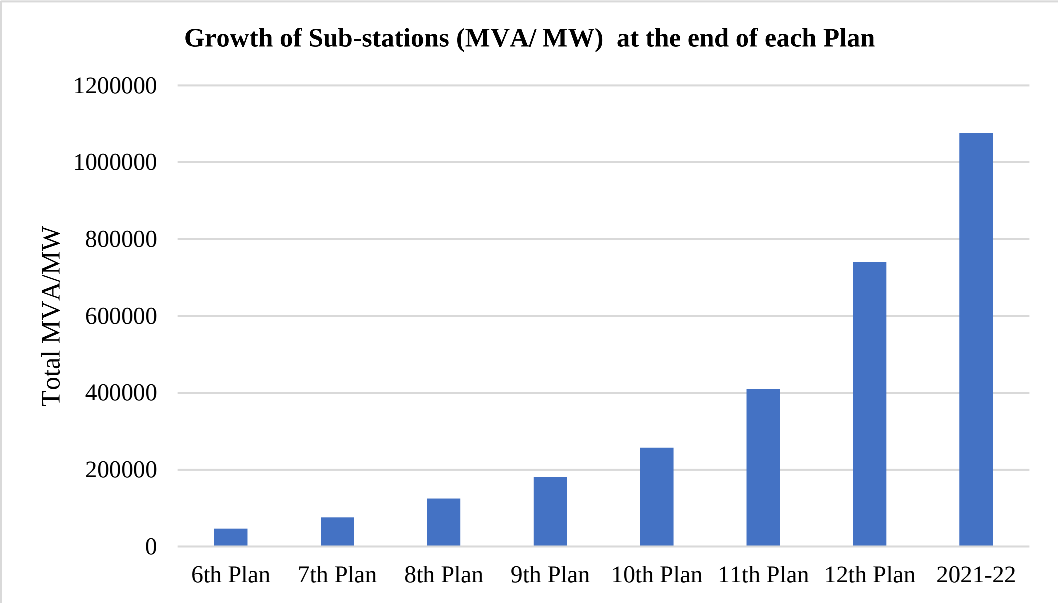

Figure 2.2: Growth of Sub-stations (MVA/ MW)

2.4 Landmark Events of Transmission Sector

Development of the transmission network has been done in tandem with growth in generation capacity. The growth in transmission system is characterized by the physical growth in transmission network as well as introduction of higher transmission voltages and new technologies for bulk power transmission. Landmark events of this growth are:

1948	Electricity (Supply) Act 1948. The Act provided for establishment of the Central Electricity Authority (CEA) and the State Electricity Boards
1950-60	Growth of State Grids and introduction of 220 kV voltage level
1964	Constitution of Regional Electricity Boards
1965-73	Interconnecting State Grids to form Regional Grid systems
1977	Introduction of 400 kV voltage level
1980-88	Growth of Regional Grid Systems as associated transmission system with Central Sector generation

1989	HVDC back-to-back System
1990	Introduction of HVDC bi-pole line (± 500 kV, 1500 MW HVDC line from Rihand to Dadri)
1992	Synchronous inter-connection of ER and NER
1999	Transmission planning re-oriented towards all-India system
2000	Introduction of 765 kV transmission line (initially charged at 400 kV)
2003	- Electricity Act, 2003 - ABT with real time settlement mechanism implemented in all the five electrical regions creating the basic infrastructure for the operation of an electricity market. - Synchronous inter-connection of WR with ER-NER system - Bulk inter-regional HVDC transmission system (Talcher – Kolar HVDC link)
2004	Open access in transmission
2006	Synchronous inter-connection of NR with ER-NER-WR system (formation of NEW Grid)
2007	- 765 kV operation of Sipat Sub-station - 765 kV operation of 765 kV transmission lines
2010	Notification of POSOCO (Power System Operation Corporation Limited, Grid Controller of India Limited since 09th November 2022) for operation of Regional Load Despatch Centres (RLDCs)/National Load Despatch Centre (NLDC) as a separate organization
2011	Implementation of point-of-connection (PoC) based method for sharing transmission charges and losses across the country.
2013	Synchronous inter-connection of SR and NEW Grid
2016-17	- Interconnection between India and Bangladesh (500 MW asynchronous HVDC back-to-back link at Bheramara, Bangladesh and 400 kV D/c transmission line between Baharampur in India and Bheramara in Bangladesh.) - Interconnection between India and Mynmaar - NER directly connected with NR. The longest ± 800 kV, 6000 MW HVDC line from Bishwanath Chariali in NER to Agra in NR for dispersal of power from NER to NR/WR
2017-18	Introduction of ±100 MVAR STATCOM at N P Kunta and ± 2 x150 MVAR STATCOMs at Aurangabad and Satna. STATCOM at N P Kunta commissioned in June, 2017 and at Aurangabad and Satna in March, 2018.
2018-19	Guidelines on Import/Export (Cross Border) of Electricity issued.
2020-21	Introduction of ± 320 kV, Voltage Sourced Converter (VSC) based HVDC terminal at Pugalur, Tamil Nadu and North Trichur, Kerala of 1000 MW capacity (Monopole-II) along with HVDC line of 288 ckm.
2021-22	- Functioning of Central Transmission Utility of India Ltd (CTUIL) as a 100% subsidiary of POWERGRID - Introduction of 1200 kV line (charged at 400 kV) between Wardha and Aurangabad

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Chapter - 3

Transmission Planning Philosophy

3.1 Transmission Planning Philosophy

3.1.1 Transmission planning philosophy in India has evolved over last few decades keeping pace with developments and needs of the electricity sector. The transmission planning has been aligned with the Electricity Act 2003, National Electricity Policy, Tariff Policy, Regulations and market orientation of the electricity sector. The objectives, approach and criteria for transmission planning, which evolved in time, take care of uncertainties in load growth and generation capacity addition while optimizing investment in transmission on long term basis. These objectives, approach and criteria are kept in view while planning transmission addition requirements to meet targets for adequacy, security and reliability. Transmission plan is firmed up through system studies/analysis considering the planning philosophy and guidelines given in "Manual on Transmission Planning Criteria" of Central Electricity Authority.

3.2 Transmission Planning Criteria

Manual on Transmission Planning Criteria was first brought out by CEA in 1985 setting the planning philosophy of regional self-sufficiency. The manual was revised in 1994 considering the experience gained on EHV systems. Technological advancements and institutional changes necessitated further review of the Transmission Planning Criteria.

Electricity Act, 2003 has brought profound changes in electricity supply industry of India leading to unbundling of vertically integrated State Electricity Boards, implementation of Open Access in power transmission and liberalisation of generation sector, among others. The phenomenal growth of private sector generation and the creation of open market for electricity have brought its own uncertainties. Large numbers of generation projects are coming up with no information regarding firm beneficiaries. Adequate flexibility needs to be built in the transmission system to cater to such uncertainty, to the extent possible. However, given the uncertainties, the possibility of stranded assets or congestion cannot be entirely ruled out. In creation of very large interconnected grid, there can be unpredictable power flows leading to overloading of transmission lines due to imbalance in load generation in different pockets of the grid in real time operation. Reliable transmission planning is basically a trade-off between the cost and the risk involved. There are no widely adopted uniform guidelines which determine the criteria for transmission planning vis-à-vis acceptable degree of adequacy and security. Practices in this regard vary from country to country. The common theme in the various approaches is "acceptable system performance".

As the National grid grew in size and complexity, grid security was required to be enhanced considering large scale integration of renewable energy sources. Therefore, the transmission planning criteria was reviewed again in the year 2013.

The regional electrical grids of Northern, Western, Southern, Eastern and North-Eastern regions have been synchronously interconnected in December 2013 to form one of the largest synchronous electricity grid in the world. The country has moved from the concept of regional self-sufficiency to bulk inter-regional transfer of power through high capacity AC and HVDC corridors forming an all-India National Grid.

Ministry of Power has promulgated Electricity (Transmission System Planning, Development and Recovery of Inter-State Transmission Charges) Rules, 2021, in October 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 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. These rules also introduced General Network Access (GNA) in the inter-state transmission system.

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, the 'Manual on Transmissions Planning Criteria' has been revised in 2023.

3.2.1 Scope

(i) 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. 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-STS). The ISTS and Intra-STS are interconnected and together constitute the electricity grid. It is therefore imperative that there should be a uniform approach to transmission planning for developing a reliable transmission system.

(ii) The planning criteria is primarily meant for planning of Inter-State Transmission System (ISTS), Intra-State Transmission System (Intra-STS) and dedicated transmission lines down to 66 kV level.

(iii) The manual covers the planning philosophy, the information required from various entities, permissible limits, reliability criteria, broad scope of system studies, modelling and analysis, and prescribes guidelines for transmission planning.

3.2.2 Applicability

(i) These planning criteria shall be applicable with effect from 1st April, 2023.

(ii) The existing and already planned transmission system may be reviewed with respect to the provisions of these planning criteria. Wherever required and possible, additional system may be planned to strengthen the existing system. Till implementation of the additional system, suitable defence mechanisms may be put in place.

3.2.3 Planning philosophy and general guidelines

(i) The transmission system forms a vital link in the electricity supply chain. Transmission system provides inter-connection between the source (electrical energy sources) and consumption (load centres) of electricity. In the Indian context, the transmission system has been broadly categorised as Inter-State Transmission System (ISTS) and Intra-State Transmission system (Intra-STS). The ISTS is the top layer of National Grid below which lies the Intra-STS. The smooth operation of power system gets adversely affected on account of any disturbance in these systems. Therefore, the criteria prescribed in the Manual are intended to be followed for planning of ISTS, Intra-STS and dedicated transmission line.

(ii) The transmission system is generally augmented to cater to the power transfer requirements posed by eligible entities, for example, for increase in electricity demand, generation capacity addition etc. Further, system may also be augmented considering the feedback regarding operational constraints and feedback from drawing entities.

(iii) The principle for planning of the ISTS shall be to ensure that it is available as per the requirements of the States and the generators, as reflected by their General Network Access (GNA)/connectivity requests. As far as possible, the transmission system shall be planned and developed matching with growth of generation and load and care shall be taken that there is no wasteful investment.

(iv) The transmission customers as well as utilities shall give their network access requirement well in advance considering time required for implementation of the transmission assets. The transmission customers are also required to provide a reasonable basis for their transmission requirement such as size and completion schedule of their generation facility, demand and their commitment to bear transmission service charges.

(v) 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.

(vi) In case of highly constrained areas like congested urban / semi-urban area, very difficult terrain (including hilly terrain) etc., the transmission corridor may be planned by considering long term perspective of optimizing the right-of-way and cost. This may be done by adopting higher voltage levels for final system and operating one level below voltage level in the initial stage, or by using multi-circuit towers for stringing circuits in the future etc.

(vii) Routing of the transmission line may be planned in accordance with Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022, and its amendments or re-enactment thereof, to minimise Right of Way (RoW), technical options and line configurations.

(viii) PM Gati Shakti National Master Plan (PMGS-NMP) was launched on 13th October 2021 for providing multimodal connectivity infrastructure to various economic zones. It provides a digital platform for integrated planning and coordinated implementation of infrastructure connectivity projects. The information available on this platform to be used while planning of transmission system. For planning of any new transmission lines or substations, the portal of PMGS-NMP to be used to identify preliminary feasibility of the same.

(ix) In line with Section 39 of the Electricity Act, 2003, STU shall act as the nodal agency for Intra-STS planning in coordination with distribution licensees and intra-state generators connected/to be connected in the STU grid. The STU shall be the single point contact for the purpose of ISTS planning and shall be responsible on behalf of all the intra-State entities for evacuation of power from State's generating stations, meeting requirements of DISCOMs and exchange of power with ISTS commensurate with the ISTS plan with due consideration to the margins available in existing system.

(x) Normally, various intra-state entities shall be supplied power through the intra-state network. Only under exceptional circumstances, the load serving intra-state entity may be allowed direct inter-connection with ISTS on recommendation of STU, provided that such an entity would continue as intra-state entity for the purpose of all jurisdictional matters including energy accounting. Under such situation, this direct interconnection may also be used by other intra-state entity(ies). Further, STUs shall coordinate with urban planning agencies, Special Economic Zone (SEZ) developers, industrial developers etc. to keep adequate provision for transmission corridor and land for new substations for their power transfer requirements.

(xi) The system parameters and loading of system elements shall remain within permissible limits as specified in the Manual on Transmission Planning Criteria. The adequacy of the transmission system should be tested for different probable load-generation scenarios.

(xii) The system shall be planned to operate within permissible limits both under normal as well as after probable credible contingency(ies). However, the system may experience extreme contingencies which are rare, and the system may not be planned for such rare contingencies. To ensure security of the grid, the extreme/rare but credible contingencies should be identified from time to time and suitable defence mechanism, such as load shedding, generation rescheduling, islanding, system protection schemes, Automatic Under Frequency Load Shedding (AUFLS) schemes (AUF Relay & df/dt), etc. may be worked out to mitigate their adverse impact.

(xiii) For strengthening of the transmission network, cost, reliability, Right of Way requirements, transmission losses, down time (in case of up-gradation and re-conductoring options) etc. need to be studied. If need arises, addition of new transmission lines/ substations to avoid overloading of existing system including adoption of next higher voltage may be explored.

(xiv) Critical loads such as - railways, metro rail, airports, refineries, underground mines, steel plants, smelter plants etc. shall plan their interconnection with the grid with 100% redundancy and as far as possible from two different sources of supply.

(xv) The planned transmission capacity would be finite and there are bound to be congestions if large quantum of electricity is sought to be transmitted in the direction not previously planned.

(xvi) Communication system for new transmission system shall be planned and implemented in accordance with Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022, and its amendments or re-enactment thereof. Central Electricity Authority (Technical Standards for Communication System in Power System Operations) Regulations, 2020 and its amendments or re-enactment thereof and CEA Manual of Communication Planning in Power System Operation 2022 and its amendments, such that the communication system is available at the time of commissioning of the transmission system.

3.2.4 Transmission Planning

3.2.4.1 Power system data for transmission planning and modelling

(i) In order to precisely model the power system for planning studies, accuracy of data is very important as the same can have considerable effect on outcome of system studies and ultimately on the system planning.

(ii) For ISTS planning, the transmission network may be modelled down to 220 kV level and wherever required such as for North Eastern Region, Uttarakhand, Himachal Pradesh and Sikkim, the transmission network may be modelled down to 132 kV level.

The generating units that are stepped-up at 132 kV level may be connected at the nearest 220 kV bus through a 220/132 kV transformer for simulation purpose. The generating units smaller than 50 MW size within a plant may be lumped and modelled as a single unit. Load may be lumped at 220 kV or 132 kV, as the case may be.

(iii) For Intra-STS planning, the transmission network may be modelled down to 66 kV level and lumping of generating units & loads may be considered accordingly. The STUs may consider modelling of smaller size generating units, if required.

3.2.4.2 Time Horizons for transmission planning

(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 year time horizon on rolling basis every year.

3.2.4.3 Load - generation scenarios

(i) The load-generation scenarios shall be worked out in a pragmatic manner so as to reflect the typical daily and seasonal variations in electricity demand and generation availability. Typical load generation scenario may include high/low wind, high/low solar, high/low hydro generation, high electricity demand, low electricity demand and combinations thereof.

3.2.4.4 Load

(A) Active power (MW)

(i) The system peak electricity demand (state-wise, regional and national) shall be based on the latest Electric Power Survey (EPS) report of CEA. However, the same may be moderated based on actual load growth of past five years, if required.

(ii) The electricity demand at other periods (seasonal variations and minimum loads) shall be derived based on the annual peak demand and past pattern of demand variations.

(iii) While doing the simulation, if the peak load figures are more than the peaking availability of generation, the loads may be suitably adjusted substation-wise to match with the availability. Similarly, if the peaking availability is more than the peak load, the generation dispatches may be suitably reduced to the extent possible considering merit order dispatch.

(iv) From practical considerations the load variations over the year shall be considered as under:

a) Annual peak load

b) Variation of load in different hours of the day

c) Seasonal variation in peak loads for Winter, Summer and Monsoon

(B) Reactive power (MVAr)

(i) Reactive power plays an important role in EHV transmission system planning and hence, forecast of reactive power demand on an area-wise or substation-wise basis is as important as active power forecast. This forecast would obviously require adequate data on the reactive power demand at different sub-stations as well as the projected plans (including existing) for reactive power compensation.

(ii) For developing an optimal ISTS, STUs must clearly spell out the substation-wise maximum and minimum demand in MW and MVAr on seasonal basis. In the absence of MVAR data, the load power factor shall be taken as per Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007, and its amendments or re-enactment thereof. The STUs shall provide adequate reactive compensation to bring power factor as close to unity at 132 kV and 220 kV voltage levels.

(iii) Reactive power capability of generators including RE generators shall be as per provisions of Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007, and its amendments or re-enactment thereof.

3.2.4.5 Generation dispatches and modelling

(i) For the purpose of development of Load Generation scenarios on all India basis, all India peaking availability may be calculated as per seasonal and daily variations based on the past pattern of generation variations.

(ii) For evolving transmission systems for integration of RE generation projects, high wind/solar generation injections may also be studied in combination with suitable conventional dispatch scenarios.

3.2.4.6 Special area dispatches such as following may be considered in planning, wherever necessary:

a) Special dispatches corresponding to high agricultural load/lift irrigation schemes with low power factor, wherever applicable.

b) Complete closure of a generating station close to a major load centre.

3.2.4.7 In case of coal based thermal generating units, the minimum level of output (ex-bus generation, i.e. net of the auxiliary consumption) shall be taken as not less than 40% of the rated installed capacity.

3.2.4.8 The generating units shall be modelled to run as per their respective capability curves. In the absence of capability curve, the reactive power limits (Q_{max} and Q_{min}) for generating units can be taken as under:

Type of generating unit	Q_{max}	Q_{min}
Thermal units	$Q_{max} = 0.60 \times P_{max}$	$Q_{min} = (-)\ 0.30 \times P_{max}$
Nuclear units	$Q_{max} = 0.50 \times P_{max}$	$Q_{min} = 0$
Hydro units	$Q_{max} = 0.48 \times P_{max}$	$Q_{min} = (-)\ 0.24 \times P_{max}$
Wind / Solar / BESS	$Q_{max} = 0.33 \times P_{max}$	$Q_{min} = (-)\ 0.33 \times P_{max}$

3.2.4.9 It shall be duty of all the generators to provide technical details of generating units, such as generator capability curves, exciter, governor, PSS parameters etc., for modelling of their machines for steady-state and transient-state studies. In case of Wind/Solar/BESS, equivalent generator model shall also be provided.

3.2.4.10 Planning margins

(i) In a very large interconnected grid, there can be unpredictable power flows in real time due to variation in load-generation balance with respect to anticipated load generation balance in different pockets of the grid. This may lead to overloading of transmission elements during operation, which cannot be predicted in advance at the planning stage. This can also happen due to delay in commissioning of a few planned transmission elements, delay/abandoning of planned generation additions or load growth at variance with the estimates. Such uncertainties are unavoidable and hence some margins at the planning stage may help in reducing impact of such uncertainties. Therefore, at the planning stage, planning margins need to be provided. However, care also need to be taken to avoid stranded transmission assets.

(ii) Against the requirement of power transfer, the new transmission lines emanating from a power station to the nearest grid point may be planned considering overload capacity of the generating stations in consultation with generators.

(iii) The new transmission additions required for system strengthening may be planned keeping a margin of 10% in the thermal loading limits of lines and transformers. Further, the margins in the interregional links may be kept as 15%.

(iv) At the planning stage, a margin of about ± 2% may be kept in the voltage limits and thus the voltages under load flow studies (for 'N-0' and 'N-1' steady-state conditions only) may be maintained within the limits given below:

Voltage (kV_{rms}) (after planning margins)		
Nominal	**Maximum**	**Minimum**
765	785 (1.03 pu)	745 (0.97 pu)
400	412 (1.03 pu)	388 (0.97 pu)
230	240 (1.04 pu)	212 (0.92 pu)
220	240 (1.09 pu)	203 (0.92 pu)
132	142 (1.08 pu)	125 (0.95 pu)
110	119 (1.08 pu)	102 (0.93 pu)
66	70 (1.06 pu)	62 (0.94 pu)

(v) In planning studies all the transformers may be kept at nominal taps and On Load Tap Changer (OLTC) may not be considered. The effect of the taps should be kept as operational margin.

(vi) For the purpose of load flow studies at planning stage, the nuclear generating units shall normally not run at leading power factor. To keep some margin at planning stage, the reactive power limits (Q_{max} and Q_{min}) for generating units may be taken as under:

Type of generating unit	Q_{max}	Q_{min}
Thermal Units	Q_{max} = 0.50 x P_{max}	Q_{min} = (-) 0.10 x P_{max}
Nuclear units	Q_{max} = 0.40 x P_{max}	Q_{min} = 0
Hydro units	Q_{max} = 0.40 x P_{max}	Q_{min} = (-) 0.20 x P_{max}
Wind / Solar / BESS	Q_{max} = 0.20 x P_{max}	Q_{min} = (-) 0.20 x P_{max}

Note: In case of limitation in Q_{max} and Q_{min}, similar ratio of margins as provided in Paragraph 3.2.4.8 and Paragraph 3.2.4.10 of the Maual, shall be considered for the generating unit with respect to capability curve.

(vii) During operation, as per the instructions of the System Operator, the generating units shall operate at leading power factor within their respective capability curves.

3.2.4.11 System studies for transmission planning

(i) The system shall be planned based on one or more of the following power system studies, as per requirements:

a) Power Flow Studies
b) Short Circuit Studies
c) Stability Studies
d) TTC/ATC Calculations

(ii) Additional studies as given below may be carried out at appropriate time as per requirement.

a) EMT studies
b) Inertia studies

Power flow studies and short circuit studies are described below. For other studies the Manual on Transmission Planning Criteria to be referred.

Power Flow studies

(i) Load flow study is the steady state analysis of 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.

(ii) All the elements of transmission network viz. transmission lines, transformers, generators, load, bus reactors, line reactors, HVDC, FACTS etc. are modelled using steady state parameters in the simulation software.

(iii) Load flow solves a set of simultaneous non-linear algebraic equations for the two unknown variables ($|V|$ and $\angle\delta$) at each node in a system. The output of the load flow analysis is the voltage and phase angle, real and reactive power, losses and slack bus power.

Short circuit studies

(i) The short circuit studies shall be carried out using the classical method with flat pre-fault voltages and sub-transient reactance (X''_d) of the synchronous machines.

(ii) For inverter based generators, the response of an inverter to grid disturbances is a function of the controls programmed into the inverter and the rated capability of the inverter. Wind / Solar / Hybrid plants need to clearly articulate how the inverter would behave during fault events to ensure that the correct response is provided during and immediately following fault conditions. In case of non-availability of data, sub-transient reactance (X''_d) for wind and solar generation may be assumed as 0.85 pu and 1 pu respectively for short circuit studies.

(iii) MVA of all the generating units in a plant may be considered for determining maximum short-circuit level at various buses in system. This short-circuit level may be considered for substation planning.

(iv) Vector group of the transformers shall be considered for doing short circuit studies for asymmetrical faults. Inter-winding reactances in case of three winding transformers shall also be considered. For evaluating the short circuit levels at a generating bus (11 kV, 13.8 kV, 21 kV etc.), the unit and its generator transformer shall be represented separately.

(v) Short circuit level for both, three phase to ground fault, and single phase to ground fault shall be calculated.

(vi) The short-circuit level in the system varies with operating conditions, it may be low for light load scenario as compared to peak load scenario, as some of the plants / unit(s) may not be on-bar. For getting an understanding of system strength under different load-generation / export-import scenarios, the MVA of only those machines shall be taken which are on bar in that scenario.

3.2.5 Criteria for Contingency

3.2.5.1 General Principles

The transmission system shall be planned considering following general principles:

(i) In normal operation ('N-0') of the grid, with all elements to be available in service in the time horizon of study, it is required that all the system parameters like voltages, loadings, frequency should remain within permissible normal limits.

(ii) The grid may however be subjected to outage / loss of an element and it is required that after loss of an element ('N-1' or single contingency), all the system parameters like voltages, loadings, frequency shall be within permissible normal limits.

(iii) Under outage / loss of an element, the grid may experience another contingency, though less probable ('N-1-1'), wherein some of the equipment may be loaded up to their emergency limits. To bring the system parameters back within their normal limits, load shedding/re-scheduling of generation may have to be done, either manually or through automatic system protection schemes (SPS). Such measures shall generally be applied within one hour after the disturbance.

3.2.5.2 Permissible normal and emergency limits

(i) Normal thermal ratings and normal voltage limits represent equipment limits that can be sustained on continuous basis. Emergency thermal ratings and emergency voltage limits represent equipment limits that can be tolerated for a relatively short time which may be one hour to two hours, depending on design of the equipment. The normal and emergency ratings to be used in this context are given in subsequent paragraphs.

(ii) The loading limit for a transmission line shall be its thermal loading limit. The thermal loading limit of a line is determined by design parameters based on ambient temperature, maximum permissible conductor temperature, wind speed, solar radiation, absorption coefficient, emissivity coefficient etc. In India, all the above factors and more particularly ambient temperatures in various parts of the country are different and vary considerably during various seasons of the year. However, during planning, the ambient temperature and other factors are assumed to be fixed, thereby permitting margins during operation. Generally, the ambient temperature may be taken as 45 deg Celsius; however, in some areas like hilly areas where ambient temperatures are less, the same may be taken.

(iii) Design of transmission lines with various types of conductors should be based on conductor temperature limit, right-of-way optimization, losses in the line, cost and reliability considerations etc.

(iv) The loading limit for an inter-connecting transformer (ICT) shall be its name plate rating.

(v) During planning, a margin as specified in Paragraph: 3.2.4.10 shall be kept in the above lines/transformers loading limits.

(vi) The emergency thermal limits for the purpose of planning shall be 120% of the normal thermal limits for one hour and 110% of the normal thermal limits for two hours.

(vii) In real time system operation, capacity of transmission line may be assessed through Dynamic Line Loading, however, this may not be used while transmission system planning.

3.2.5.3 Voltage limits

a) The steady-state voltage limits are given below. However, at the planning stage a margin as specified at Paragraph 3.2.4.10 may be kept in the voltage limits.

Voltages (kV_{rms})				
	Normal rating		Emergency rating	
Nominal	**Maximum**	**Minimum**	**Maximum**	**Minimum**
765 (1 pu)	800 (1.05 pu)	728 (0.95 pu)	800 (1.05 pu)	713 (0.93 pu)
400 (1 pu)	420 (1.05 pu)	380 (0.95 pu)	420 (1.05 pu)	372 (0.93 pu)
230 (1 pu)	245 (1.07 pu)	207 (0.90 pu)	245 (1.07 pu)	202 (0.88 pu)
220 (1 pu)	245 (1.11 pu)	198 (0.90 pu)	245 (1.11 pu)	194 (0.88 pu)
132 (1 pu)	145 (1.10 pu)	122 (0.92 pu)	145 (1.10 pu)	119 (0.90 pu)
110 (1 pu)	123 (1.12 pu)	99 (0.90 pu)	123 (1.12 pu)	97 (0.88 pu)
66 (1 pu)	72.5 (1.10 pu)	60 (0.91 pu)	72.5 (1.10 pu)	59 (0.89 pu)

b) Temporary over voltage limits due to sudden load rejection:

i) 800 kV system 1.4 p.u. peak phase to neutral (653 kV = 1 p.u.)
ii) 420 kV system 1.5 p.u. peak phase to neutral (343 kV = 1 p.u.)
iii) 245 kV system 1.8 p.u. peak phase to neutral (200 kV = 1 p.u.)
iv) 145 kV system 1.8 p.u. peak phase to neutral (118 kV = 1 p.u.)
v) 123 kV system 1.8 p.u. peak phase to neutral (100 kV = 1 p.u.)
vi) 72.5 kV system 1.9 p.u. peak phase to neutral (59 kV = 1 p.u.)

c) Switching over voltage limits:

i) 800 kV system 1.9 p.u. peak phase to neutral (653 kV = 1 p.u.)
ii) 420 kV system 2.5 p.u. peak phase to neutral (343 kV = 1 p.u.)

3.2.5.4 Reliability criteria

(i) No contingency ('N-0')

a) The system shall be tested for all the load-generation scenarios as given at Paragraph 3.2.4.3.

b) For the planning purpose all the equipment shall remain within their normal thermal loadings and voltage ratings.

c) The angular separation between adjacent buses shall not exceed 30 degrees.

(ii) Single contingency ('N-1')

Steady-state:

a) All the equipment in the transmission system shall remain within their normal thermal and voltage ratings after outage / loss of any one of the following elements (called single contingency or 'N-1'), but without load shedding / rescheduling of generation:

- Outage of a 132 kV single circuit,

- Outage of a 220 kV single circuit,

- Outage of a 400 kV single circuit (with or without fixed series capacitor),

- Outage of an Inter-Connecting Transformer (ICT) / power transformer,

- Outage of a 765 kV single circuit

- Outage of one pole of HVDC bipole

b) The angular separation between adjacent buses under 'N-1' shall not exceed 30 degrees.

c) 'N-1' criteria for FACTS devices may not be considered, however studies may be carried out to address the issues like reduction in transfer capability, restriction on generation evacuation etc. in case of outage of FACTS devices.

Transient-state:

Usually, perturbation causes a transient that is oscillatory in nature, but if the system is stable, the oscillations will be damped. The system is said to be stable in which synchronous machines, when perturbed, will either return to their original state, if there is no change in exchange of power or will acquire new state asymptotically without losing synchronism. The transmission system shall be stable after it is subjected to one of the following outage / loss:

a) The system shall be able to survive a permanent three phase to ground fault on a 765 kV line close to the bus to be cleared in 100 ms.

b) The system shall be able to survive a permanent single phase to ground fault on a 765 kV line close to the bus. Accordingly, single pole opening (100 ms) of the faulted phase and unsuccessful re-closure (dead time 1 second) followed by 3-pole opening (100 ms) of the faulted line shall be considered.

c) The system shall be able to survive a permanent three phase to ground fault on a 400 kV line close to the bus to be cleared in 100 ms.

d) The system shall be able to survive a permanent single phase to ground fault on a 400 kV line close to the bus. Accordingly, single pole opening (100 ms) of the faulted phase and unsuccessful re-closure (dead time 1 second) followed by 3-pole opening (100 ms) of the faulted line shall be considered.

e) In case of 220 kV / 132 kV networks, the system shall be able to survive a permanent three phase fault on one circuit, close to a bus, with a fault clearing time of 160 ms (8 cycles) assuming 3-pole opening.

f) The system shall be able to survive a fault in HVDC convertor station, resulting in permanent outage of one of the poles of HVDC Bipole.

g) Loss of generation: The system shall remain stable under the loss of single largest generating unit or a critical generating unit (choice of candidate critical generating unit is left to the transmission planner).

h) Loss of largest radial load, connected at single point.

(iii) Second contingency ('N-1-1')

1. Under the scenario as defined at Paragraph 3.2.5.4 (ii) the system may experience another contingency (called 'N-1-1'):

   a) The system shall be able to survive a temporary single phase to ground fault on a 765 kV line close to the bus. Accordingly, single pole opening (100 ms) of the faulted phase and successful re-closure (dead time 1 second) shall be considered.

   b) The system shall be able to survive a permanent single phase to ground fault on a 400 kV line close to the bus. Accordingly, single pole opening (100 ms) of the faulted phase and unsuccessful re-closure (dead time 1 second) followed by 3-pole opening (100 ms) of the faulted line shall be considered.

c) In case of 220 kV / 132 kV networks, the system shall be able to survive a permanent three phase fault on one circuit, close to a bus, with a fault clearing time of 160 ms (8 cycles) assuming 3-pole opening.

2. In the ‘N-1-1’ as stated above, if there is a temporary fault, the system shall not lose the second element after clearing of fault but shall successfully survive the disturbance.

3. In case of permanent fault, the system shall lose the second element as a result of fault clearing and thereafter, shall asymptotically reach to a new steady state without losing synchronism. In this new state, the system parameters (i.e. voltages and line loadings) shall not exceed emergency limits, however, there may be requirement of load shedding / rescheduling of generation so as to bring system parameters within normal limits.

(iv) Radially connected generation with the grid

For the transmission system connecting generator(s) radially with the grid, the following criteria shall apply:

1. The radial system shall meet ‘N-1’ reliability criteria as given at Paragraph 3.2.5.4 (ii) for both the steady-state as well as transient-state.
2. For subsequent contingency i.e. ‘N-1-1’ (as given at Paragraph 3.2.5.4 (iii)), only temporary fault shall be considered for the radial system.
3. If the ‘N-1-1’ contingency is of permanent nature or any disturbance/contingency causes disconnection of such generator(s) from the main grid, the remaining main grid shall asymptotically reach to a new steady-state without losing synchronism after loss of generation. In this new state the system parameters shall not exceed emergency limits, however, there may be requirement of load shedding / rescheduling of generation so as to bring system parameters within normal limits.

(v) The ‘N-1’ criteria may not be applied to the immediate connectivity system of renewable generations with the ISTS/Intra-STS grid i.e. the line connecting the generation project switchyard to the grid and the step-up transformers at the grid station.

Provided that, ‘N-1’ criteria shall be applicable in case of renewable generation projects with storage, which are firm in nature and fully dispatchable.

Provided that, ‘N-1’ reliability criteria may be considered for ICTs at the ISTS / STU pooling stations for renewable energy based generation of more than 1000 MW after considering the capacity factor of renewable generating stations.

3.2.6 Sub-station Criteria

3.2.6.1 General criteria

(i) The requirements in respect of EHV sub-stations in a system such as the total load to be catered by the sub-station of a particular voltage level, its MVA capacity, number of feeders permissible etc. are important to the planners so as to provide an idea to them about the time for going in for the adoption of next higher voltage level sub-station and also the number of substations required for meeting a particular quantum of load. Keeping these in view, the EHV substation planning criteria have been laid down in this Chapter.

(ii) There may be need for upgradation of the system or renovation and modernization of the existing system depending on technological options and system studies. Therefore, transmission licensee shall provide details to CEA/CTU/STUs of the transmission equipment which are required to be upgraded or for which renovation and modernization needs to be carried out.

(iii) As far as possible, an incoming and an outgoing feeder of same voltage level in a substation may be terminated in bays of same diameter in one and half breaker switching scheme, so as to make direct connection in case of outage of the substation, especially in case of Loop-in Loop-out of existing line(s).

(iv) Line approaching substation shall normally be perpendicular to the substation boundary for a stretch of 2-3 km.

(v) The maximum short-circuit level on any new substation bus should not exceed 80% of the rated short circuit capacity of the substation equipment. The 20% margin is intended to take care of the increase in short-circuit levels as the system grows. The rated breaking current capability of switchgear at different voltage levels may be taken as given below:

Voltage Level	Rated Breaking Capacity
765 kV	50 kA / 63 kA
400 kV	63 kA / 80 kA
220 kV	40 kA / 50 kA / 63 kA
132 kV	25 kA / 31.5 kA / 40 kA
66kV	31.5 kA

Measures such as sectionalisation of bus, series reactor, or any new technology may also be adopted to limit the short circuit levels at existing substations wherever short circuit levels are likely to cross the designed limits.

(vi) Rating of the various substation equipment shall be such that they do not limit the loading limits of connected transmission lines.

(vii) Connection arrangement of switchable line reactors shall be such that it can be used as line reactor as well as bus reactor with suitable NGR bypass arrangement.

3.2.6.2 Transformers

(i) Sub-stations may be classified into two categories i.e. (i) Load Serving Sub-station (LSS); where loads are connected (ii) Generation Pooling Sub-station (GPS); where generating stations are connected directly or through dedicated transmission line for evacuation of their power.

Provided that the substations where both generator(s) and load(s) are connected, shall be treated as load serving sub-station.

(ii) The capacity of any single sub-station at different voltage levels shall not normally exceed as given in column (B) and (C) in the following table:

Voltage Level (A)	Transformation Capacity	
	Load Serving Substation (B)	Generation Pooling substations (C)
765 kV	9000 MVA	9000 MVA
400 kV	2500 MVA	5000 MVA
220 kV	1000 MVA	1000 MVA
132 kV	500 MVA	500 MVA
66 kV	160 MVA	160 MVA

(iii) Size and number of interconnecting transformers (ICTs) shall be planned in such a way that the outage of any single unit would not over load the remaining ICT(s) or the underlying system

Provided that for immediate connectivity of RE plants, Paragraph 3.2.5.4 (v) may be referred.

(iv) While augmenting the transformation capacity at an existing substation or planning a new substation, the fault level of the substation shall also be kept in view. If the fault level is low, the voltage stability studies shall be carried out.

3.2.6.3 Bus- Sectionalisation

(i) To have minimum disruption during struck breaker condition, the bus switching scheme provided in Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022 and its amendments or re-enactment thereof shall be implemented.

(ii) Sources and loads should be mixed in each diameter to maximize reliability in 'one and half breaker scheme' during planning of a new substation. Hence, one double circuit line consisting of two numbers feeders and originating from a transmission or generating switchyard shall not be terminated in one diameter. Similarly, termination of two numbers of transformers of identical primary voltage rating in one diameter of 'one and half breaker scheme' shall be avoided so that sudden outage is minimized. Layout and bus switching scheme of a substation shall be planned in such way that it shall have maintainability, operation flexibility, security and reliability.

(iii) Bus switching scheme shall be as per Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022 and its amendments or re-enactment thereof. Bus section shall be planned in such a way that feeders are adequately distributed with respect to power flow with bus sectionalizers open condition. Further, sectionaliser arrangement may be implemented also keeping in view transformation capacity in each section, fault current rating adopted, number of feeders etc.

3.2.6.4 Reactive Power compensation

(i) **General:**

a) 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 shall be assessed through appropriate studies.

b) Near to large RE complex(es) synchronous condenser(s) may be planned for dynamic voltage support, in addition to FACTS devices.

c) While planning of bus capacitors/reactors, aspects such as voltage sensitivity due to switching of these devices, size, reliability (contingency) etc. shall be considered.

d) Space provision for converting fixed line reactors/switchable line reactors to be usable as bus reactors after line opening with bypass arrangement for NGR/control switching.

e) RE generators to have provision to operate the generators in voltage control mode, fixed-Q and power factor control mode as per the grid requirements.

f) While planning Bus Reactor (BR), size, reliability aspect (outage of BR), etc. may be taken care of.

(ii) **Shunt capacitors**

a) Reactive Compensation shall be provided as far as possible in the low voltage systems with a view to meet the reactive power requirements of load close to the load points, thereby avoiding the need for VAr transfer from high voltage system to the low voltage system. In the cases where network below 132 kV/220 kV voltage level is not represented in the system planning studies, the shunt capacitors required for meeting the reactive power requirements of loads shall be provided at the 132 kV/220 kV buses for simulation purpose.

b) It shall be the responsibility of the respective utility to bring the load power factor as close to unity as possible by providing shunt capacitors at appropriate places in their system.

c) Reactive power flow through 400/220 kV or 400/132 kV or 220/132(or 66) kV or 220/33kV ICTs, shall be minimal. Wherever voltage on HV side of such an ICT is less than 0.975 pu no reactive power shall flow down through the ICT. Similarly, wherever voltage on HV side of the ICT is more than 1.025 pu no reactive power shall flow up through the ICT. These criteria shall apply under the N-0 conditions. It shall be responsibility of respective STU to plan suitable reactive compensation in their network including at 220 kV and 132 kV levels connected to ISTS, in order to fulfil this provision.

(iii) **Shunt reactors**

a) Bus reactors shall be provided at EHV substations for controlling voltages within the limits (defined in the Paragraph: 3.2.5.3(a)) without resorting to switching-off the lines. The bus reactors may also be provided at generation switchyards to supplement reactive capability of generators. The size of reactors should be such that under steady state condition, switching on and off of the reactors shall not cause a voltage change exceeding 5%. The standard sizes (MVAr) of reactors are:

Voltage Level	**Standard sizes of reactors (in MVAr)**
132 kV (3-ph unit)	12.5 and 25 (rated at 145 kV)
220 kV (3-ph unit)	50, 25 (rated at 245 kV)
400 kV (3-ph unit)	50, 63, 80,125 and 250 (rated at 420 kV)
765 kV (1-ph unit)	80 and 110 (rated at 765/√3 kV)

b) Fixed line reactors may be provided to control power frequency temporary over-voltage (TOV) after all voltage regulation action has taken place within the limits as defined in Paragraph: 3.2.5.3(b) under all probable operating conditions.

c) Line reactors (switchable/ controlled/ fixed) may be provided if it is not possible to charge EHV line without exceeding the maximum voltage limits given in Paragraph: 3.2.5.3(a). The possibility of reducing pre-charging voltage of the charging end shall also be considered in the context of establishing the need for reactors.

d) The line reactors may be planned as switchable wherever the voltage limits, without the reactor(s), remain within limits specified for TOV conditions given at Paragraph: 3.2.5.3(b).

(iv) **Shunt FACTS devices**

a) Shunt FACTS devices such as Static VAr Compensation (SVC) and STATCOM shall be provided where found necessary to damp the power swings and provide the system stability under conditions defined in the 'Reliability Criteria' (Paragraph 3.2.5.4). As far as possible, the dynamic range of static compensators shall not be utilized under steady state operating condition.

(v) **Synchronous Condenser**

a) A synchronous condenser (SC) is a synchronous machine operating without a prime mover. Reactive power output regulation of SC is performed by regulating the excitation current. The level of excitation determines if the synchronous condenser generates or consumes reactive power. SC provides improved voltage regulation and stability by continuously generating/absorbing reactive power, improved short-circuit strength and frequency stability by providing inertia.

b) The conventional power stations could be refurbished to a synchronous condenser, thereby potentially reducing initial capital cost. A synchronous condenser consumes a small amount of active power from the system to cover losses. As many gas and coal-based synchronous generators approach the end of their life, the retiring of a plant can possibly create a reactive power deficit at the local network, which may impact voltage stability. The conversion of the existing generator to a synchronous condenser can be potentially economical and effective.

c) Operating Hydro generators in synchronous condenser mode may be a possible way for voltage control with the existing resources, which may be explored to regulate voltage in grid locally and thus preventing the switching of other elements for voltage control purpose, which in turn help in keeping the system reliability intact.

3.2.7 Additional Criteria

3.2.7.1 Wind / Solar / Hybrid projects

(i) All the generation projects based on renewable energy sources shall comply with Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007, and its amendments or re-enactment thereof, for which requisite system studies shall be carried out by renewable generation project developer.

(ii) Connectivity/GNA quantum shall be considered while planning the evacuation system, both for immediate connectivity with the ISTS/Intra-STS and for onward transmission requirement.

(iii) As the generation of energy at a wind farm is possible only with the prevalence of wind, the thermal line loading limit of the lines connecting the wind farms to the pooling substations may be assessed considering 12 km/hour wind speed.

3.2.7.2 Nuclear power stations

(i) In case of transmission system associated with a nuclear power station, there shall be two independent sources of power supply for the purpose of providing start-up power. Further, the angular separation between start-up power source and the generation switchyard should be, as far as possible, be maintained within 10 degrees.

(ii) The evacuation system shall generally be planned so as to terminate it at large load centres to facilitate islanding of the power station in case of contingency.

(iii) Adequate reactive power compensation shall be provided at generation switchyard so as to maintain power factor in accordance with Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 and its amendments or re-enactment thereof.

3.2.7.3 HVDC Transmission System

(i) The option of HVDC bipole may be considered for transmitting bulk power (more than 2000 MW) over long distance (preferably more than 700 km). HVDC transmission may also be considered in the transmission corridors that have AC lines carrying heavy power flows (total more than 5000 MW) to control and supplement the AC transmission network.

(ii) The ratio of fault level in MVA at any of the convertor station (for conventional current source type), to the power flow on the HVDC bipole shall not be less than 3.0 under any of the load-generation scenarios and reliability criteria mentioned above. Further, in areas where multiple Conventional HVDC bipoles are feeding power (multi infeed), the appropriate studies may be carried at planning stage so as to avoid commutation failure.

3.2.7.4 Resiliency

(i) The IEEE Technical Report PES-TR65 defines resilience as “The ability to withstand and reduce the magnitude and/or duration of disruptive events, which includes the capability to anticipate, absorb, adapt to, and/or rapidly recover from such an event”. This may also be simply defined as “The ability to protect against and recover from any event that would significantly impact the grid”.

(ii) **Resilience v/s Reliability:**

The IEEE defines Reliability as “The probability that a system will perform its intended functions without failure, within design parameters, under specific operating conditions, and for a specific period of time.” Further different utilities worldwide have defined and developed different reliability standards for robustness, resourcefulness, rapid recovery and adaptability of their power systems.

The IEEE Technical Report PES-TR83 states that reliability is a system performance measure, and resilience is a system characteristic. Generally better reliability results in better resilience and vice versa.

However, in some cases, a highly reliable system may have lower resilience and vice versa. The primary difference between reliability and resilience is that resilience encompasses all events, including "High Impact – Low Frequency" events commonly excluded from the reliability calculations.

(iii) Resilience Evaluation: Several frameworks and methods for advancing resilience evaluation have been developed in the last decade. These frameworks can be grouped into two general categories: qualitative and quantitative frameworks.

a) Qualitative Frameworks: Qualitative frameworks usually evaluate the power system's resilience, along with other interdependent systems, such as information systems, fuel supply chain, and other such infrastructures. These frameworks evaluate resilience capabilities such as preparedness, mitigation, response, and recovery. Qualitative frameworks are appropriate for long-term planning because they provide a comprehensive and holistic depiction of system resilience.

b) Quantitative Frameworks: Quantitative frameworks are based on the quantification of system performance. Resilience is quantitatively evaluated based on the reduced magnitude and duration of deviations from the targeted or acceptable performance. Quantitative resilience metrics should be: 1) performance-related, 2) event-specific, 3) capable of considering uncertainty, and 4) useful for decision-making.

An effective resiliency framework should strive to minimize the likelihood and impacts of a disruptive event from occurring and provides the right guidance and resources to respond and recover effectively and efficiently when an incident happens. This can be accomplished by applying the framework towards assessing and developing a mitigation program with the five main focus areas: Prevention, Protection, Mitigation, Response, and Recovery.

(iv) The Recommended Measures in the "Report of Task Force on Cyclone Resilient Robust Electricity Transmission and Distribution Infrastructure in the Coastal Areas" accepted by Ministry of Power vide letter dated 10th June, 2021 for Creating Resilient Transmission Infrastructure may be referred.

3.2.7.5 Right of Way (RoW)

(i) For laying electricity transmission lines, licensee erects towers at stipulated intervals and conductors are strung on these towers maintaining a safe height depending on the voltage and other geographical parameters. The tower base area and corridor of land underneath the strung conductors between two towers forms RoW. The maximum width of RoW corridor is calculated on the basis of tower design, span, wind speed, maximum sag of conductor and its swing plus other requirement of electric safety.

(ii) In order to reduce RoW, the technological options for reducing the tower footing/base, area/corridor requirements may be explored.

(iii) Central Electricity Authority (Technical Standards for Construction of Electric Plants and Electric Lines) Regulations, 2022, provides that, Right of Way for transmission lines shall be optimized keeping in view the corridor requirement for the future by adopting suitable alternative of multi-circuit or multi-voltage lines as applicable. Following may be adopted to optimise RoW utilisation:

- Application of Series Capacitors, FACTS devices and phase-shifting transformers in existing and new transmission systems to increase power transfer capability.
- Up-gradation of the existing AC transmission lines to higher voltage using existing line corridor.
- Re-conductoring of the existing AC transmission line with higher ampacity conductors.
- Use of multi-voltage level and multi-circuit transmission lines.
- Use of narrow base towers and pole type towers in semi-urban / urban areas keeping in view cost and right-of-way optimization.
- Use of HVDC transmission – both conventional as well as voltage source convertor (VSC) based.

3.3 Technological Options

The various technological options that are available are given below. Consideration of these options is problem-specific, that is, in a particular exercise, only a limited number of options may be relevant.

- ⇨ 220 kV AC, 400 kV AC, 765 kV AC, 1200 kV AC
- ⇨ HVDC/UHVDC (±350 kV, ±500 kV, ±600 kV, ±800 kV)
- ⇨ AIS/GIS/Hybrid sub-station
- ⇨ High capacity lines with high conductor temperature
- ⇨ Towers with Insulated Cross arm
- ⇨ Series compensation, dynamic reactive power compensation- TCSC, SVC, STATCOM/FACTS, Synchronous condenser

Various technological options are given in detail in Chapter 4.

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Chapter - 4

New Technologies Options for Transmission System & Cyber Security

4.1 New Technology Options for Substations:

4.1.1. Hybrid sub-station

Hybrid sub-station can be considered as one of the techno-economic solution for locations where availability of space is a constraint and also for renovation/augmentation of existing sub-stations. Hybrid sub-station can be of outdoor or indoor type. In a hybrid sub-station, the bus-bar is air insulated type. In present day construction technology, switchgear for a hybrid sub-station has some or all of the functional units generally enclosed in SF_6 gas (at suitable pressure) filled housing. A hybrid sub-station requires lesser space than conventional Air Insulated Sub-station (AIS) but comparable with Gas Insulated Sub-station (GIS) based on layout/configuration. Just to cite few examples, hybrid sub-stations have been implemented at 220 kV Hapur and Ghaziabad sub-stations of UPPTCL.

4.1.2. Digital Sub-station

A sub-station is called digital in which the data related to protection, control and monitoring of the primary processes is digitized immediately after the measurement. Technically, digital sub-station refers to a sub-station that employs both IEC 61850 Process Bus and Station Bus in its protection and control architecture. In the digital sub-station, conventional measuring equipment such as current transformers (CTs) and voltage transformers (VTs) are replaced with non-conventional instrument transformers using digitalized sensor technology. Due to unavailability of non-conventional instrument transformers at Extra High Voltage (EHV) level, conventional instrument transformers in conjunction with "merging units" and process bus communications technology are employed, which allow the primary values to be digitalized at process level and be communicated within the sub-station via Ethernet. This new breed of high-performance digital sensors and merging units are much easier to install and can pass digital outputs directly to the process bus and preserve signal integrity. Cost saving by reducing wiring, improved safety, space saving, interoperability, flexible assignment of functions, minimizing cyber security risks etc are the advantages of the digital sub-station.

POWERGRID has commissioned a 400 kV digital sub-station at Malerkotla, Punjab, in December, 2020. The digital sub-station was a case of retrofitting the existing conventional Malerkotla sub-station (commissioned in 1992) with full digital technology.

4.1.3. Fault Current Limiter

In order to meet growing electricity demand, generation capacity addition and strengthening of transmission and distribution (T&D) network is being done in the country. With the addition of huge power generation capacity and increase in number of connecting transmission lines at a bus, fault level at number of sub-stations is approaching or exceeding existing equipment ratings. High fault current causes severe mechanical and thermal stresses on equipment and material of the Power System which could lead to damage and failure of equipment/material.

Fault Current Limiter can be considered as an alternative to conventional method to limit the short circuit levels at existing sub-station where the fault level has exceeded the design limit or is likely to exceed the design limit. These fault-current limiters, unlike reactors or high-impedance transformers, can limit fault currents without adding impedance to the circuit during normal operation. Detailed system studies and techno-economic analysis are required to be carried out for implementation of the Fault Current Limiter at specific locations.

4.1.4. Use of Environmental-friendly gas in place of SF_6 in Circuit Breaker and GIS

Global warming potential of SF_6 gas is very high and it is about 25,200 times warmer than CO_2 and has life span of 3200 years. This huge carbon footprint needs to be reduced by use of SF_6 gas free options/alternative gas mixtures. Such alternatives are already in use in different parts of the world and more encouraging results are envisaged in near future, especially in EHV category. Switching technology using purified air and vacuum is also an environment friendly solution which needs to be adopted for appropriate circuit breaker or gas insulated (SF_6) switchgear.

4.1.5. Voltage source converters (VSC) based HVDC

The use of VSC based HVDC may be planned for enhancement of power transfer i.e. increase in power transfer per meter of RoW. The forced switching converters are a new version of High Voltage Direct Current (HVDC) technology that uses Voltage Source Converters (VSC), which are based mainly on Insulated Gate Bipolar Transistors (IGBT). VSCs utilize a power electronic valve with both turn-on and turn-off capability. The converters work by using Pulse Width Modulation (PWM), making it possible to alter both the phase and amplitude, which allows the independent regulation of active and reactive power, as well as the voltage and frequency control. VSC based HVDC can operate with a weak AC system and it also possesses black start capability.

From the AC transmission grid point of view, the VSC-HVDC systems act similar to a motor or generator without inertia, that is able to control the active and/or reactive power.

$\pm$320 kV, 2000 MW VSC based HVDC from Pugalur (Tamil Nadu) – North Trichur (Kerala) is operational in the country.

4.1.6. Resin Impregnated Paper (RIP) and Resin Impregnated Synthetic (RIS) Bushings

Failure of Oil Impregnated Paper (OIP) bushings is one of the major causes of failure of transformers. Use of Resin Impregnated Paper (RIP) bushing is on rise as these bushings are more resilient to fire and fail less. However, these bushings require precautions during storage as these tend to absorb moisture.

RIS bushings are better alternatives which provide a better performance in service. However, these bushings are still under development stage for EHV voltage class.

4.1.7. Regulation of Power Flow: FACTS Devices

With integration of huge quantum of renewable energy generation and expansion of electricity grid, there is a need for optimum utilization of existing assets and regulation of power flow. The use of FACTS devices is need of the hour. FACTS devices are of two categories and are connected to the power system either as a parallel/shunt Compensation (most common) or as a series compensation device. Static Var Compensator (SVC) and STATCOM are shunt connected reactive power compensation elements of FACTS family, capable of providing dynamic control of system voltage at the point of connection with the grid. Static Synchronous Compensator (STATCOM) is basically a Voltage Source Converter (VSC) and can act as either a source or sink of reactive power to an electrical network. VSCs operating with the specified vector control strategy can perform independent control of active/reactive power at both ends of the transmission line. This ability of VSC makes it suitable for connection to weak AC networks, i.e. without local voltage sources. Number of STATCOMs have been planned and commissioned in the system. Similarly, series compensating devices are in operation in Indian Power system either as Fixed Series Compensation (FSC) or as Thyristor Controlled Series Compensation (TCSC).

4.1.8. Containerized Sub-station or Mobile Sub-stations

In the case of any disaster, immediate restoration of power supply, particularly to vital services or installations become one of the prime objectives. The vehicle mounted mobile sub-station [comprising of trailer, incoming and outgoing High Voltage (HV) and Low Voltage (LV) hybrid switchgears, power transformer, and associated connectors] can be put into immediate service as a quick substitute to conventional sub-station of 220 kV and below voltage class to resume power supply in short time in case of emergency/natural or other disasters causing total collapse/disruption of power supply.

Many big industry projects require temporary and fast power supply to feed their expansion needs. Mobile or containerized sub-station may also be used as an alternative for supplying power in such situations, till the time planned sub-station is constructed.

4.1.9. Tank-rupture proof transformers

In general, and especially with increasing concentration of electric power sub-stations in the prime locations within the cities, safety is of paramount importance in the sub-station. A large number of failures related to transformers are attributable to tank rupture/explosion. Depending on the application and place of installation, transformers with “Tank-rupture proof” technology can be used to prevent the potential catastrophic failures to catch fire.

4.1.10. Controlled Switching Devices

Random switching of Circuit Breaker can result in high transient over voltages and / or high inrush current. These transients generate stresses for sub-station and network equipment. Controlled switching devices are now well proven to control switching over voltages during switching of transformers and reactive elements to minimize switching transients and inrush currents. In accordance with the power system requirement and to improve equipment performance and their useful life, as an alternative to Pre-Insertion Resistor (PIR), the circuit breakers of 400 kV voltage class on electric transmission lines of more than 200 km length may be provided with Controlled Switching Devices (CSD). In case of voltages higher than 400 kV the CSD might be required for shorter lengths also, and the same shall be determined by the studies. Controlled Switching Devices would increase the life of high voltage equipments and enhance power system security.

4.1.11. Regulation of Power Flow: Phase Shifting Transformer (PST)

In order to achieve the optimum utilization of transmission lines, power flows needs to be controlled which can be achieved by using a Phase Shifting Transformer (PST). Phase-shifting transformer can be used for controlling the power flow through various lines in a power transmission network by changing the effective phase displacement. These transformers are site specific and need to be planned on case to case basis through proper system studies. One phase shifting transformer was installed at Kothagudem Thermal Power station (TPS) in Telangana.

4.1.12. Static Synchronous Series Compensators (SSSC)

The SSSC is a series compensation solution that manages active power flow on meshed networks to increase overall system utilisation. SSSC solutions are installed in series with the transmission line to push power away from the line or to pull power into the line and thereby relieve the line(s) from overloads. The same device can operate in both push and pull modes to meet different network requirements at different times. Optimum network performance can typically be achieved by using a number of smaller installations rather than a single installation. Examples of where this is needed include where there is unequal power flow in parallel circuits having unequal lengths (impedance) or parallel circuits at different voltages. An SSSC injects a voltage in quadrature with the line current. This allows the SSSC to have a similar effect as adjusting the line impedance or changing the phase angle of the line as explained below in the phasor diagrams.

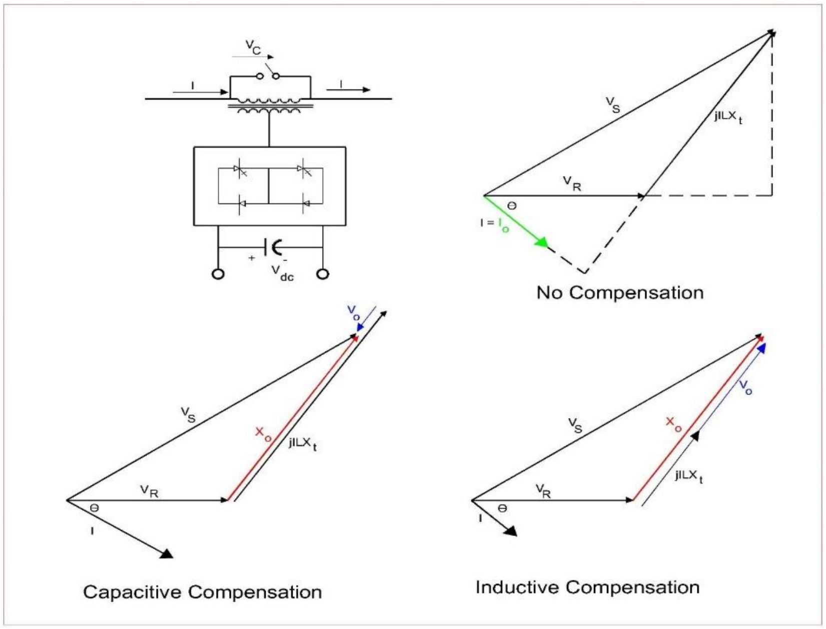

Fig 4.2: Phasor diagram of voltage injections

The SSSC is comparable to a STATCOM but is connected in series with the line rather than shunt connected. Similar to STATCOM, Voltage Source Converters (VSCs) are used to create a voltage waveform that is injected in quadrature with the line current and a transformer then couples this to the electricity system. The injection leads or lags the line current by 90^0, which has the effect of adjusting the line reactance. The leading or lagging injection dictates whether it is increasing or decreasing the line reactance, and therefore whether the SSSC is acting to push active power off an overloaded line or pull on to an under loaded line.

The SSSC solution has been implemented in large scale commercial projects, an example is National Grid in the UK where initially 48 devices of Smart Wires patented “Smart Valve” technology have been installed across five circuits.

4.1.13. Grid Forming Inverters

At present, the inverters in the RE plants in the Indian power system operate as grid-following sources i.e., the inverter controllers cannot create AC voltage independently at their terminals and lock to the phase of the already existing AC voltage. The large RE complexes in the Indian power system are mostly coming up at remote locations. The non-availability of grid forming sources, (conventional synchronous generators) especially in these remotely located large RE complexes, may significantly delay the restoration of supply in case of any untoward incident. Emerging technologies such as grid-forming inverters can play a pivotal role in the remote renewable energy complexes, offering a host of critical advantages. One of their key benefits is their capability to initiate a black start, a crucial function for restoring power in case of grid failures. By autonomously re-establishing the grid's operation, grid-forming inverters can minimize downtime, prevent economic losses, and enhance overall grid resilience. These inverters also provide stability to grids which may get weak due to replacement of conventional generation. Moreover, these inverters help in maintaining grid frequency and voltage, ensuring a smooth and consistent supply of electricity even in the presence of intermittent renewable sources. Their adaptability and ability to synchronize with the grid make them an invaluable asset in the transition towards a cleaner and more sustainable energy future.

4.2 New Technology Options for Transmission Lines:

4.2.1. Insulated Cross Arm (ICA)

Upgrading lines on existing corridors is one of the options to deal with growing electricity demand and can be achieved by modifying towers to handle higher voltages which could be possible with Insulated Cross Arm.

The key benefits of Insulated Cross Arms are that insulator swing under windy conditions is reduced to a minimum and instead it is determined by metal clamping assemblies. There is no requirement for additional tower height to accommodate the length of the insulator string itself. Therefore, using insulated cross-arms can effectively raise the height of conductors from ground level, i.e. approximately 4 m in the case of a 400 kV line. Basically, such a solution can resolve ground clearance problems on existing lines, allow greater sag on existing or new conductors, facilitate voltage upgrading due to improved clearances from towers, permit more compact towers with smaller foundations etc. Insulated Cross Arm can also be provided with the Pole type Structures. Use of less foot print and additional ground clearances are the major advantages of using pole type structures with ICA. The ICA with the adoption of High Temperature Low Sag (HTLS) conductor, which have excellent sag characteristics (lesser sag as compared to conventional line conductors), can further raise the height of conductor above the ground, which can contribute to voltage up-gradation to higher level, leading to increase in power transfer capability of the line.

At present, the use of insulated cross arm is not much in practice in Indian transmission system, except for a few utilities in the states of Telangana and Kerala. In Kerala, one 66 kV line (50 km) was upgraded to 110 kV using Composite Insulated Cross Arm (CICA), which is in operation since 2007. In Telangana, the steel cross arm of Imlibun-Bandlaguda 132 kV transmission line was replaced in 2019 by CICA to reduce Right-of-Way (RoW), increase horizontal clearance to buildings and increase ground clearance. The corridor width was reduced by about 4 m and ground clearance was increased by about 2 m. Other utilities are also exploring the possibility of using Insulated Cross Arm on transmission lines. Use of CICA is particularly useful on old existing transmission lines which could be upgraded to higher than the existing voltage level on the same towers, offering the above stated advantages.

4.2.2. EHV XLPE Cable

Due to increasing urbanization and scarcity of land (particularly in densely populated urban areas), it has become very difficult for utilities to construct overhead transmission and distribution lines. RoW issues have always resulted in inordinate delays in execution of transmission projects. To avoid such problems, utilities resort to use of EHV XLPE Cables. Due to technical limitations, the use of XLPE cable at EHV level is restricted to a certain length. The creation of unavoidable joints and terminations are vulnerable to failure, leading to outage of cable system. Gas Insulated Lines (GIL) in certain areas of application is considered to be a good alternative to EHV XLPE cables, especially where normal current/power flow requirement is high and length is short. Manufacturing facilities in respect of XLPE cable upto 400 kV level are available in the country.

4.2.3. High Performance Conductors

The conventional Aluminium Conductor Steel reinforced (ACSR) and All Aluminium Alloy Conductors (AAAC) are currently designed to operate at maximum temperature of 85 ^{0}C and 95 ^{0}C respectively. The thermal limit of the conductor is established by the fact that further heating results in annealing of the conductor. The ordinary hard drawn aluminium used in conventional ACSR starts annealing and losing strength above 93 ^{0}C and is not suitable for use at temperature above this. Thus, the ampacity of these conductors is restricted by above mentioned conductor temperature and further enhancement of ampacity is not possible. Ampacity in the same transmission line can be enhanced by use of either higher size conductor or High Performance Conductors (HPC). High Performance Conductors are designed to operate at temperature higher than that for conventional conductors. Because of their operation at high temperature, these conductors can carry higher current (typically 1.5 to 2 times of the ACSR conductors) without exceeding the size and the weight of existing conductor and offering similar or better tensile strength, hence, allowing use of same structure without any or with minimal modification, resulting into short construction period. Apart from its use in enhancement of power transmission capacity in existing corridor, such conductors could also be used in new lines where higher power flow is required which otherwise is not possible through ACSR or AAAC conductors. HTLS conductors are already in use in India. In February 2019, CEA published a report on "Guidelines for Rationalised Use of High Performance Conductors". The report provides the detailed description of High Performance conductors, ampacity comparison and cost benefit analysis.

4.2.4. Photonic Coating on Conductor

Thermal rating of overhead transmission line conductors limits the transmission capacity, especially at 66 kV / 132 kV/220 kV level. Applying photonic coating on the conductors, lowers the operating temperature of the line through increasing thermal radiation and minimising the heat absorbed. With this, the capacity of the line can be increased up to some extent. Sufficient data/study shall be required before adoption of this technology. Further, this technology may be deployed in selected lines considering temperature zone and capacity enhancement requirement.

4.2.5. Covered Conductor

Covered conductors may be one of the solutions for the transmission and distribution lines passing through the forest areas where problem of accidental electrocution of animals is very prominent. Covered conductor will be helpful where there is high probability of trees in forest or densely vegetated areas touching the live conductor due to wind forces. This will avoid frequent outage of the lines and burning of trees.

4.2.6. Dynamic Line Rating (DLR)

The rating (current carrying capacity) of a conductor varies according to the prevalent atmospheric conditions. Factors like ambient temperature, solar irradiance, wind speed etc impact the rating of a conductor in real time. If the varying weather conditions cannot be monitored in real time, the safest method is to assume the worst-case conditions (which didn't exist, most of the time) for conductor design and strictly adhere to it, in view of safety requirements.

Amongst all the ambient factors, wind speed is the single most critical parameter to impact the rating of the Conductor/overhead line. Ampacity loading of a conductor with varying wind speed is shown below:

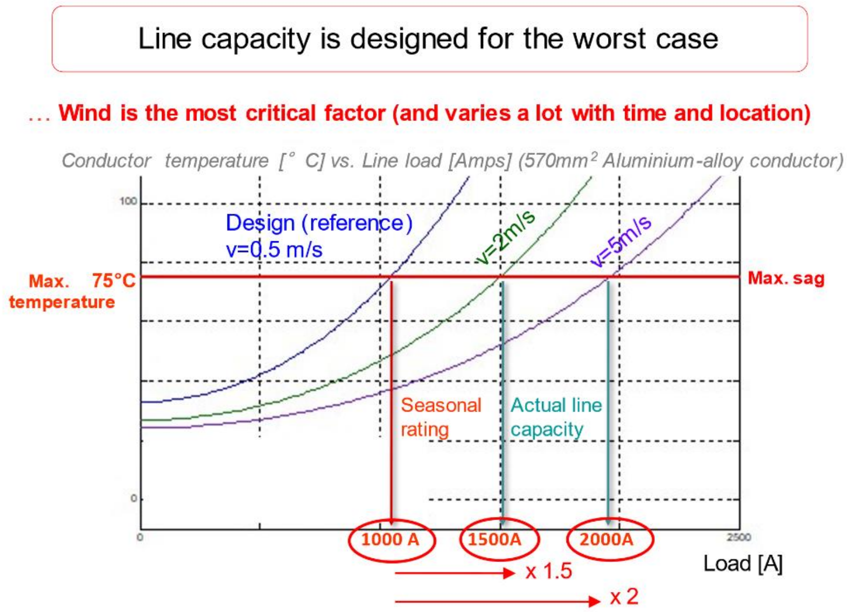

Fig 4.1: Ampacity of conductor vs wind speed

The actual wind speed impacting the conductor in real time helps the conductor dissipate the heat continuously; thereby releasing the additional reserves in capacity. With evolution of technology and innovation, it has been possible to monitor these changes in real time and Dynamic Line Rating (DLR) has been used in Grid Optimization since more than a decade now.

Experience in Europe and other western countries have shown substantial growth in capacities which have been possible due to deployment of proper DLR solutions; in some cases, even 30-40% growth in capacities have been achieved.

DLR solution can be a boon to handle congestion issues immediately as the cost of deploying DLR could be a fraction of other forms of mitigating congestion issues on overhead line. However, it should be noted that DLR is not a substitute for augmentation of transmission lines.

4.2.7. Monopole structure

In recent years, use of monopole structures are increasing in specific areas due to much reduced footprints, less component and faster erection and commissioning. The benefit of smaller base installation space, even for erection of higher than 40 to 50 m heights, makes monopoles an eco-friendly alternative to lattice towers. Monopoles have distinct advantages over the lattice towers with respect to space, faster erection and short delivery time. In India, monopoles have been installed at several locations.

4.3 New Technology Options for Communication Equipment in Transmission System:

4.3.1. OPGW based Communication in Power Sector

Communication System plays a critical role in ensuring safe, secure, stable and reliable operation of the grid as well as economical and integrated operation of the grid. Power System in the country is expanding rapidly with increased number of interconnections between Regions, integration of RE, and emergence of Smart Grid applications.

In addition, Indian Grid is characterized by wide power flow variation due to daily/monthly/seasonal variation in demand/ generation. As a result, the complexity in Grid operation has increased manifold, which necessitates dynamic monitoring of Grid parameters/conditions on real-time basis. The existing Supervisory Control and Data Acquisition (SCADA) system/Energy Management System (EMS) provides data which is steady state in nature and not suitable for dynamic monitoring and control of the Grid due to high degree of latency of tele-metered data and also non-synchronized sampling of data. Technologies like Phasor Measurement Unit (PMU), Wide Area Measurement (WAM) system provide dynamic monitoring of network on real time basis. Monitoring through the said measurements shall facilitate development of various control, regulation and preventive features like Remedial Action Schemes (RAS), System Integrated Protection Scheme (SIPS), Adaptive islanding, Self-healing Grid etc. In addition to these, utilities are moving towards more advanced monitoring with Asset Management. These technologies require a highly reliable communication system with high bandwidth and low latency.

While Power Line Carrier Communication (PLCC) based communication system has been a reliable technology for distance protection, it falls short of meeting bandwidth requirement of current differential protection for transmission lines and other communication services. The Fiber Optic based communication system, viz. optical ground wire (OPGW), underground fiber optic (UGFO) cable and all-dielectric self-supporting (ADSS) fiber optic cable being widely adopted nowadays is capable of meeting this high bandwidth requirements of power system for its reliable and stable operation.

Considering above aspects, in all upcoming transmission lines of 110 kV and above, OPGW is being provisioned in place of the conventional earth wire.

4.3.2. Communication Equipment and DC Power Supply

With wider adoption of fiber optic communication to achieve the high bandwidth requirement of power system communication services, associated terminal equipment such as Synchronous Digital Hierarchy (SDH), Plesiochronous Digital Hierarchy (PDH) etc are being used. Unlike PLCC equipment, this terminal equipment offers higher data rate and require low input power. In addition, these equipment offer the advantage of linking multiple directions into the same terminal equipment.

Optical terminal equipment has been evolving from circuit switching technologies like SDH and PDH to packet switching technologies like Multi-Protocol Label Switching (MPLS) which use routers to transmit and receive data. Packet switching technologies offer advantages of dynamic routing, scalability and bandwidth provisioning over circuit switching technologies. With MPLS technology already tried, tested and evolved in telecom domain, power utilities are eyeing for migration from SDH technology to MPLS technology in power system operation. In spite of the fact that SDH is an established technology in power sector for data communications and tele-protection services, MPLS technology is being evaluated by the power utilities as a replacement to the legacy system.

The above communication equipment mostly operate at 48 V DC power supply and ensuring continuous DC supply is important for uninterrupted data transfer. Reliable 48 V DC Power Supply with a suitable capacity is to be planned in a comprehensive manner to cater to all the communication applications instead of multiple supply systems. This will optimize space and avoid multiple systems in a sub-station/control centre.

4.4 Surveying Technologies

4.4.1. Pre-construction survey is essential for the construction of transmission lines/sub-stations. It helps in identifying the shortest possible route of the transmission line and number of towers required along the route. Owing to the time-consuming nature and inaccuracy of conventional surveying techniques such as walkover surveys, utilities may explore use of Light Detection and Ranging (LiDAR) technology and drones for surveys, topographic mapping, to assess potential site locations, design site layouts, generate 3D visualizations and make RoW estimations.

Further, helicopters/drones equipped with LiDAR, thermo-vision cameras and corona cameras can be used for aerial patrolling, operations and maintenance of transmission lines and towers.

4.5 Cyber Security

4.5.1 The Indian electricity grid comprises of the utilities of Generators, Transmission, Distribution systems and the consumers of the electricity. The Indian grid is demarcated into five synchronously connected regional grid viz. Northern Region, Western Region, Southern Region, Eastern Region and North Eastern Region which also encompass the state grids in respective regions. The supervision of electricity grid and coordination with different utilities is being carried out by the respective Load Despatch Centres (LDCs) as per their jurisdiction at various hierarchical level at state, regional and national level.

Cyber Security plays a very important role in smooth operation of the grid. To ensure that the electricity grid is resilient to cyber-attacks, following steps have been taken by the Government:

(a) **Sub-sector Specific CERTS:** Ministry of Power has established following six sub-sector-specific Computer Emergency Response Teams (CERTs) to detect and respond to cybersecurity incidents. i. CERT Thermal, ii. CERT Hydro iii. CERT Renewable Energy, iv. CERT Transmission, v. CERT Grid Operation and vi. CERT Distribution. For necessary coordination of Cyber Security preparedness of respective sectors with CERT-IN.

(b) **CEA (Cyber Security in Power Sector) Guidelines 2021:** Central Electricity Authority (CEA) has issued "CEA (Cyber Security in Power Sector) Guidelines 2021" on 07.10.2021, which serves as a roadmap for cybersecurity readiness in the power sector. By adhering to these guidelines, power companies can ensure the integrity and resilience of their critical systems, mitigating the risk of cyber-attacks.

(c) **Implementation of Cyber Crisis Management Plan:** Each power sector utilities have developed their own Cyber Crisis Management Plans (C-CMPs) based on customized C-CMP developed for each sub-sector to ensure quick response and recovery.

(d) **Establishment of National Critical Information Infrastructure Center (NCIIPC):** IT Act recognizes the concept of "Critical Information Infrastructure" (CII) in the form of Section 70A wherein the nodal agency designated by central government shall be responsible for all measures including R &D related to protection of CIIs. The Designated agency NCIIPC (National Critical Information Infrastructure Protection Center) shall identify certain computer systems, networks, or databases as CII based on factors like their significance to the national security, economy, public health, or safety.

(e) **Notification of CSIRT-Power:** Ministry of Power vide Office Order dt. 05.04.2023 has decided to set up Computer Security Incident Response Team-Power (CSIRT-Power) at CEA, specifically for Power Sector and to function as extended arm to CERT-In to coordinate and support the response to cyber security incidents and hand-hold utilities for preventing, detecting, handling, and responding to cyber security incidents. CSIRT-Power provides expert guidance to mitigate and prevent cyber incidents to protect Critical Information Infrastructure

(f) **Establishment of Disaster Recovery Plan:** For ensuring the cyber security, disaster recovery, redundancy and business continuity, the comprehensive Disaster Recovery and backup plan have been setup. All five regional grid centers along with national Load Dispatch Centre along with State Load Dispatch Centers are having functional backup setup in geographically distant locations.

(g) **Laying down the Cyber security framework for power sector** - Nomination of CISOs and Alternate CISOs, Identification of CIIs, Cyber Security Audit, Cyber security awareness, Cyber security training programs among others.

(h) **Establishment of Security Operations Center (SOC) and on boarding with Cyber Swachhta Kendra (CSK)**: GRID-INDIA has established a 24x7 Security Operations Center. Logs from various devices of the critical IT and OT systems are continuously being collected and monitored in the SOC. Various Artificial Intelligence (AI)/ Machine Learning (ML) based automated response techniques have been adopted to mitigate cyber incidences and vulnerabilities observed in SOC. The public interfaces of GRID-INDIA have been onboarded with CSK established by CERT-IN for constant monitoring and mitigation of open vulnerabilities.

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Chapter - 5

Analysis and Studies for 2026-27

5.1 Introduction

5.1.1 Expansion of the transmission system depends on the projected electricity demand and the generation capacity addition. For planning of transmission system, peak demand projection, demand variations over various seasons/months during a year as well as daily variations in electricity demand are required, as the flow on transmission lines keep on varying based on load-generation scenarios throughout the year. With high share of RE in the grid, the RE generation pattern is also equally important in planning of transmission system as power flow on the transmission lines may totally change and a net exporting zone during high RE generation may become a net importing zone in low RE generation scenario.

5.2 Electricity Demand Projections for 2026-27

5.2.1 The 20th Electric Power Survey (EPS) Report gives the projections of annual electricity demand. The all-India, region-wise and state-wise electricity demand as per the 20th EPS Report has been considered in the studies and the same is given in Table 5.1:

Table – 5.1: Forecast of Annual Peak Electricity Demand for 2026-27 as per 20th EPS Report

Region	Peak Electricity Demand 2026-27 (MW)	Electrical Energy Requirement 2026-27 (MU)
Northern Region	97898	592312
Western Region	89457	596793
Southern Region	80864	460853
Eastern Region	37265	232971
North-Eastern Region	4855	24904
All- India	**277201**	**1907835**

5.2.2 State-wise projections of peak electricity demand for the year 2026-27 as per the 20th EPS Report are given in Table 5.2**:**

Table – 5.2: State-wise forecast of Annual Peak Electricity Demand for 2026-27 as per 20th EPS Report

Northern Region		
State	**Peak Electricity Demand (MW)**	**Electrical Energy Requirement (MU)**
Chandigarh	492	1911
Delhi	9460	42566
Haryana	16337	82981
Himachal Pradesh	2571	15238
Jammu & Kashmir	3566	22507

Ladakh	85	321
Punjab	16925	81959
Rajasthan	21175	133550
Uttar Pradesh	33017	191138
Uttarakhand	3249	20142
Total (Northern Region)	**97898**	**592312**
Western Region		
State	**Peak Electricity Demand (MW)**	**Electrical Energy Requirement (MU)**
Chhattisgarh	7081	47208
Dadra & Nagar Haveli	1273	9559
Daman & Diu	493	3437
Goa	901	5512
Gujarat	27710	182507
Madhya Pradesh	21592	128844
Maharashtra	36376	219726
Total (Western Region)	**89457**	**593793**
Southern Region		
State	**Peak Electricity Demand (MW)**	**Electrical Energy Requirement (MU)**
Andhra Pradesh	17758	98162
Karnataka	17810	88232
Kerala	5549	33903
Lakshadweep	13	66
Puducherry	567	3436
Tamil Nadu	21736	144086
Telangana	19529	92967
Total (Southern Region)	**80864**	**460853**
Eastern Region		
State	**Peak Electricity Demand (MW)**	**Electrical Energy Requirement (MU)**
Andaman & Nicobar	67	368
Bihar	10553	58256
DVC	4220	23087
Jharkhand	3808	25463
Odisha	7630	48627
Sikkim	179	819
West Bengal	12891	76352
Total (Eastern Region)	**37265**	**232971**
North Eastern Region		
State	**Peak Electricity Demand (MW)**	**Electrical Energy Requirement (MU)**

Arunachal Pradesh	223	1117
Assam	3045	15151
Manipur	344	1363
Meghalaya	492	2711
Mizoram	231	1252
Nagaland	195	1088
Tripura	531	2222
Total (North Eastern Region)	**4855**	**24904**

5.2.3 Region-wise Growth in Electricity Demand

For comparison purposes, the region-wise growth of peak electricity demand since 2016-17 is given in Table 5.3 and depicted in Figure 5.1:

Table – 5.3: Region-wise growth of peak electricity demand since 2016-17

Region	Peak Electricity Demand (Actual) in 2016-17 (MW)	Peak Electricity Demand (Actual) in 2021-22 (MW)	Projected Peak Electricity Demand in 2026-27 (MW) as per 20th EPS Report
Northern Region	53372	73305	97898
Western Region	48531	65433	89457
Southern Region	42232	61138	80864
Eastern Region	18908	26019	37265
North-Eastern Region	2487	3427	4855
All India	**159542**	**203014**	**277201**

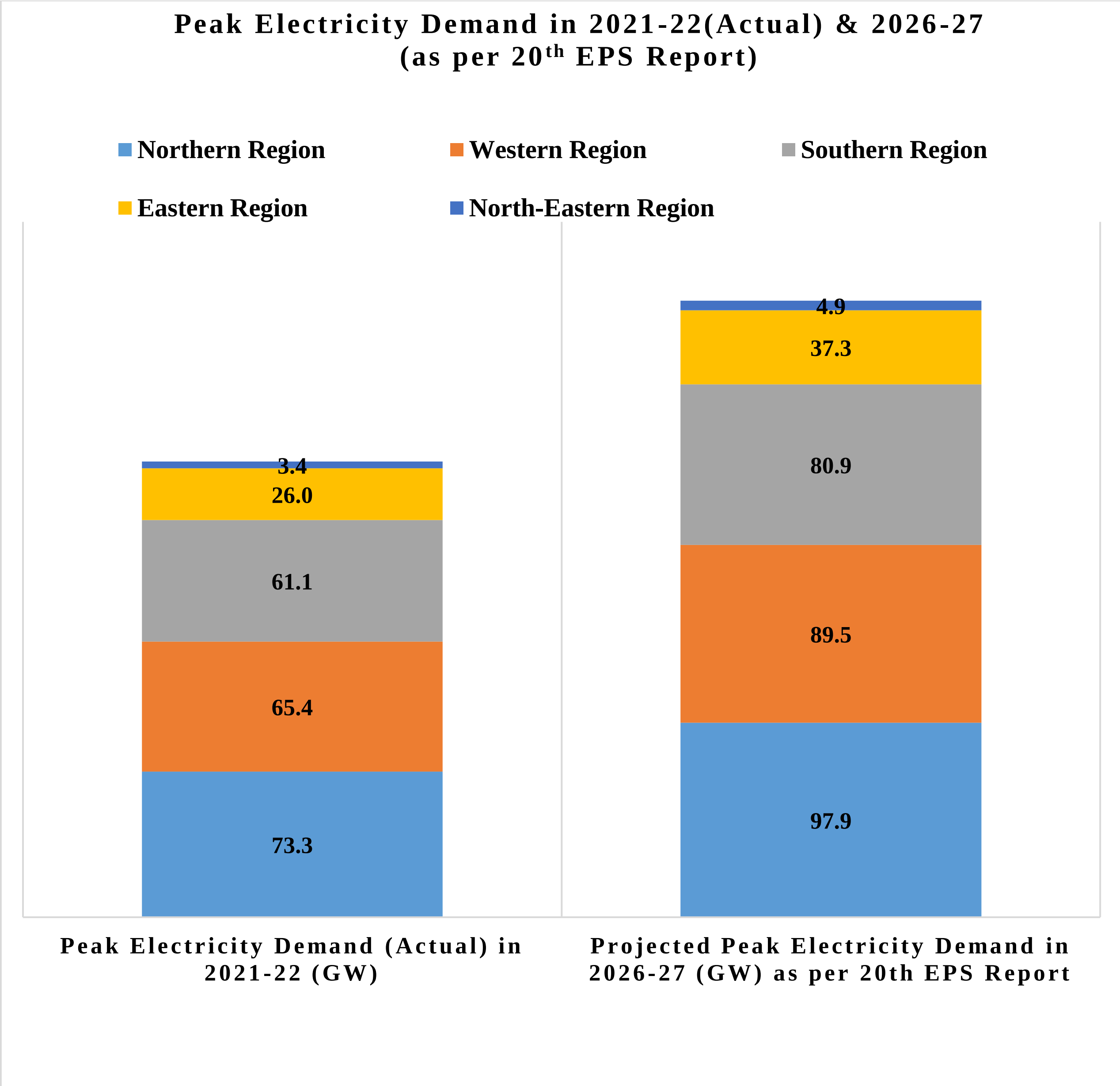

Fig 5.1: Region-wise Peak Electricity Demand in 2021-22 & 2026-27

5.3 Growth in Peak Electricity Demand: State-Wise

The state-wise growth of Peak Electricity Demand since the year 2016-17 is given in Table 5.4:

Table – 5.4: State-wise growth of Peak Electricity Demand

Northern Region			
State	**Peak Electricity Demand (Actual) in 2016-17 (MW)**	**Peak Electricity Demand (Actual) in 2021-22 (MW)**	**Projected Peak Electricity Demand in 2026-27 (MW) as per 20th EPS Report**
Chandigarh	361	426	492
Delhi	6342	7323	9460

Northern Region			
State	**Peak Electricity Demand (Actual) in 2016-17 (MW)**	**Peak Electricity Demand (Actual) in 2021-22 (MW)**	**Projected Peak Electricity Demand in 2026-27 (MW) as per 20th EPS Report**
Haryana	9262	12120	16337
Himachal Pradesh	1499	2030	2571
Jammu & Kashmir	2675*	3076*	3566
Ladakh			85
Punjab	11408	13556	16925
Rajasthan	10613	15784	21175
Uttar Pradesh	17183	24965	33017
Uttarakhand	2037	2468	3249
Northern Region	**53372**	**73305**	**97898**

***Including the peak electricity demand of UT of Ladakh**

Western Region			
State	**Peak Electricity Demand (Actual) in 2016-17 (MW)**	**Peak Electricity Demand (Actual) in 2021-22 (MW)**	**Projected Peak Electricity Demand in 2026-27 (MW) as per 20th EPS Report**
Gujarat	14724	19451	27710
Madhya Pradesh	11512	15917	21592
Chhattisgarh	3875	5019	7081
Maharashtra	22516	28075	36376
Goa	546	703	901
Dadra & Nagar Haveli	784	891	1273
Daman & Diu	334	371	493
Western Region	**48531**	**65433**	**89457**

Southern Region			
State	**Peak Electricity Demand (Actual) in 2016-17 (MW)**	**Peak Electricity Demand (Actual) in 2021-22 (MW)**	**Projected Peak Electricity Demand in 2026-27 (MW) as per 20th EPS Report**
Andhra Pradesh	7969	12551	17758
Karnataka	10261	14830	17810
Kerala	4132	4374	5549

Southern Region			
State	**Peak Electricity Demand (Actual) in 2016-17 (MW)**	**Peak Electricity Demand (Actual) in 2021-22 (MW)**	**Projected Peak Electricity Demand in 2026-27 (MW) as per 20th EPS Report**
Lakshadweep	8	11	13
Puducherry	371	469	567
Tamil Nadu	14823	16891	21736
Telangana	9187	14163	19529
Southern Region	**42232**	**61138**	**80864**

Eastern Region			
State	**Peak Electricity Demand (Actual) in 2016-17 (MW)**	**Peak Electricity Demand (Actual) in 2021-22 (MW)**	**Projected Peak Electricity Demand in 2026-27 (MW) as per 20th EPS Report**
A&N	40	60	67
Bihar	3883	7154	10553
DVC	2721	3355	4220
Jharkhand	1498	1887	3808
Odisha	4012	5643	7630
Sikkim	112	133	179
West Bengal	7931	9089	12891
Eastern Region	**18908**	**26019**	**37265**
North-Eastern Region			
State	**Peak Electricity Demand (Actual) in 2016-17 (MW)**	**Peak Electricity Demand (Actual) in 2021-22 (MW)**	**Projected Peak Electricity Demand in 2026-27 (MW) as per 20th EPS Report**
Arunachal Pradesh	140	197	223
Assam	1673	2126	3045
Manipur	163	258	344
Meghalaya	331	408	492
Mizoram	98	169	231
Nagaland	148	173	195
Tripura	284	328	531
North-Eastern Region	**2487**	**3427**	**4855**

5.4 Monthly Variation of Peak Electricity Demand

5.4.1 The electricity demand varies on a diurnal, monthly and seasonal basis throughout the year. In India, there are distinct time periods of peak (peak load) and off-peak (base load) electricity demand during a year. The region-wise and state-wise plot of monthly peak electricity demand (in %) for the year 2021-22 is depicted in Figures 5.2 - 5.7:

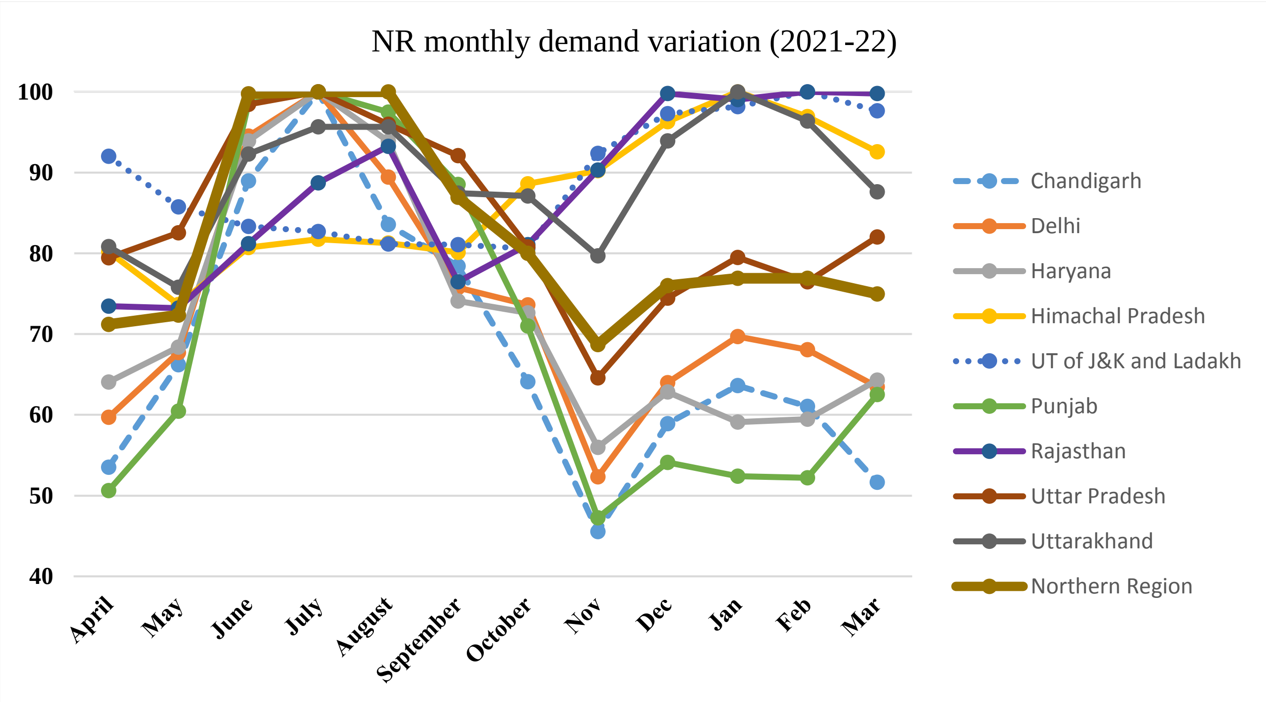

Figure 5.2: NR monthly demand variation 2021-22

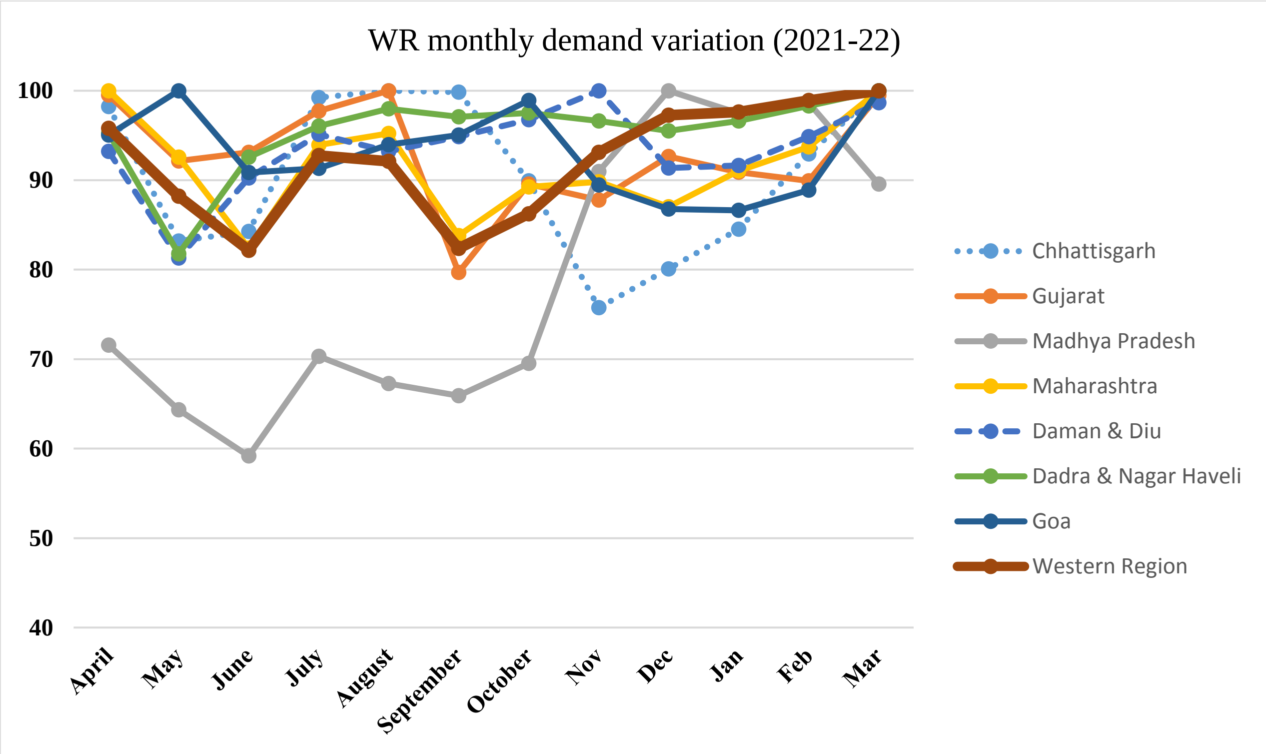

Figure 5.3: WR monthly demand variation 2021-22

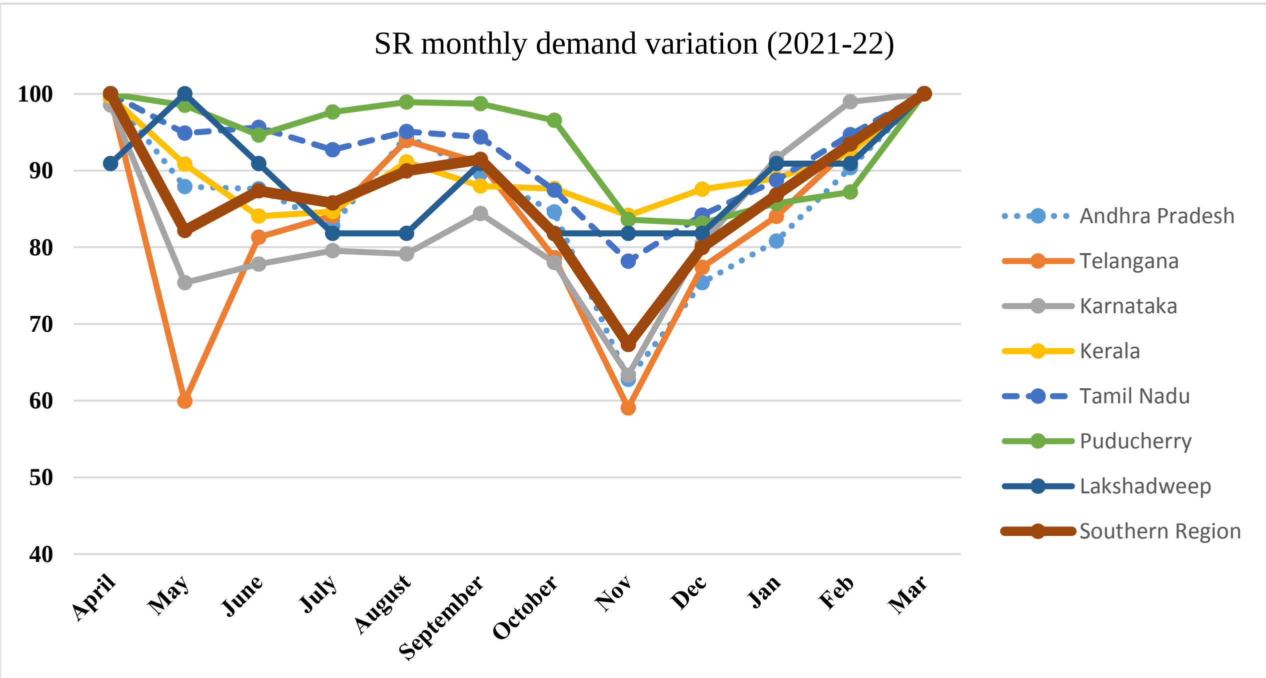

Figure 5.4: SR monthly demand variation 2021-22

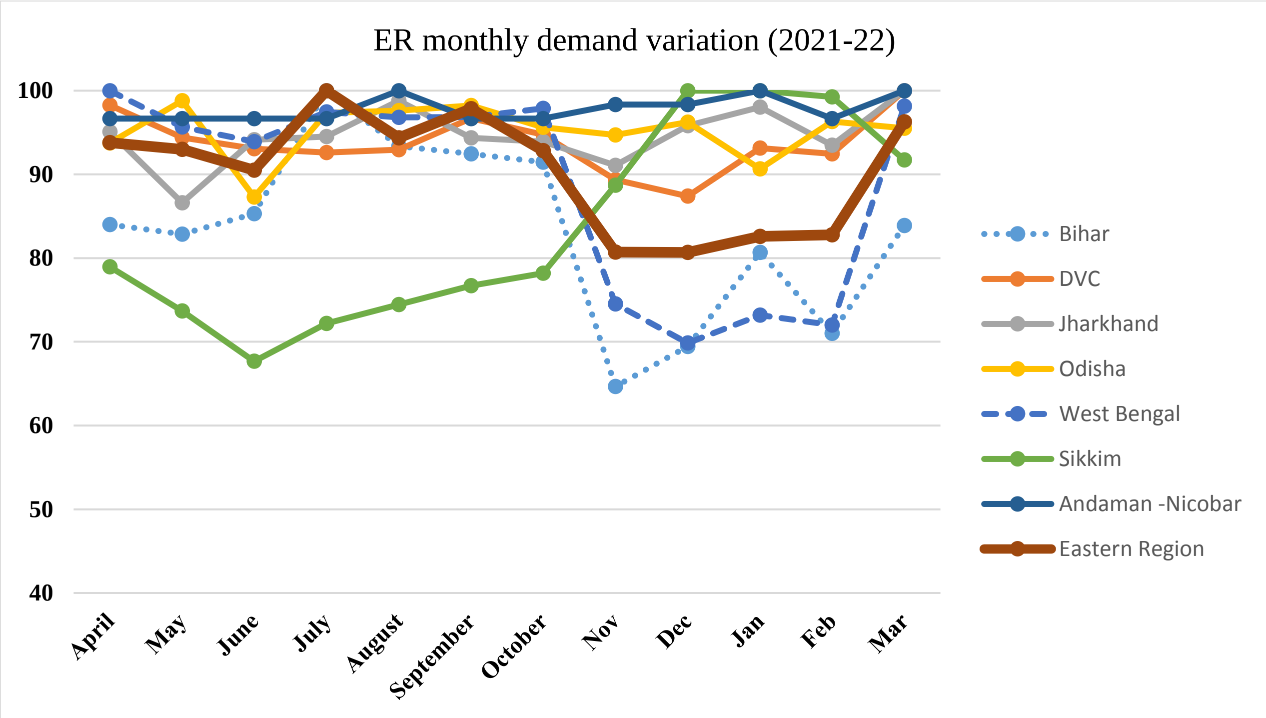

Figure 5.5: ER monthly demand variation 2021-22

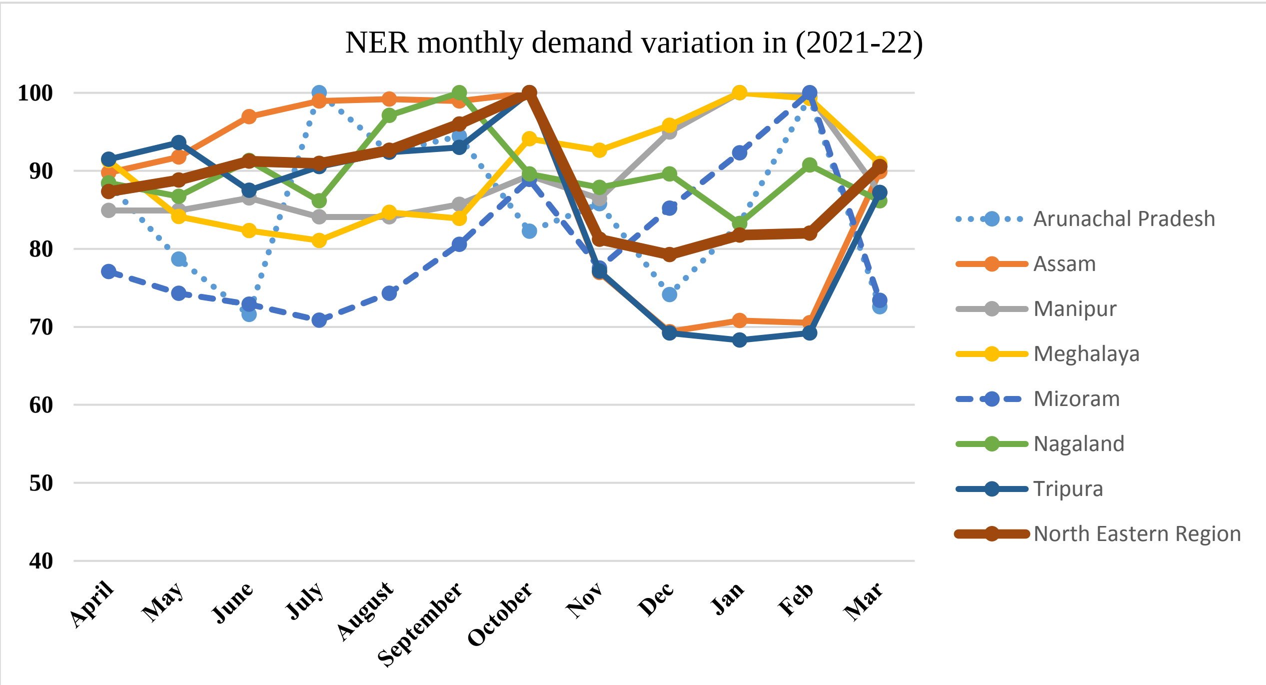

Figure 5.6: NER monthly demand variation 2021-22

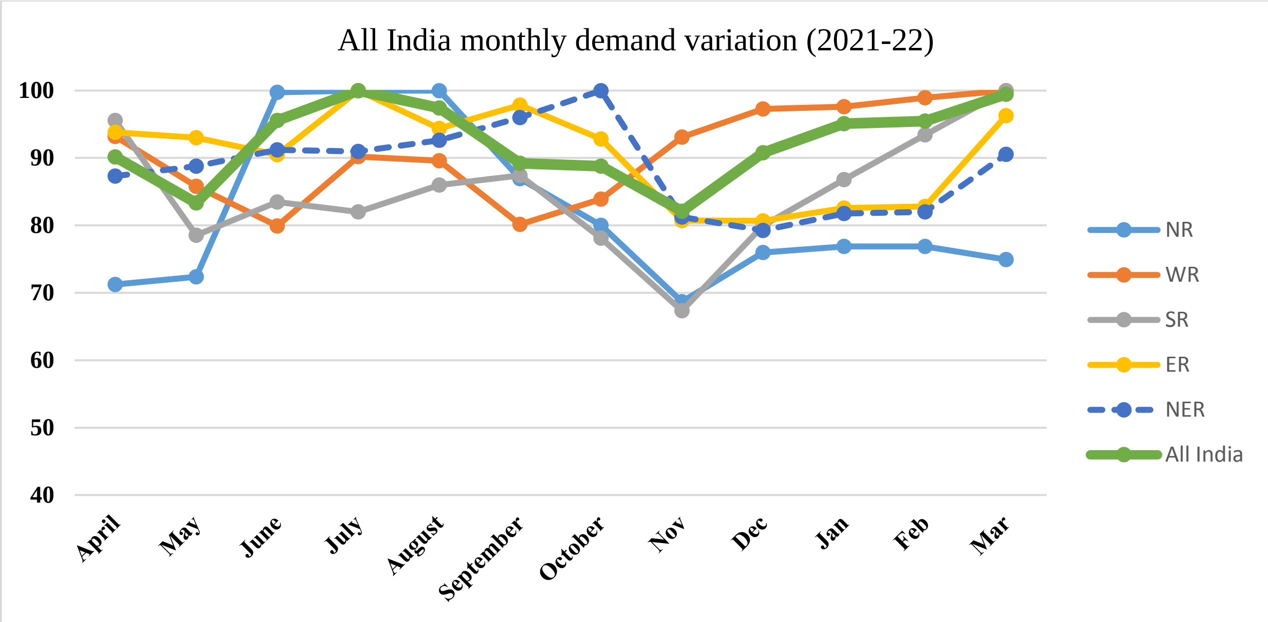

Figure 5.7: All India monthly demand variation 2021-22

5.4.2 These load profiles have importance in transmission planning as it helps in identifying the key load-generation scenarios in which maximum stress is likely to occur on the system.

5.5 Installed Generation Capacity by 2026-27

5.5.1 Installed electricity generation capacity in March 2022, was about 399.5 GW. Generation capacity addition likely during 2022-27 is about 210.1 GW. Thus, the installed electricity generation capacity at the end of March 2027, would be about 609.6 GW. Region-wise summary of the likely installed generating capacity at the end of March, 2027, is given in Table 5.5.

Table – 5.5: Installed generating capacity: Region-wise

Region	Installed Capacity in March, 2022 (MW)	Installed Capacity likely in March, 2027 (MW)*
Northern	99927	184403
Western	139274	194400
Southern	111494	171928
Eastern	43795	51767
North Eastern	5007	7095
all – India	399497	609591

**Capacity to be retired by 2026-27 has been adjusted*.

5.5.2 Installed electricity generation capacity in the country in March, 2022, was about 399.5 GW as given in Table

Table – 5.6: Installed Electricity Generation Capacity at the end of March, 2022

Installed Electricity Generation Capacity at the end of the March, 2022 (MW)										
State	**Coal**	**Gas**	**Diesel**	**Hydro**	**Nuclear**	**Wind**	**Solar**	**Biomass**	**Small Hydro**	**Total**
Northern Region										
Haryana	5330	432	0	0	0	0	911	258	74	7004
Himachal Pradesh	0	0	0	10263	0	0	76	10	954	11303
J&K and Ladakh	0	175	0	3449	0	0	55	0	184	3863
Punjab	5680	0	0	1096	0	0	1100	492	176	8544
Rajasthan	10480	1023	0	411	1180	4327	12565	125	24	30135
Uttar Pradesh	24389	1493	0	502	440	0	2244	2190	49	31307
Uttarakhand	0	450	0	3855	0	0	574	139	219	5237
Delhi	0	2208	0	0	0	0	211	59	0	2478
Chandigarh	0	0	0	0	0	0	55	0	0	55
Total-NR	**45879**	**5781**	**0**	**19576**	**1620**	**4327**	**17791**	**3273**	**1680**	**99927**
Western Region										
Gujarat	16092	7551	0	1990	440	9209	7180	109	89	42661
Madhya Pradesh	21950	0	0	2235	0	2520	2718	131	100	29654
Chhattisgarh	23688	0	0	120	0	0	518	275	76	24677
Maharashtra	23856	3207	0	3047	1400	5013	2631	2632	381	42167
Goa	0	48	0	0	0	0	20	0	0	68
DNH & DD	0	0	0	0	0	0	46	0	0	46
Total-WR	**85586**	**10806**	**0**	**7392**	**1840**	**16742**	**13113**	**3148**	**646**	**139274**
Southern Region										
Andhra Pradesh	11590	4899	37	1610	0	4097	4387	566	162	27347
Karnataka	9480	0	25	3689	880	5131	7591	1902	1281	29979
Kerala	0	534	160	1857	0	63	363	3	243	3221
Tamil Nadu	13685	1027	212	2178	2440	9871	5112	1043	123	35690
Telangana	7843	0	0	2406	0	128	4520	220	91	15208
Puducherry	0	33	0	0	0	0	14	0	0	46
Lakshadweep	0	0	0	0	0	0	3	0	0	3
Total-SR	**42598**	**6492**	**434**	**11740**	**3320**	**19290**	**21989**	**3733**	**1899**	**111494**
Eastern Region										
Andaman Nicobar	0		41	0	0	0	29	0	5	75
Bihar	8400	0	0	0	0	0	191	126	71	8788
Jharkhand	4250	0	0	210	0	0	89	4	4	4557
Odisha	9540	0	0	2155	0	0	451	59	107	12312
West Bengal	13697	100	0	1341	0	0	166	322	99	15725
Sikkim	0	0	0	2282	0	0	5	0	52	2339

State	Coal	Gas	Diesel	Hydro	Nuclear	Wind	Solar	Biomass	Small Hydro	Total
Total-ER	**35887**	**100**	**41**	**5988**	**0**	**0**	**931**	**512**	**337**	**43796**
North-Eastern Region										
Assam	750	620	0	350	0	0	118	2	34	1874
Manipur	0	0	36	105	0	0	12	0	5	158
Meghalaya	0	0	0	322	0	0	4	14	33	372
Nagaland	0	0	0	75	0	0	3	0	31	109
Tripura	0	1100	0	0	0	0	15	0	16	1131
Arunachal Pradesh	0	0	0	1115	0	0	11	0	131	1257
Mizoram	0	0	0	60	0	0	8	0	36	104
Total-NER	**750**	**1720**	**36**	**2027**	**0**	**0**	**171**	**16**	**286**	**5006**
Total All India	**210700**	**24900**	**510**	**46723**	**6780**	**40359**	**53995**	**10682**	**4848**	**399497**

5.5.3 As per the NEP (Volume-I) Generation, the installed generating capacity required to meet the projected electricity demand during the year 2026-27 would be of the order of 609.6 GW (after deducting capacity likely to retire during the period 2022-27) which includes about 277 GW of renewable generation capacity comprising of 73 GW of wind, 186 GW of Solar, 13 GW of Biomass and 5.2 GW of Small Hydro Projects as given in Table 5.7.

Table – 5.7: Installed Generation Capacity (MW) likely by 2026-27 as per NEP (Volume-I) Generation

Installed Generation Capacity projected at the end of 2026-27 (in MW)											
State	**Coal**	**Gas**	**Hydro**	**PSP**	**Nuclear**	**Wind**	**Solar**	**Biomass**	**Small Hydro**	**Total#**	**BESS**
Total All India	235133	24824	52446	7446	13080	72896	185566	13000	5200	**609591**	8680

#Exclusive of the BESS capacity

5.5.4 However, as per SECI/MNRE additional RE capacity is likely to be added by March, 2027. Some additional RE capacity addition has also been planned by States/UTs. To meet the requirement of RTC power, additional storage capacity is also likely to be added along with the RE capacity. Hence, for the purpose of transmission planning, the additional wind and solar generation capacity (about 20 GW each wind and solar) as well as additional BESS have been considered. Details of the installed generating capacity considered by the year 2026-27 for the purpose of transmission planning are given in Table 5.8 and Table 5.9.

Table – 5.8: Installed Generation Capacity (MW) likely by 2026-27 for the purpose of transmission planning

Installed Generation Capacity projected at the end of 2026-27 (in MW)											
State	**Coal**	**Gas**	**Hydro**	**PSP**	**Nuclear**	**Wind**	**Solar**	**Biomass**	**Small Hydro**	**Total#**	**BESS**
Total All India	235133	24824	52446	7446	13080	92992	206146	13000	5200	**650267**	13500

#Exclusive of the BESS capacity

Table – 5.9: State-wise likely Installed Generation Capacity (MW) by 2026-27

Installed Generation Capacity by 2026-27 (in MW)

State	Coal	Gas	Hydro	PSP	Nuclear	Wind	Solar	Biomass	Small Hydro	Total#	BESS
Northern Region											
Haryana	5330	432	0	0	0	0	1795	279	74	7909	0
Himachal Pradesh	0	0	12279	0	0	0	90	13	1014	13396	0
J&K and Ladakh	0	175	6549	0	0	0	96	0	184	7005	0
Punjab	5680	0	1302	0	0	0	1396	608	176	9162	0
Rajasthan	9840	1023	411	0	2580	13327	79198	155	24	106558	5000
Uttar Pradesh	31100	1493	502	0	440	0	8819	2693	49	45097	0
Uttarakhand	0	450	5075	1000	0	0	874	172	260	7831	0
Delhi	0	2208	0	0	0	0	422	64	0	2694	0
Chandigarh	0	0	0	0	0	0	102	0	0	102	0
Total-NR	**51950**	**5781**	**26118**	**1000**	**3020**	**13327**	**92792**	**3984**	**1781**	**199753**	**5000**
Western Region											
Gujarat	16092	7551	550	1440	1840	20794	33950	131	95	82444	3700
Madhya Pradesh	21120	0	2235	0	0	4716	6727	156	112	35066	0
Chhattisgarh	25067	0	120	0	0	0	893	335	86	26501	0
Maharashtra	23967	3207	2647	400	1400	8731	11345	3208	415	55321	300
Goa	0	48	0	0	0	0	40	0	0	88	0
DNH & DD	0	0	0	0	0	0	70	0	0	70	0
Total-WR	**86246**	**10806**	**5552**	**1840**	**3240**	**34242**	**53025**	**3830**	**708**	**199490**	**4000**
Southern Region											
Andhra Pradesh	11930	4899	2570	1200	0	14596	23135	674	182	59186	500
Karnataka	9850	0	3689	0	880	15077	20453	2326	1360	53635	3000
Kerala	0	534	1964	0	0	63	557	3	264	3385	0
Tamil Nadu	18128	1027	1778	900	5940	12556	5316	1272	131	47048	0
Telangana	13266	0	800	1606	0	3128	9344	269	94	28507	1000
Puducherry	0	33	0	0	0	0	72	0	0	105	0
Lakshadweep	0	0	0	0	0	3	5	0	0	8	0
Total-SR	**53175**	**6492**	**10801**	**3706**	**6820**	**45423**	**58883**	**4544**	**2031**	**191874**	**4500**
Eastern Region											
Bihar	12200	0	0	0	0	0	248	153	75	12676	0
Jharkhand	7575	0	210	0	0	0	145	5	5	7940	0
Odisha	9540	0	2155	0	0	0	504	72	115	12386	0
West Bengal	13697	100	561	900	0	0	238	393	106	15995	0
Sikkim	0	0	2902	0	0	0	10	0	62	2974	0
Andaman Nicobar	0		0	0	0	0	39	0	6	45	0

State	Coal	Gas	Hydro	PSP	Nuclear	Wind	Solar	Biomass	Small Hydro	Total#	BESS
Total-ER	**43012**	**100**	**5828**	**900**	**0**	**0**	**1184**	**623**	**369**	**52016**	**0**
North-Eastern Region											
Assam	750	620	470	0	0	0	164	2	38	2045	0
Manipur	0	0	105	0	0	0	26	0	6	137	0
Meghalaya	0	0	322	0	0	0	9	14	38	383	0
Nagaland	0	0	75	0	0	0	6	0	34	115	0
Tripura	0	1024	0	0	0	0	21	0	19	1064	0
Arunachal Pradesh	0	0	3115	0	0	0	21	3	139	3278	0
Mizoram	0	0	60	0	0	0	16	0	37	113	0
Total-NER	**750**	**1644**	**4147**	**0**	**0**	**0**	**263**	**19**	**311**	**7134**	**0**
Total All India	**235133**	**24824**	**52446**	**7446**	**13080**	**92992**	**206146**	**13000**	**5200**	**650267**	**13500**

 # Exclusive of the BESS capacity

5.6 Assessment of Transmission Capacity Requirement

The transmission system requirement needs to be evolved at the State level which is aggregated at regional level and then at the National level. In any given state, there can be State sector generation tied up completely to the host state, Central sector generating station serving more than one State as well as generating stations with 100% share of the host state, and Inter-State IPPs. Further, each State has its own electricity demand with typical variation in demand throughout the year. The net electricity demand of a State and power availability from all the sources in the State gives the net import or export of that State. The aggregation of import or export requirements of States within a region, and taking into consideration the diversity factor in electricity demand, translates into inter-regional power transfer requirements. The transmission system has been evolved to meet the projected electricity demand.

5.7 Load Generation Balance Approach

In order to find out the requirement of the transmission system, it is important to find out the surplus/deficit of each Region/State under various conditions which would give the import/export requirement of respective Region/State. For this, the total power available within a Region/State has been considered based on the generation projects physically located in the Region/State irrespective of its classification. Based on the combined availability of power from the central sector/State sector/IPP projects in the Region / State as well as the projected electricity demand, the import/export requirement has been worked out as shown in Figure 5.8.

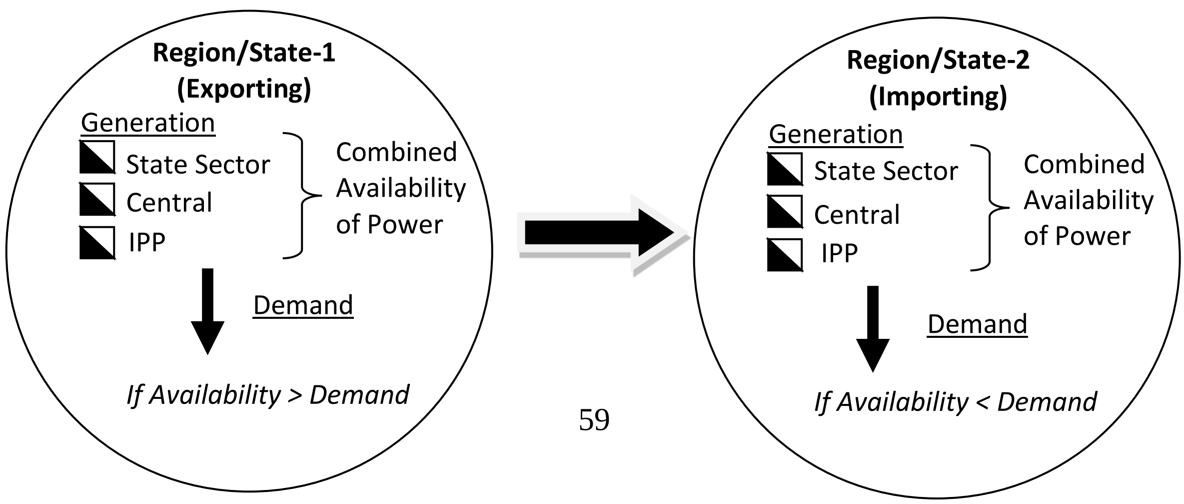

Figure 5.8: Load Generation balance approach

5.8 Load-Generation Scenarios and Transmission Capacity Requirement for 2026-27

5.8.1 The load generation scenarios have been worked out subject to different scenarios corresponding to seasonal load and generation variations. Nine scenarios (three scenarios each for February, June & August) have been considered. The power exchanges with neighbouring countries considered for the year 2026-27 include about 5,856 MW import from Bhutan and Nepal and 1,160 MW export to Bangladesh and some power being exported to Myanmar. The region wise installed capacity and peak demand at the end of 2026-27, considering the import and export with the neighbouring countries are given in Table 5.9.

Table 5.9 – Installed Generating Capacity and Peak Electricity Demand likely by 2026-27

(Figures in MW)

Region	Coal	Gas	Hydro	PSP	Nuclear	Wind	Solar	Biomass	Small Hydro	Total#	BESS	Peak Electricity Demand
Northern	51950	5781	26118	1000	3020	13327	92792	3984	1781	199753	5000	97898
Western	86246	10806	5552	1840	3240	34242	53025	3830	708	199490	4200	89457
Southern	53175	6492	10801	3706	6820	45423	58883	4544	2031	191874	4500	80864
Eastern	43012	100	5828	900	0	0	1184	623	369	52016	0	37265
North Eastern	750	1644	4147	0	0	0	263	19	311	7134	0	4855
All-India	**235133**	**24824**	**52446**	**7446**	**13080**	**92992**	**206146**	**13000**	**5200**	**650267**	**13500**	**277201**
Bangladesh	0	0	0	0	0	0	0	0	0	0	0	1160
Nepal	0	0	900	0	0	0	0	0	0	900	0	0
Bhutan	0	0	4956	0	0	0	0	0	0	4956	0	0
Grand Total	**235133**	**24824**	**58302**	**7446**	**13080**	**92992**	**206146**	**13000**	**5200**	**656123**	**13500**	**278361**

#Includes 16,743 MW solar roof top capacity. Excludes BESS capacity

5.8.2 The availability factor for various type of RE generation varies throughout the day and across the seasons. Actual availability factors have been considered wherever available otherwise normative values have been considered. Also, due to low availability of Gas, low availability factor has been considered for Gas based generation projects. Accordingly, the load generation balance for nine scenarios are given in **Table 5.11 – 5.19.**

5.8.3 From the load generation balance for different scenarios, it is observed that as far as installed electricity generating capacity is concerned, all the regions have surplus installed capacity. However, considering dispatch priority from RE sources, Northern Region is a net exporter of power during afternoon due to large installed capacity of solar generation in the region. Western Region is a net exporter of power during evening peak demand and night off-peak due to large quantum of thermal generation in the region.

5.8.4 Based on the analysis, about 1,23,577 ckm of transmission lines and 7,10,940 MVA of transformation capacity in the substations at 220 kV and above voltage levels are required to be added during the period 2022-27. The projected growth of the transmission system during the period 2022-27 is given in Table 5.10 (a) and Table 5.10 (b). 14,625 ckm of transmission lines and 75,902 MVA of transformation capacity (at 220 kV and above voltage level) has been added during the year 2022-23. 5,206 ckm of transmission lines and 22,126 MVA of transformation capacity (at 220 kV and above voltage level) has been added during the year 2023-24 (till September, 2023).

Table 5.10 (a) Transmission lines and sub-station capacity addition by 2026-27

Transmission System Type / Voltage Class	Unit	At the end of 2016-17 (31.03.2017)	Addition during 2017-22	At the end of 2021-22 (31.03.2022)	Likely addition during 2022-27	Likely at the end of 2026-27 (31.03.2027)
TRANSMISSION LINES						
(a) HVDC ± 320 kV/ 500 kV/800 kV Bipole	ckm	15556	3819	19375	4300	23675
(b) 765 kV	ckm	31240	19783	51023	35005	86028
(c) 400 kV	ckm	157787	36191	193978	38245	232223
(d) 230/220 kV	ckm	163268	29072	192340	46027	238367
Total–Transmission Lines	**ckm**	**367851**	**88865**	**456716**	**123577**	**580293**
SUBSTATIONS						
(a) 765 kV	MVA	167500	89700	257200	319500	576700
(b) 400 kV	MVA	240807	152306	393113	268135	661248
(c) 230/220 kV	MVA	312958	107679	420637	123305	543942
Total – Substations	**MVA**	**721265**	**349685**	**1070950**	**710940**	**1781890**
HVDC						
(a) Bi-pole link capacity	MW	16500	14000	30500	12000	42500
(b) Back-to back capacity	MW	3000	0	3000	0	3000
Total- HVDC	**MW**	**19500**	**14000**	**33500**	**12000**	**45500**

Details of transmission system addition during period 2022-27 under ISTS and Intra- State is given below:

Table 5.10 (b) Details of transmission system addition during the period 2022-27

	Unit	Under ISTS	Under Intra State	Total
Substation	**MVA**	426675	284265	710940
Transmission Lines	**ckm**	53132	70445	123577

Table 5.11 –Load Generation Balance for June Evening Peak Electricity Demand: 2026-27 (in MW)

Region	Coal	Gas	Hydro	PSP	Nuclear	Solar	Wind	Small Hydro	BESS	Total Availability	Electricity Demand
Northern	18844	2313	24812	900	2416	0	9329	1692	2450	62755	88580
Western	51520	4323	3886	1656	2592	0	25682	496	1960	92114	75547
Southern	12616	2597	7556	3335	5456	0	34018	1422	2205	69204	61786
Eastern	24060	40	5245	810	0	0	0	332	0	30487	33718
North Eastern	0	658	3732	0	0	0	0	280	0	4670	3710
All India	107040	9930	45232	6701	10464	0	69028	4221	6615	259231	263341
Bhutan	0	0	4460	0	0	0	0	0	0	4460	0
Nepal	0	0	810	0	0	0	0	0	0	810	0
Bangladesh	0	0	0	0	0	0	0	0	0	0	1160
Grand Total	107040	9930	50502	6701	10464	0	69028	4221	6615	264501	264501

Table 5.12 –Load Generation Balance for June Night Off-Peak Electricity Demand: 2026-27 (in MW)

Region	Coal	Gas	Hydro	PSP	Nuclear	Solar	Wind	Small Hydro	BESS	Total Availability	Demand
NR	18844	2313	18283	900	2416	0	7996	1247	2550	54548	80269
WR	51520	4323	2221	1656	2592	0	22257	283	2040	86892	70631
SR	12616	2597	4318	3335	5456	0	29482	812	2295	60911	54843
ER	24136	40	4080	810	0	0	0	258	0	29324	29800
NER	0	658	2903	0	0	0	0	218	0	3778	2850
All India	107116	9930	31803	6701	10464	0	59736	2818	6885	235454	238393
Bhutan	0	0	3469	0	0	0	0	0	0	3469	0
Nepal	0	0	630	0	0	0	0	0	0	630	0
Bangladesh	0	0	0	0	0	0	0	0	0	0	1160
Grand Total	107116	9930	35903	6701	10464	0	59736	2818	6885	239553	239553

Table 5.13 –Load Generation Balance for June Solar Peak Generation: 2026-27 (in MW)

Region	Coal	Gas	Hydro	PSP	Nuclear	Solar	Wind	Small Hydro	BESS	Total Availability	Demand
NR	9045	0	18283	-1100	2416	60292	6664	1247	-5000	91846	82185
WR	24730	0	2221	-2024	2592	28646	18833	283	-4000	71281	76004
SR	6056	0	4318	-4077	5456	34941	24946	812	-4500	67952	61342
ER	11405	0	4080	-990	0	315	0	258	0	15067	29776
NER	0	0	2903	0	0	47	0	218	0	3167	2946
All India	51235	0	31803	-8191	10464	124240	50443	2818	-13500	249314	252253
Bhutan	0	0	3469	0	0	0	0	0	0	3469	0
Nepal	0	0	630	0	0	0	0	0	0	630	0
Bangladesh	0	0	0	0	0	0	0	0	0	0	1160
Grand Total	51235	0	35903	-8191	10464	124240	50443	2818	-13500	253413	253413

(-) sign indicates pumping mode operation of PSP/ charging of BESS

Table 5.14 –Load Generation Balance for August Evening Peak Electricity Demand: 2026-27 (in MW)

Region	Coal	Gas	Hydro	PSP	Nuclear	Solar	Wind	Small Hydro	BESS	Total Availability	Demand
NR	13036	2313	24812	900	2416	0	9329	1692	3250	57747	81904
WR	46944	4323	3886	1656	2592	0	25682	496	2600	88178	67629
SR	6456	2597	7556	3335	5456	0	34018	1422	2925	63764	58687
ER	21519	40	5245	810	0	0	0	332	0	27946	34182
NER	0	658	3732	0	0	0	0	280	0	4670	4307
All India	87955	9930	45232	6701	10464	0	69028	4221	8775	242306	246709
Bhutan	0	0	4708	0	0	0	0	0	0	4708	0
Nepal	0	0	855	0	0	0	0	0	0	855	0
Bangladesh	0	0	0	0	0	0	0	0	0	0	1160
Grand Total	87955	9930	50795	6701	10464	0	69028	4221	8775	247869	247869

Table 5.15 –Load Generation Balance for August Night Off-Peak Electricity Demand: 2026-27 (in MW)

Region	Coal	Gas	Hydro	PSP	Nuclear	Solar	Wind	Small Hydro	BESS	Total Availability	Demand
NR	12922	2313	18283	900	2416	0	7996	1247	1750	47826	74501
WR	46533	4323	2221	1656	2592	0	22257	283	1400	81265	59000
SR	6400	2597	4318	3335	5456	0	29482	812	1575	53975	48410
ER	21246	40	4080	810	0	0	0	258	0	26434	31006
NER	0	658	2903	0	0	0	0	218	0	3778	3301
All India	87101	9930	31803	6701	10464	0	59736	2818	4725	213278	216217
Bhutan	0	0	3469	0	0	0	0	0	0	3469	0
Nepal	0	0	630	0	0	0	0	0	0	630	0
Bangladesh	0	0	0	0	0	0	0	0	0	0	1160
Grand Total	87101	9930	35903	6701	10464	0	59736	2818	4725	217377	217377

Table 5.16 –Load Generation Balance for August Solar Peak Generation: 2026-27 (in MW)

Region	Coal	Gas	Nuclear	Hydro	PSP	Solar	Wind	Small Hydro	BESS	Total Availability	Demand
NR	6257	0	2416	18283	-1100	54204	6664	1247	-5000	82970	75863
WR	22533	0	2592	2221	-2024	25539	18833	283	-4000	65977	64820
SR	3099	0	5456	4318	-4077	31150	24946	812	-4500	61205	56966
ER	10195	0	0	4080	-990	280	0	258	0	13824	29252
NER	0	0	0	2903	0	42	0	218	0	3162	3176
All India	42084	0	10464	31803	-8191	111215	50443	2818	-13500	227138	230077
Bhutan	0	0	0	3469	0	0	0	0	0	3469	0
Nepal	0	0	0	630	0	0	0	0	0	630	0
Bangladesh	0	0	0	0	0	0	0	0	0	0	1160
Grand Total	42084	0	10464	35903	-8191	111215	50443	2818	-13500	231237	231237

(-) sign indicates pumping mode operation of PSP/ charging of BESS

Table 5.17 –Load Generation Balance for February Evening Peak Electricity Demand: 2026-27 (in MW)

Region	Coal	Gas	Nuclear	Hydro	PSP	Solar	Wind	Small Hydro	BESS	Total Availability	Demand
NR	30264	2313	2416	15671	900	0	4664	1069	3250	60546	68805
WR	59736	4323	2592	2221	1656	0	8561	283	2600	81971	73651
SR	30672	2597	5456	4318	3335	0	13607	812	2925	63722	66576
ER	29218	40	0	3497	810	0	0	221	0	33786	28810
NER	600	658	0	2488	0	0	0	187	0	3932	3656
All India	150490	9930	10464	28194	6701	0	26832	2572	8775	243959	241499
Bhutan	0	0	0	0	0	0	0	0	0	0	300
Nepal	0	0	0	0	0	0	0	0	0	0	1000
Bangladesh	0	0	0	0	0	0	0	0	0	0	1160
Grand Total	150490	9930	10464	28194	6701	0	26832	2572	8775	243959	243959

Table 5.18 –Load Generation Balance for February Night Off-Peak Electricity Demand: 2026-27 (in MW)

Region	Coal	Gas	Nuclear	Hydro	PSP	Solar	Wind	Small Hydro	BESS	Total Availability	Demand
NR	27874	2313	2416	7835	900	0	1333	534	1750	44955	44466
WR	55019	4323	2592	1110	1656	0	1712	142	1400	67954	65012
SR	28250	2597	5456	2159	3335	0	4536	406	1575	48314	58767
ER	27248	40	0	1748	810	0	0	111	0	29957	21064
NER	553	658	0	1244	0	0	0	93	0	2548	1960
All India	138945	9930	10464	14097	6701	0	7581	1286	4725	193729	191269
Bhutan	0	0	0	0	0	0	0	0	0	0	300
Nepal	0	0	0	0	0	0	0	0	0	0	1000
Bangladesh	0	0	0	0	0	0	0	0	0	0	1160
Grand Total	138945	9930	10464	14097	6701	0	7581	1286	4725	193729	193729

Table 5.19 –Load Generation Balance for February Solar Peak Generation: 2026-27 (in MW)

Region	Coal	Gas	Nuclear	Hydro	PSP	Solar	Wind	Small Hydro	BESS	Total Availability	Demand
NR	16288	0	2416	7835	-1100	76874	1333	534	-5000	99180	65388
WR	32150	0	2592	1110	-2024	36795	1712	142	-4000	68477	84193
SR	16508	0	5456	2159	-4077	44880	4536	406	-4500	65368	72832
ER	15922	0	0	1748	-990	404	0	111	0	17195	24513
NER	323	0	0	1244	0	60	0	93	0	1720	2555
All India	81191	0	10464	14097	-8191	159013	7581	1286	-13500	251941	249481
Bhutan	0	0	0	0	0	0	0	0	0	0	300
Nepal	0	0	0	0	0	0	0	0	0	0	1000
Bangladesh	0	0	0	0	0	0	0	0	0	0	1160
Grand Total	81191	0	10464	14097	-8191	159013	7581	1286	-13500	251941	251941

(-) sign indicates pumping mode operation of PSP/ charging of BESS

5.9 Power System Studies

5.9.1 The adequacy of existing and under construction transmission system and the requirement of additional transmission system has been assessed based on the load flow studies representing the intra-state as well as the inter-state transmission system. The load generation balance scenarios have been worked out for the nine scenarios (three scenarios each for February, June and August) and load flow studies have been carried out corresponding to the year 2026-27 for the nine scenarios. The existing transmission system and generation projects as well as those planned for the period 2022-27 have been simulated in the study. Base case analysis has been carried out for each scenario and then contingency/outage analysis has been carried out to ensure that the planned transmission system is adequate for normal and 'N-1' contingency scenarios.

5.9.2 The study results have been represented in terms of the power flow between regions as well as between states in each region.

5.9.3 In all the scenarios, generation dispatch has been considered as per the availability factors. Generation from biomass and small hydro sources are likely to be connected at lower voltage levels (i.e. 11 kV / 33 kV). Accordingly, these generations in respective state / region have been adjusted against the electricity demand of the corresponding state / region. Also, the electricity demand has been adjusted locally to account for the electricity generation from solar roof top capacity.

5.10 Analysis of load-generation scenarios

5.10.1 Inter-regional power flow

Other than the existing and under-construction transmission system, the transmission system has been planned for the period 2022-27 to meet the requirement of transfer of power within and among the Regions of the country to meet the projected electricity demand. Based on load-flow studies, details of inter-regional power flow in base case for each of the nine scenarios are given in Table 5.20 and Fig. 5.9.

Table 5.20: Inter-regional power flow in different scenarios (figures in MW)

	ER-NR	ER-WR	ER-SR	WR-NR	WR-SR	NER-ER
June Evening Peak	5001	-3651	1120	20567	-8545	1403
June Night Off-peak	5462	-2686	1304	20049	-7374	1236
June Solar Peak	-4624	-8121	1969	-4581	-8603	516
August Evening Peak	3052	-4967	1222	21029	-6297	877
August Night Off-peak	3488	-4887	1087	23118	-6646	815
August Solar Peak	-5123	-9071	2120	-2092	-6368	337
February Evening Peak	2427	-475	2543	5867	325	101
February Night Off-peak	2940	1993	3577	-3369	6893	399
February Solar Peak	-8450	-4324	3308	-25406	4156	-991
Maximum Power Flow between two Regions	**8450**	**9071**	**3577**	**25406**	**8603**	**1403**
Power Transmission Capacity Between Two Regions	**22530**	**22790**	**7830**	**56720**	**28120**	**2860**

Note: (i) The transmission capacity between two regions as mentioned above is the aggregate of capacity of individual transmission lines between the two regions. The ability of a single transmission line to transfer power, when operated as part of the interconnected network is a function of the physical relationship of that line to the other elements of the transmission network and the prevalent load – generation scenario. Hence, the actual power transfer capacity between two regions may be less than the aggregated capacity of the individual transmission lines.

(ii) The inter-regional transmission capacity in one direction may not be same as the inter-regional capacity in other direction. For instance, the maximum capacity of HVDC Raigarh-Pugalur is 6000 MW in WR-SR direction whereas the capacity in reverse direction (i.e. SR-WR) is limited to only 3000 MW. Similarly, the Champa – Kurukshetra HVDC link cannot be operated in reverse direction.

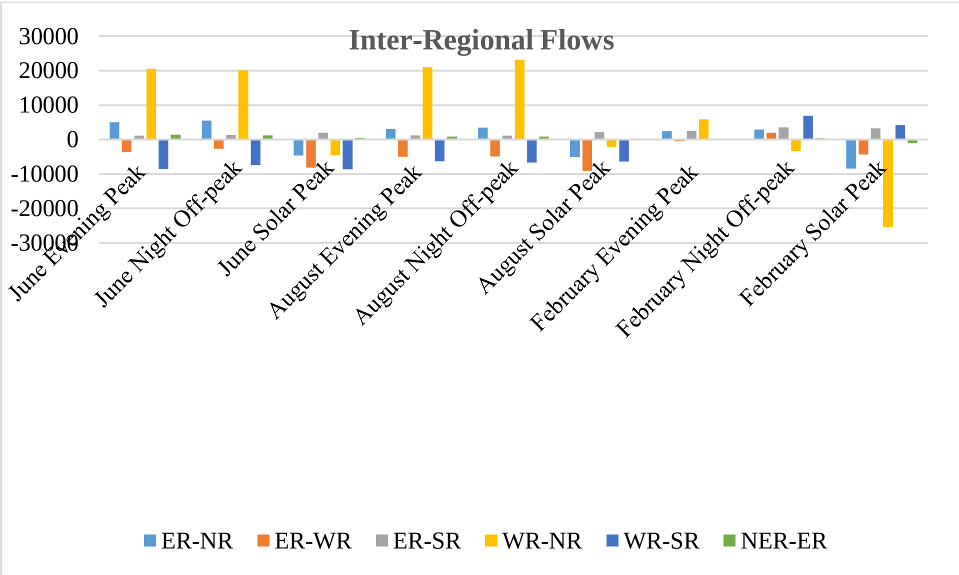

Figure 5.9: Inter-regional power flows (in MW) for various scenarios considered in studies

The power flow between regions in different scenarios are given as per the following annexures.

Case Studies			
	June	**August**	**February**
Evening Peak Demand	Annex-5.1a	Annex-5.2a	Annex-5.3a
Night Off-Peak Demand	Annex-5.1b	Annex-5.2b	Annex-5.3b
Maximum Solar Generation	Annex-5.1c	Annex-5.2c	Annex-5.3c

The detailed power flow within each region and among the states in each region and tie-line flows are given at Annexure as detailed below:

Case Studies									
Region / States	June cases			August cases			February cases		
	A	B	C	A	B	C	A	B	C
NR States	5.4a	5.5a	5.6a	5.7a	5.8a	5.9a	5.10a	5.11a	5.12a
WR States	5.4b	5.5b	5.6b	5.7b	5.8b	5.9b	5.10b	5.11b	5.12b
SR States	5.4c	5.5c	5.6c	5.7c	5.8c	5.9c	5.10c	5.11c	5.12c
ER States	5.4d	5.5d	5.6d	5.7d	5.8d	5.9d	5.10d	5.11d	5.12d
NER States	5.4e	5.5e	5.6e	5.7e	5.8e	5.9e	5.10e	5.11e	5.12e

A - Evening Peak Demand

B - Night Off-peak Demand

C - Afternoon Peak Solar Generation

5.11 Analysis of Power Flow Study results

From power flow studies, it is observed that the planned transmission corridors will be sufficient to cater to the assessed import / export requirement of each region/state for the year 2026-27 under normal and ‘N-1’ contingency conditions.

5.12 Conclusions

About 1,23,577 ckm of transmission lines and 7,10,940 MVA of transformation capacity (220 kV and above voltage level) is required to be added during the period 2022-27. The inter-regional transmission capacity addition likely during 2022-27 is 31,600 MW. The inter-regional power transmission capacity at the end of 2026-27 is likely to be 1,43,850 MW.

Chapter - 6

Review of Programme of Transmission System Augmentation during 2017-2022

6.1 Introduction

6.1.1 As on 31st March 2017, the installed electricity generation capacity and peak electricity demand in the country was about 326.8 GW and 159.5 GW respectively. The corresponding transmission network (220 kV and above voltage level) spread over the country was 367,851 circuit kilometres (ckm) of transmission lines and 740.76 GVA of transformation capacity.

6.1.2 As per the 19th Electric Power Survey (EPS) Report, the projected peak electricity demand during the year 2021-22 was 225.7 GW. However, the actual peak electricity demand during the year 2021-22 has been about 203 GW. The generation capacity addition during 2017-22 was 30,667.91 MW from conventional sources (Thermal & Nuclear) which is about 59.5 % of the target of 51,561.15 MW. Capacity addition of 54,779.15 MW from renewable energy sources including large hydro has been achieved during the period 2017-22.

6.1.3 1,10,281 ckms of transmission lines and 3,83,690 MVA of transformation capacity in sub-stations at 220 kV and above voltage levels was targeted to be added during 2017-22. Against this target, 88,865 ckm (about 80.6 % of the target) of transmission lines and 3,49,685 MVA (about 91% of the target) of transformation capacity addition in sub-stations (220 kV and above) have been achieved during the period 2017-22. Few transmission schemes were delayed because of Right-of-Way (RoW) issues, delay in getting Forest Clearance, delay in land acquisition for sub-stations, delay due to COVID-19 pandemic etc.

6.2 Target v/s Achievement of Transmission Capacity addition during 2017-22

6.2.1 1,10,281 ckms of transmission lines and 3,83,690 MVA of transformation capacity in sub-stations at 220 kV and above voltage levels were planned to be added during the period 2017-22. Against this target, 88,865 ckms of transmission lines and 349,685 MVA transformation capacity has been added. In addition, 14,000 MW of HVDC bipole capacity as planned has also been added during 2017-22. Details are given in Table 6.1.

Table – 6.1: Summary of target v/s achievement of transmission capacity addition during 2017-22

Transmission System Type / Voltage Class	Unit	Target for 2017-22	Achievement during 2017-22	% Achievement wrt Target
Transmission Lines				
(a) HVDC ± 320 kV/ ± 800 kV Bipole	ckm	4040	3819	95%
(b) 765 kV	ckm	21603	19783	92%
(c) 400 kV	ckm	48092	36191	75%
(d) 230/220 kV	ckm	36546	29072	80%
Total-Transmission Lines	**ckm**	**110281**	**88865**	**81%**
Sub-stations- AC				
(a) 765 kV	MVA	109500	89700	82%
(b) 400 kV	MVA	178610	152306	85%
(c) 230/220 kV	MVA	95580	107679	113%
Total – AC Sub-stations	**MVA**	**383690**	**349685**	**91%**
HVDC				

Transmission System Type / Voltage Class	Unit	Target for 2017-22	Achievement during 2017-22	% Achievement wrt Target
(a) Bi-pole + Monopole	MW	14000	14000	100%
(b) Back-to-back capacity	MW	0	0	
Total - HVDC	**MW**	**14000**	**14000**	**100%**

Note: Total achievement considering HVDC converter capacity would be about 95%.

The target of transmission line addition of 1,10,281 ckm comprised of 42,947 ckm in ISTS and 67,334 ckm in intra-state. The target of transformation capacity augmentation of 3,83,690 MVA comprised of 1,65,415 MVA in ISTS and 2,18,275 MVA in intra-state.

6.2.2 With the addition of 88,865 ckms of transmission lines and 349,685 MVA transformation capacity during the period 2017-22, the length of transmission lines and transformation capacity in sub-stations (220 kV and above voltage level) has increased to 456,716 ckms and 1070,950 MVA respectively. At the end of 2021-22 the HVDC bipole and back to back capacity has been 33,500 MW. Details are given in Table 6.2.

Table - 6.2: Transmission system at the end of 2021-22

Transmission System Type / Voltage Class	Unit	At the end of 2011-12 (31.03.2012)	At the end of 2016-17 (31.03.2017)	Addition during 2017-22	At the end of 2021-22 (31.03.2022)
Transmission Lines					
(a) HVDC ± 320 kV/ 500 kV/800 kV Bipole	ckm	9432	15556	3819	19375
(b) 765 kV	ckm	5250	31240	19783	51023
(c) 400 kV	ckm	106819	157787	36191	193978
(d) 230/220 kV	ckm	135980	163268	29072	192340
Total - Transmission Lines	**ckm**	**257481**	**367851**	**88865**	**456716**
Sub-Stations AC					
(a) 765 kV	MVA	25000	167500	89700	257200
(b) 400 kV	MVA	151027	240807	152306	393113
(c) 230/220 kV	MVA	223774	312958	107679	420637
Total-AC Sub-stations	**MVA**	**399801**	**721265**	**349685**	**1070950**
HVDC					
(a)Bi-pole + Monopole	MW	6750	16500	14000	30500
(b)Back-to-back capacity	MW	3000	3000	0	3000
Total of (a), (b)	**MW**	**9750**	**19500**	**14000**	**33500**

6.3 Summary of Target v/s Achievement during 2017-22

The details of target v/s achievement of transmission system augmentation (220 kV and above voltage level) during the years 2017-18, 2018-19, 2019-20, 2020-21 and 2021-22 is summarised in Table 6.3(a).

Table - 6.3(a): Summary of Target V/S Achievement during 2017-22

	Target	Achievement

Year	**Transmission lines (ckm)**	**Sub-station (MVA)**	**Transmission lines (ckm)**	**Sub-station (MVA/MW)**
2017-18	23,086	53,978	23,119	86,193
2018-19	22,647	62,600	22,437	72,705
2019-20	23,621	81,716	11,664	68,230
2020-21	15,791	63,050	16,750	57,575
2021-22	19,255	81,545	14,895	78,982
Total (2017-22)			**88,865**	**363,685***

*including HVDC bi-pole link and back-to-back capacity

Further, the details of target v/s achievement of transmission system augmentation (220 kV and above voltage level) for ISTS and Intra-state transmission system during the years 2017-18, 2018-19, 2019-20, 2020-21 and 2021-22 are summarised in Tables 6.3(b) & 6.3(c).

Table - 6.3(b): Summary of Target v/s Achievement of transmission line during 2017-22 for ISTS and Intra-state

	ISTS			**Intra- State**		
Year	**Target (ckm)**	**Achievement (ckm)**	**% Achievement**	**Target (ckm)**	**Achievement (ckm)**	**% Achievement**
2017-18	9047	10142	112.10%	14039	12977	92.44%
2018-19	9961	11064	111.07%	12686	11373	89.65%
2019-20	8395	5259	62.64%	15226	6405	42.07%
2020-21	6856	8464	123.45%	8935	8286	92.74%
2021-22	5516	5450	98.80%	13739	9445	68.75%

Table - 6.3(c): Summary of Target V/S Achievement of transformation capacity during 2017-22 for ISTS and Intra-state

	ISTS			**Intra- State**		
Year	**Target (MVA)**	**Achievement (MVA)**	**% Achievement**	**Target (MVA)**	**Achievement (MVA)**	**% Achievement**
2017-18	27090	35725	131.88%	26888	50468	187.70%
2018-19	34435	36575	106.21%	28165	36130	128.28%
2019-20	36150	35815	99.07%	45566	32415	71.14%
2020-21	25335	24115	95.18%	37715	33460	88.72%
2021-22	41595	40095	96.39%	39950	38887	97.34%

Achievement during the year 2019-20 was substantially low due to impact of COVID-19 pandemic. Target of transmission system augmentation during the year 2020-21 was kept low keeping in view the slow progress of works due to COVID-19 pandemic.

Table - 6.3(d): Summary of Target V/S Achievement of transmission lines and transformation capacity during 2017-22 for ISTS and Intra-state

	Transmission lines			**Transformation Capacity**		
Year	**Target (ckm)**	**Achievement (ckm)**	**% Achievement**	**Target (MVA)**	**Achievement (MVA)**	**% Achievement**
ISTS	42947	40379	94.02%	165415	172325	104.18%
Intra-State	67334	48486	72.01%	218275	191360	87.67%

Total	110281	88865	80.58%	383690	363685	94.79%

Target v/s achievement of transmission line and sub-station capacity addition during 2017-22 is depicted in Figure 6.1 and Figure 6.2 respectively.

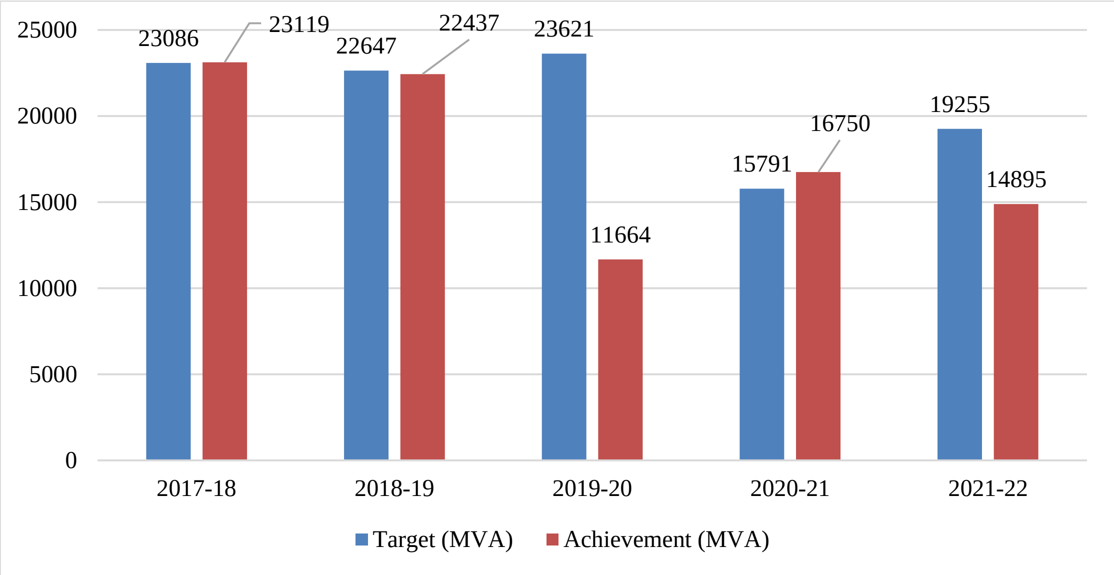

Figure 6.1: **Target vs achievement of transmission line addition during 2017-22**

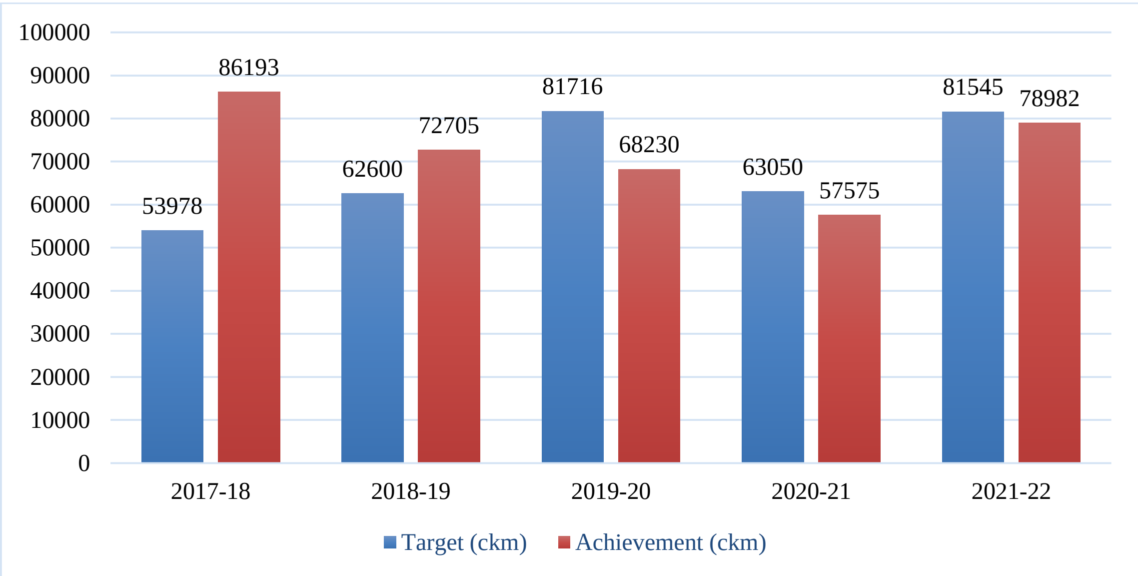

Figure 6.2: **Target vs achievement of sub-station capacity addition during 2017-22**

6.3.1 Transmission System addition during 2017-18

23,119 ckm of transmission lines and transformation capacity of 86,193 MVA (220 kV and above voltage level) was commissioned during 2017-18. Special achievement during this period was the completion of 4th pole of 1500 MW capacity at Alipurduar and Agra (Extn) converter station and completion of 2nd pole of 1500 MW capacity at Champa and Kurukshetra converter station. 23,000 MVA transformation capacity at 765 kV level along with 3,819 ckms of 765 kV transmission lines were commissioned in 2017-18.

6.3.2 Transmission System addition during 2018-19

22,437 ckm of transmission lines and transformation capacity of 72,705 MVA (220 kV and above voltage level) was commissioned during 2018-19, including 21,000 MVA of transformation capacity at 765 kV level along with 6,750 ckm of 765 kV transmission lines.

6.3.3 Transmission System addition during 2019-20

11,664 ckm of transmission lines and transformation capacity of 68,230 MVA (220 kV and above voltage level) was commissioned during 2019-20. Highlights of this period has been commissioning of 3rd and 4th poles of 1500 MW each at Champa and Kurukshetra HVDC station. Transformation capacity of 19,500 MVA at 765 kV level along with 3,044 ckm of 765 kV transmission lines were commissioned.

6.3.4 Transmission System Addition during 2020-21

16,750 ckm of transmission lines and transformation capacity of 57,575 MVA (220 kV and above voltage level) was added during 2020-21. HVDC line of 3,531 ckm with voltage level of ± 800 kV from Raigarh HVDC Sub-station in Chhattisgarh to Pugalur HVDC sub-station in Tamil Nadu was operationalised along with 1st and 2nd poles of 1500 MW each at Raigarh and Pugalur HVDC station during 2020-21. VSC based HVDC terminal at Pugalur and North Trichur of 1000 MW capacity (Monopole –II) was commissioned during this period. HVDC line of 288 ckm with voltage level of ± 320 kV from Pugalur, Tamil Nadu to North Trichur, Kerala was also commissioned. 7,700 MVA of transformation capacity at 765 kV level along with 1,237 ckm of 765 kV transmission lines were commissioned.

To minimise the wide spreading of COVID-19 in the coutry, Government of India issued orders for national lockdown from last week of March 2020. This affected manpower mobilization and transportation of materials to project sites, delaying the completion of transmission projects.

All the inter-state transmission projects which were under construction as on 25th March, 2020 (date of lockdown), and whose SCoD was not prior to 25th March, 2020, were granted an extension of five months in respect of SCoD by Ministry of Power, Government of India vide letter dated 27th July 2020.

6.3.5 Transmission System Addition during 2021-22

14,895 ckm of transmission lines and transformation capacity of 78,982 MVA (220 kV and above voltage level) was added during 2021-22. VSC based HVDC terminal at Pugalur and North Trichur of 1000 MW capacity (Monopole –I) and 3rd & 4th poles of 1500 MW each at Raigarh and Pugalur were commissioned during this period. 18,500 MVA transformation capacity at 765 kV level along with 4,933 ckm of 765 kV transmission lines were commissioned. Due to spread of second wave of COVID-19 during April'21, May'21 and June'21, manpower mobilization and transportation of materials to project sites becme difficult and the construction activities had been affected at almost all the sites.

Further, in view of second wave of COVID-19 pandemic, all the inter-state transmission projects which were under construction with SCoD after 1st April, 2021, were granted an extension of three months in respect of their SCoD by Ministry of Power, Government of India vide letter dated 12th June 2021.

6.4 Development of Inter-Regional Transmission Capacity during 2017-22

6.4.1 Progress and achievement at the end of 2021-22

The inter-regional transmission capacity at 220 kV and above voltage level was 75,050 MW as on 31.03.2017. The target of inter-regional transmission capacity addition during 2017-22 was 43,000 MW. Against this target, 37,200 MW of inter-regional transmission capacity was added, taking the total inter-regional transmission capacity (at 220 kV and above voltage level) to 1,12,250 MW as on 31.03.2022. Details are given in Table 6.4.

Table - 6.4: Details of the inter-regional transmission capacity by 2021-22

Inter-Regional Links	Transmission capacity (MW)
EAST-NORTH	
Dehri-Sahupuri 220 kV S/c line	130
Muzaffarpur-Gorakhpur 400 kV D/c line (with Series Cap+TCSC)	2000
Patna – Balia 400 kV D/c (Quad) line	1600
Biharshariff – Balia 400 kV D/c (Quad) line	1600
Barh – Patna - Balia 400 kV D/c (Quad) line	1600
Gaya - Balia 765 kV S/c line	2100
Sasaram – Allahabad/Varanasi 400 kV D/c line (Sasaram HVDC back to back has been bypassed)	1000
Sasaram - Fatehpur 765 kV S/c line	2100
Barh-II-Gorakhpur 400 kV D/c (Quad) line	1600
Gaya-Varanasi 765 kV 2xS/c line	4200
Biharsharif-Varanasi 400 kV D/c (Quad) line	1600
LILO of Biswanath Chariali - Agra $\pm$ 800 kV, 3000 MW HVDC Bi-pole at Alipurduar	3000
Sub-total (East-North)	**22530**
EAST-WEST	
Raigarh-Budhipadar 220 kV S/c line	130
Budhipadar-Korba 220 kV 2xS/c line	260
Rourkela-Raipur 400 kV D/c line (with series comp.+TCSC)	1400
Ranchi –Sipat 400 kV D/c line (with series comp.)	1200
Rourkela-Raipur 400 kV D/c 2nd line (with series comp.)	1400
Ranchi - Dharamjayagarh 765 kV S/c line	2100
Ranchi - Dharamjaygarh 765 kV 2nd S/c line	2100
Jharsuguda-Dharamjaygarh 765 kV D/c line	4200
Jharsuguda-Dharamjaygarh 765 kV 2nd D/c line	4200
Jharsuguda - Raipur Pool 765 kV D/c line	4200
Sub-total (East-West)	**21190**
WEST- NORTH	
Bhanpura-Ranpur 220 kV S/c line	130
Bhanpura-Modak 220 kV S/c line	130
Auriya (UP)-Malanpur 220 kV S/c line	130
Auriya (UP) – Bhind 220 kV S/c line	130
Vindhyachal HVDC back-to-back	500

Inter-Regional Links	Transmission capacity (MW)
Gwalior-Agra 765 kV 2 x S/c line	4200
Zerda-Kankroli 400 kV D/c line	1000
Gwalior-Jaipur 765 kV 2xS/c lines	4200
Adani (Mundra) - Mahendranagar +/- 500 kV, HVDC Bi-pole	2500
RAPP-Sujalpur 400 kV D/c line	1000
Champa Pool- Kurukshetra +/- 800 kV, HVDC Bi-pole	6000
Jabalpur - Orai 765 kV D/c line	4200
LILO of Satna - Gwalior 765 kV S/c line at Orai	4200
Banaskantha-Chittorgarh 765 kV D/c line	4200
Vindhyachal-Varanasi 765 kV D/c line	4200
Sub-total (West-North)	**36720**
EAST- SOUTH	
Balimela-Upper Sileru 220 kV S/c line	130
Gazuwaka HVDC back-to-back	1000
Talcher-Kolar HVDC bipole	2000
Upgradation of Talcher-Kolar HVDC Bipole	500
Angul – Srikakulum 765 kV D/c line	4200
Sub-total (East-South)	**7830**
WEST- SOUTH	
Chandrapur HVDC back-to-back	1000
Kolhaphur (Talandage)-Chikkodi 220 kV S/c line	130
Ponda-Ambewadi 220 kV S/c line	130
Xeldem-Ambewadi 220 kV S/c line	130
Kolhaphur (Mudshingi)-Chikkodi 220 kV S/c line	130
Raichur - Sholapur 765 kV S/c line	2100
Raichur - Sholapur 765 kV S/c line	2100
Narendra - Kolhapur 765 kV D/c line	2200
Wardha - Nizamabad 765 kV D/c line	4200
Raigarh-Pugulur $\pm$ 800 kV HVDC Bi-pole link	6000
Sub-total (West-South)	**18120**
EAST- NORTH EAST	
Birpara-Salakati 220 kV D/c line	260
Siliguri - Bongaigaon 400 kV D/c line	1000
Siliguri - Bongaigaon 400 kV D/c (Quad) line	1600
Sub-total (East- North East)	**2860**
NORTH EAST-NORTH	
Biswanath Chariali - Agra $\pm$ 800 kV HVDC Bi-pole	3000

Inter-Regional Links	Transmission capacity (MW)
Sub-total (North East –North)	**3000**
TOTAL	**112,250**

Note: (i) The transmission capacity between two regions as mentioned above is the aggregate of capacity of individual transmission lines between the two regions. The ability of a single transmission line to transfer power, when operated as part of the interconnected network is a function of the physical relationship of that line to the other elements of the transmission network and the prevalent load –generation scenario. Hence, the actual power transfer capacity between two regions may be less than the aggregated capacity of the individual transmission lines.

(ii) It is to mention that the inter-regional transmission capacity in one direction may not be same as the inter-regional capacity in other direction. For instance, the maximum capacity of HVDC Raigarh-Pugalur is 6000 MW in WR-SR direction whereas the capacity in reverse direction (i.e. SR-WR) is limited to only 3000 MW. Similarly, the Champa – Kurukshetra HVDC link cannot be operated in reverse direction.

6.5 Development of HVDC Systems during 2017-22

3,819 ckm of HVDC transmissison lines and 14,000 MW of HVDC Bi-pole capacity has been added during the period 2017-22. The total ckm of HVDC lines, bi-pole capacity and back-to back capacity at the end of 2021-22 was 19,375 ckm, 30,500 MW and 3,000 MW respectively. Summary of development of HVDC systems in India till 2021-22 is given in Table 6.5.

Table - 6.5: Development of HVDC systems in India till 2021-22

HVDC Transmission Systems				At the end of 2016-17 (31.03.2017)	Addition during 2017-22	At the end of 2021-22 (31.03.2022)
HVDC Bipole Line						
Chandrapur-Padghe	± 500 kV	MSEB	ckm	1504		1504
Rihand-Dadri	± 500 kV	PGCIL	ckm	1634		1634
Talcher-Kolar	± 500 kV	PGCIL	ckm	2734		2734
Balia-Bhiwadi	± 500 kV	PGCIL	ckm	1580		1580
Mundra-Mohindergarh	± 500 kV	Adani	ckm	1980		1980
Biswanath Chariyali - Agra	± 800 kV	PGCIL	ckm	3506		3506
Champa Pooling Station – Kurukshetra line	± 800 kV	PGCIL	ckm	2574		2574
LILO of Bishwanath Chariali - Agra at Alipurduar	± 800 kV	PGCIL	ckm	44		44
Pugalur - North Trichur	± 320 kV	PGCIL	ckm		288	288
Raigarh - Pugalur	± 800 kV	PGCIL	ckm		3531	3531
TOTAL			ckm	**15556**	**3819**	**19375**
HVDC Bi-pole Transmission Capacity						
Chandrapur-Padghe	bipole	MSEB	MW	1500		1500
Rihand-Dadri	bipole	PGCIL	MW	1500		1500

HVDC Transmission Systems				At the end of 2016-17 (31.03.2017)	Addition during 2017-22	At the end of 2021-22 (31.03.2022)
Talcher-Kolar	bipole	PGCIL	MW	2500		2500
Balia-Bhiwadi	bipole	PGCIL	MW	2500		2500
Mundra-Mohindergarh	bipole	Adani	MW	2500		2500
Biswanath Chariyali – Agra (Pole-I & II)	bipole	PGCIL	MW	3000		3000
Champa - Kurukshetra (Pole-I)	bipole	PGCIL	MW	1500		1500
Alipurduar - Agra (Extn.) HVDC S/S (Pole-III)	bipole	PGCIL	MW	1500		1500
Alipurduar and Agra (Extn) HVDC S/S (Pole -IV)	bipole	PGCIL	MW		1500	1500
Raigarh and Pugalur Station with 6000 MW HVDC Terminal (Pole-I, II, III and IV)	bipole	PGCIL	MW		6000	6000
Champa and Kurukshetra HVDC Station (Pole- II, III and IV)	bipole	PGCIL	MW		4500	4500
HVDC Mono-pole Transmission Capacity						
VSC based HVDC Terminal at Pugalur and North Trishur (2000 MW)	monopole	PGCIL	MW		2000	2000
TOTAL			**MW**	**16500**	**14000**	**30500**
HVDC Back-to-back Transmission Capacity						
Vindhyachal	b-t-b	PGCIL	MW	500		500
Chandrapur	b-t-b	PGCIL	MW	1000		1000
Gazuwaka	b-t-b	PGCIL	MW	1000		1000
Sasaram	b-t-b	PGCIL	MW	500		500
TOTAL			**MW**	**3000**		**3000**

6.6 Development of 765 kV transmission system during 2017-22

Up to the end of 10th plan (31.03.2007), all 765 kV systems in the country were operated at 400 kV. Sipat to Seoni was the first transmission system that was operated at 765 kV in September, 2007. This set a new milestone in development of transmission system in the country. At the end of 2016-17, 31,240 ckm of 765 kV transmission lines and 167,500 MVA of transformation capacity at 765 kV was existing. During the period 2017-22, 19783 ckm of 765 kV transmission lines and 89,700 MVA of transformation capacity at 765 kV level was added. At the end of 2021-22, 51023 ckm of 765 kV transmission lines and 257,200 MVA transformation capacity at 765 kV level are existing in the country. Details of 765 kV transmission system in India at the end of 2021-22 is given at **Annex 6.1**.

6.7 Challenges faced in implementation of Transmission System during 2017-22

The main challenges faced by implementing agencies in completion of transmission projects include delay in forest clearance, problems of Right of Way and compensation issues, problem in acquisition of land for sub-stations, contractual issues etc. Delay in execution of works has also been due to COVID-19 pendemic. The major challaenges are described below:

6.7.1 Forest Clearance

Forest Clearance is a mandatory requirement for the portion of the line traversing through the forest area. While finalizing the route alignment, emphasis is given to avoid forest, National Parks, Wildlife Sanctuary etc. However, it is not always possible to avoid such areas completely. Getting Forest Clearance takes considerable time due to lengthy process and involvement of different levels. The project executing agency are facing problems in getting the consent of Gram Sabhas which has been made compulsory under Forest Act, 2006. Even the State Governments take lot of time in forwarding the proposal to MoEF&CC for further clearances.

6.7.2 Right of Way (RoW) Issues

With increase in transmission voltage, the requirement of land for tower footing and RoW width increases substantially. Despite adoption of latest technological solutions to optimize the RoW requirements, difficulties in getting RoW results in delay in implementation of transmission projects. Transmission lines are also held up on matters related to payment of compensation and associated court cases.

6.7.3 Land for Sub-stations:

The land for sub-stations is normally government land or private land, which is acquired through Land Acquisition Act, 1984. Sometimes, acquisition of land for sub-station takes considerable time which delays the project. While doing town planning for new sub-urban area and planning of industrial centers, provision for laying transmission line and sub-stations should be kept in mind. To reduce the requirement of land for constructing sub-station, use of Hybrid sub-station and Gas Insulated Sub-stations (GIS) which requires about 30% of land compared to conventional sub-station are being increasingly adopted in metro cities, hilly and other areas.

6.7.4 COVID-19 Pandemic

Novel Corona virus (COVID-19) originated in December 2019 and spreaded across the globe during 2020 and 2021. In oder to control wide spread of COVID-19, Government of India had issed orders for national lockdown from last week of March 2020, which affected the manpower mobilization and transportation of materials to project sites, delaying the completion of transmission projects. Due to wide spread of COVID-19 second wave during April'21, May'21 and June'21, the manpower mobilization and transportation of materials to project sites and the construction activities have also been affected.

All the inter-state transmission projects which were under construction as on 25th March, 2020 (date of lockdown), and whose SCoD was not prior to 25th March, 2020, were granted extension of five months in respect of SCoD by Ministry of Power, Government of India, vide letter dated 27th July 2020. Further, all the inter-state transmission projects which were under construction with SCoD coming after 1st April, 2021 were granted an extension of three months in respect of their SCoD by Ministry of Power, Government of India vide letter dated 12th June 2021.

Details of under execution transmission lines and sub-stations (220 kV and above voltage level) targeted during 2017-22 but have been delayed due to above reasons (as observed during 2017-22) are given at **Annex - 6.2**.

6.8 Steps taken to resolve the issues arising in implementation of Transmission Schemes

In fulfillment of obligation under Section 73(f), of the Electricity Act, 2003, Central Electricity Authority (CEA), has to promote and assist in timely completion of projects for improving and augmenting the electricity system.

Accordingly, the physical progress and constraints / bottlenecks in execution of power transmission schemes (interstate & intrastate transmission lines & substations) under Central/State/Private sector (of 220 kV and above voltage levels) in the country are being monitored on regular basis by Power System Project Monitoring (PSPM) Division of CEA to ensure timely completion of transmission schemes.

The quarterly review meetings and meetings exclusively for critical projects (involving serious problems relating to ROW & compensation, contractual issues, clearances from railways, forest/wildlife, civil aviation/ mining/National Highway Authority of India) are being held in Ministry of Power/Central Electricity Authority on regular basis to address critical issues and resolve the bottlenecks in progress & execution of transmission schemes. The unresolved issues are also addressed in multi-tier monitoring mechanism covering PMG Portal/ NITI Ayog / E-Samiksha/ PRAGATI Portal etc.

Officers are also deputed to site to assess actual progress of transmission schemes and to assess severity of issues and take up the matter with respective state/District Authority /Concerned Ministry etc. for its early resolution.

All the power transmission utilities have been assigned User id and password for updating the progress of execution of ongoing transmission projects on monthly basis on the National Power Portal. Based on the information provided by power transmission utilities, CEA publishes various progress reports on monthly basis.

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Chapter-7

Transmission System Requirement during 2022-27

7.1 Formulation of Transmission Plan

7.1.1 Planning of transmission system for a particular timeframe considers the existing and under construction transmission system, existing generation projects, generation projects likely to be commissioned and projected electricity demand in that timeframe. The transmission system requirement covers the power evacuation system for the generation projects and strengthening of transmission network for meeting the projected electricity demand. The transmission system is evolved keeping in view the overall optimization at National level. In this process, the total investment in transmission including inter-state as well as intra-state system is optimized.

7.1.2 The development of the transmission system is a continuous process and expansion of both ISTS and Intra-STS transmission network is planned. Based on above concept, studies have been carried out as discussed in detail in Chapter-5 for assessing transmission system requirement under various scenarios.

7.2 Transmission System Requirement during 2022-27

7.2.1 The transmission system planned for the period 2022-27 has been compiled and presented in this chapter under following sub head:

(i) Transmission system planned under ISTS and Intra-State

(ii) Inter-Regional Transmission Links

(iii) Reactors including dynamic compensation

7.3 Transmission System planned under ISTS and Intra-State

Based on the planned generation capacity addition and projected electricity demand, about 123,577 ckm of transmission lines and 710,940 MVA of transformation capacity in the substations at 220 kV and above voltage levels are required to be added during the period 2022-27. In addition, 12,000 MW of HVDC Bi-pole capacity is planned to be added during 2017-22. The likely growth in transmission system from 2016-17 to 2026-27 is given in Table 7.2.

Table – 7.2: Likely growth in transmission system till 2026-27

Transmission System Type / Voltage Class	Unit	At the end of 2016-17 (31.03.2017)	Addition During 2017-22	At the end of 2021-22 (31.03.2022)	Planned addition during 2022-27	At the end of 2026-27 (31.03.2027)
Transmission Lines						
(a) HVDC ± 320 kV/ 500 kV/800 kV Bipole	ckm	15556	3819	19375	4300	23675
(b) 765 kV	ckm	31240	19783	51023	35005	86028
(c) 400 kV	ckm	157787	36191	193978	38245	232223
(d) 230/220 kV	ckm	163268	29072	192340	46027	238367
Total: Transmission Lines	**ckm**	**367851**	**88865**	**456716**	**123577**	**580293**
Sub-stations						

Transmission System Type / Voltage Class	Unit	At the end of 2016-17 (31.03.2017)	Addition During 2017-22	At the end of 2021-22 (31.03.2022)	Planned addition during 2022-27	At the end of 2026-27 (31.03.2027)
(a) 765 kV	MVA	167500	89700	257200	319500	576700
(b) 400 kV	MVA	240807	152306	393113	268135	661248
(c) 230/220 kV	MVA	312958	107679	420637	123305	543942
Total: Sub-stations	**MVA**	**721265**	**349685**	**1070950**	**710940**	**1781890**
HVDC						
(a) Bi-pole link capacity	MW	16500	14000	30500	12000	42500
(b) Back-to back capacity	MW	3000	0	3000	0	3000
Total- HVDC	**MW**	**19500**	**14000**	**33500**	**12000**	**45500**

Details of transmission system addition in ISTS and Intra- State is given in Table 7.3.

Table 7.3: Transmission lines and transformation capacity under ISTS and intra-state

		At the end of 2016-17 (31.03.2017)	Addition during 2017-22	At the end of 2021-22 (31.03.2022)	Planned addition during 2022-27	At the end of 2026-27 (31.03.2027)	At the end of 2026-27 (31.03.2027)
Transmission lines (ckm)	ISTS	165,654	40,379	206,033	53,132	259,165	**580,293**
	Intra-state	202,197	48,486	250,683	70,445	321,128	
Transformation capacity (MVA)	ISTS	302,803	172,325	475,128	438,675	913,803	**1827,390**
	Intra-state	437,962	191,360	629,322	284,265	913,587	

14,625 ckm (3,178 ckm in ISTS and 11,447 ckm in Intra-state) of transmission lines and 75,902 MVA (21,950 MVA in ISTS and 53,952 MVA in Intra-state) of transformation capacity has added during 2022-23. 7,026 ckm (3,730 ckm in ISTS and 3,296 ckm in Intra-state) of transmission lines and 29,521 MVA (15,535 MVA in ISTS and 13,986 MVA in Intra-state) of transformation capacity has been added during 2023-24 (till October, 2023).

Details of inter-state transmission system requirement during the period 2022-27 are given at Annex- 7.1. The intra-state transmission system required during the period 2022-27 are given at Annex- 7.2.

7.4 Inter-Regional Transmission Links

To cater to the import/export requirement of various regions, a number of inter-regional transmission corridors have already been planned. These high capacity transmission corridors are in various stages of implementation. Details of the under construction/planned Inter-Regional Transmission Corridors are given at Annex- 7.3. The summary of inter-regional transmission capacity required by the year 2026-27 is summerised in Table 7.4.

Table - 7.4: Inter-Regional Transmission Capacity (MW)

Inter-Regional Transmission Capacity (MW)			
Inter-Regional corridors	**At the end of 2021-22 (31.03.2022)**	**Addition planned during the period 2022-27**	**At the end of 2026-27 (31.03.2027)**
West - North	36,720	20,000	56,720
North East - North	3,000	0	3,000
East - North	22,530	0	22,530
East - West	21,190	1,600	22,790
East - South	7,830	0	7,830
West - South	18,120	10,000	28,120
East - North East	2,860	0	2,860
Total	**112,250**	**31,600**	**1,43,850**

The total inter-regional transmission capacity addition planned during the period 2022-27 is 31,600 MW. With this addition, the total inter-regional capacity would increase from 112,250 MW (as on 31st March, 2022) to 143,850 MW by the end of 2026-27.

The summation of the transmission capacities of inter-Regional links is a figurative representation of the transmission capacity between the regions. These aggregate numbers do not indicate actual power transfer capability across different regions/states. The power transfer capability between two points in a grid depends upon a number of factors such as power flow pattern, voltage stability, angular stability, loop flows, line loading etc. Hence, the actual power transfer capacity between two regions may be less than the summation of the transmission capacity of Inter-Regional links.

Further, the inter-regional transmission capacity in one direction may not be same as the inter-regional capacity in other direction. For instance, the maximum capacity of HVDC Raigarh (WR) – Pugalur (SR) is 6,000 MW in WR-SR direction whereas the capacity in reverse direction (i.e. SR-WR) is limited to only 3,000 MW. Similarly, the Champa (WR) – Kurukshetra (NR) HVDC link cannot be operated in reverse direction. The system operator would have to assess the transfer capability between two points of the grid from time to time.

7.5 Reactive Compensation

7.5.1 Voltage control in an electrical power system is important for proper operation of electrical power equipments, preventing damage due to overheating of generators and motors, reducing transmission losses and to maintain the ability of the system to withstand and prevent voltage collapse. Voltage control is essential on account of several reasons namely,

- Power-system equipments are designed to operate within a range of voltages, usually within ±5% to ±10% of the nominal voltage.
- To maximize the amount of real power that can be transferred across a transmission line, reactive-power flows must be minimized.
- Reactive power flow on transmission system incurs real-power losses.

7.5.2 The above reasons necessitate proper reactive power management in power system. In order to provide adequate reactive compensation, line reactors as well as bus reactors are planned. A large number of such compensating devices are expected by 2026-27 and the implementation plan is summarised in Tables 7.5 and Table 7.6.

Table – 7.5: Summary of Bus Reactors planned during the period 2022-27

Summary of Bus Reactors planned during the period 2022-27					
Region	**Period**	**MVAr Compensation**		**Cost (in Rs Cr)**	
		765 kV	**400 kV**	**765 kV**	**400 kV**
NR	**2022-27**	14589	9464	3073	2446
WR	**2022-27**	10560	5125	2159	1285
SR	**2022-27**	5010	4625	1066	1160
ER	**2022-27**	660	625	135	157
NER	**2022-27**	0	410	0	119
All India	**2022-27**	30819	20249	6433	5167
Total Bus Reactors (in MVAr) planned during 2022-27 and estimated cost (in Rs Crore)		**51068**		**11600**	

Table – 7.6: Summary of Line Reactors planned during the period 2022-27

Summary of Line Reactors planned during the period 2022-27					
Region	**Period**	**MVAr Compensation**		**Cost (in Rs Cr)**	
		765 kV	**400 kV**	**765 kV**	**400 kV**
NR	**2022-27**	31740	1936	7295	838
WR	**2022-27**	16110	1524	3558	624
SR	**2022-27**	4625	820	2042	238
ER	**2022-27**	660	189	135	80
NER	**2022-27**	0	286	0	109
All India	**2022-27**	53135	4755	13030	1889
Total Line Reactors (in MVAr) expected during the period 2022-27 & estimated Cost (in Rs Crore)		**57890**		**14919**	

7.5.3 In addition to the above compensation devices that provide reactive power support to the grid under steady state conditions, several Dynamic Compensation devices such as Static Var Compensators (SVCs) and Static Compensators (STATCOMs) are under implementation in the ISTS network. These devices have been planned to provide dynamic stability to the Grid under contingency conditions and to provide fast robust system response to severe disturbances in the grid where voltage recovery is critical. Currently, 12 nos. of STATCOMs/SVCs are commissioned, 17 nos. of STATCOMs/SVCs are under implementation and 2 nos. of STATCOMs/SVCs are planned in ISTS. The details with the current status of the STATCOMs/SVCs are given in Annex-7.4.

In addition to the above, following dynamic compensation devices have been commissioned/ planned under Intra-state transmission system:

i. ± 120 MVAR STATCOM at Timbdi S/s of GETCO (commissioned)
ii. ± 300 MVAR STATCOMs each at 765 kV Jaisalmer S/s and 400 kV Bhadla S/s of RVPNL (Planned)
iii. ± 100 MVAR, STATCOMs each at 220 kV Phalodi S/s and 220 kV Tinwari S/s of RVPNL (Planned)

Space provisions are being kept at several under consuruction/planned sub-stations for installation of STATCOMs as per requirement in future.

7.6 Estimated cost of Transmission System during the period 2022-27

An estimated expenditure of Rupees 4,75,804 Crore would be required for implementation of additional transmission system of 220 kV and above voltage level in the country (Transmission lines, Substations, and reactive compensation etc.) during the period 2022-27.

The addition in ISTS includes total 170 transmission schemes with estimated cost of Rs. 3,13,950 Crores. The estimated cost of intra-state transmission system is Rs. 1,61,854 Crores.

Chapter – 8

Perspective Transmission Plan for 2027-32

8.1 Introduction

8.1.1 This Chapter covers the broad transmission corridor capacity requirement during the period 2027 - 2032. As per 20th Electric Power Survey (EPS) Report, the all-India peak electricity demand is expected to increase from 277 GW in 2026-27 and to 366 GW in 2031-32.

8.1.2 The state-wise load growth and state-wise generation capacity additions of various fuel types i.e. wind, solar, hydro, coal, gas, nuclear etc. to meet the electricity demand are also required to assess the requirement of transmission system. The location and capacity of all the generation plants that may come up in these five years (2027-32) are not known with certainty. Hence, the transmission corridor capacity requirements have been worked out broadly based on estimates of peak electricity demand and assessment of region-wise generation capacity addition possibility during the period 2027-32.

8.2 Assessment of Electricity Demand

8.2.1 Demand assessment is an essential prerequisite for planning of generation capacity addition and associated transmission infrastructure required to meet the electricity requirement of various sectors of the economy. The type and location of power projects to be planned in the system is largely dependent on the magnitude, spatial distribution as well as the variation of demand during the day, seasons and on a yearly basis. Therefore, reliable planning for generation and transmission capacity addition for future is largely dependent on assessment of the future electricity demand.

8.2.2 As per 20th EPS Report, the projected peak electricity demand in the year 2031-32 (in MW) is given in Table 8.1.

Table- 8.1: Forecast of annual Peak Electricity Demand for 2031-32 as per 20th EPS Report

State/UTs	Peak Electricity Demand (MW)
Northern Region	1,27,553
Western Region	1,14,766
Southern Region	1,07,259
Eastern Region	50,420
North- Eastern Region	6,519
all-India	**3,66,393**

8.2.3 In addition to above, following peak demand in MW (export / import) of neighbouring countries has also been assumed as given in Table 8.2.

Table- 8.2: Likely export/import in 2031-32

Neighbouring Country	Export/Import (MW)
Bhutan	500 MW (Export); 4500 MW (Import)
Nepal	2000 MW (Export); 3000 MW (Import)
Bangladesh	3600 MW (Export)
Myanmar	500 MW (Export)

Neighbouring Country	Export/Import (MW)
Sri Lanka	500 MW (Export)
Total Exports	**7100 MW (Peak export)**

8.3 Assessment of Generation Capacity:

8.3.1 Installed generating capacity, including likely electricity import from neighbouring countries, has been assumed for the terminal year of 2031-32. Details are given in Table 8.3 and Figure 8.1.

Table- 8.3: Likely Installed Generating Capacity in 2031-32

(figures in MW)

Regions	Coal	Gas	Hydro	PSP	Nuclear	Wind	Solar[1]	Biomass	Small Hydro	Total[2]	BESS
Northern	54320	5781	28956	5360	6520	21327	168575	4758	1867	297464	27500
Western	93951	10806	5952	4780	3940	39842	69104	4569	742	233686	4000
Southern	54495	6492	10802	14646	9220	60726	125730	5407	2129	289646	20000
Eastern	56127	100	6765	1900	0	0	954	743	387	66975	0
North Eastern	750	1644	9704	0	0	0	203	23	326	12650	0
All India	259643	24824	62178	26686	19680	121895	364566	15500	5450	900422	51500

[1] Includes 60,207 MW of solar rooftop capacity

[2] BESS is not included in the total installed capacity

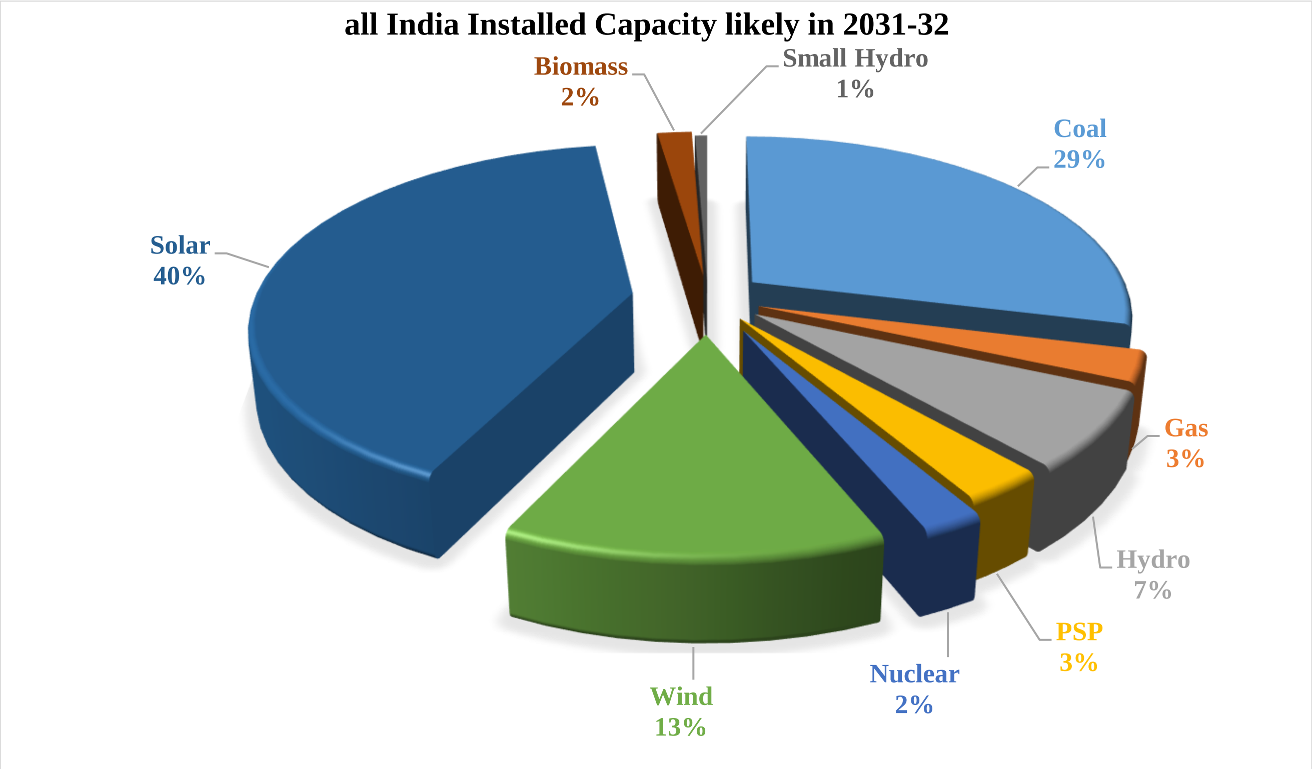

Fig. 8.1: All India Installed generating capacity likely in 2031-32

8.4 Electricity Demand and Installed Generation Capacity:

Relative growth of generation capacity with respect to the electricity demand for the years 2026-27 and 2031-32 is depicted in Figure 8.2. The higher growth in the Installed capacity is due to the higher Renewable Energy (RE) capacity addition. The RE capacity has low Capacity Utilisation factor (CUF) and some RE capacity may not be available to meet the evening peak demand, necessitating requirement of storage or capacity addition from other sources. The solar power is not available during the evening peak demand hours (6 pm - 9 pm and also beyond till sunrise), and wind being seasonal, is available only during April-September months. Thus RE may contribute less towards meeting the energy demand and peak electricity demand. However, considering clean energy transition, capacity addition from RE sources is a must.

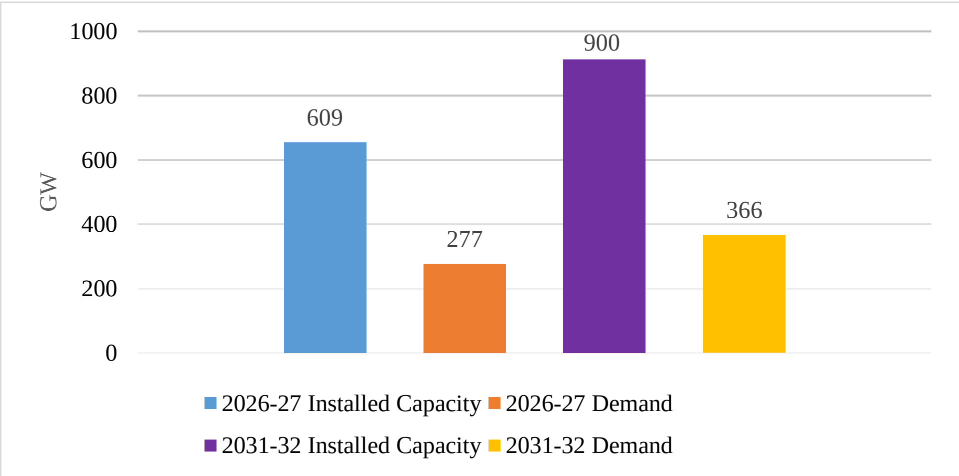

Fig. 8.2: Comparison of all India Installed capacity and electricity demand in 2026-27 & 2031-32

8.5 Assessment of Transmission Capacity Requirement

8.5.1 Transmission system has already been planned for 537 GW RE capacity/potential zones by the year 2030. Details of broad transmission system for integration of the RE capacity is given in Chapter 10. As details of RE capacity to be added during the balance period till the year 2031-32 and details of capacity addition from other sources would be visible with passage of time, the broad inter-regional transmission capacity requirement in the year 2031-32 has been worked out.

8.5.2 The projection of generation and demand under different scenarios as estimated above for 2026-27, 2031-32 time-frame have been used to find the demand-generation, surplus-deficit analysis for each region and for each scenario.

8.5.3 The variation in generation dispatch and availability has been worked out for each scenario for the terminal year 2031-32 and is discussed in subsequent paragraphs.

8.5.4 In all of these analysis, peak demand variation as given in Table 8.4 has been assumed for the five regions in different scenarios.

Table- 8.4: Scenario-wise Peak Demand

	February			June			August		
Region	Afternoon	Evening	Night	Afternoon	Evening	Night	Afternoon	Evening	Night
Northern	66%	70%	45%	83%	90%	81%	77%	83%	75%

Western	93%	82%	72%	84%	84%	78%	72%	75%	65%
Southern	89%	82%	72%	75%	76%	67%	70%	72%	59%
Eastern	65%	77%	56%	79%	90%	79%	78%	91%	82%
North Eastern	52%	75%	40%	60%	76%	58%	65%	88%	67%

8.5.4 On the basis of the demand and supply position, the requirement of power flow between various regions has been worked out. The transmission corridors between the regions including the flow to neighbouring countries have been indicated which may be required to meet the need of the power transfer among various regions. The capacity of transmission corridors thus assessed are based on only empirical analysis and therefore, are only indicative in nature.

8.6 Transmission Corridor Capacity Requirement in 2031-32

The scenario-wise demand-supply surplus/deficit for the year 2031-32 is given in Tables 8.5- 8.22:

8.6.1 February Afternoon (2031-32):

Table 8.5: Generation dispatch factors

Regions	Coal	Gas	Nuclear	Hydro	PSP	Solar	Wind	Small Hydro	BESS
Northern	64%	0%	80%	30%	-110%	90%	10%	30%	-100%
Western	64%	0%	80%	20%	-110%	80%	5%	20%	-100%
Southern	64%	0%	80%	20%	-110%	80%	10%	20%	-100%
Eastern	64%	0%	80%	30%	-110%	80%	0%	30%	-100%
North Eastern	64%	0%	80%	30%	-110%	80%	0%	30%	-100%

Table 8.6: Load Generation Balance Analysis (figures in MW)

Region	Coal[3]	Gas	Nuclear	Hydro	PSP	Solar[4]	Wind	Small Hydro	BESS	Total Availability	Demand	Surplus/ Deficit
NR	26290	0	5216	8687	-5896	117061	2133	560	-27500	126551	86068	40483
WR	49878	0	3152	1190	-5258	40152	1992	148	-4000	87255	109119	-21864
SR	25362	0	7376	2160	-16110	86340	6073	426	-20000	91627	97595	-5968
ER	27083	0	0	2029	-2090	663	0	116	0	27801	33506	-5704
NER	461	0	0	2911	0	149	0	98	0	3619	3466	153
All India	129074	0	15744	16978	-29354	244366	10197	1348	-51500	336854	329754	7100
Bhutan	0	0	0	0	0	0	0	0	0	0	500	-500
Nepal	0	0	0	0	0	0	0	0	0	0	2000	-2000
Bangladesh	0	0	0	0	0	0	0	0	0	0	3600	-3600
Myanmar	0	0	0	0	0	0	0	0	0	0	500	-500
Sri Lanka	0	0	0	0	0	0	0	0	0	0	500	-500
Total	129074	0	15744	16978	-29354	244366	10197	1348	-51500	336854	336854	0

[3] Dispatch has been considered from generating units running during the scenario
[4] Dispatch has been considered from grid connected solar projects only

8.6.2 February Evening (2031-32):

Table 8.7: Generation dispatch factors

Regions	Coal	Gas	Nuclear	Hydro	PSP	Solar	Wind	Small Hydro	BESS
Northern	80%	40%	80%	60%	90%	0%	35%	60%	66%
Western	80%	40%	80%	40%	90%	0%	25%	40%	66%
Southern	80%	40%	80%	40%	90%	0%	30%	40%	66%
Eastern	80%	40%	80%	60%	90%	0%	0%	60%	66%
North Eastern	80%	40%	80%	60%	90%	0%	0%	60%	66%

Table 8.8: Load Generation Balance Analysis (figures in MW)

Region	Coal[3]	Gas	Nuclear	Hydro	PSP	Solar	Wind	Small Hydro	BESS	Total Availability	Demand	Surplus/ Deficit
NR	34232	2313	5216	17373	4824	0	7464	1120	17875	90417	89648	770
WR	64946	4323	3152	2381	4302	0	9961	297	2600	91960	94488	-2528
SR	33024	2597	7376	4321	13181	0	18218	852	13000	92568	88308	4260
ER	35171	40	0	4059	1710	0	0	232	0	41212	38980	2232
NER	600	658	0	5822	0	0	0	195	0	7275	4909	2366
All India	167973	9929	15744	33956	24017	0	35643	2696	33475	323433	316333	7100
Bhutan	0	0	0	0	0	0	0	0	0	0	500	-500
Nepal	0	0	0	0	0	0	0	0	0	0	2000	-2000
Bangladesh	0	0	0	0	0	0	0	0	0	0	3600	-3600
Myanmar	0	0	0	0	0	0	0	0	0	0	500	-500
Sri Lanka	0	0	0	0	0	0	0	0	0	0	500	-500
Total	167973	9929	15744	33956	24017	0	35643	2696	33475	323433	323433	0

[3] Dispatch is considered from units running during the scenario

8.6.3 February Night (2031-32):

Table 8.9: Generation dispatch factors

Regions	Coal	Gas	Nuclear	Hydro	PSP	Solar	Wind	Small Hydro	BESS
Northern	80%	40%	80%	30%	90%	0%	10%	30%	34%
Western	80%	40%	80%	20%	90%	0%	5%	20%	34%
Southern	80%	40%	80%	20%	90%	0%	10%	20%	34%
Eastern	80%	40%	80%	30%	90%	0%	0%	30%	34%
North Eastern	80%	40%	80%	30%	90%	0%	0%	30%	34%

Table 8.10: Load Generation Balance Analysis (figures in MW)

Region	Coal[3]	Gas	Nuclear	Hydro	PSP	Solar	Wind	Small Hydro	BESS	Total Availability	Demand	Surplus/ Deficit
Northern	33376	2313	5216	8687	4824	0	2133	560	9625	66733	58489	8244
Western	63322	4323	3152	1190	4302	0	1992	148	1400	79829	84201	-4371
Southern	32198	2597	7376	2160	13181	0	6073	426	7000	71011	78693	-7682
Eastern	34190	40	0	2029	1710	0	0	116	0	38086	28771	9314
North Eastern	585	658	0	2911	0	0	0	98	0	4252	2657	1594
All- India	163672	9929	15744	16978	24017	0	10197	1348	18025	259911	252811	7100
Bhutan	0	0	0	0	0	0	0	0	0	0	500	-500
Nepal	0	0	0	0	0	0	0	0	0	0	2000	-2000
Bangladesh	0	0	0	0	0	0	0	0	0	0	3600	-3600
Myanmar	0	0	0	0	0	0	0	0	0	0	500	-500
Sri Lanka	0	0	0	0	0	0	0	0	0	0	500	-500
Total	163672	9929	15744	16978	24017	0	10197	1348	18025	259911	259911	0

[3] Dispatch is considered from units running during the scenario

8.6.4 June Afternoon (2031-32):

Table 8.11: Generation dispatch factors

Regions	Coal	Gas	Nuclear	Hydro	PSP	Solar[4]	Wind	Small Hydro	BESS
Northern	40%	0%	80%	70%	-110%	85%	50%	70%	-100%
Western	40%	0%	80%	40%	-110%	75%	55%	40%	-100%
Southern	40%	0%	80%	40%	-110%	75%	55%	40%	-100%
Eastern	40%	0%	80%	70%	-110%	75%	0%	70%	-100%
North Eastern	40%	0%	80%	70%	-110%	75%	0%	70%	-100%

Table 8.12: Load Generation Balance Analysis (figures in MW)

Region	Coal[3]	Gas	Nuclear	Hydro	PSP	Solar[4]	Wind	Small Hydro	BESS	Total Availability	Demand	Surplus/ Deficit
Northern	10570	0	5216	20269	-5896	117917	10664	1307	-27500	132546	108125	24420
Western	23409	0	3152	2381	-5258	35687	21913	297	-4000	77581	98458	-20877
Southern	10088	0	7376	4321	-16110	76740	33399	852	-20000	96665	82159	14506
Eastern	12876	0	0	4735	-2090	589	0	271	0	16381	40681	-24300
North Eastern	192	0	0	6793	0	133	0	228	0	7345	3995	3351
all India	57133	0	15744	38499	-29354	231066	65976	2954	-51500	330518	333418	-2900
Bhutan	0	0	0	4500	0	0	0	0	0	4500	0	4500
Nepal	0	0	0	3000	0	0	0	0	0	3000	0	3000
Bangladesh	0	0	0	0	0	0	0	0	0	0	3600	-3600
Myanmar	0	0	0	0	0	0	0	0	0	0	500	-500
Sri Lanka	0	0	0	0	0	0	0	0	0	0	500	-500
Total	57133	0	15744	45999	-29354	231066	65976	2954	-51500	338018	338018	0

[3] Dispatch is considered from units running during the scenario
[4] Dispatch is considered from grid connected solar projects only

8.6.5 June Evening (2031-32):

Table 8.13: Generation dispatch factors

Regions	Coal	Gas	Nuclear	Hydro	PSP	Solar	Wind	Small Hydro	BESS
Northern	80%	40%	80%	95%	90%	0%	70%	95%	52%
Western	80%	40%	80%	70%	90%	0%	75%	70%	52%
Southern	80%	40%	80%	70%	90%	0%	75%	70%	52%
Eastern	80%	40%	80%	90%	90%	0%	0%	90%	52%
North Eastern	80%	40%	80%	90%	90%	0%	0%	90%	52%

Table 8.14: Load Generation Balance Analysis (figures in MW)

Region	Coal[3]	Gas	Nuclear	Hydro	PSP	Solar	Wind	Small Hydro	BESS	Total Availability	Demand	Surplus/ Deficit
Northern	22020	2313	5216	27508	4824	0	14929	1773	14850	93433	116479	-23046
Western	48768	4323	3152	4166	4302	0	29882	519	2160	97272	97815	-543
Southern	21016	2597	7376	7561	13181	0	45545	1490	10800	109566	82710	26855
Eastern	26632	40	0	6088	1710	0	0	348	0	34818	46042	-11224
North Eastern	400	658	0	8734	0	0	0	293	0	10084	5027	5057
all -India	118836	9929	15744	54057	24017	0	90355	4424	27810	345173	348073	-2900
Bhutan	0	0	0	4500	0	0	0	0	0	4500	0	4500
Nepal	0	0	0	3000	0	0	0	0	0	3000	0	3000
Bangladesh	0	0	0	0	0	0	0	0	0	0	3600	-3600
Myanmar	0	0	0	0	0	0	0	0	0	0	500	-500
Sri Lanka	0	0	0	0	0	0	0	0	0	0	500	-500
Total	118836	9929	15744	61557	24017	0	90355	4424	27810	352673	352673	0

[3] Dispatch is considered from units running during the scenario

8.6.6 June Night (2031-32):

Table 8.15: Generation dispatch factors

Regions	Coal	Gas	Nuclear	Hydro	PSP	Solar	Wind	Small Hydro	BESS
Northern	80%	40%	80%	70%	90%	0%	60%	70%	48%
Western	80%	40%	80%	40%	90%	0%	65%	40%	48%
Southern	80%	40%	80%	40%	90%	0%	65%	40%	48%
Eastern	80%	40%	80%	70%	90%	0%	0%	70%	48%
North Eastern	80%	40%	80%	70%	90%	0%	0%	70%	48%

Table 8.16: Load Generation Balance Analysis (figures in MW)

Region	Coal[3]	Gas	Nuclear	Hydro	PSP	Solar	Wind	Small Hydro	BESS	Total Availability	Demand	Surplus/ Deficit
Northern	22020	2313	5216	20269	4824	0	12796	1307	12650	81394	105592	-24198
Western	48768	4323	3152	2381	4302	0	25897	297	1840	90959	91488	-528
Southern	21016	2597	7376	4321	13181	0	39472	852	9200	98014	73445	24569
Eastern	26996	40	0	4735	1710	0	0	271	0	33752	40709	-6957
North Eastern	400	658	0	6793	0	0	0	228	0	8078	3864	4214
All- India	119200	9929	15744	38499	24017	0	78165	2954	23690	312198	315098	-2900
Bhutan	0	0	0	4500	0	0	0	0	0	4500	0	4500
Nepal	0	0	0	3000	0	0	0	0	0	3000	0	3000
Bangladesh	0	0	0	0	0	0	0	0	0	0	3600	-3600
Myanmar	0	0	0	0	0	0	0	0	0	0	500	-500
Sri Lanka	0	0	0	0	0	0	0	0	0	0	500	-500
Total	119200	9929	15744	45999	24017	0	78165	2954	23690	319698	319698	0

[3] Dispatch is considered from units running during the scenario

8.6.7 August Afternoon (2031-32):

Table 8.17: Generation dispatch factors

Regions	Coal	Gas	Nuclear	Hydro	PSP	Solar	Wind	Small Hydro	BESS
Northern	40%	0%	80%	70%	-110%	80%	50%	70%	-100%
Western	40%	0%	80%	40%	-110%	70%	55%	40%	-100%
Southern	40%	0%	80%	40%	-110%	70%	55%	40%	-100%
Eastern	40%	0%	80%	70%	-110%	70%	0%	70%	-100%
North Eastern	40%	0%	80%	70%	-110%	70%	0%	70%	-100%

Table 8.18: Load Generation Balance Analysis (figures in MW)

Region	Coal[3]	Gas	Nuclear	Hydro	PSP	Solar[4]	Wind	Small Hydro	BESS	Total Availability	Demand	Surplus/ Deficit
Northern	8275	0	5216	20269	-5896	109706	10664	1307	-27500	122040	99728	22312
Western	20924	0	3152	2381	-5258	32926	21913	297	-4000	72334	83904	-11570
Southern	6355	0	7376	4321	-16110	70801	33399	852	-20000	86993	76238	10756
Eastern	9235	0	0	4735	-2090	544	0	271	0	12695	39933	-27238
North Eastern	0	0	0	6793	0	122	0	228	0	7143	4303	2841
All- India	44790	0	15744	38499	-29354	214098	65976	2954	-51500	301206	304106	-2900
Bhutan	0	0	0	4500	0	0	0	0	0	4500	0	4500
Nepal	0	0	0	3000	0	0	0	0	0	3000	0	3000
Bangladesh	0	0	0	0	0	0	0	0	0	0	3600	-3600
Myanmar	0	0	0	0	0	0	0	0	0	0	500	-500
Sri Lanka	0	0	0	0	0	0	0	0	0	0	500	-500
Total	44790	0	15744	45999	-29354	214098	65976	2954	-51500	308706	308706	0

[3] Dispatch is considered from units running during the scenario
[4] Dispatch is considered from grid connected solar projects only

8.6.8 August Evening (2031-32):

Table 8.19: Generation dispatch factors

Regions	Coal	Gas	Nuclear	Hydro	PSP	Solar	Wind	Small Hydro	BESS
Northern	80%	40%	80%	95%	90%	0%	70%	95%	58%
Western	80%	40%	80%	70%	90%	0%	75%	70%	58%
Southern	80%	40%	80%	70%	90%	0%	75%	70%	58%
Eastern	80%	40%	80%	90%	90%	0%	0%	90%	58%
North Eastern	80%	40%	80%	90%	90%	0%	0%	90%	58%

Table 8.20: Load Generation Balance Analysis (figures in MW)

Region	Coal[3]	Gas	Nuclear	Hydro	PSP	Solar	Wind	Small Hydro	BESS	Total Availability	Demand	Surplus/ Deficit
Northern	17240	2313	5216	27508	4824	0	14929	1773	16775	90578	107618	-17041
Western	43592	4323	3152	4166	4302	0	29882	519	2440	92376	87497	4879
Southern	13240	2597	7376	7561	13181	0	45545	1490	12200	103190	78503	24687
Eastern	19176	40	0	6088	1710	0	0	348	0	27362	46640	-19278
North Eastern	0	658	0	8734	0	0	0	293	0	9684	5832	3853
All- India	93248	9929	15744	54057	24017	0	90355	4424	31415	323190	326090	-2900
Bhutan	0	0	0	4500	0	0	0	0	0	4500	0	4500
Nepal	0	0	0	3000	0	0	0	0	0	3000	0	3000
Bangladesh	0	0	0	0	0	0	0	0	0	0	3600	-3600
Myanmar	0	0	0	0	0	0	0	0	0	0	500	-500
Sri Lanka	0	0	0	0	0	0	0	0	0	0	500	-500
Total	93248	9929	15744	61557	24017	0	90355	4424	31415	330690	330690	0

[3] Dispatch is considered from units running during the scenario

8.6.9 August Night (2031-32):

Table 8.21: Generation dispatch factors

Regions	Coal	Gas	Nuclear	Hydro	PSP	Solar	Wind	Small Hydro	BESS
Northern	80%	40%	80%	70%	90%	0%	60%	70%	42%
Western	80%	40%	80%	40%	90%	0%	65%	40%	42%
Southern	80%	40%	80%	40%	90%	0%	65%	40%	42%
Eastern	80%	40%	80%	70%	90%	0%	0%	70%	42%
North Eastern	80%	40%	80%	70%	90%	0%	0%	70%	42%

Table 8.22: Load Generation Balance Analysis (figures in MW)

Region	Coal[3]	Gas	Nuclear	Hydro	PSP	Solar	Wind	Small Hydro	BESS	Total Availability	Demand	Surplus/ Deficit
Northern	17240	2313	5216	20269	4824	0	12796	1307	10725	74689	97901	-23212
Western	43592	4323	3152	2381	4302	0	25897	297	1560	85503	76342	9161
Southern	13240	2597	7376	4321	13181	0	39472	852	7800	88838	64762	24076
Eastern	19421	40	0	4735	1710	0	0	271	0	26177	42311	-16134
North Eastern	0	658	0	6793	0	0	0	228	0	7678	4470	3209
All- India	93493	9929	15744	38499	24017	0	78165	2954	20085	282886	285787	-2900
Bhutan	0	0	0	4500	0	0	0	0	0	4500	0	4500
Nepal	0	0	0	3000	0	0	0	0	0	3000	0	3000
Bangladesh	0	0	0	0	0	0	0	0	0	0	3600	-3600
Myanmar	0	0	0	0	0	0	0	0	0	0	500	-500
Sri Lanka	0	0	0	0	0	0	0	0	0	0	500	-500
Total	93493	9929	15744	45999	24017	0	78165	2954	20085	290386	290387	0

[3] Dispatch has been considered from coal based generating units operating in the scenario

8.6.10 Accordingly, the transmission capacity requirement for 2031-32 has been assessed as given in Figure 8.3. The maximum surplus/deficit is based on the electricity demand and the generation availability in the nine scenarios.

<u>Power scenario of India (including exchange with neighbouring countries) at the end of 2031-32</u>

(All figures in MW)

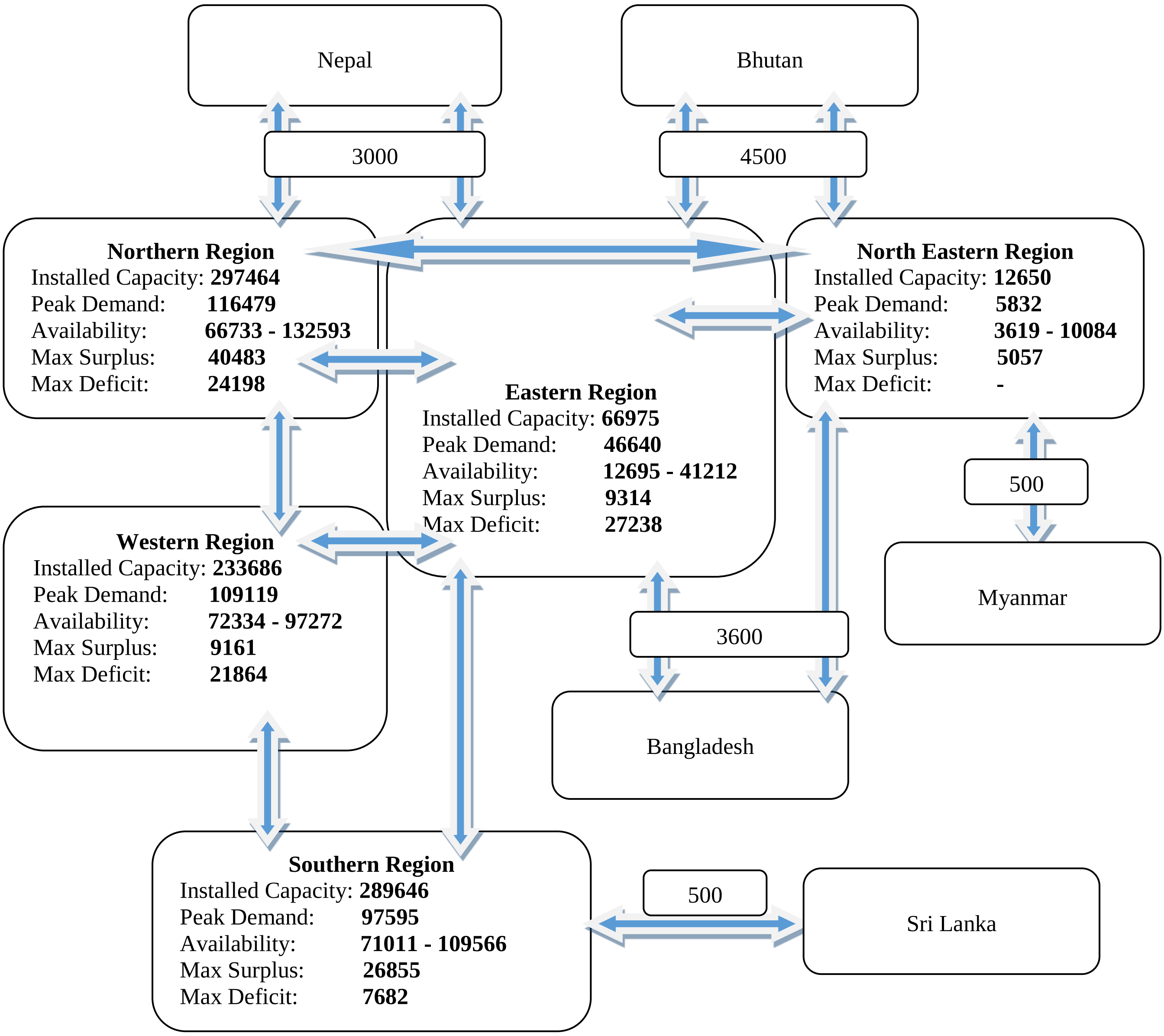

Fig. 8.3: Power scenario of India (including exchange with neighbouring countries) at the end of 2031-32

8.7 Transmission schemes planned for the period 2027-32

For the period 2027-32, various transmission schemes have been planned. These transmission schemes majorly involve the transmission system for:

- evacuation of power from identified hydro and nuclear projects

- potential zones for wind and solar generation projects,

- cross border interconnections.

The identified transmission schemes may be implemented in next 5 to 8 year time period commensurate with the development of the associated generation projects. As the demand/generation scenario evolves with time, the transmission plans would be further firmed up and implemented matching with schedule of generation projects.

8.7.1 Transmission System for evacuation of Power from Hydro Electric Projects in Chandrabhaga River Basin:

8.7.1.1. The major planned Hydro Electric Power Projects in Chandrabhaga river basin in the state of Himachal Pradesh are given in Table-8.23:

Table-8.23
Planned HEPs in Chandrabhaga River Basin

Sl. No.	Project Name	Capacity (MW)	Project Developer	Likely Commissioning
1	Tandi HEP	104	**SJVN Ltd**	2031-32
2	Rashil HEP	130		2031-32
3	Bardang HEP	175		2031-32
4	Reoli Dugli HEP	430		2029-30
5	Purthi HEP	232		2029-30
6	Sach Khas HEP	267		2030-31
7	Dugar HEP	500	**NHPC Ltd**	2027-28
8	Miyar HEP	120	**NTPC Ltd**	2031-32
9	Seli HEP	400		2031-32

The location of above mentioned HEPs along with other existing and planned HEP in Chandrabhaga/Chenab river basin is shown in **Figure 8.4.**

8.7.1.2. Transmission system has been planned for evacuation of power from the upcoming HEPs in Chandrabhaga basin as detailed below:

- **Comprehensive transmission system for evacuation of power from HEPs in Chandrabhaga river basin** (to be developed under ISTS)**:**

  (i) 400 kV Pooling/Switching Station (GIS) at Tindi and Barangal village (under the scope of ISTS)
  (ii) LILO of Chamera-I – Chamera –II 400 kV line at Barangal PS.
  (iii) High Capacity 400 kV D/c Transmission line from Kishtwar PS – Tindi PS – Barangal PS
  (iv) High Capacity 400 kV D/c Transmission line from Tandi PS – Tindi PS

- **Transmission system System for Dugar HEP** (to be developed under ISTS)**:**

  Initially Kishtwar to Dugar Section of Kishtwar PS – Tindi PS – Barangal PS 400kV D/c to be taken up for implementation and to be terminated at Dugar HEP switchyard

  After completion of the section from Dugar to Tindi, one circuit of Dugar-Kishtwar D/c line would be connected directly to one circuit of Dugar to Tindi 40 0kV D/c line thus forming Kistwar- Dugar-Tindi 400kV S/c line and Kishtwar- Tindi 400 kV S/c line

- **Transmission system System for Purthi HEP:**

  LILO of one circuit of 400 kV Kishtwar/Dugar-Tindi 400 kV D/c line at Purthi

- **Transmission system System for Sachkhas HEP:**

  LILO of one circuit of 400 kV Kishtwar/Dugar-Tindi 400 kV D/c line at Sachkhas HEP

- **Transmission system System for Reoli Dogli HEP**

  LILO of 400kV one circuit of Kishtwar/Dugar -Tindi 400 kV D/c line at Reoli Dogli

- **Transmission system System for Bardang HEP** (to be developed under ISTS)**:**

  Bardang HEP -Tindi 400kV D/c line

  The line will be extended to Tandi HEP in the matching time frame so as to form Tandi- Bardang –Tindi 400 kV S/c line and Tandi- Tindi 400 kV S/c line

  The power from Miyar HEP, Rasil HEP and Seli HEP would be evacuated through LILO of one circuit of Tandi – Tindi 400 kV D/c line

  Note: The high capacity line would be developed in phases as per the commissioning schedule of Hydro Generating Plants.

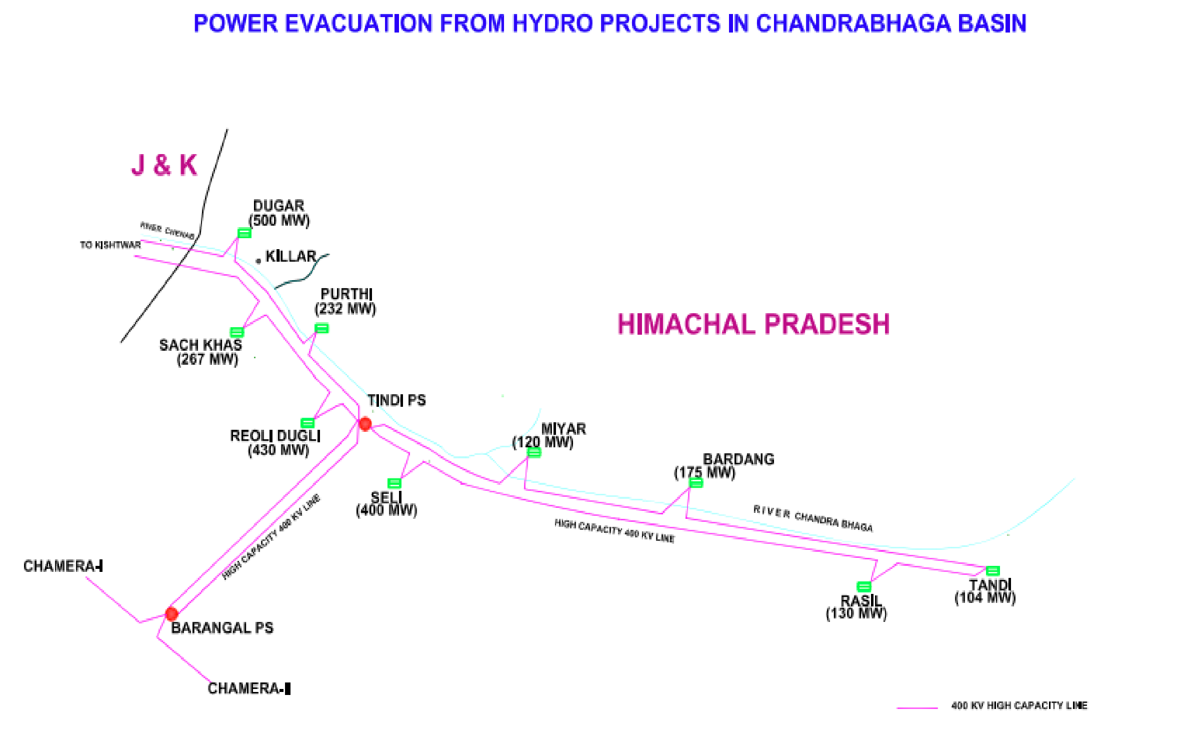

Fig 8.4: Proposed power evacuation system for HEPs in Chandrabhaga river basin

8.7.2 Transmission Plan for Evacuation of Power from Hydro Electric Projects in Northern region likely to be commissioned beyond 2026-27:

The details of the transmission system planned for other hydro projects likely to be commissioned beyond 2026-27 are given below:

Sl. No.	Name of Hydro Project	Capacity (MW)	Broad transmission system
1.	Kiru (CVPPL)	624	**Common System:** 1. Establishment of 2x200 MVA, 400/132 kV Kishtwar Pooling station by LILO of one circuit of Kishenpur – Dulhasti 400 kV D/c (Quad) line 2. Stringing of 2nd circuit of Kishenpur – Dulhasti 400 kV D/c (Quad) line from Kishtwar to Kishenpur. **Under the scope of generation developer:** Implementation of Kiru –Kwar – Pakal Dul - Kishtwar 400 kV D/C Triple HTLS line
2.	Kwar (CVPPPL)	540	**Common System:** 1. Establishment of 2x200 MVA, 400/132 kV Kishtwar Pooling station by LILO of one circuit of Kishenpur – Dulhasti 400 kV D/c (Quad) line 2. Stringing of 2nd circuit of Kishenpur – Dulhasti 400 kV D/c (Quad) line from Kishtwar to Kishenpur. **Under the scope of generation developer:** Implementation of Kiru –Kwar – Pakal Dul - Kishtwar 400 kV D/C Triple HTLS line.
3.	Ratle (RHEPPL / NHPC)	850	**Common System:** 1. Establishment of 2x200 MVA, 400/132 kV Kishtwar Pooling station by LILO of one circuit of Kishenpur – Dulhasti 400 kV D/c (Quad) line 2. Stringing of 2nd circuit of Kishenpur – Dulhasti 400 kV D/c (Quad) line from Kishtwar to Kishenpur. 3. Kishtwar – Kishenpur 400 kV (2nd) D/c line **Under the scope of generation developer:** Ratle HEP - Kishtwar PS 400 kV D/c line
4.	Luhri Stage-II (SJVN)	172	**Common System:** 1. Establishment of 7x105 MVA, 400/220 kV Nange GIS Pooling Station. 2. Nange (GIS) Pooling Station – Koldam 400 kV D/c line. 3. Bypassing one ckt of Koldam – Ropar/ Ludhiana 400 kV D/c line at Koldam and connecting it with one of the circuit of Nange- Koldam 400 kV D/c line, thus forming Nange- Ropar/ Ludhiana 400 kV S/c line. **Under the scope of generation developer:** Luhri Stage-II – Nange Pooling Station 220 kV D/c line.
5.	Sunni Dam HEP (SJVN)	382	**Common System:** 1. Establishment of 7x105 MVA, 400/220 kV Nange GIS Pooling Station. 2. Nange (GIS) Pooling Station – Koldam 400 kV D/c line. 3. Bypassing one ckt of Koldam – Ropar/ Ludhiana 400 kV D/c line at Koldam and connecting it with one of the circuit of Nange- Koldam 400 kV D/c line, thus forming Nange- Ropar/ Ludhiana 400 kV S/c line. **Under the scope of generation developer:** Sunni Dam – Nange Pooling Station 220 kV D/c line.
6.	Lakhwar HEP (UJVNL)	300	Lakhwar-Dehradun 220 kV D/c line

Sl. No.	Name of Hydro Project	Capacity (MW)	Broad transmission system
7.	Jangi Thopan Powari HEP (SJVN)	804	LILO of Kaza/ Jhangi 400 kV PS – Wangtoo (HPPTCL) 400 kV D/c line at Jangi Thopan HEP.
8.	Kirthai-I HEP	390	LILO of one circuit of Kishtwar- Dugar 400 kV D/c line at Kirthai-I HEP
9.	Kirthai-II HEP (CVPPPL)	930	Kirthai-II HEP – Kishtwar Pooling station 400 kV D/c line (Quad HTLS) (The transmission system is under review. Dugar – Kishtawar 400 kV D/c line is proposed to LILOed at Kirthai-II)
10.	Thana Plaun HEP (HPPCL)	191	LILO of one circuit of Patti (HPPTCL)– Hamirpur (PG) 220 kV D/c line (twin moose) at Thana Plaun HEP
11.	Uri-I Stage-II HEP (NHPC)	240	LILO of one circuit of Uri-I Stage-I – Amargarh 400 kV D/c line at Uri-I Stage-II
12.	Lata Tapovan (NTPC)	171	Lata Tapovan- Joshimath- Pipalkoti 220 kV D/c line
13.	Tangnu Romai	44	Transmission system planned under intra-state

8.7.3 Transmission Plan for Evacuation of Power from identified Hydro Projects in North Eastern Region likely to be commissioned beyond 2026-27:

Sl. No.	Name of Hydro Project	Capacity (MW)	Broad transmission system
1.	Dibang HEP (12x240 MW)	12x240	• Dibang – Gogamukh 400 kV 2xD/c line • Gogamukh – Biswanath Chariali 400 kV D/c line.
2.	Myndtu –Leshka II HEP (MLHEP-II)	3x70	• Transmission system planned under intra-state [MLHEP-II – Sohara (Meghalaya) 220 kV D/c line]

8.7.4 Transmission Plan for Nuclear Power Projects to be commissioned beyond 2026-27:

Nuclear Project	Capacity (MW)	Tentative Transmission System
Northern Region		
Gorakhpur (Unit 1,2, 3 & 4)	2800	• Gorakhpur Haryana Anu Vidyut Pariyojana (GHAVP) - Fatehabad (PG) 400 kV (Quad) D/c line • Gorakhpur Haryana Anu Vidyut Pariyojana (GHAVP) – Patran (TBCB) 400 kV (Quad) D/c line
Southern Region		
Kaiga A.P.S. (Unit 5 & 6)	1400	• Re-conductoring of Kaiga – Narendra 400 D/c line with high capacity conductors • Re-conductoring of Kaiga – Guttur (Davangere) 400 kV D/c line with high capacity conductors
Kudankulam (Unit 3,4,5 & 6)	4000	**Transmission System requirement for evacuation of power from Kudankulam Unit - 3 & 4 (2x1000 MW)**

Nuclear Project	Capacity (MW)	Tentative Transmission System
		• KNPP 3&4 – Tuticorin-II GIS PS 400kV (quad) D/c line • KNPP 3&4 – Samugarangapuram (TN) 400 kV (quad) D/c line • Shifting of one circuit of KNPP 1&2 – Tirunelveli 400kV (quad) D/c line to KKNP 3&4 to form KKNP 3&4 – Tirunelveli 400kV (quad) S/c line • Interconnection between KNPP 1&2 and KNPP 3&4 generation switchyards through laying of 400kV overhead transmission line or cable and to be kept open under normal operating conditions **Transmission System requirement for evacuation of power from Kudankulam Unit - 5 & 6 (2x1000 MW)** • Interconnection of KNPP-3&4 and KNPP-5&6 switchyards with 400kV quad D/c line • Shifting of KNPP-3&4 – Tuticorin-II GIS 400 kV (quad) D/c line to KNPP-5&6 to form KNPP-5&6 – Tuticorin-II GIS 400 kV (quad) D/c line and with provision of SLR at terminating bays of KNPP-5&6 • KNPP-5&6 – Virudhanagar (TN) 400kV (quad) D/c line with 80 MVAR SLR in each circuit at KNPP-5&6

8.7.5 Greening the Andaman & Nicobar Islands

Electricity demand of Andaman & Nicobar Islands is primarily met through electricity generated using DG sets with some small-scale renewable energy sources such as solar and wind power. A plan has been prepared for connecting Andaman & Nicobar Islands with main land of the country through HVDC under-sea cables. The ±320 kV, 250 MW HVDC (VSC based) interconnection of 1150 km through under-sea cable will be first of its kind in the country. Tentative cost of the transmission would be approx. Rs. 15,120 crore. This interconnection will help the islands go green by 2028-29 onwards.

8.7.6 Transmission Plan for integration of RE Capacity beyond 2026-27

Transmission plan for integration of about 537 GW RE Capacity by 2030 has been prepared considering the identified RE potential zones in the country. The details of broad transmission system for evacuation of power from the RE potential Zones are given in Chapter 10.

8.7.7 ckm and MVA estimated for the period 2027-32

The estimated ckm and MVA addition during the period 2027-32 is given below:

Tentative addition of transmission system in 2027-32	
Transmission Line (ckm)	105000
Transformation capacity (MVA)	595000

The estimated requirement of transmission system for the period 2027-32 would be further firmed up based on the location of generating stations to be added during the period and as well as the location of new load centres.

8.7.8 Cross Border Inter-connections

At present, exchange of power between India and Neighbouring countries (Nepal, Bangladesh, Bhutan and Myanmar) is taking place in synchronous as well as asynchronous mode. Transmission links (at 11 kV, 33 kV, 132 kV and 400 kV levels) have been established between Border States (Bihar, UP, Uttarakhand, Tripura, West Bengal and Assam) of Indian Territory with neighbouring countries. Some interconnections are under construction and several cross border interconnections have been planned. At present about 4,100 MW of Power is being exchanged with the neighbouring countries through cross border links and the same is likely to increase to about 7,000 MW by the end of 2026-27. A list of cross border links likely to be completed beyond 2026-27 are listed below:

Cross Border links likely to be completed beyond 2026-27:

India –Nepal

(i) Dododhara (Nepal) - Bareilly (India) 400 kV D/c (Quad Moose) line

(ii) Inaruwa (Nepal) - Purnea (India) New 400 kV D/c (Quad Moose) line

India – Sri Lanka

(i) HVDC link between Madurai (India) and New Habarana (Sri Lanka) with 2x500 MW HVDC terminals

India-Myanmar

(i) 500 MW HVDC interconnection between India (Imphal) and Myanmar (Tamu)

Further details about these cross border inter-connection links are given in Chapter-9.

8.8 Conclusions:

8.8.1 The transmission corridor capacity requirements have been worked out based on estimates of peak electricity demand and assessment of region-wise generation capacity addition possibility during 2027-28 to 2031-32. As huge solar generation is coming in Northern Region, there is need to enhance storage capacity through BESS, other storage etc. in the vicinity of the RE Zones in order to reduce the requirement of transmission system. Green Hydrogen production facilities co-located with RE Zones may also reduce the requirement of transmission system from the RE Zones.

8.8.2 Transmission system has been planned for the generating capacity likely to be added during the period 2027-32. The transmission capacity requirements are sensitive to load growth and generation capacity addition, especially when load growth is expected in the range of 6% per annum, and location, capacity of generating capacity to be added during the period 2027-32 would be known with certainty in due course. Accordingly, the planned transmission system would need to be reviewed and firmed up.

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Chapter - 9

Cross Border Inter-Connections

9.1 Cross Border Power Transfer

The cross border power transfer between India and neighbouring countries is taking place through inter-Governmental bilateral cooperation. The planning of cross border interconnection, system operation, commercial agreement, Regulatory matters etc. are in accordance with the bilateral agreement between Governments.

India, being centrally placed in South Asian region and sharing political boundaries with SAARC/BIMSTEC countries namely Nepal, Bhutan, Bangladesh, Myanmar & Sri Lanka, is playing a major role in facilitating planning of interconnections with these countries for effective utilization of regional resources. This will also ensure Energy Security of the entire region. Existing and planned cross border interconnections between India and neighbouring countries are given below:

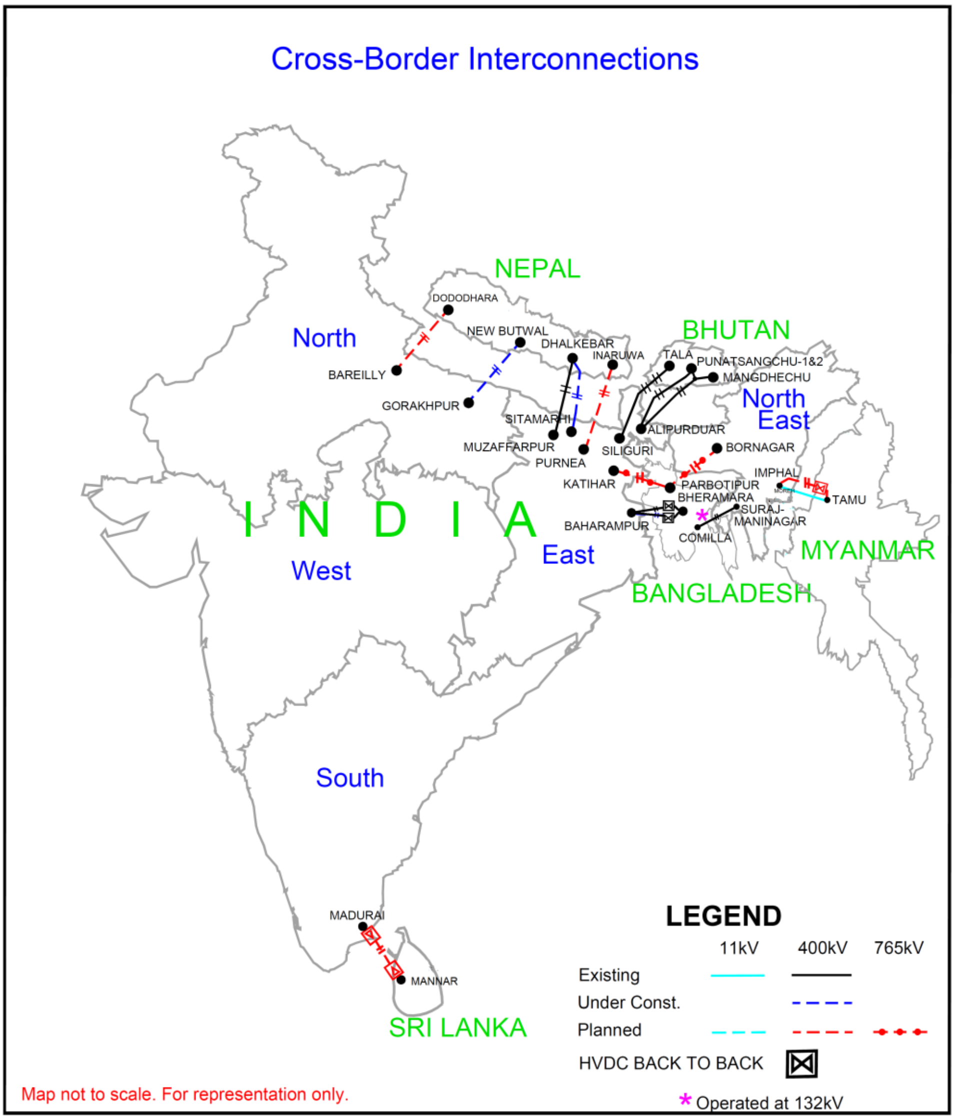

Figure 9.1: Cross Border Interconnections

9.2 Guidelines on Cross Border Trade of Electricity

Guidelines for Import/Export (Cross Border) of Electricity 2018 was issued by Ministry of Power on 18th December 2018, with the following objectives:

- Facilitate import/ export of electricity between India and neighbouring countries;
- Evolve a dynamic and robust electricity infrastructure for import/ export of electricity;
- Promote transparency, consistency and predictability in regulatory mechanism pertaining to import/ export of electricity;
- Reliable grid operation and transmission of electricity for import/ export.

Ministry of Power has appointed Member (Power Systems), Central Electricity Authority as Designated Authority under Clause 4.2 of the "Guidelines for Import/Export (Cross Border) of Electricity 2018" for facilitating the process of approval and laying down the procedure for import/ export of electricity. The Designated Authority has issued "Procedure for approval and facilitating Import/Export (Cross Border) of Electricity" on 26th February, 2021. Broad functions of Designated Authority are as under:

a) To facilitate coordination with nodal agencies/Authority of Neighbouring Countries (ANC) for transmission system planning, joint system studies, surveys, preparation of feasibility study reports, system development, construction, erection, monitoring, testing, commissioning, operation and maintenance of transmission system for Import/Export (Cross Border) of Electricity in transparent manner, etc.
b) To lay down procedure for safety, security and coordinated operation of the interconnected national grids.
c) To facilitate grant of approval to eligible entities to participate in Import/Export (Cross Border) of Electricity.
d) To lay down procedure for grant of approval to an Indian generating station, supplying electricity exclusively to neighbouring country for building a dedicated transmission line for connecting to the transmission system of neighbouring country.

9.3 Agreements with Neighbouring Countries

9.3.1 India-Bhutan

An agreement was signed between Government of the Republic of India and The Royal Government of Bhutan on the 28th day of July, 2006, on "Cooperation in the Field of Hydroelectric Power". The agreement, inter-alia, envisages development and construction of hydro power projects and associated transmission systems as well as trade in electricity between the two countries, both through public and private sector participation.

9.3.2 India-Bangladesh

A Memorandum of Understanding (MoU) was signed between Government of the Republic of India and Government of the People's Republic of Bangladesh on the 11th day of January, 2010 on "Cooperation in Power Sector". The MoU, inter alia envisages cooperation in power generation, transmission, energy efficiency, development of various types of renewable energy and establishment of grid connectivity between the two countries.

9.3.3 India-Nepal

An agreement was signed between the Government of the Republic of India and the Government of Nepal on the 21st October, 2014 on "Electric Power Trade, Cross-Border Transmission Interconnection and Grid Connectivity". The agreement, inter alia, envisages cooperation in the power sector, including developing transmission interconnections, grid connectivity, power exchange and trading through the governmental, public and private enterprises of the two countries on mutually acceptable terms.

9.3.4 India-Myanmar

A Memorandum of Understanding (MoU) between the Govt. of the Republic of India and the Govt. of the Republic of the Union of Myanmar on Cooperation in the field of Power Sector was signed on 19th October, 2016. The MoU, inter- alia, envisages cooperation in the field of power sector including investments for mutual benefit, cooperation in power generation, transmission, energy efficiency and development of various types of renewable energy including hydropower, trading and transfer of power at a mutually agreed price and procedure, consultancy services, training, research and development programmes for the development of human resources and enhancement of productivity and efficiency in the power sector.

9.3.5 SAARC Framework Agreement

"SAARC Framework Agreement for Energy Cooperation (Electricity)" was signed by member countries of SAARC during the 18th SAARC Summit held at Kathmandu, Nepal on 26-27 November, 2014. This Agreement, inter-alia, has enabling provisions for following:

i) Cross border trading of electricity on voluntary basis
ii) Planning of cross border grid interconnection by transmission planning agencies of the Governments through bilateral/trilateral/mutual agreements, based on the needs of the trade in the foreseeable future through studies and sharing technical information required for the same.
iii) Building, owning, operating and maintaining the associated transmission system of cross-border interconnection falling within respective national boundaries and/or interconnected at mutually agreed locations.
iv) Joint development of coordinated network protection systems incidental to the cross-border interconnection to ensure reliability and security of the grids of the Member States.
v) Joint development of coordinated procedures for the secure and reliable operation of the inter-connected grids and to prepare scheduling, dispatch, energy accounting and settlement procedures for cross border trade.

9.4 Existing Cross Border Inter-Connections

9.4.1 India-Bhutan

Presently, about 2,070 MW power from the existing hydro power projects in Bhutan is being exported to India from Bhutan**.** The associated cross-border transmission system for evacuation and transfer of power from these HEPs is being operated in synchronism with the Indian Grid**.**

Chukha HEP (336 MW):

i) Chukha (Bhutan)-Birpara (West Bengal) 220 kV D/C line
ii) Chukha (Bhutan) –Birpara (West Bengal) via Singhigaon (Bhutan) 220 kV S/C line

Kurichu HEP (60 MW):

i) Kurichu (Bhutan) –Gelephu (Bhutan)-Salakati (Assam) 132 kV S/C line

Tala HEP (1020 MW):

i) Tala (Bhutan) – Siliguri (West Bengal) 400 kV 2xD/C lines (one of the circuit of a D/C line is LILOed at Malbase S/S in Bhutan

Dagachu HEP (126 MW)

i) Power from Dagachhu HEP is exported to India using transmission system associated with Chukha and Tala HEPs through Dagachhu-Tsirang-Rurichhu-Chukha 220 kV S/c line.

Mangdechu HEP (720 MW)

i) Jigmeling – Alipurduar 400 kV D/c (Quad) line

Punatsangchu-I HEP (1200 MW)

i) Punatsangchu-I – Alipurduar 400 kV D/c (Quad) line

Punatsangchu-II HEP (1020 MW)

i) Punatsangchu-II – Alipurduar 400 kV D/c (Quad) line

(Punatsanghu I & II HEPs are yet to be commissioned but the associated transmission line works have been completed)

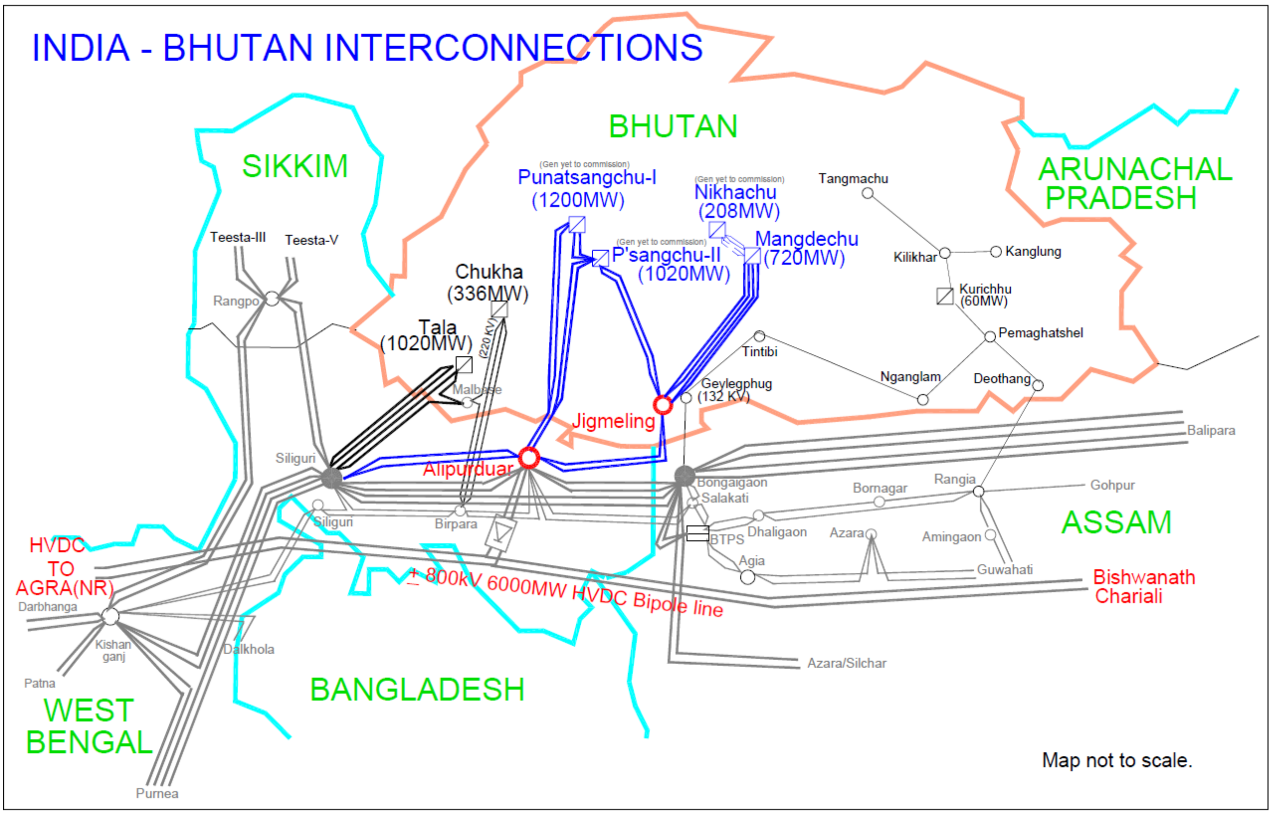

Figure 9.2: India – Bhutan Interconnections

Power from the HEPs in Bhutan along with other hydro project in Sikkim and NER can be transferred to other parts of India through high capacity multi terminal ±800 kV, 6000 MW Biswanath-Chariali– Alipurduar – Agra HVDC bipole link.

9.4.2 India- Bangladesh

1) India is supplying power to the extent of 1160 MW to Bangladesh through the following existing interconnections:

   i) Baharampur (India)-Bheramara (Bangladesh) 2x400 kV D/C line alongwith 2x500 MW HVDC back-to-back Station at Bheramara.

ii) Surajmaninagar (Tripura) – Bangladesh (Comilla) 400 kV D/C line (operated at 132 kV)

2) Planned links

i) 765 kV D/C Katihar (India) – Parbotipur (Bangladesh) – Bornagar (India) cross border link.

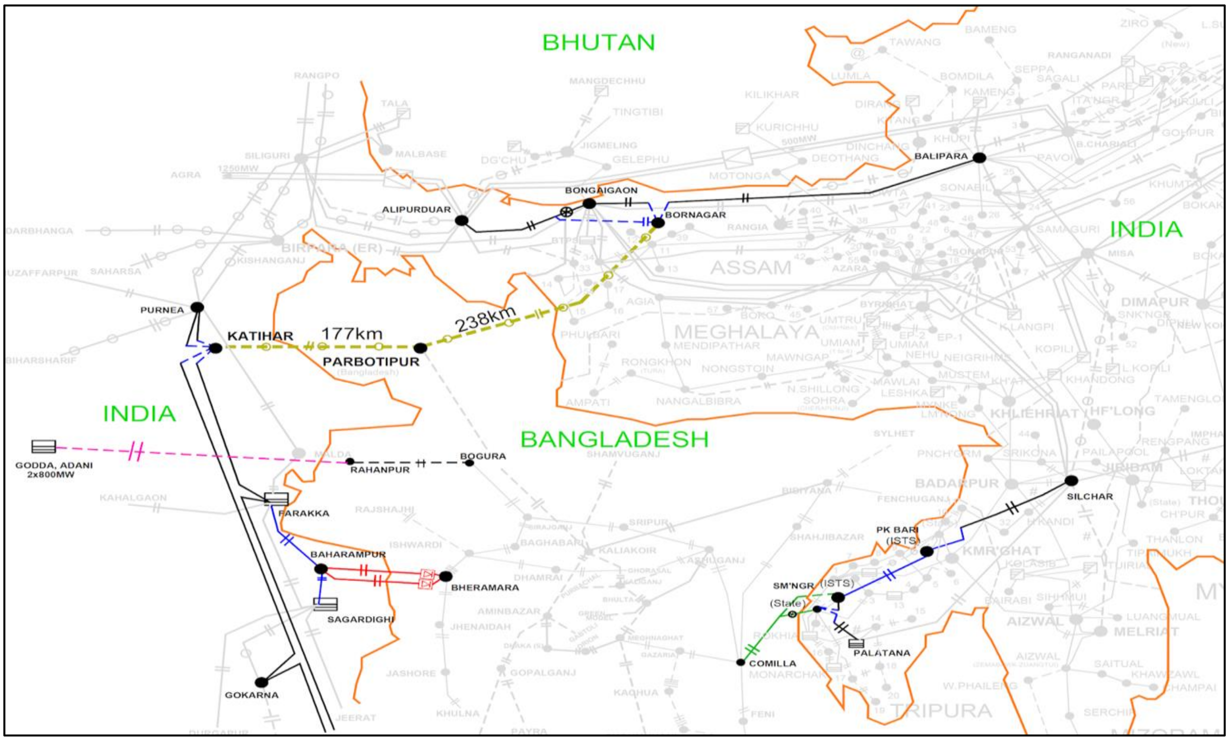

Figure 9.3: India – Bangladesh Interconnections

9.4.3 India-Nepal

At present, Nepal is drawing power from India through cross border interconnections at 11 kV, 33 kV, 132 kV and 400 kV voltage level. Details of the same are given below:

Existing links

(i) Muzaffarpur (India) - Dhalkebar (Nepal) 400 kV D/C (Twin) line
(ii) Tanakpur HEP-Mahendra Nagar 132 kV S/C line

Under implementation links

(i) Gorakhpur (India) – New Butwal (Nepal) 400 kV D/c (Quad) line
(ii) Arun-3 HEP (Nepal) – Dhalkebar (Nepal) – Sitamarhi (India) 400 kV D/c (Quad) line for evacuating power from Arun-3 (900 MW) HEP and other hydro projects

Planned links

(i) Dododhara - Bareilly (New) 400 kV D/c (Quad) line
(ii) Inaruwa - Purnea (New) 400 C D/c (Quad) line

State Grids-Nepal

Several interconnections at 132 kV and below voltage level exist /planned between Nepal and State grid of Bihar, Uttar Pradesh and Uttarakhand.

Existing links

Bihar (BSPTCL)-Nepal:

132 kV links

i) Kataiya – Kusaha S/C line
ii) Ramnagar – Gandak / Surajpura (Nepal) S/C line
iii) New 132 kV Katiya – Kusaha S/C on D/C line.
iv) New 132 kV Raxaul – Parwanipur S/C on D/C line

33 kV links

i) Kataiya – Inarwa (Biratnagar) S/C (not in service) line
ii) Kataiya – Rajbiraj S/C line
iii) Jaynagar-Sirha (Bishnupur) S/C line
iv) Sitamarhi – Jaleshwer S/C line
v) Raxaul-Birganj S/C line

Uttar Pradesh (UPPTCL)-Nepal:

33 kV links

i) Nanpara-Nepalgunj S/C line
ii) Paliya –Dhangadi line

Uttarakhand (UPCL) – Nepal:

11 kV links

i) Pithoragarh – Baitadi line
ii) Dharchula – Jalujavi line
iii) Dharchula – Huti line
iv) Pithoragarh – Pipli line

Planned/Under implementation links

Bihar (BSPTCL)-Nepal:

(i) Stringing of second circuit of Kataiya (India) – Kushaha (Nepal) 132 kV line
(ii) Stringing of second circuit of Raxaul (India) – Parwanipur (Nepal) 132 kV line

Uttar Pradesh (UPPTCL)-Nepal:

(i) Nanpara (India) – Kohalpur (Nepal) 132 kV D/C line
(ii) New Nautanwa (UP) – Mainhiya (Nepal) 132 kV D/c line

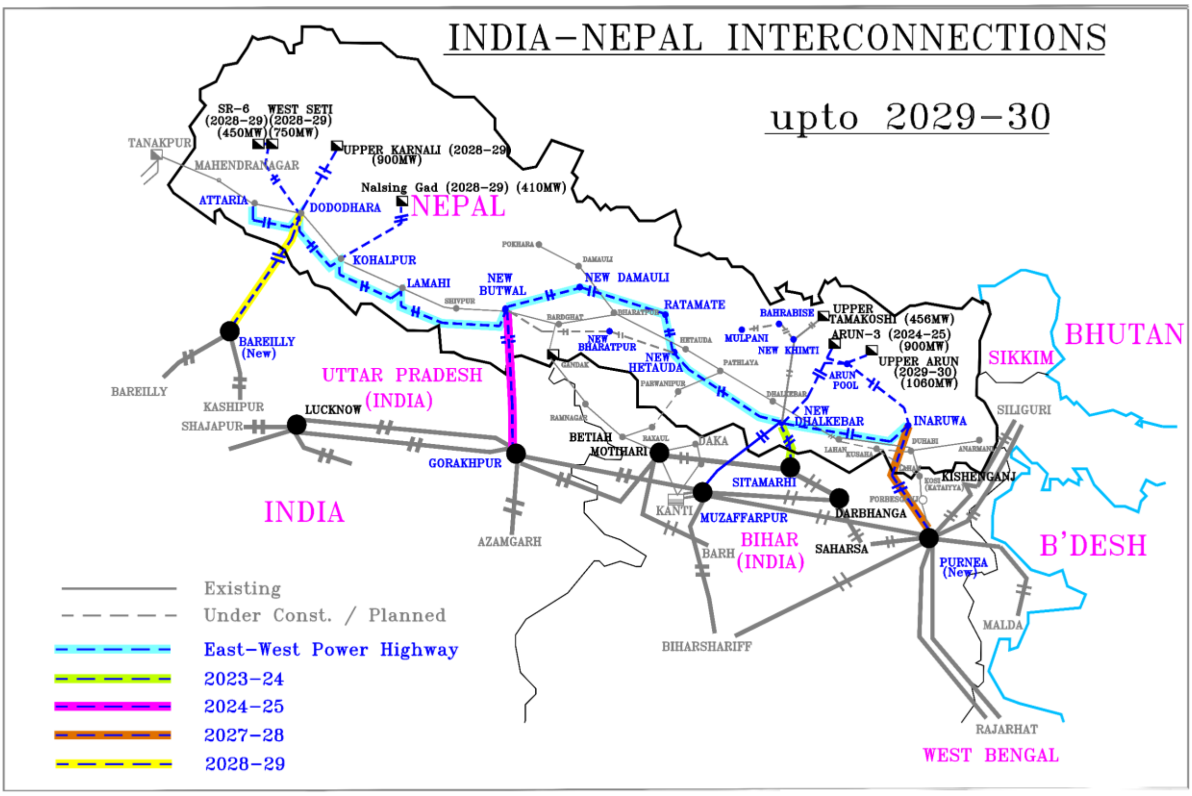

Figure 9.4: India – Nepal Interconnections

9.4.4 India-Myanmar

India is providing about 2 to 3 MW power (since 5th April 2016) from Manipur (India) to Myanmar through 11 kV transmission line from Moreh in Manipur (India) to Tamu Town in Myanmar. Further, a 500 MW HVDC interconnection between India (Imphal) and Myanmar (Tamu) has been agreed. Additionally, low voltage radial interconnection between India and Myanmar from Indian States (Arunachal Pradesh, Manipur, Mizoram and Nagaland) are under consideration.

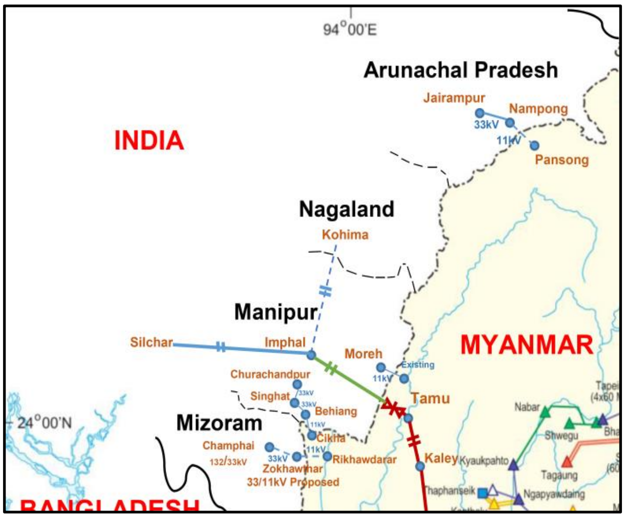

Figure 9.5: India – Myanmar Interconnections

9.4.5 India-Sri Lanka

Detailed Project Report (DPR) for a HVDC link between Madurai (India) and Mannar (Sri Lanka) with 2x500 MW HVDC terminals based on Voltage Source Converter (VSC) technology is under finalization.

Figure 9.6: India – Sri Lanka Interconnection

9.5 One Sun One World One Grid (OSOWOG) Initiative

The idea for the One Sun One World One Grid (OSOWOG) initiative was put forth by the Hon'ble Prime Minister of India at the First Assembly of the International Solar Alliance (ISA) in October 2018. The vision behind the OSOWOG initiative is the mantra that "the sun never sets". The OSOWOG initiative aims to connect different regional grids through a common grid that will be used to transfer power generated from renewable energy and, thus, realize the potential of renewable energy sources, especially solar energy.

Under OSOWOG initiative, interconnection of Indian Electricity Grid with Maldives, Singapore, UAE, Saudi Arabia etc. are under discussion.

9.6 Conclusions

Cross border interconnections have a vital role in ensuring energy transition. With grid interconnections, the surplus clean sources of electricity in one country can be effectively utilised by other countries. Time diversity in solar generation can be very effectively utilised with interconnections. With the existing/planned interconnections, hydro generation of Bhutan and Nepal is being exported to India. During lean hydro season, power is being exported from India to Nepal and Bhutan to meet the electricity demand. Power is also being exported by India to Bangladesh. Interconnection between India and Sri Lanka is in advanced stage of discussion. Under OSOWOG initiative, interconnection of Indian Electricity Grid with Maldives, Singapore, UAE, Saudi Arabia etc. are under discussion.

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Chapter – 10

Transmission Plan for Integration of Renewable Energy Sources

10.1 Introduction

The installed generating capacity from RE sources as on 31st March, 2022 was 157 GW (including large hydro), which was about 39% of the total installed capacity. As on 31st October 2023, the installed electricity generating capacity in the country from RE sources was 178.98 GW (including 46.85 GW large hydro), which is about 42% of the total installed electricity generating capacity in the country. For enabling growth of Renewable Energy (RE) capacity, areas which have high solar and wind energy potential, needs to be connected to Inter-State Transmission System (ISTS), so that the power generated could be evacuated to the load centers. The gestation period of wind and solar based generation projects being much less than the gestation period of associated transmission system, the transmission system has to be planned well in advance. As a significant step towards successfully achieving the planned RE capacity by 2030, transmission system has been planned for about 537 GW of RE capacity by the year 2030 as summarized below:

	Capacity (GW)
RE Capacity existing (as on 31.10.2023)	179.0
RE capacity for which ISTS network is under implementation (*includes 64.1 GW network under construction and 63.8 GW network under bidding*)	127.9
RE Capacity for which ISTS network has been planned	154.9
RE Capacity to be added to intra-state network under GEC Scheme	25.9
Additional Hydro capacity likely by 2030	16.6
Margin available in ISTS network for integration of generating capacity	33.3
Total	**537.6**

10.2 Wind and Solar potential zones

State -wise bifurcation of the potential Solar and Wind zones (excluding the commissioned RE capacity) for which transmission system is either under implementation or has been planned, is given in Table 10.1:

Table 10.1: Wind and Solar potential zones

State/District	Capacity (GW)
Northern Region	
Rajasthan	98.1
Ladakh	13.0
Himachal Pradesh	0.9
Sub Total (NR)	**112**
Western Region	
Gujarat	41.0
Maharashtra	11.3
Madhya Pradesh	13.0
Sub Total (WR)	**65.3**
Southern Region	
Andhra Pradesh	59.0

State/District	Capacity (GW)
Karnataka	24.5
Tamil Nadu	8.0
Telangana	13.0
Sub Total (SR)	**104.5**
NER	
Assam	1.0
Sub Total (NER)	**1.0**
Total (GW)	**282.8**

10.3 Transmission system for evacuation of power from solar and wind potential zones in Northern Region

10.3.1 Rajasthan

Status of transmission schemes for 98.1 GW solar and wind potential zones in Rajasthan is given in Table 10.2:

Table 10.2: Status of Transmission schemes in Rajasthan

Sl. No.	Status of transmission schemes	Locations with identified potential	Total solar and wind potential to be evacuated (GW)
1	Under Implementation	a) Fatehgarh-II (Phase-II)- 2.2	22.1
		b) Bhadla-II (Phase-II) – 1.05 GW	
		c) Fatehgarh-III (Phase II) (erstwhile Ramgarh) - 1.9 GW	
		d) Bikaner-II (Phase II)- 2.95 GW	
		e) Fatehgarh-II (Phase III) - 1 GW	
		f) Fatehgarh-III (new section) - 6 GW	
		g) Fatehgarh IV (Phase III)- 2.1 GW	
		h) Ramgarh (Phase III)- 2.9 GW	
		i) Bhadla II (Phase III) - 1.5 GW	
		j) Bhadla-III (Phase III) - 0.5 GW	
2	Under Tendering	a) Bhadla-III (HVDC) (Phase III)– 6 GW	19.5
		b) Bikaner (Phase IV) - 8 GW	
		c) Fatehgarh IV(new section) (Phase IV) - 4 GW	
		d) Barmer- I (Phase IV)– 1.5 GW	
3	Planned	a) Jalore - 3 GW	56.5
		b) Sanchore – 3 GW	
		c) Sirohi – 3 GW	
		d) Pali – 3 GW	
		e) Ajmer – 2 GW	
		f) Nagaur – 2 GW	
		g) Bhadla IV – 5 GW	
		h) Ramgarh – 10 GW	
		i) Fatehgarh- IV – 8 GW	
		j) Barmer- I – 5.5 GW	
		k) Barmer –II – 12 GW	

Sl. No.	Status of transmission schemes	Locations with identified potential	Total solar and wind potential to be evacuated (GW)
	Total		98.1

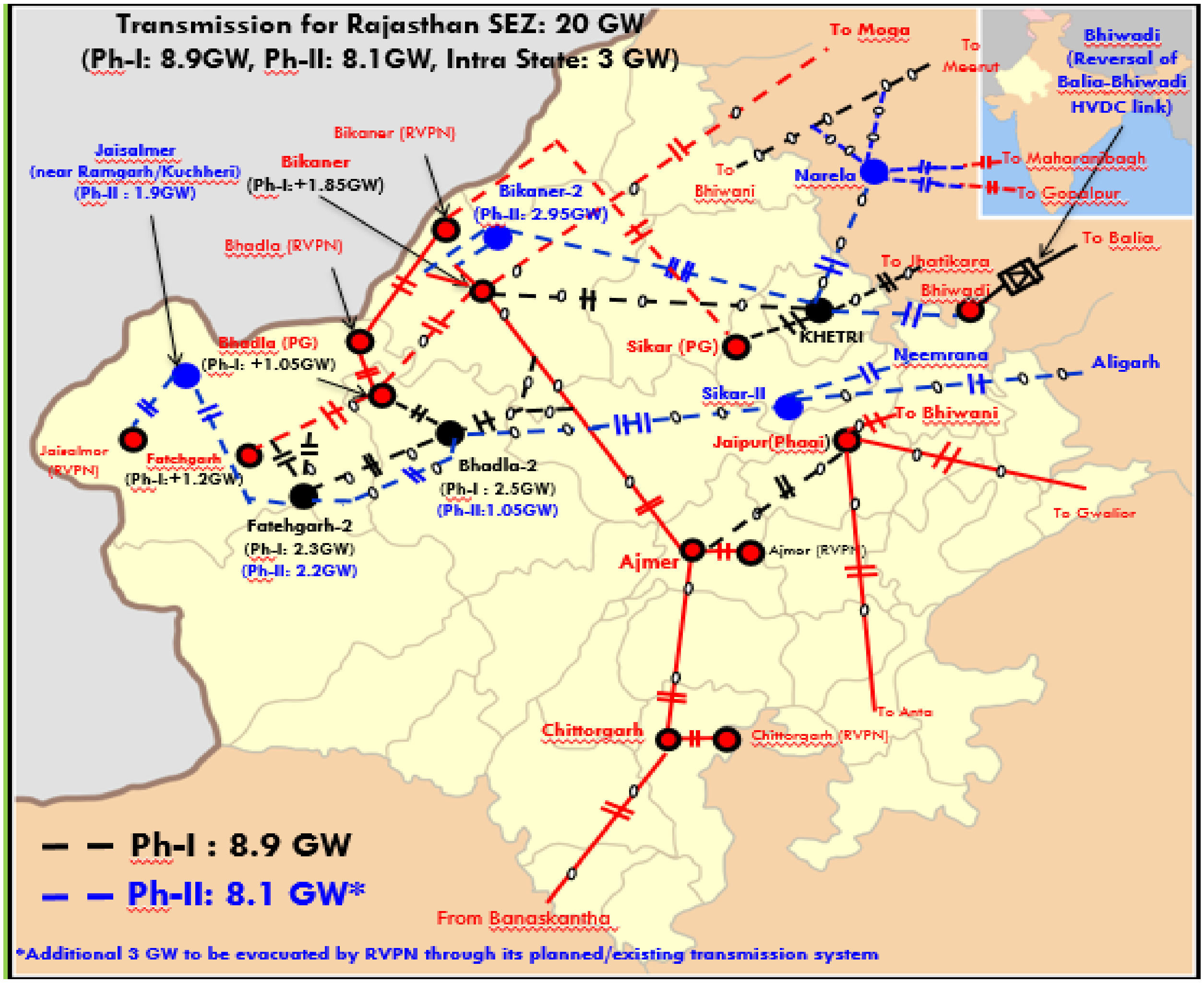


Fig 1: Transmission system for evacuation of RE power in Rajasthan (Phase-I & Phase-II)

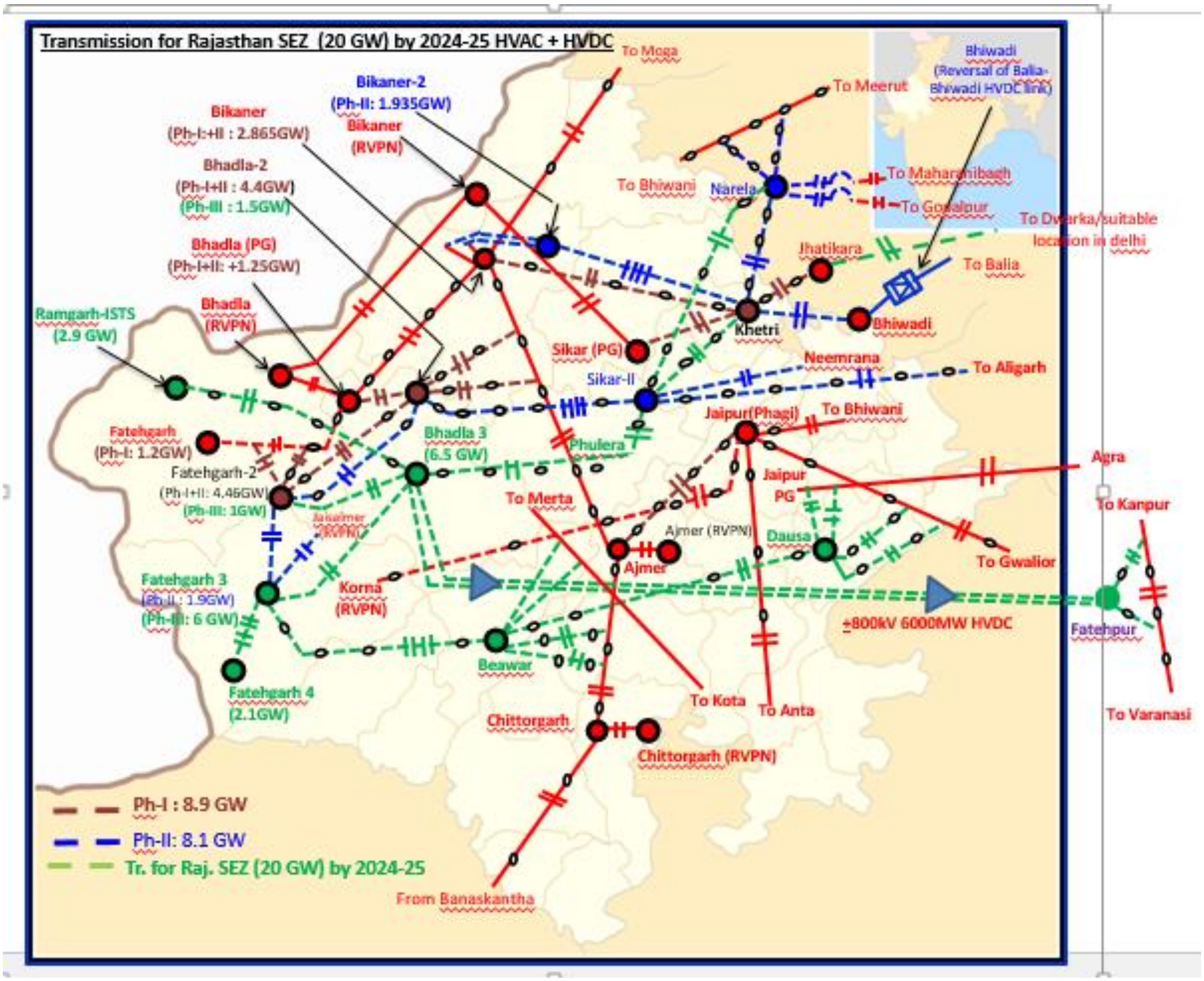


Fig 2: Transmission system for evacuation of RE power in Rajasthan (Phase-III)

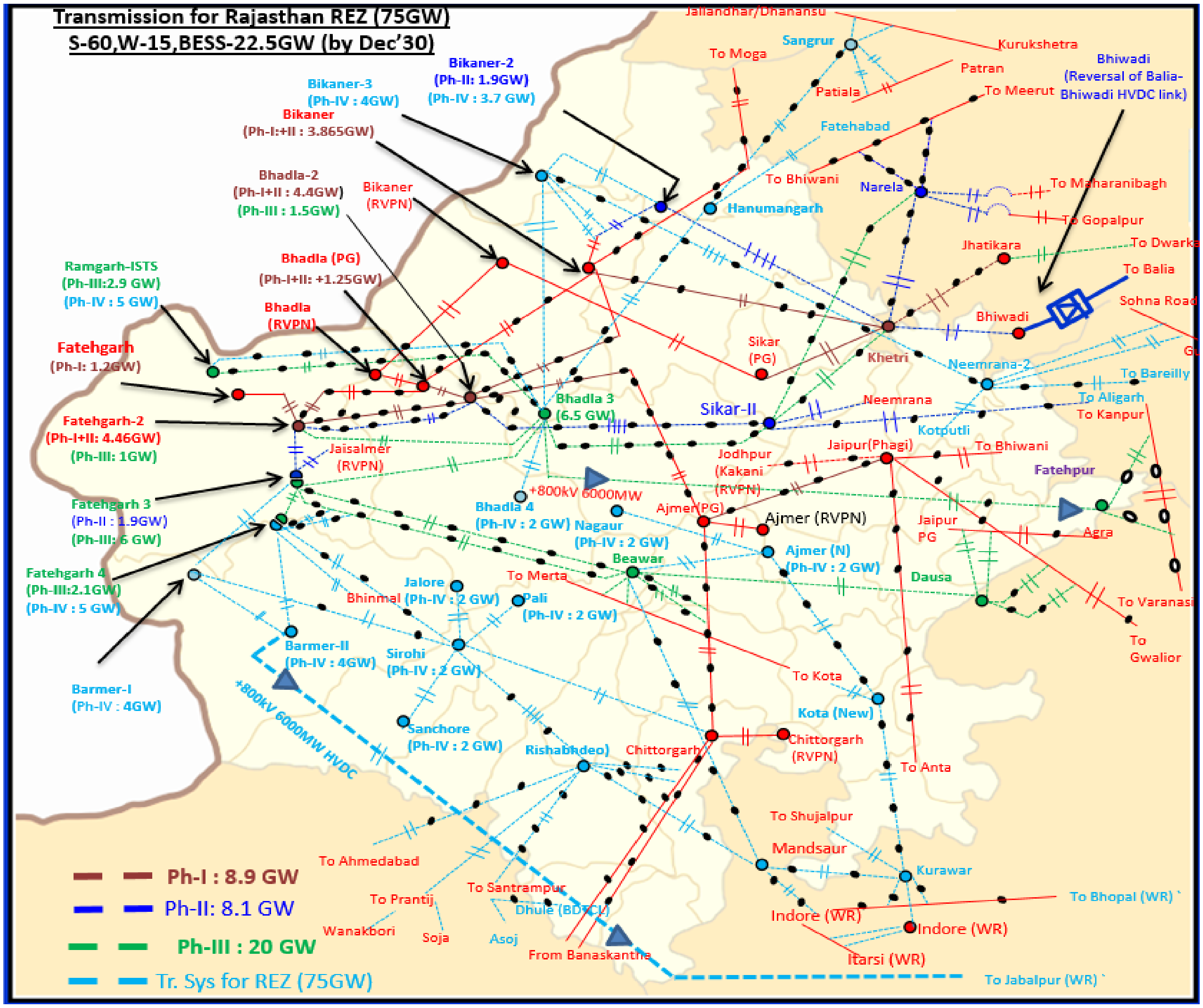


Fig. 3: Transmission system for evacuation of 75 GW RE power in Rajasthan

10.3.2 Ladakh

Status of transmission schemes for 13 GW RE capacity in Ladakh is given below:

Sl. No.	Status of transmission scheme	Location with identified potential	Total RE potential to be evacuated (GW)
1.	Under Implementation	Leh (9 GW solar + 4 GW wind + 12 GWh Storage)	13

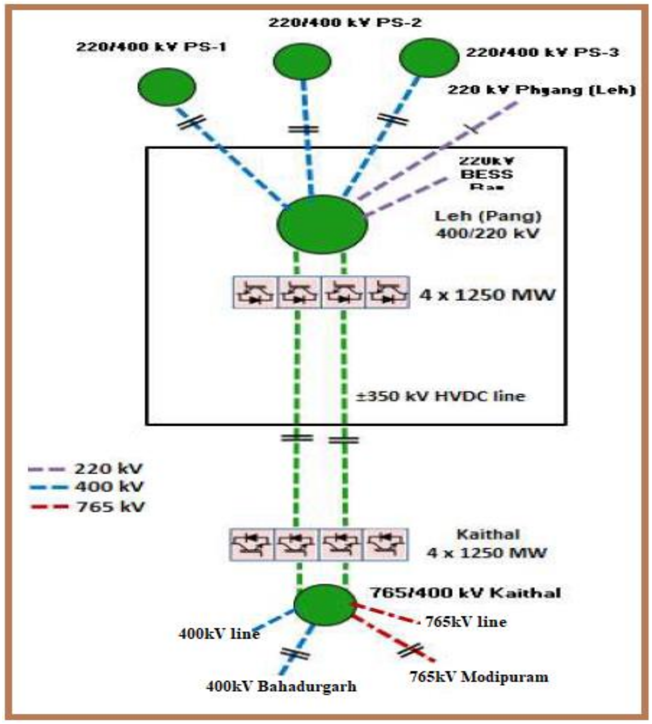


Fig. 4: Transmission system for evacuation of RE power from renewable energy parks in Leh

10.3.3 Himachal Pradesh

Status of transmission scheme for 880 MW Kaza Solar Park in Himachal Pradesh is given below:

Sl. No.	Status of transmission scheme	Location with identified potential	Total RE potential to be evacuated (GW)
1.	Planned	Kaza Solar park	0.88 GW

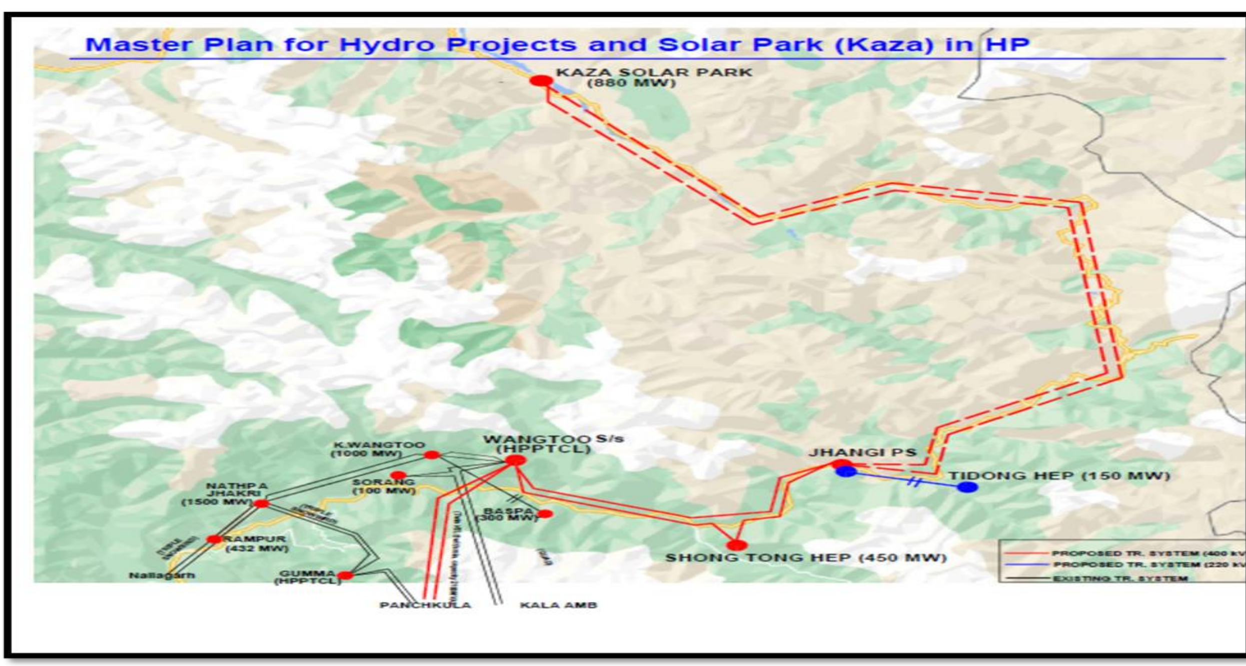


Fig. 5: Transmission system for evacuation of power from Kaza Solar Park in Himachal Pradesh

Details of the transmission system in Northern Region with broad scope of works is given at Annex 10.1

10.4 Transmission system for evacuation of power from solar and wind potential zones in Western Region

10.4.1 Gujarat

Status of transmission schemes for 41 GW solar and wind capacity in Gujarat is given in Table 10.3:

Table 10.3: Status of transmission schemes in Gujarat

Sl. No.	Status of transmission schemes	Locations with identified potential	Total RE potential to be evacuated (GW)
1	Under Implementation	a) Khavda (Phase-I) – 3 GW	8
		b) Khavda (Phase-II) - 5 GW	
2	Under Tendering	a) Khavda (Phase-III) - 7 GW	22
		b) Khavda (Phase-IV)- 7 GW	
		c) Khavda (Phase-V) – 8 GW	
3	Planned	a) Lakadia - 2 GW	11
		b) Dholera – 4 GW	
		c) Offshore- 5 GW	
	Total		**41.0**

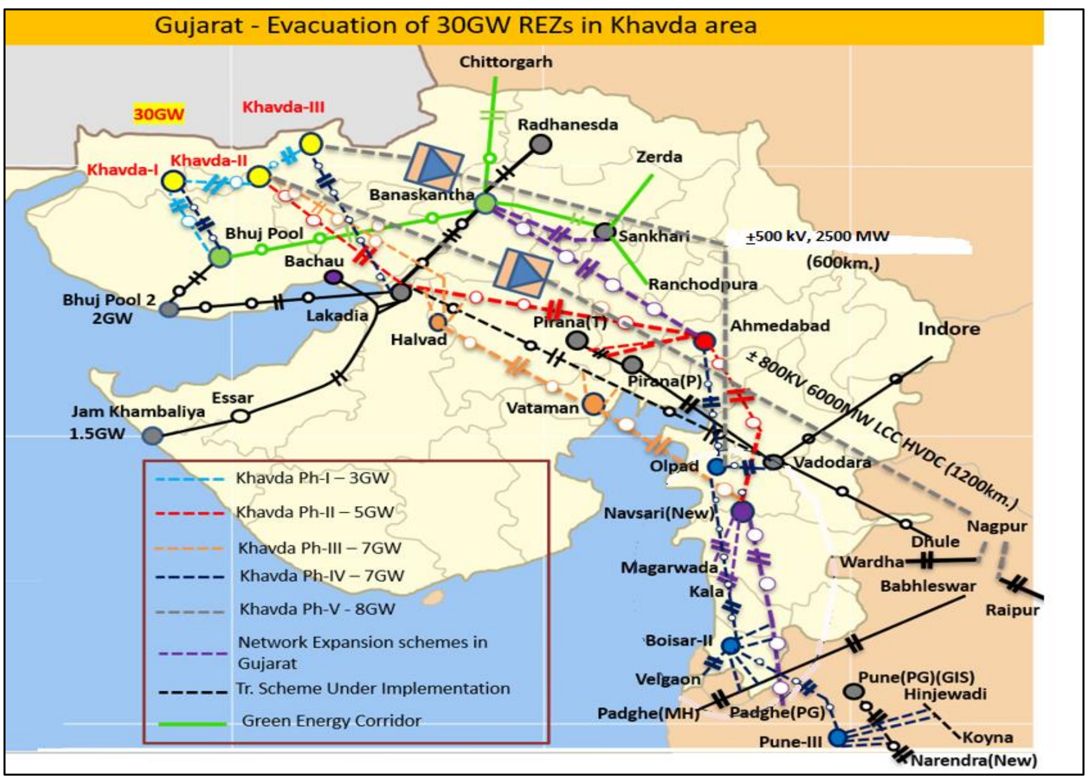


Fig. 6: Transmission system for evacuation of 30 GW RE power from Khavda in Gujarat

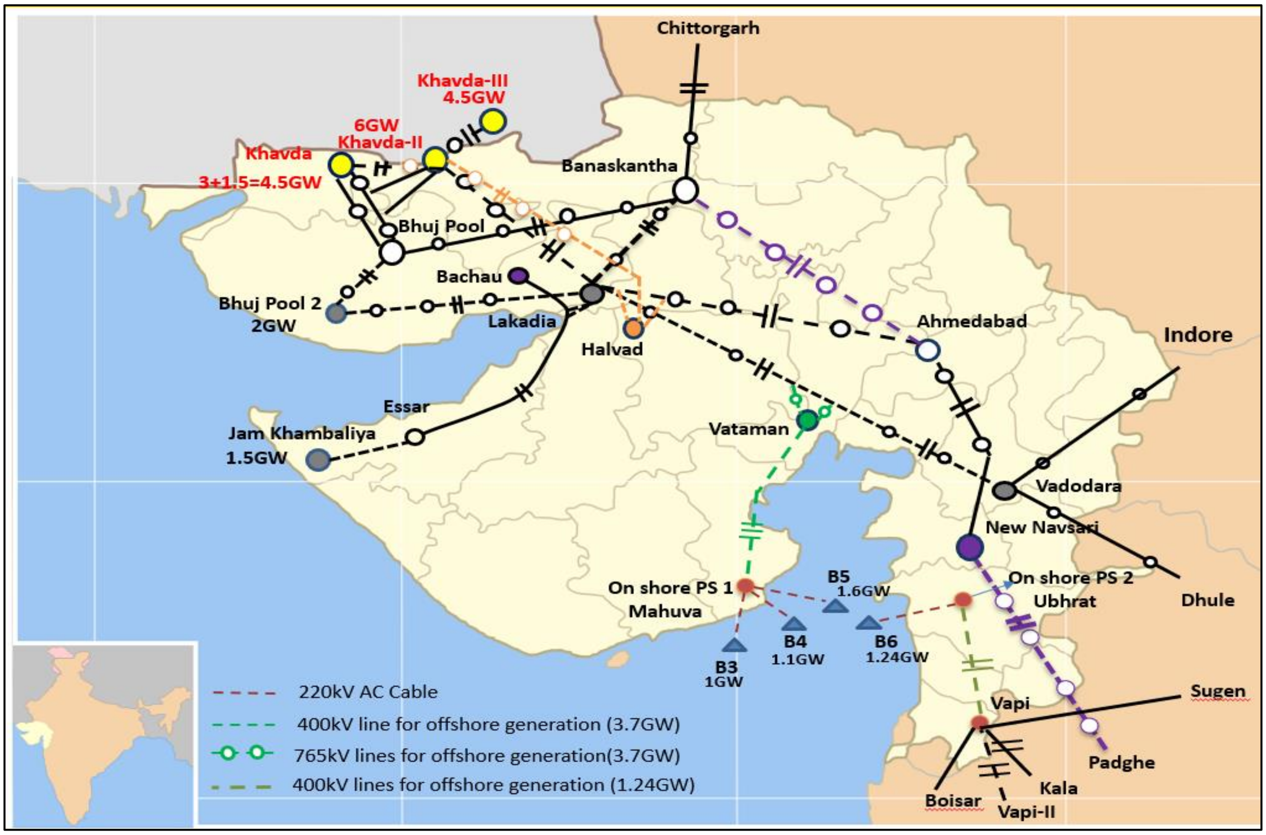


Fig. 7: Transmission system for off-shore wind potential zones in Gujarat

10.4.2 Maharashtra

Status of transmission schemes for 11.25 GW solar and wind capacity in Maharashtra is given in Table 10.4:

Table 10.4: Status of transmission schemes in Maharashtra

Sl. No.	Status of transmission schemes	Locations with identified potential	Total RE potential to be evacuated (GW)
1.	Under Implementation	a) Kallam I - 2 GW	4
		b) Solapur - 2 GW [to be integrated at existing Solapur (PG) S/s]	
2.	Under Tendering	a) Solapur - 1.5 GW	4.75
		b) Dhule – 2 GW	
		c) Kallam II- 1.25 GW	
3.	Planned	a) Wardha – 2.5 GW	2.5
	Total		**11.25**

Fig 8: Transmission system for potential RE Zones in Maharashtra

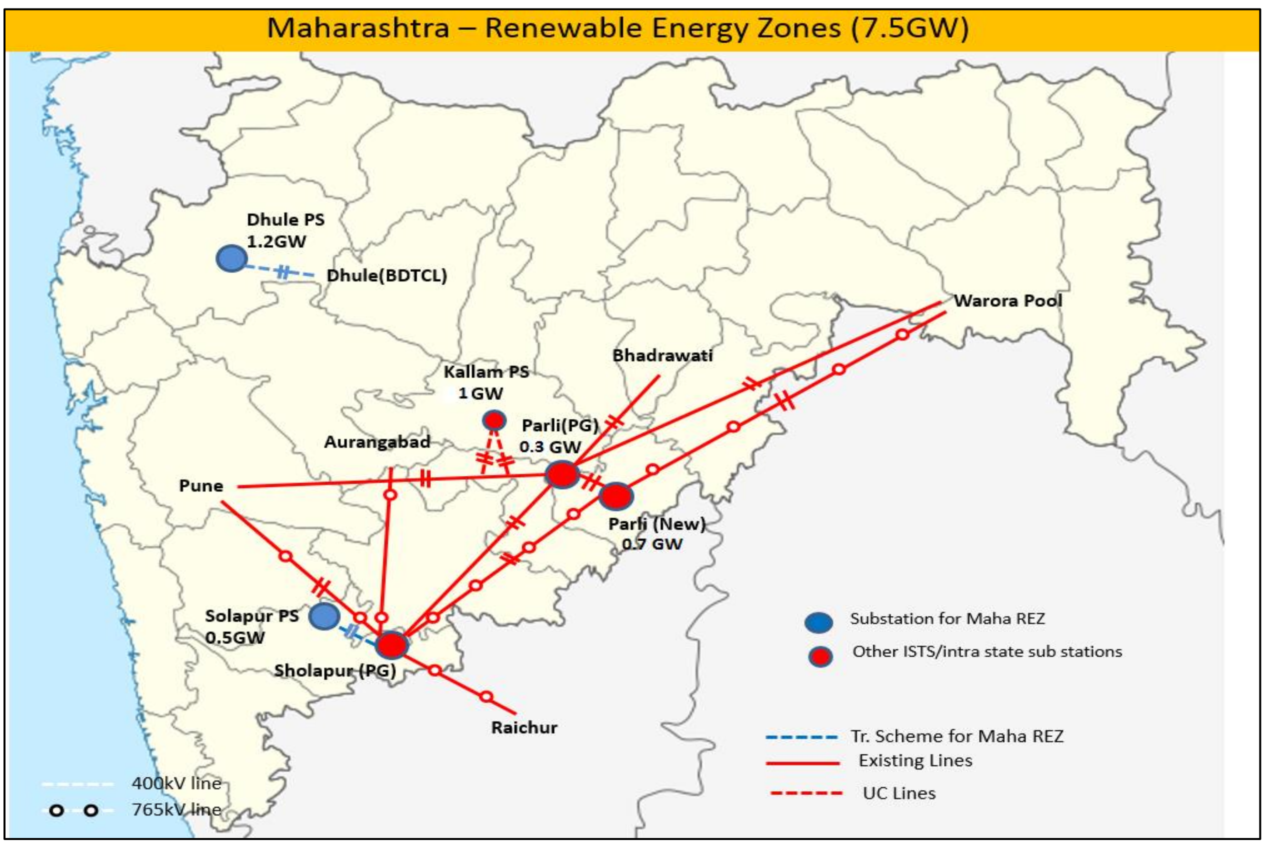


Fig 9: Transmission system for potential RE Zones in Maharashtra

10.4.3 Madhya Pradesh

Status of transmission schemes for 13 GW wind and solar capacity in Madhya Pradesh is given in Table 10.5:

Table 10.5: Status of transmission schemes in Madhya Pradesh

Sl. No.	Status of transmission schemes	Locations with identified potential	Total RE potential to be evacuated (GW)
1.	Under Implementation	a) Rajgarh I- 1.5 GW	2.5
		b) Neemuch - 1 GW	
2.	Under Tendering	a) Chhatarpur- 1.5 GW	4.5
		b) Rajgarh II - 1 GW	
		c) Mandsaur – 2 GW	
3.	Planned	a) Sagar- 1.5 GW	6
		b) Morena – 3.9 GW	
		c) Khandwa – 0.6 GW	
	Total		**13**

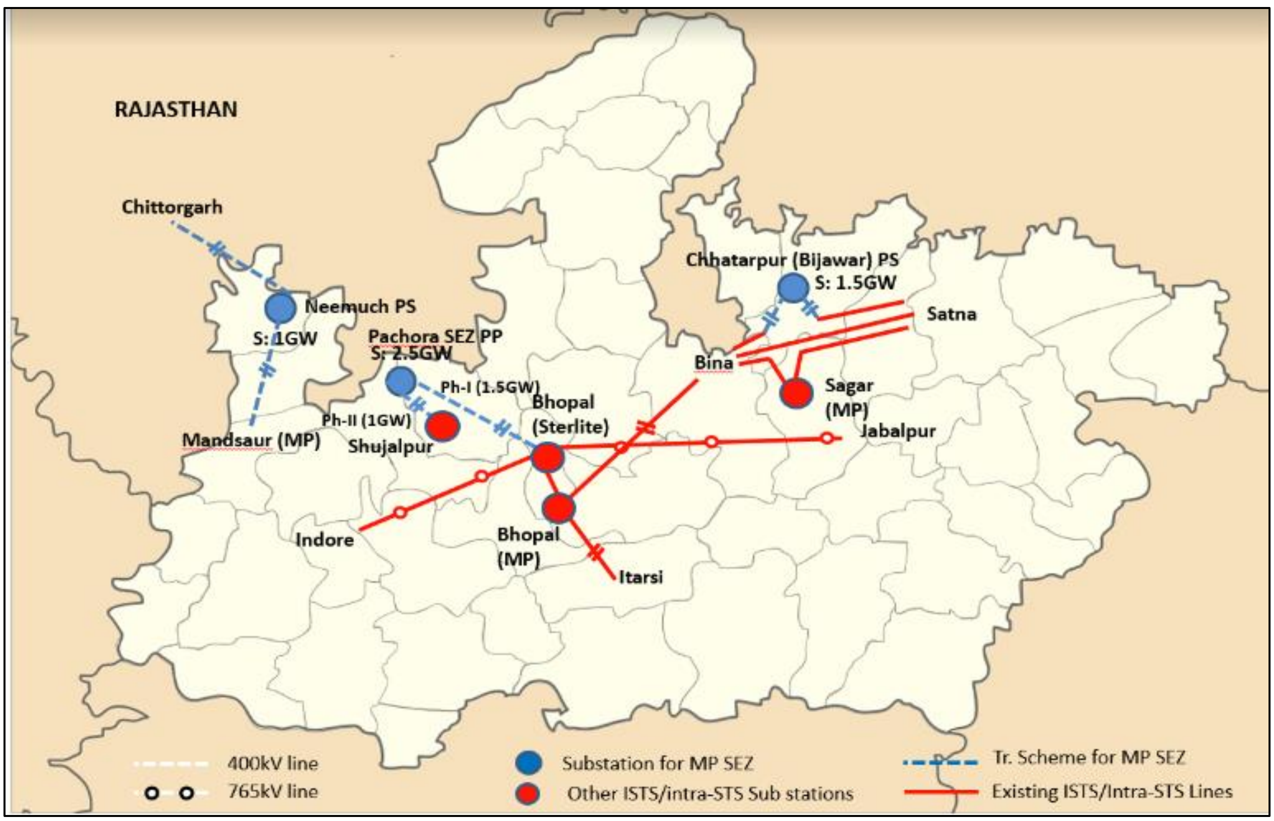


Fig 10: Transmission system for potential RE Zones in Madhya Pradesh

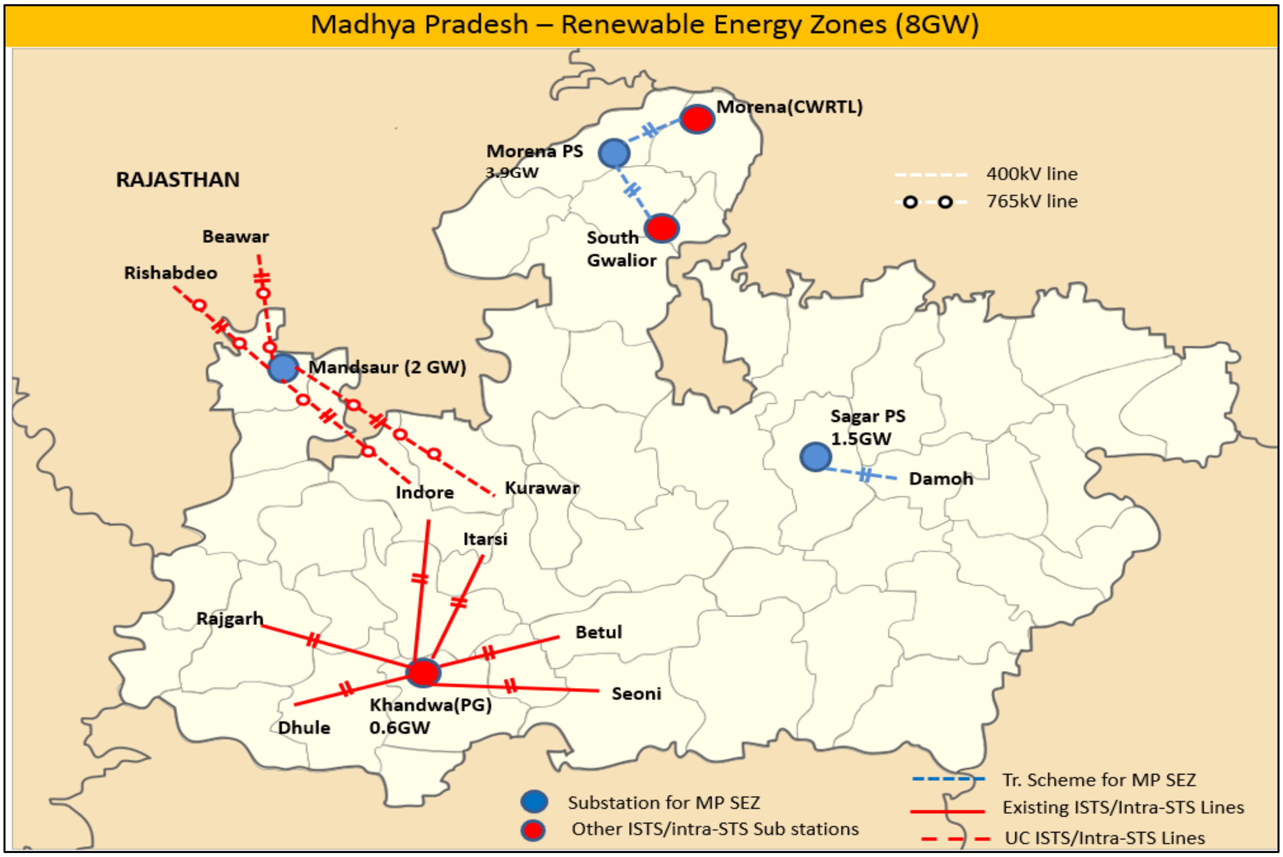


Fig 11: Transmission system for potential RE Zones in Madhya Pradesh

Details of the transmission system in Western Region with broad scope of works is given at Annex 10.1

10.5 Transmission system for evacuation of power from solar and wind potential in Southern Region

10.5.1 Andhra Pradesh

Status of transmission schemes for 59 GW solar and wind capacity in Andhra Pradesh is given in Table 10.6:

Table 10.6: Status of transmission schemes in Andhra Pradesh

Sl. No.	Status of transmission schemes	Locations with identified potential	Total RE potential to be evacuated (GW)
1.	Under Implementation	a) Anantapuram - 3.5 GW	8
		b) Kurnool III - 4.5 GW	
2.	Planned	a) Kurnool IV – 11.5 GW	51
		b) Kurnool V – 11.5 GW	
		c) Anantapuram - 4 GW	
		d) Anantapur II – 16 GW	
		e) Kadapa – 8 GW	
	Total		**59**

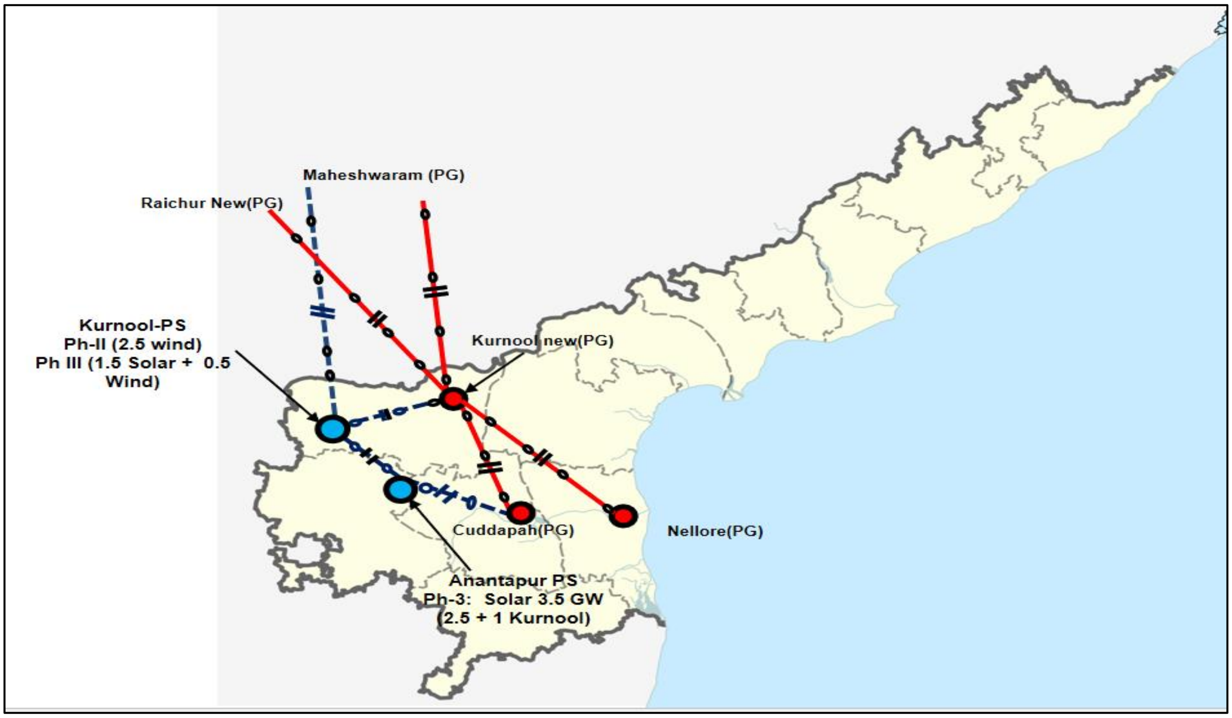


Fig. 12: Transmission system for evacuation of RE power in Andhra Pradesh

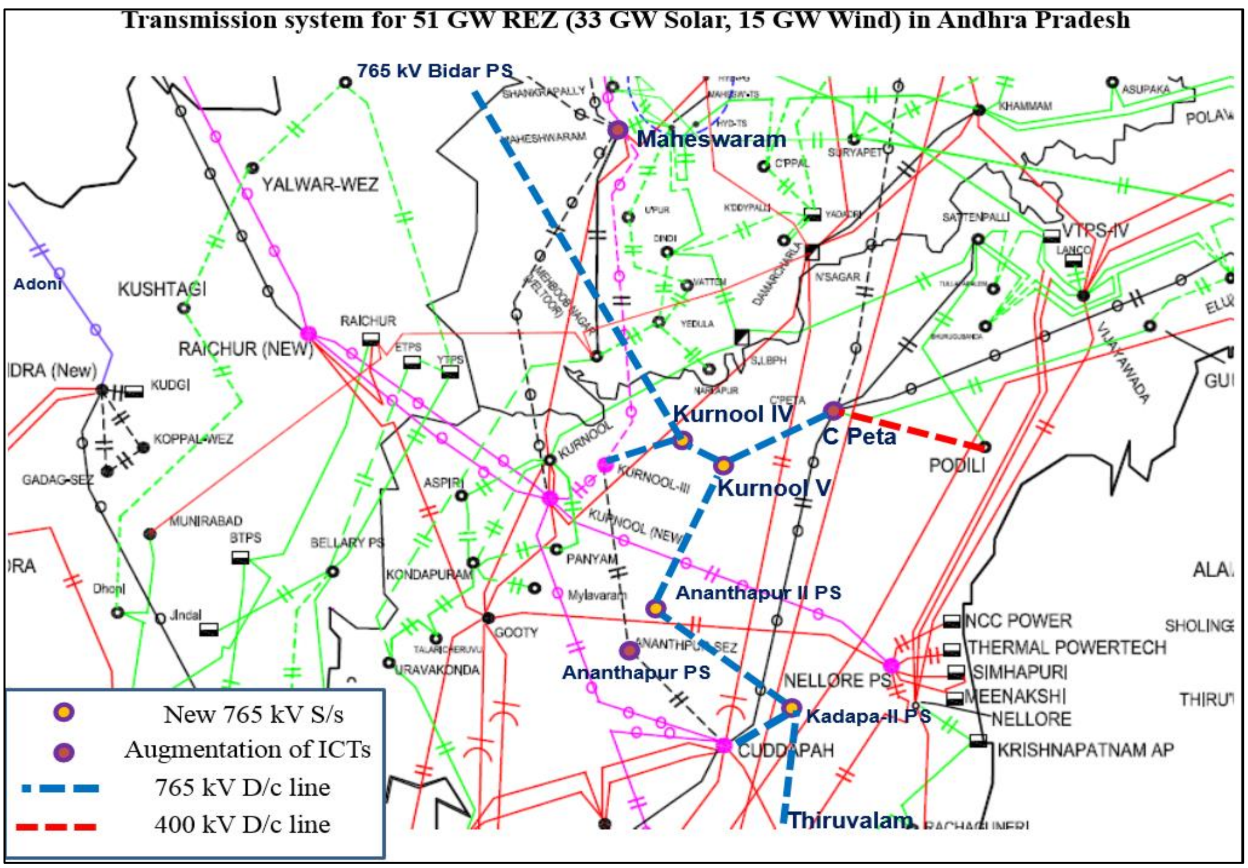


Fig. 13: Transmission system for evacuation of 51 GW RE power in Andhra Pradesh

10.5.2 Karnataka

Status of transmission schemes for 24.5 GW solar and wind capacity in Karnataka is given in Table 10.7:

Table 10.7: Status of transmission schemes in Karnataka

Sl. No.	Status of transmission schemes	Locations with identified potential	Total RE potential to be evacuated (GW)
1	Under Implementation	a) Koppal – 2.5 GW b) Gadag – 2.5 GW	5
2	Under Tendering	a) Bidar – 2.5 GW b) Koppal II – 4 GW c) Gadag II - 4 GW d) Tumkur II – 1.5 GW	12
3	Planned	a) Bijapur – 2 GW b) Bellary – 1.5 GW c) Devanagere/ Chitragurga- 4 GW	7.5
	Total		**24.5**

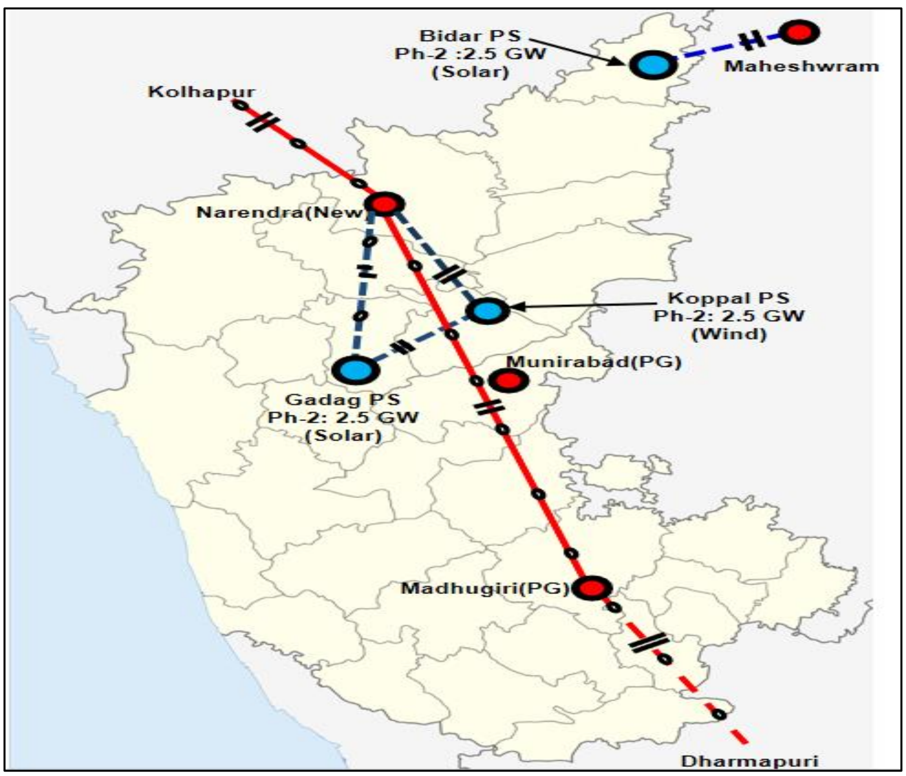


Fig 14: Transmission system for evacuation of RE power in Karnataka

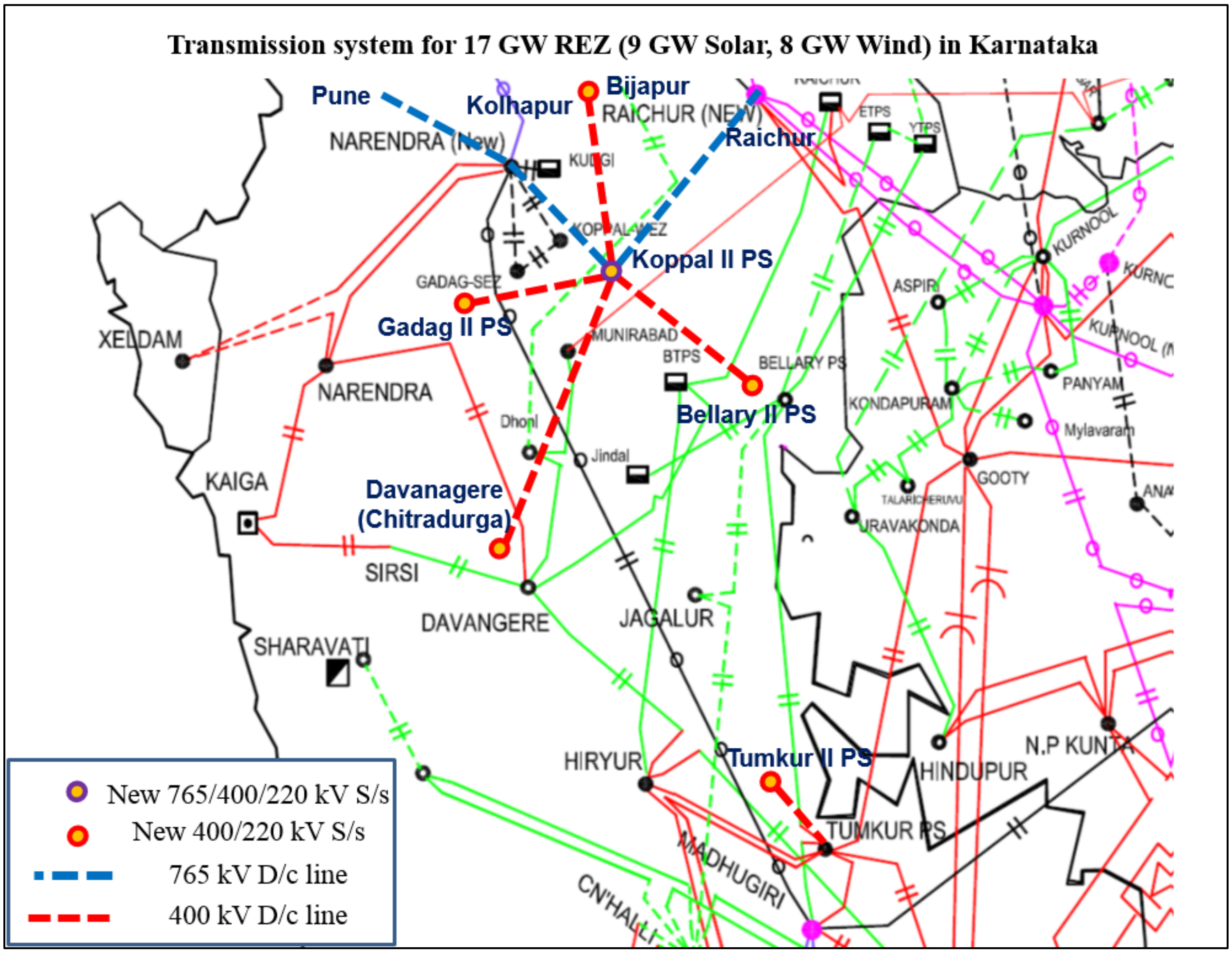


Fig. 15: Transmission system for potential RE Zones in Karnataka

10.5.3 Tamil Nadu

Status of transmission schemes for 8 GW solar and wind capacity in Tamil Nadu is given in Table 10.8:

Table 10.8: Status of transmission schemes in Tamil Nadu

Sl. No.	Status of transmission schemes	Locations with identified potential	Total RE potential to be evacuated (GW)
1	Under Implementation	a) Karur I- 1 GW b) Tuticorin-II – 0.5 GW	1.5
2	Planned	a) Karur II- 1.5 GW b) Offshore- 5 GW	6.5
	Total		**8.0**

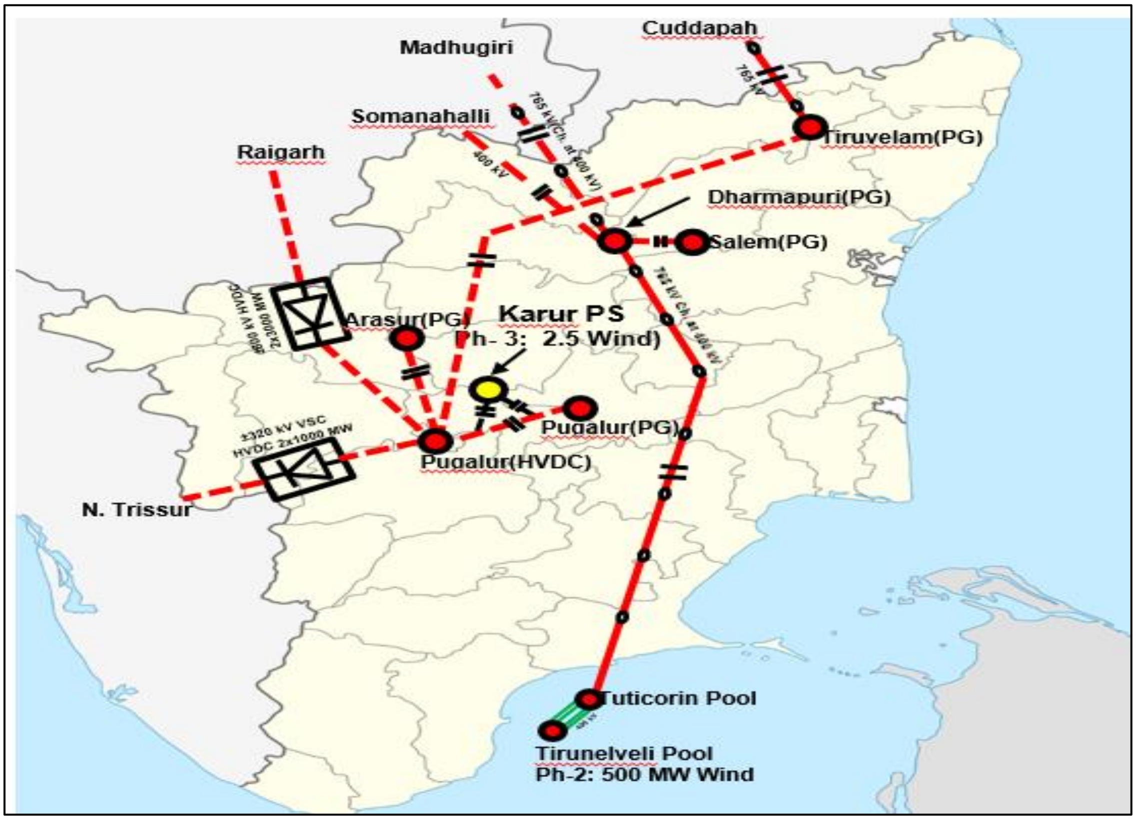


Fig. 16: Transmission system for evacuation of RE power in Tamil Nadu

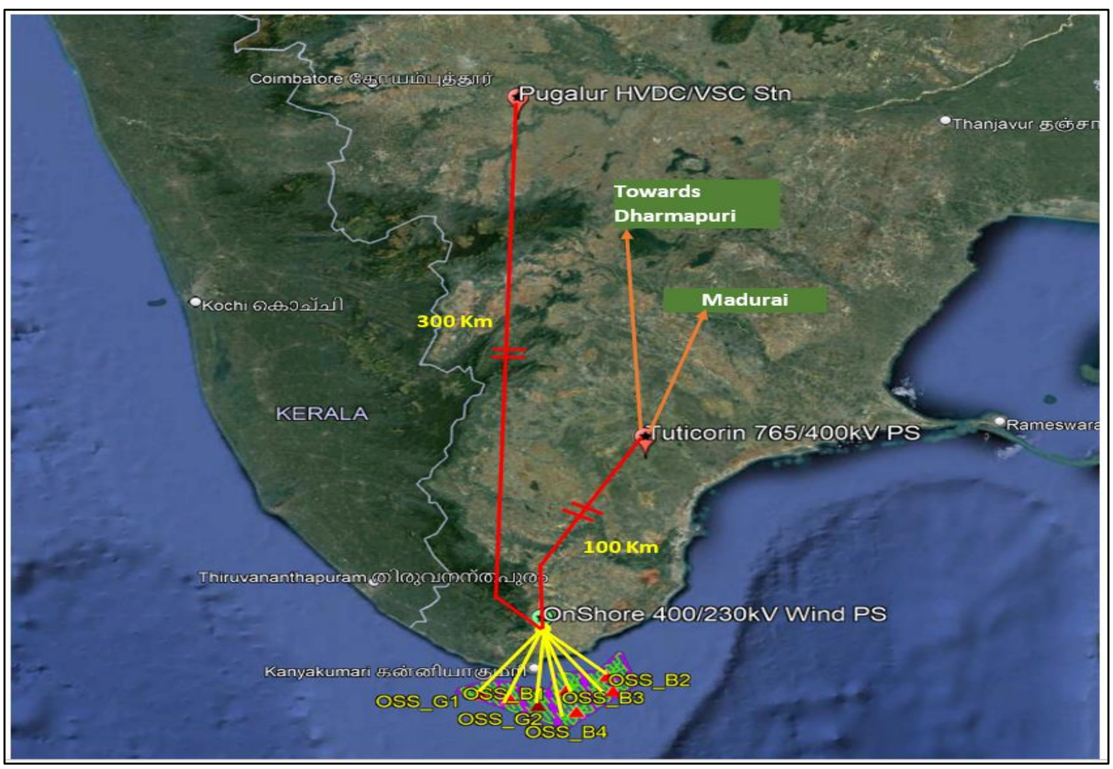


Fig 17: Transmission system for off-shore wind potential zones in Tamil Nadu

10.5.4 Telangana

Status of transmission schemes for 13 GW solar and wind capacity in Telangana is given in Table 10.9:

Table 10.9: Status of transmission schemes in Tamil Nadu

Sl. No.	Status of transmission schemes	Locations with identified potential	Total RE potential to be evacuated (GW)
1	Planned	a) Rangareddy – 3.5 GW	13
		b) Medak – 3.5 GW	
		c) Nizamabad – 3.5 GW	
		d) Karimnagar – 2.5	
	Total		**13**

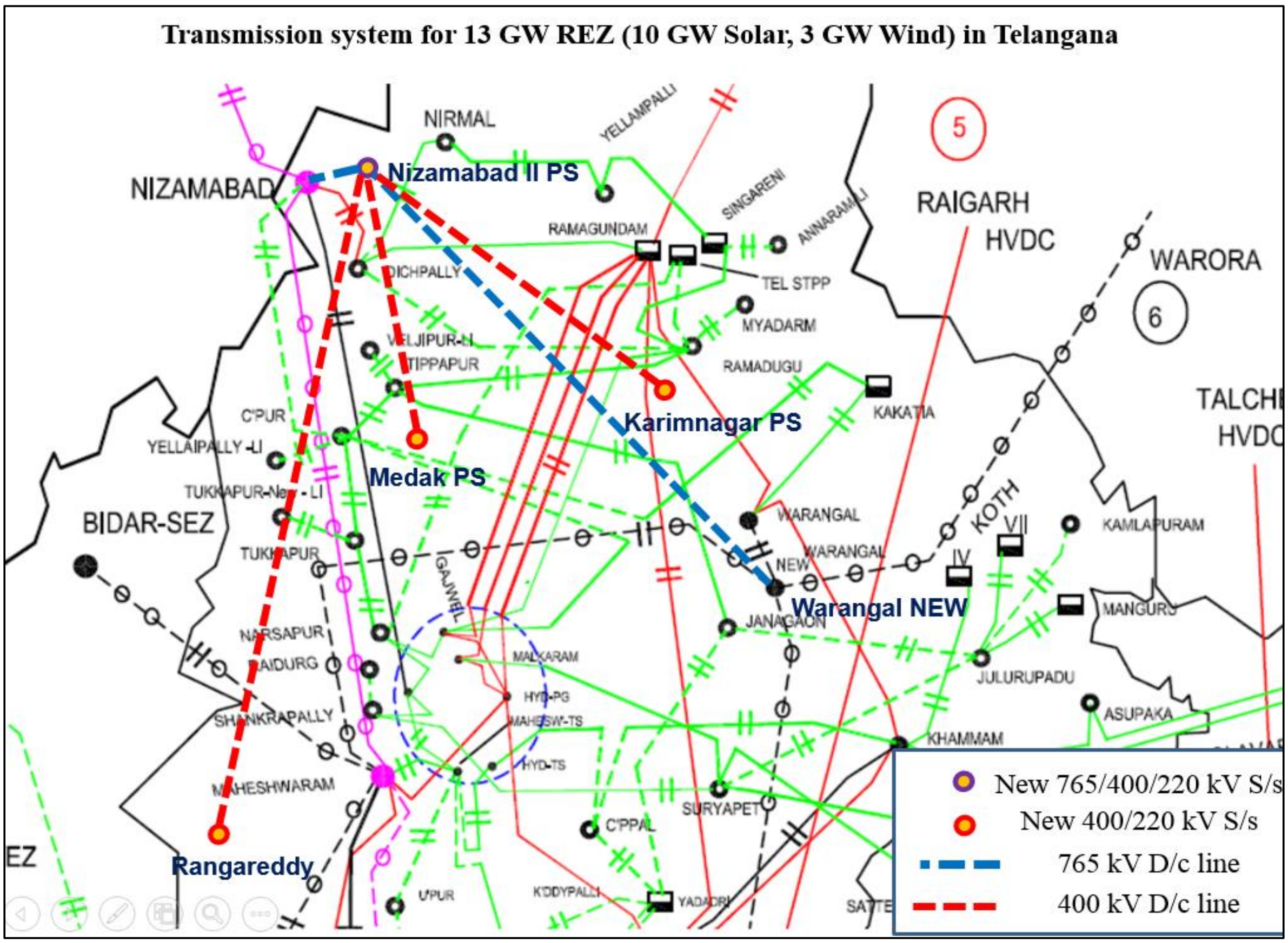


Fig. 18: Transmission system for potential RE Zones in Telangana

Details of the transmission system in Southern Region with broad scope is given at Annex 10.1

10.6 Transmission scheme for evacuation of power from Solar generation in North Eastern Region

Assam Power Distribution Company Limited (APDCL) had applied for ISTS Connectivity for solar generation of 1000 MW to be installed in Karbi Anglong, Bokajan, Assam. Transmission system for evacuation of power is given below:

- Establishment of 400 kV switching station at Bokajan in Assam.
- LILO of both circuits of Misa (PG) – New Mariani (PG) 400 kV D/c line at Bokajan (LILO route length ~ 20 km)
- 420 kV, 80 MVAr bus reactor: 2 Nos.

The transmission scheme is under bidding.

10.7 Margin already available in ISTS network which can be used for integration of additional RE capacity

About 33,350 MW margin is already available in existing/under construction ISTS sub-stations which can be used for RE integration. Region-wise summary of margin available in ISTS sub-stations is given below in Table 10.10:

Table 10.10: Region-wise summary of margin available in ISTS sub-stations

Region	Additional Margin in existing / UC system		
	220 kV level	400 kV level	Total
Northern	1650	3500	5150
Western	2100	7400	9500
Southern	2900	2700	5600
Eastern	8200	4900	13100
Total	**14850**	**18500**	**33350**

State-wise summary of margin available in ISTS sub-stations is given below in Table 10.11: (Source: CTUIL)

Table 10.11: State-wise summary of margin available in ISTS sub-stations

Region	Additional Margin in existing / UC system (MW)		
	220 kV level	400 kV level	Total
Rajasthan	850	0	850
Haryana	550	0	550
Uttar Pradesh	250	3500	3750
Gujarat	1100	0	1100
Maharashtra	600	3000	3600
Madhya Pradesh	400	1000	1400
Chhattisgarh	0	3400	3400
Andhra Pradesh	300	500	800
Karnataka	1300	1200	2500

Region	Additional Margin in existing / UC system (MW)		
	220 kV level	400 kV level	Total
Tamil Nadu	1000	1000	2000
Kerala	300	0	300
Odisha	2300	2000	4300
Jharkhand	800	500	1300
Bihar	4800	0	4800
West Bengal	300	2400	2700
Total	**14850**	**18500**	**33350**

10.8 RE capacity to be integrated to intra-state system under Green Energy Corridor (GEC) I & II Schemes

Under the Green Energy Corridor-I (GEC-I) scheme, about 24 GW of RE capacity was planned to be integrated to intra-state network, out of which about 6.5 GW of RE capacity is yet to be commissioned. Most of the transmission schemes under GEC-I have been commissioned and balance transmission schemes are likely to be commissioned by December, 2023.

About 19.4 GW RE capacity is planned to be integrated to intra-state system under Green Energy Corridor-II (GEC-II) Scheme. State-wise details are given below in Table 10.12:

Table 10.12: State-wise details of RE capacity under GEC-II

Sl. No.	State	RE capacity under GEC-II Scheme (MW)
1.	Himachal Pradesh	317
2.	Rajasthan	4023
3.	Uttar Pradesh	4000
4.	Gujarat	4000
5.	Karnataka	2639
6.	Tamil Nadu	4000
7.	Kerala	452
	Total	**19431**

DPR of the transmission schemes have already been prepared by the respective states. The GEC II scheme has been approved at an estimated project cost of Rs. 12,031.33 Crore with Central Financial Assistance (CFA) @ 33 % of the project cost i.e. Rs. 3970.34 crore. The balance 67% of the project cost is available as loan.

States are preparing the packages and are in process of issuing tenders for implementing the transmission schemes.-List of Packages sanctioned under the Intra-State Transmission System Green Energy Corridor Phase-II scheme are given at **Annex 10.2.**
(Source: MNRE)

10.9 Transmission plan for additional Hydro Electric Projects likely by 2030

Installed capacity of hydroelectric projects in the country is 46,850.18 GW (as on 31st October, 2023).

Transmission system has been planned for about 16,673 MW additional hydro capacity likely to be commissioned by the year 2030.

Details of additional hydroelectric projects along with broad transmission system for the projects likely to be integrated to ISTS network are given below at **Annex 10.3.**

10.10 Conclusions

Transmission system has been planned for about 537 GW RE capacity by the year 2030. The transmission schemes are under various stages of implementation. Some schemes have been commissioned, some are under construction and some other schemes are under bidding process. Other planned transmission schemes would be taken up progressively for implementation commensurate with the RE capacity. The transmission plan is a major step towards achievement of Government's energy transition goal.

Chapter - 11

Private Sector Participation In Transmission

11.1 Introduction

Private sector has an important role to play in the development of power sector. Introducing competition in different segments of the electricity industry is one of the key features of the Electricity Act, 2003. The National Electricity Policy, 2005, mentions about encouraging private investment in transmission sector. Tariff Policy mentions about tariff determination through competitive bidding. Government has taken a number of steps for creating an enabling framework for encouraging competition and private sector participation in transmission sector.

11.2 Enabling provisions for private sector participation

11.2.1 Enabling provisions in Electricity Act 2003:

Promotion of competition in the electricity industry in India is one of the key objective of the Electricity Act, 2003. Section 61 & 62 of the Act provides for tariff regulation and determination of tariff of generation, transmission, wheeling and retail sale of electricity. Section 63 (Determination of tariff by Bidding process) of the Act states that:

"Notwithstanding anything contained in Section 62, the Appropriate Commission shall adopt the tariff if such tariff has been determined through transparent process of bidding in accordance with the guidelines issued by the Central Government."

11.2.2 Enabling provisions in National Electricity Policy 2005:

The National Electricity Policy notified on 12th February, 2005, inter-alia states the following:

"5.3.10 Special mechanisms would be created to encourage private investment in transmission sector so that sufficient investments are made……

5.8.1 Considering the magnitude of the expansion of the sector required, a sizeable part of the investments will also need to be brought in from the private sector. The Act creates a conducive environment for investments in all segments of the industry, both for public sector and private sector, by removing barrier to entry in different segments. Section 63 of the Act provides for participation of suppliers on competitive basis in different segments which will further encourage private sector investment."

11.2.3 Provisions in Tariff Policy

Tariff Policy issued by Ministry of Power on 6th January, 2006

5.1 ………..Tariff of all new generation and transmission projects should be decided on the basis of competitive bidding after a period of five years or when the Regulatory Commission is satisfied that the situation is ripe to introduce such competition.

7.1 (6) Investment by transmission developer other than CTU/STU would be invited through competitive bids. The Central Government will issue guidelines in three months for bidding process for developing transmission capacities. The tariff of the projects to be developed by CTU/STU after the period of five years or when the Regulatory Commission is satisfied that the situation is right to introduce such competition (as referred to in para 5.1) would also be determined on the basis of competitive bidding.

7.1 (7) After the implementation of the proposed framework for the inter-State transmission, a similar approach should be implemented by SERCs in next two years for the intra-State transmission, duly considering factors like voltage, distance, direction and quantum of flow."

Revised Tariff Policy issued by Ministry of Power on 28th January, 2016

5.3: "The tariff of all new generation and transmission projects of company owned or controlled by the Central Government shall continue to be determined on the basis of competitive bidding as per the Tariff Policy notified on 6th January, 2006 unless otherwise specified by the Central Government on case to case basis.

Further, intra-state transmission projects shall be developed by State Government through competitive bidding process for projects costing above a threshold limit which shall be decided by the SERCs."

7.1(7): "While all future inter-state transmission projects shall, ordinarily, be developed through competitive bidding process, the Central Government may give exemption from competitive bidding for (a) specific category of projects of strategic importance, technical upgradation etc. or (b) works required to be done to cater to an urgent situation on a case to case basis".

11.3 Steps taken by Ministry of Power

(i). As per the provisions under Section 63 of the Electricity Act 2003, and the Tariff Policy dated 6th January 2006, Ministry of Power, Government of India, issued "Guidelines for Encouraging Competition in Development of Transmission Projects" and "Tariff Based Competitive Bidding Guidelines for Transmission Services" in 2006. These guidelines aimed at laying down a transparent procedure for facilitating competition in the transmission sector through wide participation in providing transmission services and tariff determination through a process of Tariff Based Competitive Bidding (TBCB).

Ministry of Power issued Standard Bidding Documents viz. Request for Qualification (RfQ), Request for Proposal (RfP), Transmission Service Agreement (TSA) and Share Purchase agreement (SPA) in 2008.

The guidelines and Standard Bidding Documents have been revised by MoP in August 2021, after consultation with the stakeholders. Two stage bidding process featuring separate RfQ & RfP, has now been discontinued and single stage two envelope bid process is being followed.

(ii). As provided in the Guidelines, Ministry of Power had appointed PFC Consulting Limited (PFCCL) and REC Power Development and Consultancy Limited (RECPDCL) as the Bid Process Coordinators (BPC) for carrying out the bidding process.

(iii). Further, Ministry of Power in compliance with provisions laid down in Tariff Policy dated 6th January, 2006, issued an O.M on 9th December, 2010 has clarified the applicability of tariff based competitive bidding for the projects in the transmission sectors except for following exemptions for transmission projects of STUs/CTU:

a) The upgradation/strengthening of the existing "transmission lines" and associated sub-stations.
b) Projects for which BPTA(s)/TSA(s) have been signed on or before 5.1.2011.

The revised Tariff Policy issued by Ministry of Power on 28th January, 2016 has continued to support private sector participation in transmission.

"

(iv). As envisaged in the Guidelines, Ministry of Power had constituted an Empowered Committee on Transmission to identify inter-state transmission projects to be developed through competitive bidding and to oversee the process of competitive bidding. MoP vide office order no. 15/3/2017-Trans dated 13.04.2018 reconstituted the Empowered Committee on Transmission (ECT) and also constituted the National Committee on Transmission (NCT). Based on the recommendations of NCT, ECT allocated the transmission projects to be implemented through either through TBCB route or RTM route.

(v). MoP vide office order dated 4th November, 2019 dissolved the ECT and only NCT remained in existence whose terms of reference inter-alia included recommendation of ISTS schemes to MoP for approval.

(vi). To further streamline the process of planning and approval of ISTS schemes, MoP vide its office order dated 28.10.2021 has revised the Terms of Reference of the NCT delegating powers for approval of ISTS system costing between 100 to 500 crores to NCT and for ISTS schemes costing upto Rs. 100 crores to Central Transmission Utility. Now ISTS schemes costing above Rs. 500 crores have to be recommended by NCT to MoP.

11.4 Overview of ISTS Schemes notified, awarded and commissioned through TBCB route

Till 31st October 2023, total 133 number of ISTS schemes have been identified for implementation through TBCB route. Out of these, 92 ISTS transmission schemes have been awarded through Tariff Based Competitive Bidding route and 41 projects are currently under bidding.

Out of the ninety- two (92) transmission schemes already awarded for implementation through TBCB route, forty-seven (47) schemes have already been commissioned and forty-one (41) are under implementation by various Transmission Service Providers. Out of the balance four (4) projects, one project has been cancelled by CERC, for one project the TSP has been requested for closure and construction of two projects could not start due to litigation. The same is summarized in the Table -11.1:

Table – 11.1: Status of the ISTS schemes awarded through TBCB route (till 31st October 2023)

TBCB Schemes	Number of Schemes
Schemes commissioned	47
Schemes under implementation	41
Schemes cancelled by CERC	1
Schemes not taken up & CERC cancelled license	1
Schemes under litigation	2
Total	**92**

The ninety-two ISTS schemes with an estimated cost of Rs 1,23,725 Crore have been awarded during the period 2007-08 to 2023-24 (till 31st October 2023). Details of projects awarded through TBCB route is given in Table 11.2:

Table – 11.2

Sl. No.	Period	Number of Schemes awarded	Estimated cost (Rs crore)
1	2007-12	8	12370
2	2012-17	31	50130
2	2017-22	26	27823

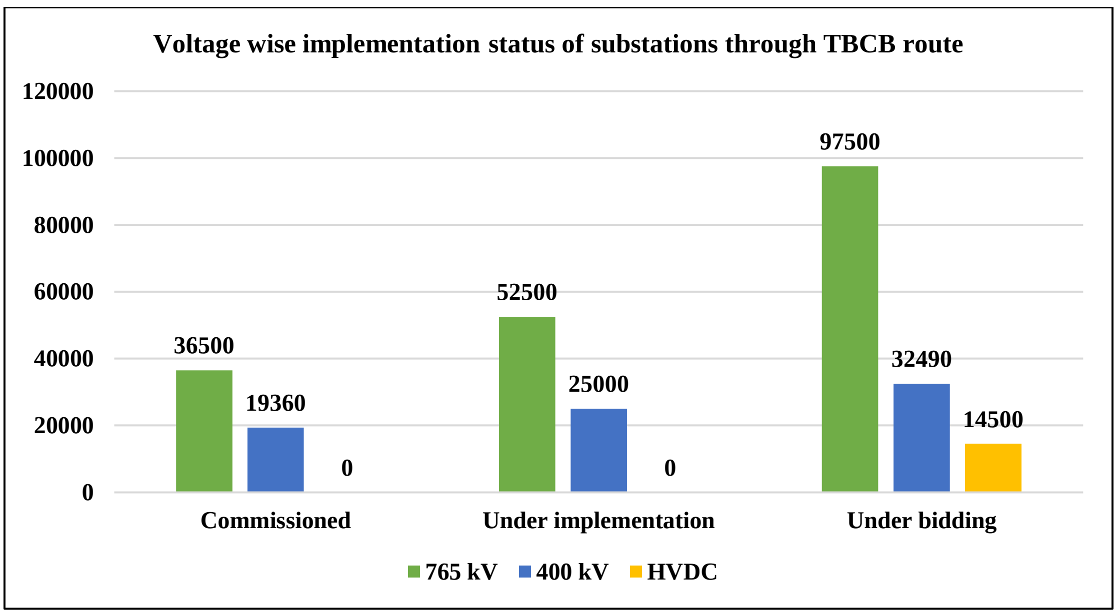
Sl. No.	Period	Number of Schemes awarded	Estimated cost (Rs crore)
3	2022-24 (Till 31st October 2023)	27	33402
Total		**92**	**123725**

The overall summary of the 129 ISTS schemes (excluding 4 stalled projects) being implemented through TBCB route, in term of ckm and MVA capacity is summarized in below Table 11.3:

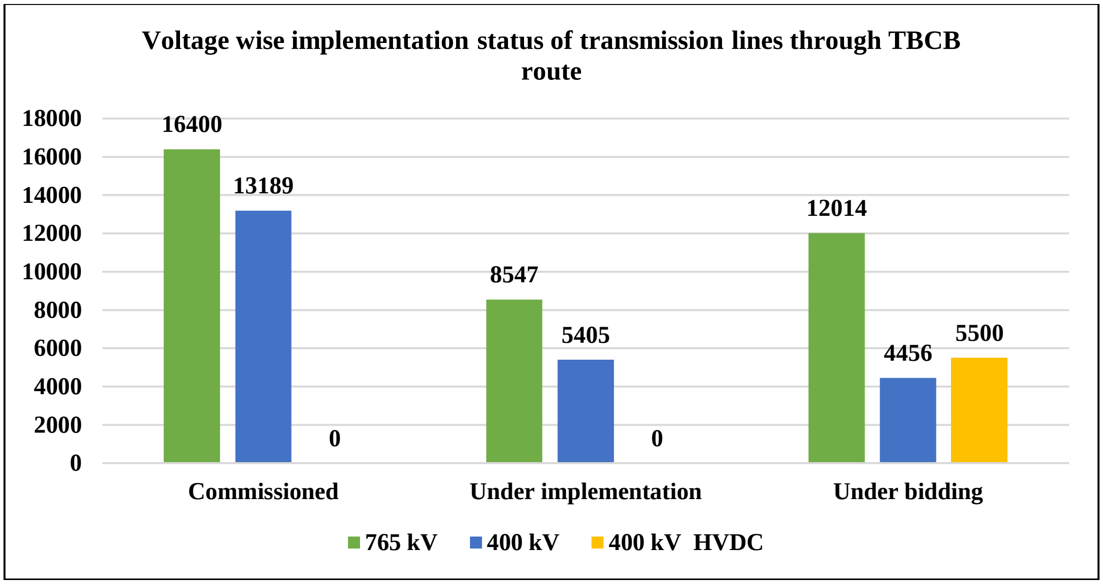
Table – 11.3

Status of schemes recommended through TBCB route	No. of ISTS Schemes	765/400 kV transformation capacity (MVA)	400/220 kV transformation capacity (MVA)	HVDC ±800, ±500 kV (MW)	765 kV (ckm)	400 kV (ckm)	HVDC ±800, ±500 kV (ckm)
Commissioned	47	36500	19360	0	16400	13189	0
Under implementation	41	52500	25000	0	8547	5405	0
Under bidding	41	97500	32490	14500	12014	4456	5500
Total	**129**	**186500**	**76850**	**14500**	**36961**	**23050**	**5500**

The voltage-wise summary of the substation capacity (MVA) (commissioned, under implementation, under bidding) recommended through TBCB route is given below:



The voltage-wise summary of transmission lines (ckm) (commissioned, under implementation, under bidding) through TBCB route is given below:



11.4.1 ISTS schemes commissioned through TBCB route

Forty-seven (47) transmission schemes have been commissioned by various Transmission Service Providers (TSP) till 31st October 2023. Summary of transformation capacity (765/400 kV, 400/220 kV) and transmission lines commissioned through TBCB route is given in the Table 11.4.

Table – 11.4

Sl. No.	Period	Transformation capacity commissioned (in MVA)	Transmission lines commissioned (in ckm)
1.	2012-17	7000	8999
2.	2017-22	28360	14537
3.	2022-24 (till 31st October 2023)	20500	6054
Total		**55860**	**29589**

Commissioned Schemes	Number of ISTS Schemes	765/400 kV MVA capacity	400/220 kV MVA capacity	765 kV ckm	400 kV ckm
Prior to 31st March 2022	38	21500	13860	12429	11106
After 31st March 2022	9	15000	5500	3971	2083

The TSP wise break up of transmission schemes commissioned is given in the Table 11.5:

Table – 11.5

Name of TSP	Number of Transmission Schemes commissioned
POWERGRID	16
Sterlite Power Limited	12
Adani Transmission Ltd	12
Essel Infra	2
Kalptaru	2
L&T	1
Techno Electric	1
RSTCL	1
Total	**47**

The list of transmission schemes already commissioned through TBCB route is given at Annex-11.1.

11.4.2 ISTS schemes under implementation through TBCB route

Forty- one (41) ISTS schemes at an estimated cost Rs. 46,024 Crore are under implementation through TBCB route. List of transmission schemes is given at Annex-11.2. The transmission lines and substation capacity under implementation till 2023-24 (till 31st October 2023) are 13,952 ckm and 77,500 MVA respectively. Details of estimated cost, ckm and MVA capacity of under implementation transmission schemes is given in the Table 11.6.

Table - 11.6

Sl. No.	Period	Transmission lines under implementation (in ckm)	Substation capacity under implementation (in MVA)	Estimated cost (Rs. Crore)
1	2016-22	4292	18000	12622
2	2022-24 (till 31st October 2023)	9660	59500	33402
Total		**13952**	**77500**	**46024**

The forty-one (41 nos.) transmission schemes are under implementation by various Transmission Service Providers (TSPs). The TSP wise break up of transmission schemes is given in the Table -11.7:

Table – 11.7

Name of TSP	Number of Transmission Schemes under implementation
POWERGRID	20
Sterlite Power Limited	7
Adani Transmission Limited	4
ReNew Transmission Ventures Pvt. Ltd.	3
Apraava Energy Private Limited	2

Name of TSP	Number of Transmission Schemes under implementation
Megha Engineering & Infra	2
GR Infra Projects Limited	1
Indi Grid Limited	1
Resurgent Power Venture Pvt Ltd	1
Total	**41**

11.4.3 ISTS Schemes under bidding

Forty-one (41) ISTS schemes at an estimated cost Rs. 1,35,222 crores are under bidding. The transmission lines and substation capacity under bidding till 2023-24 (till 31st October 2023) are 21,970 ckm (including 5500 ckm HVDC line) and 1,29,990 MVA & 14,500 MW (HVDC) respectively. The list of transmission schemes under bidding is given at Annex-11.3.

11.5 Progress of TBCB at intra-state level

Revised Tariff Policy, 2016 inter-alia states the following:

"*Further, intra-state transmission projects shall be developed by State Government through competitive bidding process for projects costing above a threshold limit which shall be decided by the SERCs.*"

In line with the above provision, some States have also initiated the competitive bidding for award of intra-state transmission schemes. Till now, Uttar Pradesh, Madhya Pradesh and Maharashtra have started the implementation of the transmission projects through TBCB route. Total 10 nos. of intra-state transmission schemes for Uttar Pradesh, Madhya Pradesh and Maharashtra has been completed under TBCB (Table-11.11). Further, seven intra-state transmission projects in Uttar Pradesh, Odisha, DVC (West Bengal) and DVC (Jharkhand) are to be awarded through TBCB route (Table-11.12). Some other states like Rajasthan are also planning to implement the intra –state transmission projects through TBCB route.

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Table-11.11
Intra-State Transmission Schemes awarded through TBCB route

Sl. No.	Name of Scheme	State	TSP	Date of SPV Transfer
1.	Transmission system for evacuation of Power from 3x660 MW Ghatampur Thermal Power Project	Uttar Pradesh	Adani Transmission Limited	19.06.2018
2.	Transmission system for evacuation of power from 2x660 MW Jawaharpur Thermal Power Project and construction of 400 kV substation at Firozabad alongwith associated transmission lines	Uttar Pradesh	Power Grid Corporation of India Limited	21.12.2018

Sl. No.	Name of Scheme	State	TSP	Date of SPV Transfer
3.	Intra-State Transmission work associated with construction of 400 kV substation near Guna (Distt. Guna) & Intra-state Transmission work associated with construction of 220 kV S/s near Bhind (Distt. Bhind)	Madhya Pradesh	Power Grid Corporation of India Limited	11.09.2019
4.	Construction of 765/400/220 kV GIS substation, Rampur, and 400/220/132 kV GIS Substation, Sambhal, with associated transmission lines	Uttar Pradesh	Power Grid Corporation of India Limited	12.12.2019
5.	Development of Intra-state Transmission Work in Madhya Pradesh through Tariff Based Competitive Bidding: PACKAGE - I	Madhya Pradesh	Adani Transmission Limited	01.11.2021
6.	Development of Intra-state Transmission Work in M.P. through Tariff Based Competitive Bidding: PACKAGE - II	Madhya Pradesh	Megha Engineering & Infrastructures Limited	21.01.2023
7.	Transmission System for 400 kV Vikhroli receiving station and associated incoming transmission lines for strengthening of Mumbai Transmission System	Maharashtra	Adani Transmission Limited	01.12.2019
8.	Evacuation of power from Obra-C (2x660 MW) Thermal Power Project & Construction of 400 kV GIS Substation Badaun with associated Transmission Lines	Uttar Pradesh	Adani Transmission Limited	21.12.2018
9.	Construction of 765/400/220 kV GIS Substation, Meerut with associated lines and 400/220/132 kV GIS Substation, Simbhavali with associated Transmission lines	Uttar Pradesh	Power Grid Corporation of India Limited	19.12.2019
10.	Construction of 400/220/132kV GIS Substation, Mohanlalganj (Lucknow) with associated 400kV lines, and other 765kV & 400kV LILO lines at 765kV GIS Substation Rampur and 400kV LILO (Quad Moose on Monopole) at	Uttar Pradesh	Power Grid Corporation of India Limited	30.05.2022

Sl. No.	Name of Scheme	State	TSP	Date of SPV Transfer
	400kV GIS Substation Sector 123 Noida			

Table-11.12

Intra-State Transmission Schemes to be awarded through TBCB route

Sl. No.	Name of Scheme	State	Bidding Status
1.	Construction of Meerut (765 kV) - Shamli 400 kV D/C Line	Uttar Pradesh	Bidding has been completed. SPV is to be transferred
2.	Construction of 220/132/33 kV Tirwa (Kannauj) substation with associated lines and LILO of one circuit of Shamli – Aligarh 400 kV D/C Line at Khurja TPS	Uttar Pradesh	Under bidding
3.	Construction of 400/220 kV, 2x500 MVA GIS substation Metro Depot (Gr. Noida) and 400/220 kV, 2x500 MVA GIS substation Jalpura with associated lines	Uttar Pradesh	Bidding has been completed. SPV is to be transferred
4.	Construction of 400/220 kV, 2x500 MVA GIS Substation Jewar, 220/33 kV, 2x60 MVA GIS substation Cantt (Chaukaghat) Varanasi, 220/33 kV, 3x60 MVA GIS substation Vasundhara (Ghaziabad), 220/132/33 kV, 2x160+2x40 MVA khaga (Fatehpur) with associated lines	Uttar Pradesh	Under bidding
5.	Construction of 400/220/132 kV Grid Sub-station with associated transmission lines at Joda/Barbil and LILO of 400 kV Kaniha-Bisra D/C line at 400 kV Sub-station Joda	Odisha	Under Bidding
6.	Package A (West Bengal)- (i) 400/220/132/33 kV SS at Ramakanali-B along with associated transmission lines. (ii) 220/33 kV SS at Panagarh along with associated transmission line	DVC(West Bengal)	Under Bidding
7.	Package B (Jharkhand) - (i) 400/220/132/33 kV SS at Gola-B along with associated transmission lines. (ii) 220/33 kV SS at Ramgarh along with associated transmission line	DVC(Jharkhand)	Under Bidding

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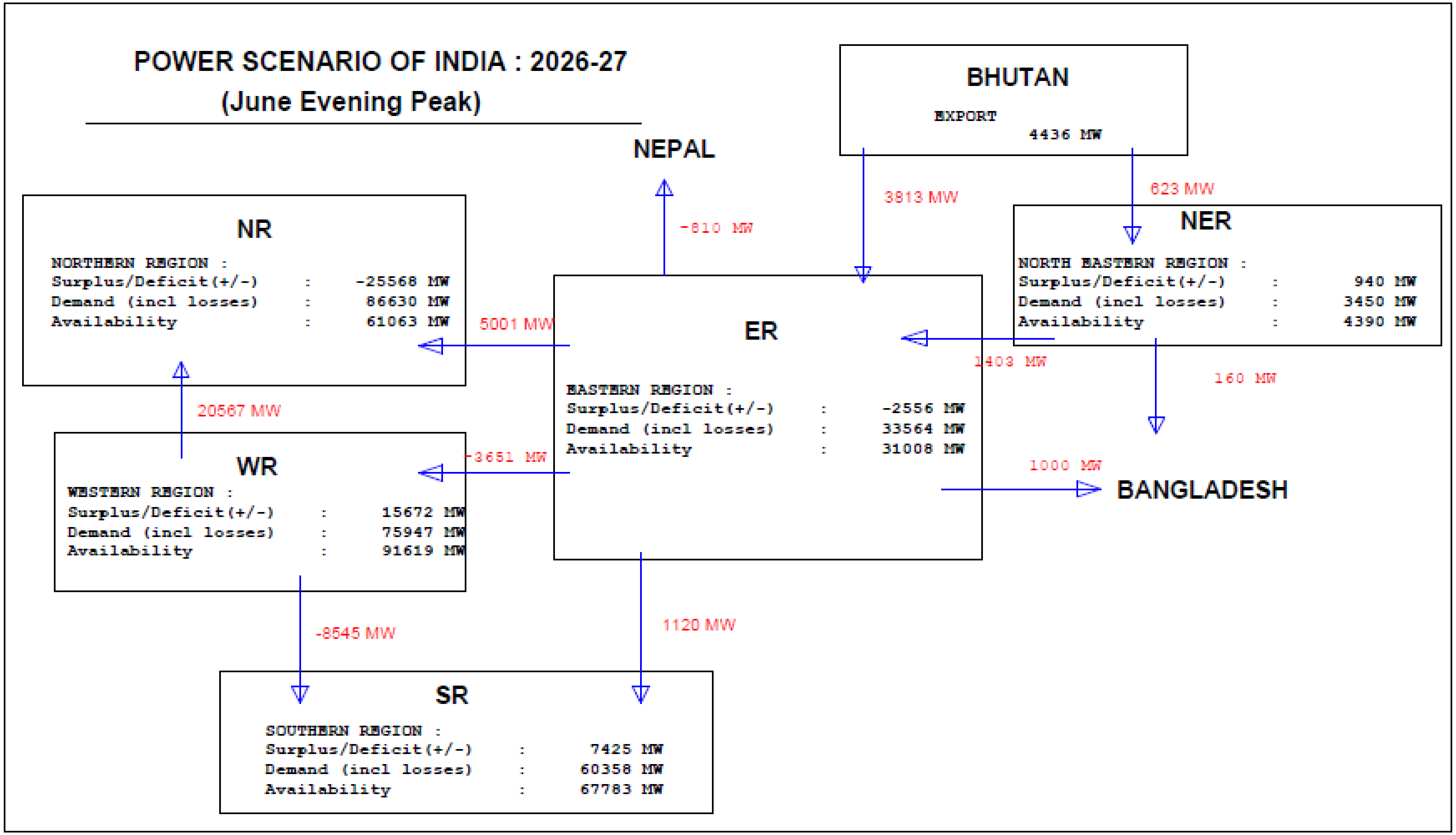
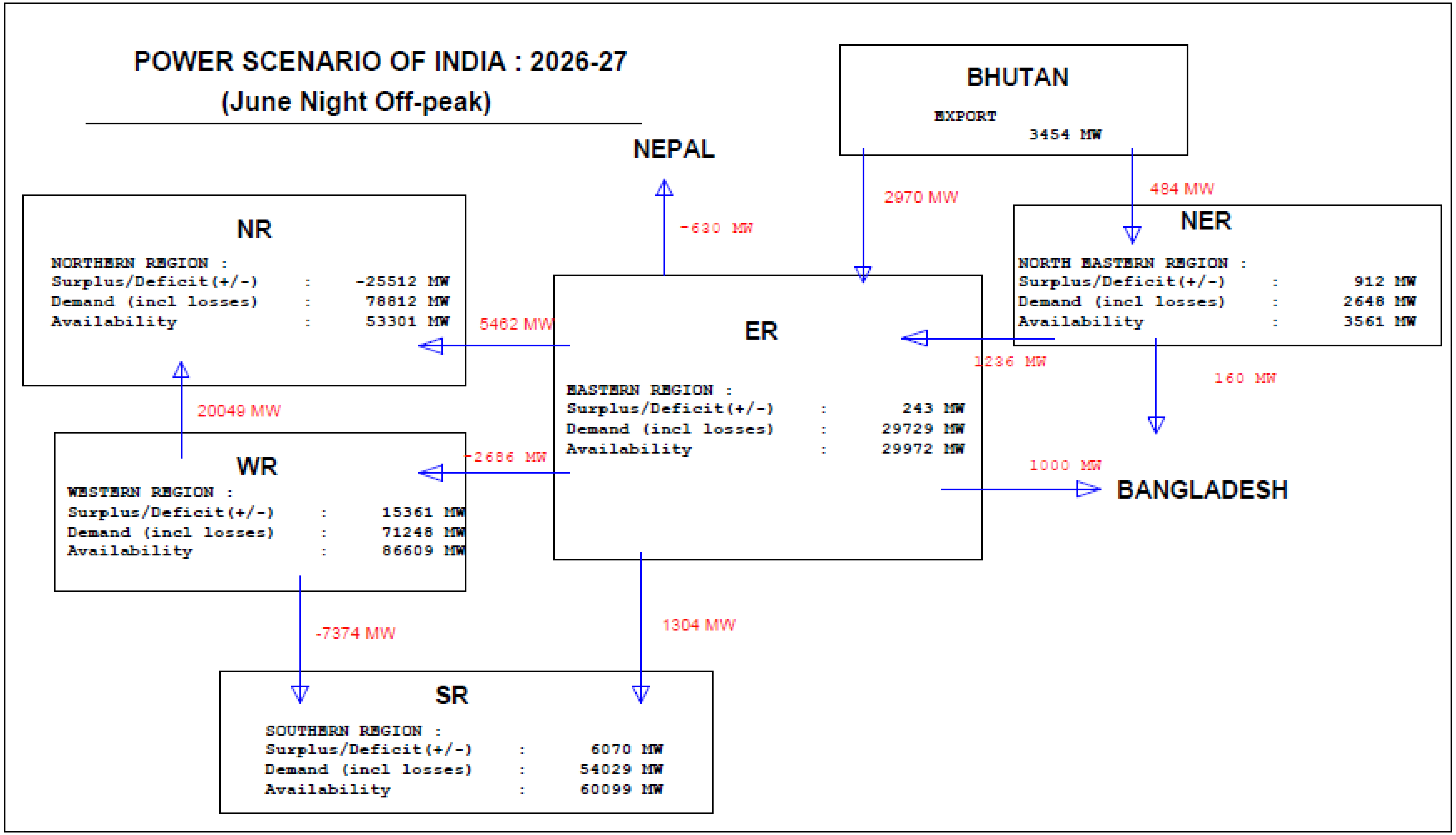
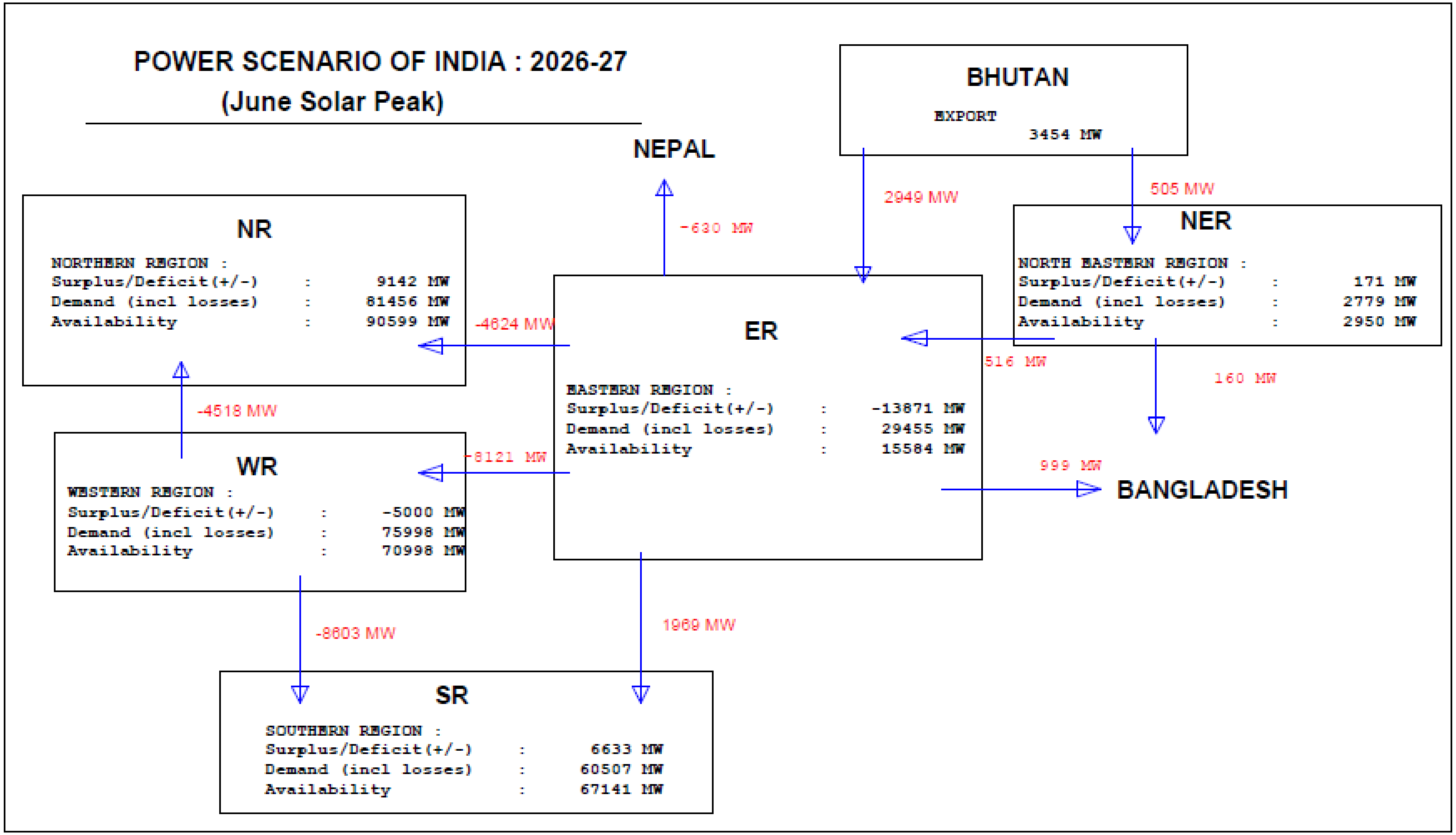
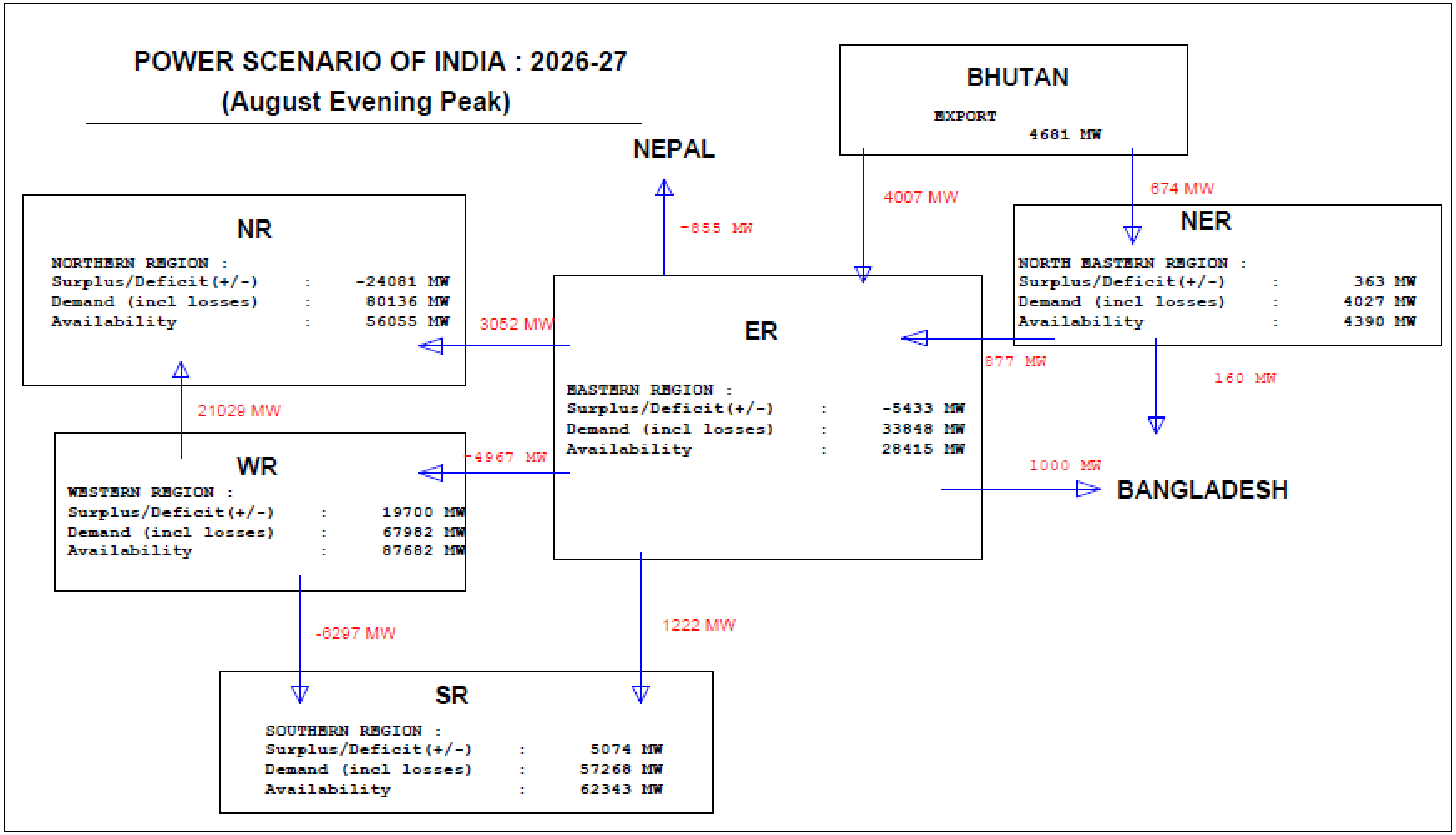
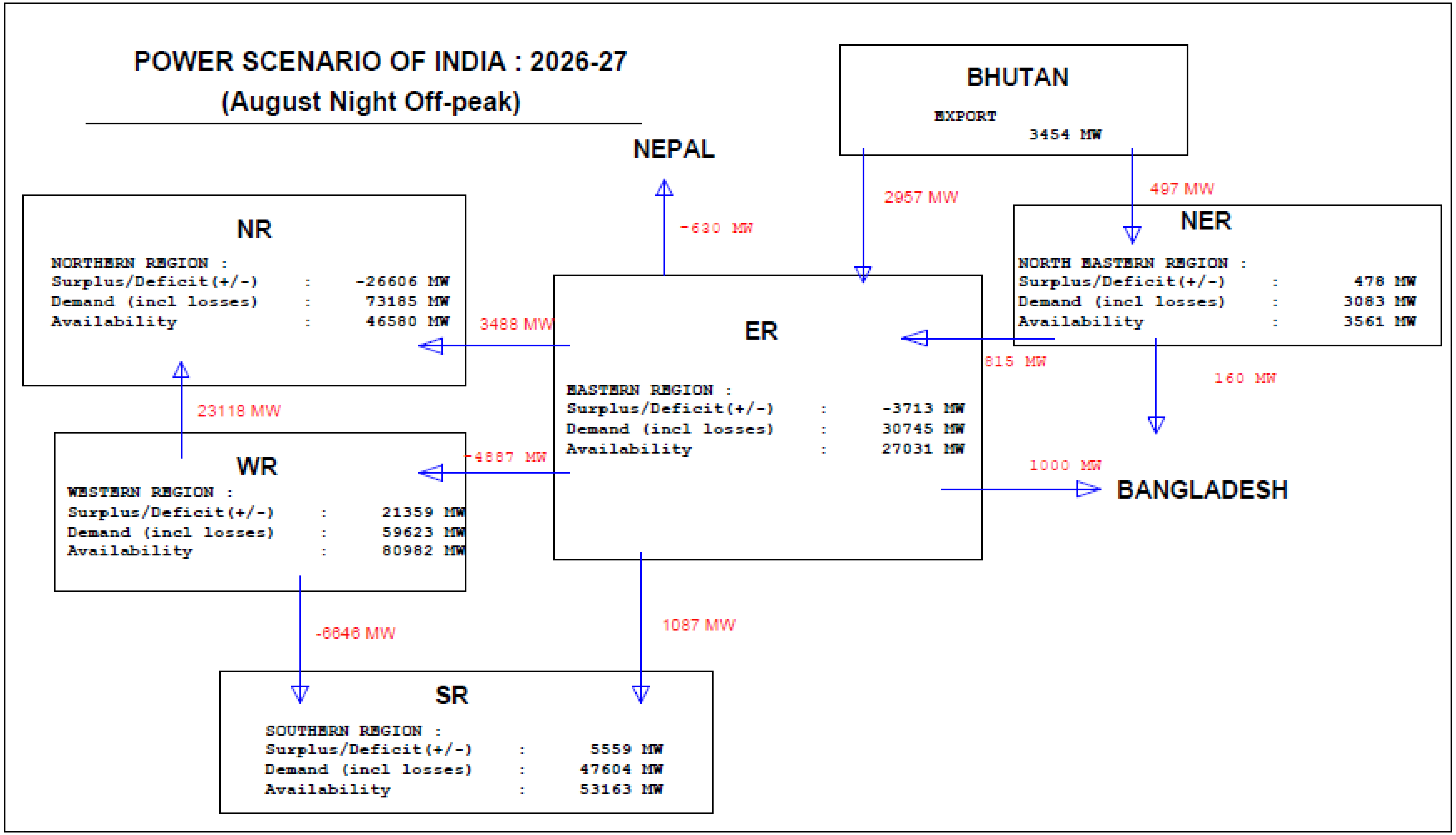
June Evening Peak **ANNEX: 5.1a**

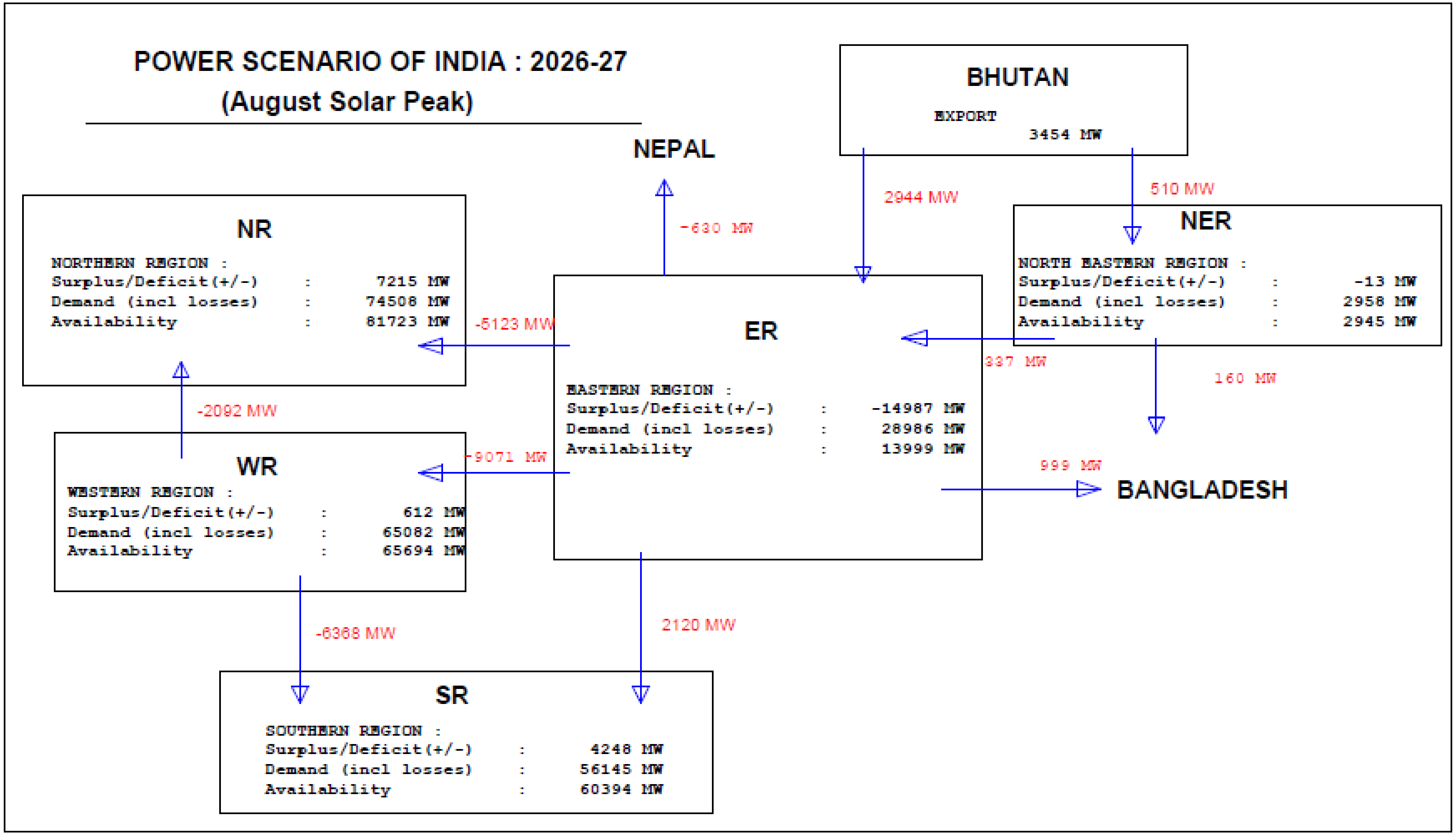


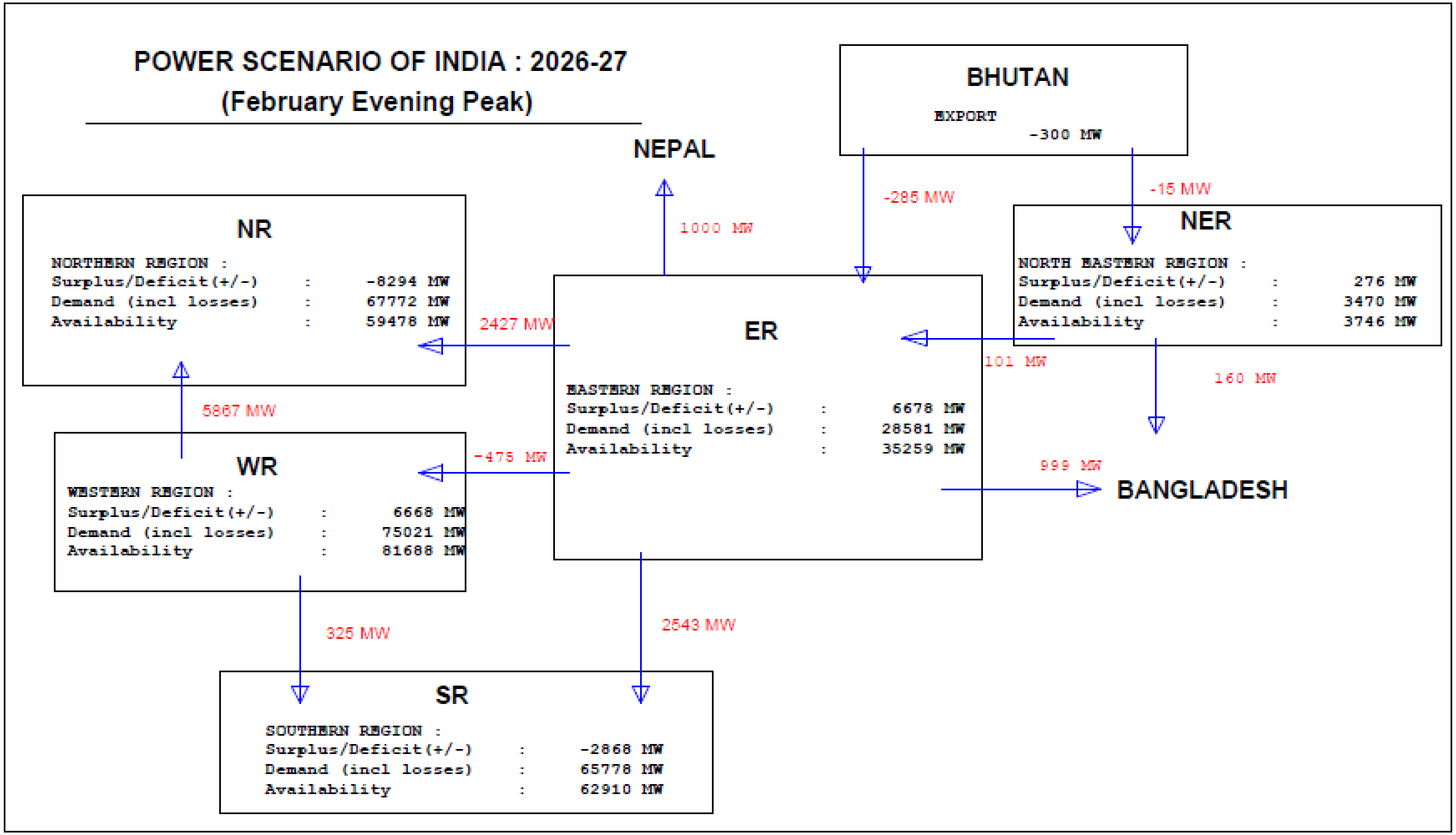

POWER SCENARIO OF INDIA : 2026-27
(June Night Off-peak)
BHUTAN
EXPORT
3454 MW
NEPAL
-630 MW
2970 MW
484 MW
NR
NORTHERN REGION :
Surplus/Deficit(+/-) : -25512 MW
Demand (incl losses) : 78812 MW
Availability : 53301 MW
NER
NORTH EASTERN REGION :
Surplus/Deficit(+/-) : 912 MW
Demand (incl losses) : 2648 MW
Availability : 3561 MW
5462 MW
ER
EASTERN REGION :
Surplus/Deficit(+/-) : 243 MW
Demand (incl losses) : 29729 MW
Availability : 29972 MW
1236 MW
160 MW
20049 MW
WR
WESTERN REGION :
Surplus/Deficit(+/-) : 15361 MW
Demand (incl losses) : 71248 MW
Availability : 86609 MW
-2686 MW
1000 MW
BANGLADESH
-7374 MW
1304 MW
SR
SOUTHERN REGION :
Surplus/Deficit(+/-) : 6070 MW
Demand (incl losses) : 54029 MW
Availability : 60099 MW


POWER SCENARIO OF INDIA : 2026-27
(June Solar Peak)
BHUTAN
EXPORT
3454 MW
NEPAL
2949 MW
505 MW
-630 MW
NR
NORTHERN REGION :
Surplus/Deficit(+/-) : 9142 MW
Demand (incl losses) : 81456 MW
Availability : 90599 MW
NER
NORTH EASTERN REGION :
Surplus/Deficit(+/-) : 171 MW
Demand (incl losses) : 2779 MW
Availability : 2950 MW
-4624 MW
ER
516 MW
160 MW
EASTERN REGION :
Surplus/Deficit(+/-) : -13871 MW
Demand (incl losses) : 29455 MW
Availability : 15584 MW
-4518 MW
WR
WESTERN REGION :
Surplus/Deficit(+/-) : -5000 MW
Demand (incl losses) : 75998 MW
Availability : 70998 MW
-8121 MW
999 MW
BANGLADESH
-8603 MW
1969 MW
SR
SOUTHERN REGION :
Surplus/Deficit(+/-) : 6633 MW
Demand (incl losses) : 60507 MW
Availability : 67141 MW

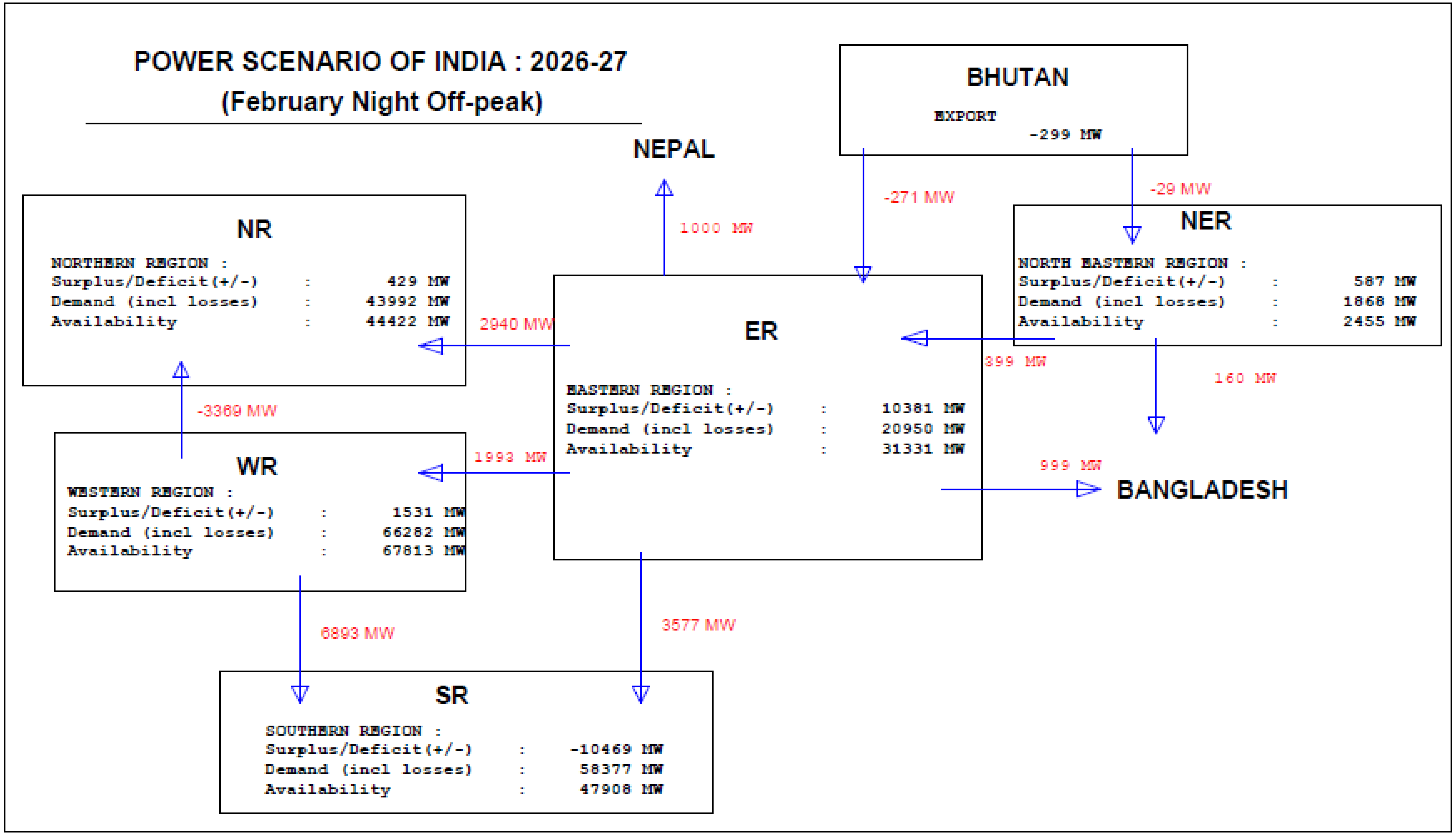

POWER SCENARIO OF INDIA : 2026-27
(August Evening Peak)
BHUTAN
EXPORT
4681 MW
NEPAL
-855 MW
4007 MW
674 MW
NR
NORTHERN REGION :
Surplus/Deficit(+/-) : -24081 MW
Demand (incl losses) : 80136 MW
Availability : 56055 MW
NER
NORTH EASTERN REGION :
Surplus/Deficit(+/-) : 363 MW
Demand (incl losses) : 4027 MW
Availability : 4390 MW
3052 MW
ER
EASTERN REGION :
Surplus/Deficit(+/-) : -5433 MW
Demand (incl losses) : 33848 MW
Availability : 28415 MW
877 MW
160 MW
21029 MW
WR
WESTERN REGION :
Surplus/Deficit(+/-) : 19700 MW
Demand (incl losses) : 67982 MW
Availability : 87682 MW
-4967 MW
1000 MW
BANGLADESH
-6297 MW
1222 MW
SR
SOUTHERN REGION :
Surplus/Deficit(+/-) : 5074 MW
Demand (incl losses) : 57268 MW
Availability : 62343 MW


POWER SCENARIO OF INDIA : 2026-27
(August Night Off-peak)
BHUTAN
EXPORT
3454 MW
NEPAL
NR
NORTHERN REGION :
Surplus/Deficit(+/-) : -26606 MW
Demand (incl losses) : 73185 MW
Availability : 46580 MW
-630 MW
2957 MW
497 MW
NER
NORTH EASTERN REGION :
Surplus/Deficit(+/-) : 478 MW
Demand (incl losses) : 3083 MW
Availability : 3561 MW
3488 MW
ER
815 MW
160 MW
EASTERN REGION :
Surplus/Deficit(+/-) : -3713 MW
Demand (incl losses) : 30745 MW
Availability : 27031 MW
23118 MW
WR
WESTERN REGION :
Surplus/Deficit(+/-) : 21359 MW
Demand (incl losses) : 59623 MW
Availability : 80982 MW
-4887 MW
1000 MW
BANGLADESH
-6646 MW
1087 MW
SR
SOUTHERN REGION :
Surplus/Deficit(+/-) : 5559 MW
Demand (incl losses) : 47604 MW
Availability : 53163 MW

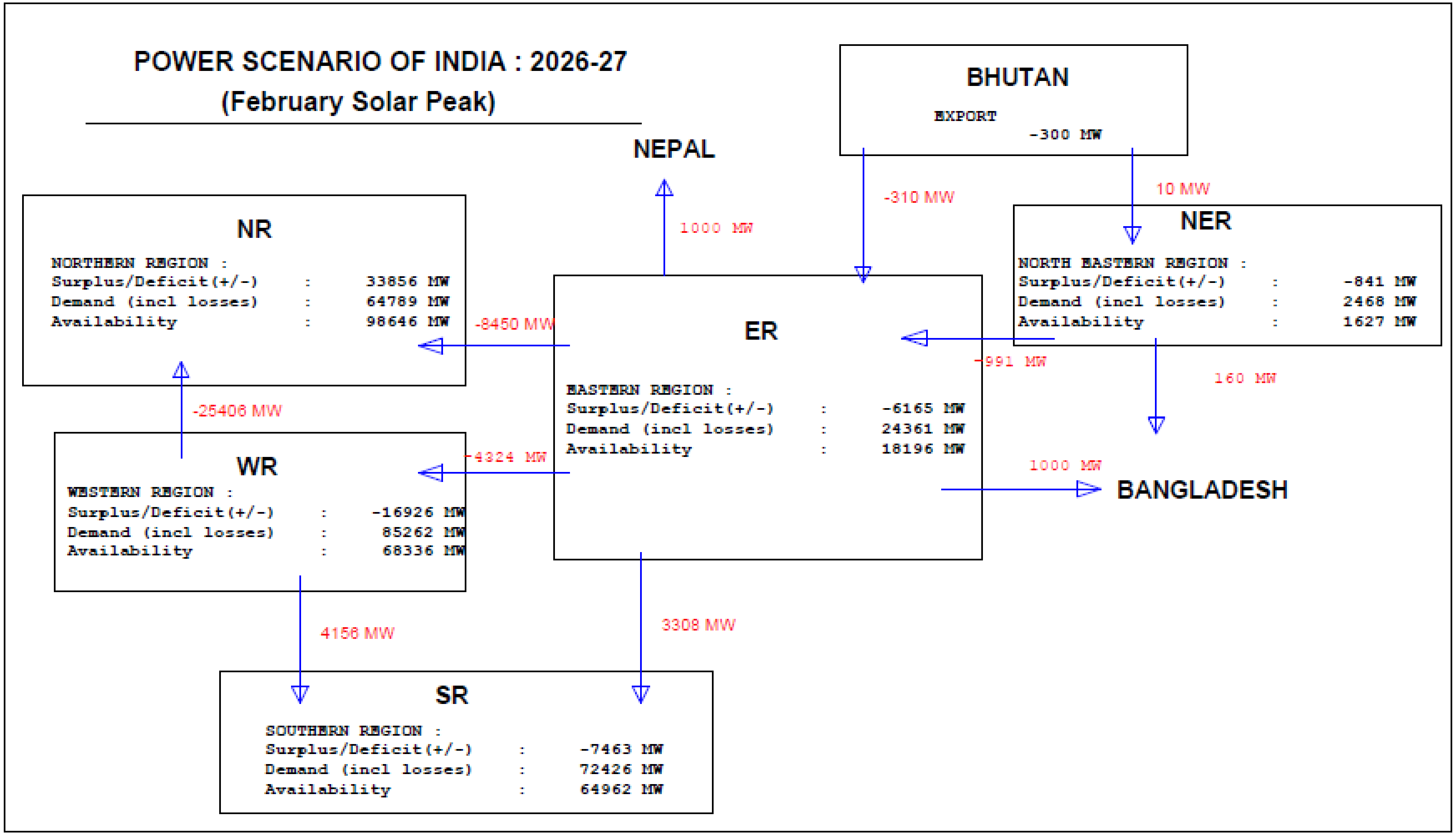

POWER SCENARIO OF INDIA : 2026-27
(August Solar Peak)
BHUTAN
EXPORT
3454 MW
NEPAL
-630 MW
2944 MW
510 MW
NR
NORTHERN REGION :
Surplus/Deficit(+/-) : 7215 MW
Demand (incl losses) : 74508 MW
Availability : 81723 MW
NER
NORTH EASTERN REGION :
Surplus/Deficit(+/-) : -13 MW
Demand (incl losses) : 2958 MW
Availability : 2945 MW
-5123 MW
ER
EASTERN REGION :
Surplus/Deficit(+/-) : -14987 MW
Demand (incl losses) : 28986 MW
Availability : 13999 MW
337 MW
160 MW
-2092 MW
WR
WESTERN REGION :
Surplus/Deficit(+/-) : 612 MW
Demand (incl losses) : 65082 MW
Availability : 65694 MW
-9071 MW
999 MW
BANGLADESH
-6368 MW
2120 MW
SR
SOUTHERN REGION :
Surplus/Deficit(+/-) : 4248 MW
Demand (incl losses) : 56145 MW
Availability : 60394 MW


POWER SCENARIO OF INDIA : 2026-27
(February Evening Peak)
BHUTAN
EXPORT
-300 MW
NEPAL
1000 MW
-285 MW
-15 MW
NR
NORTHERN REGION :
Surplus/Deficit(+/-) : -8294 MW
Demand (incl losses) : 67772 MW
Availability : 59478 MW
2427 MW
NER
NORTH EASTERN REGION :
Surplus/Deficit(+/-) : 276 MW
Demand (incl losses) : 3470 MW
Availability : 3746 MW
ER
EASTERN REGION :
Surplus/Deficit(+/-) : 6678 MW
Demand (incl losses) : 28581 MW
Availability : 35259 MW
101 MW
160 MW
5867 MW
WR
WESTERN REGION :
Surplus/Deficit(+/-) : 6668 MW
Demand (incl losses) : 75021 MW
Availability : 81688 MW
-475 MW
999 MW
BANGLADESH
325 MW
2543 MW
SR
SOUTHERN REGION :
Surplus/Deficit(+/-) : -2868 MW
Demand (incl losses) : 65778 MW
Availability : 62910 MW

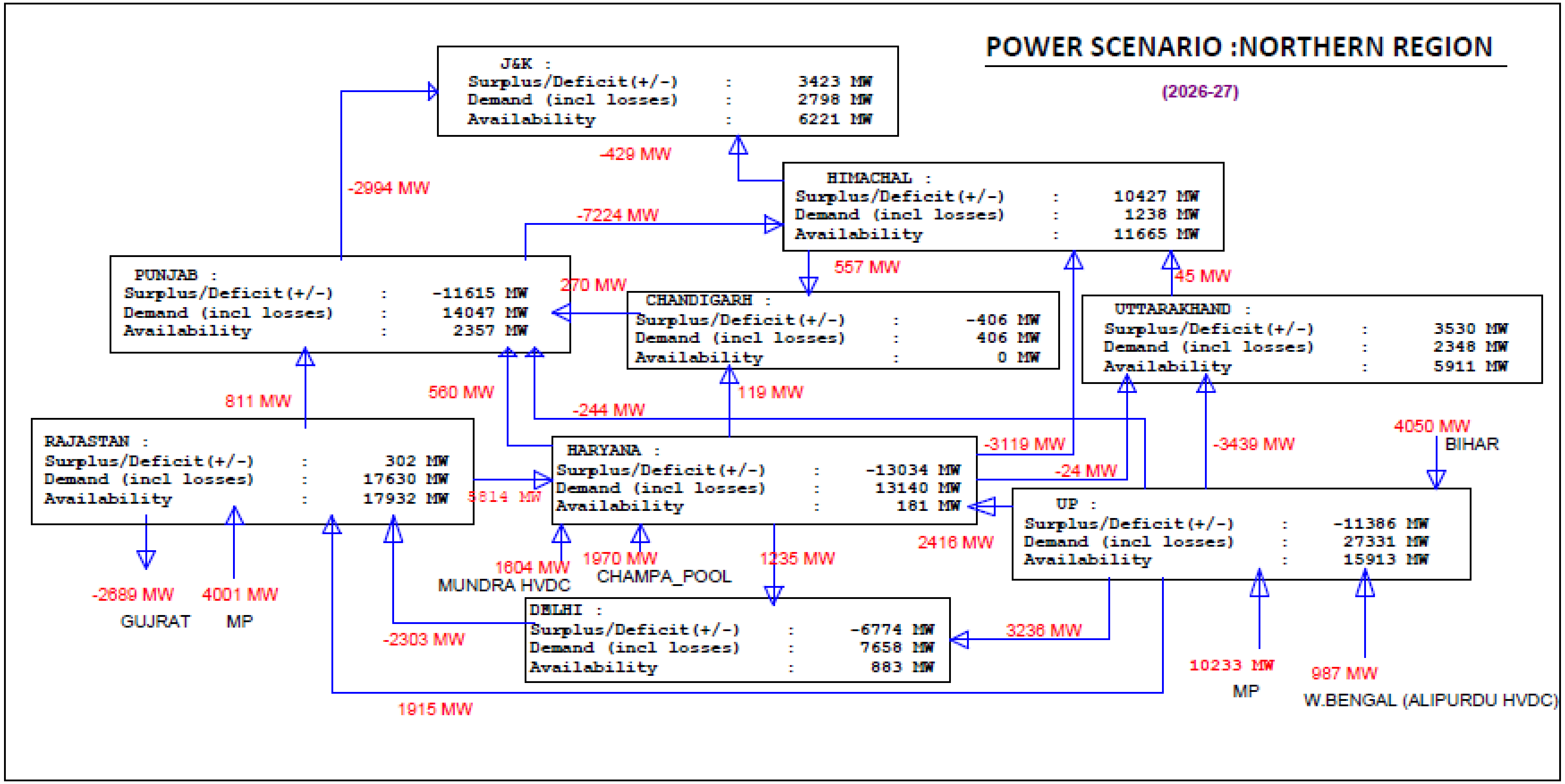
February Night Off-Peak ANNEX: 5.3b



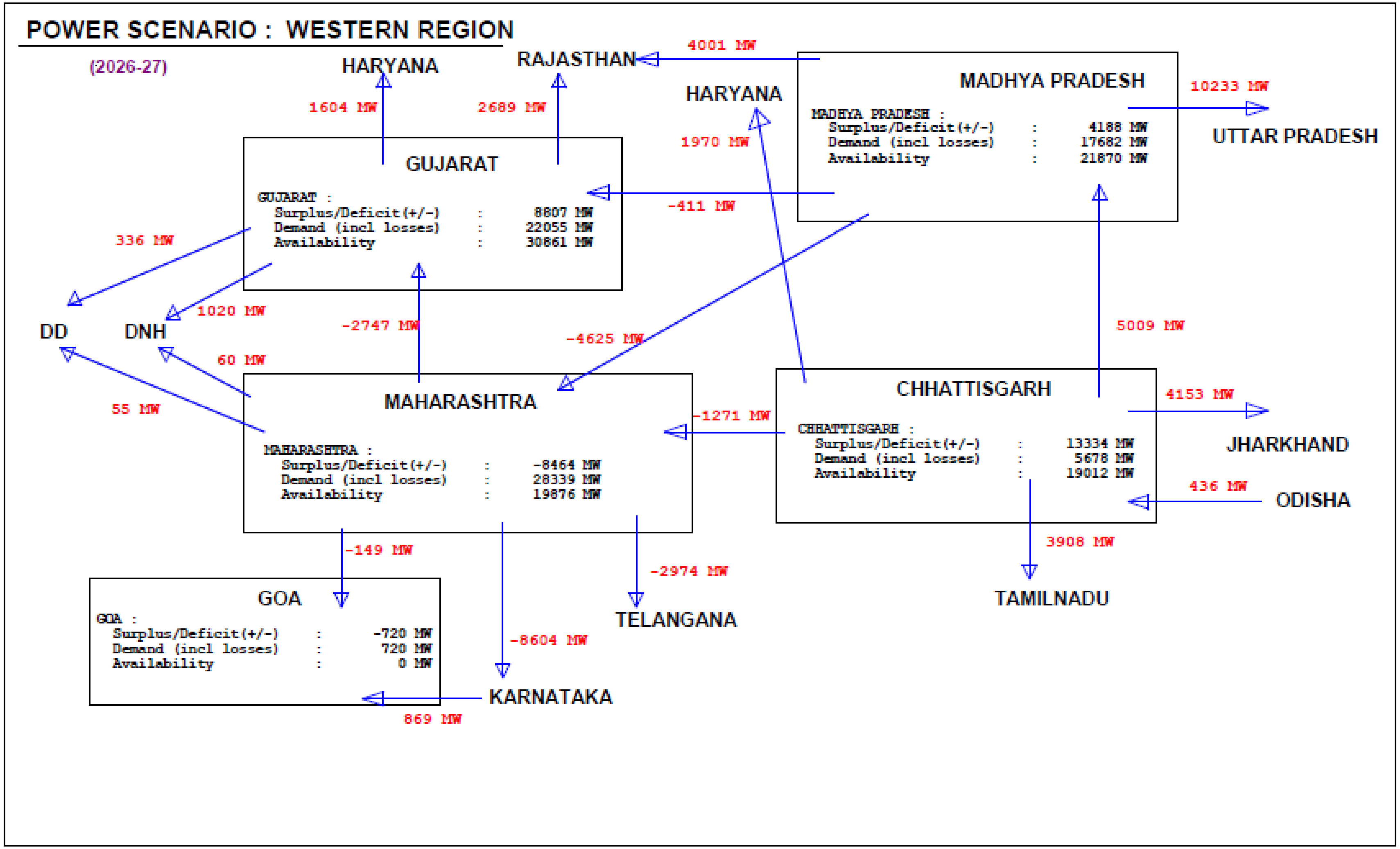
February Solar Peak ANNEX: 5.3c



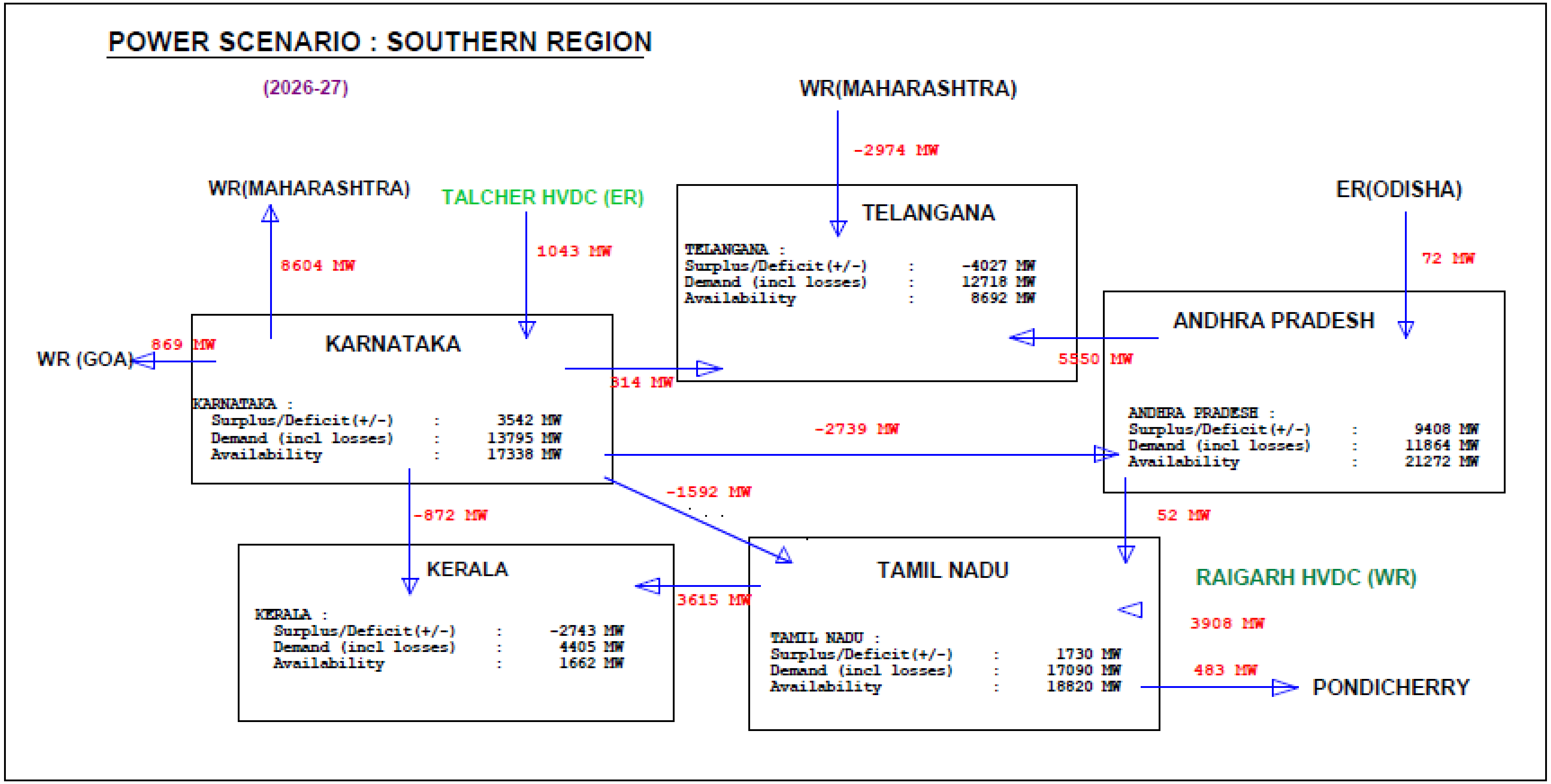
June Evening Peak (Northern Region) **ANNEX: 5.4a**



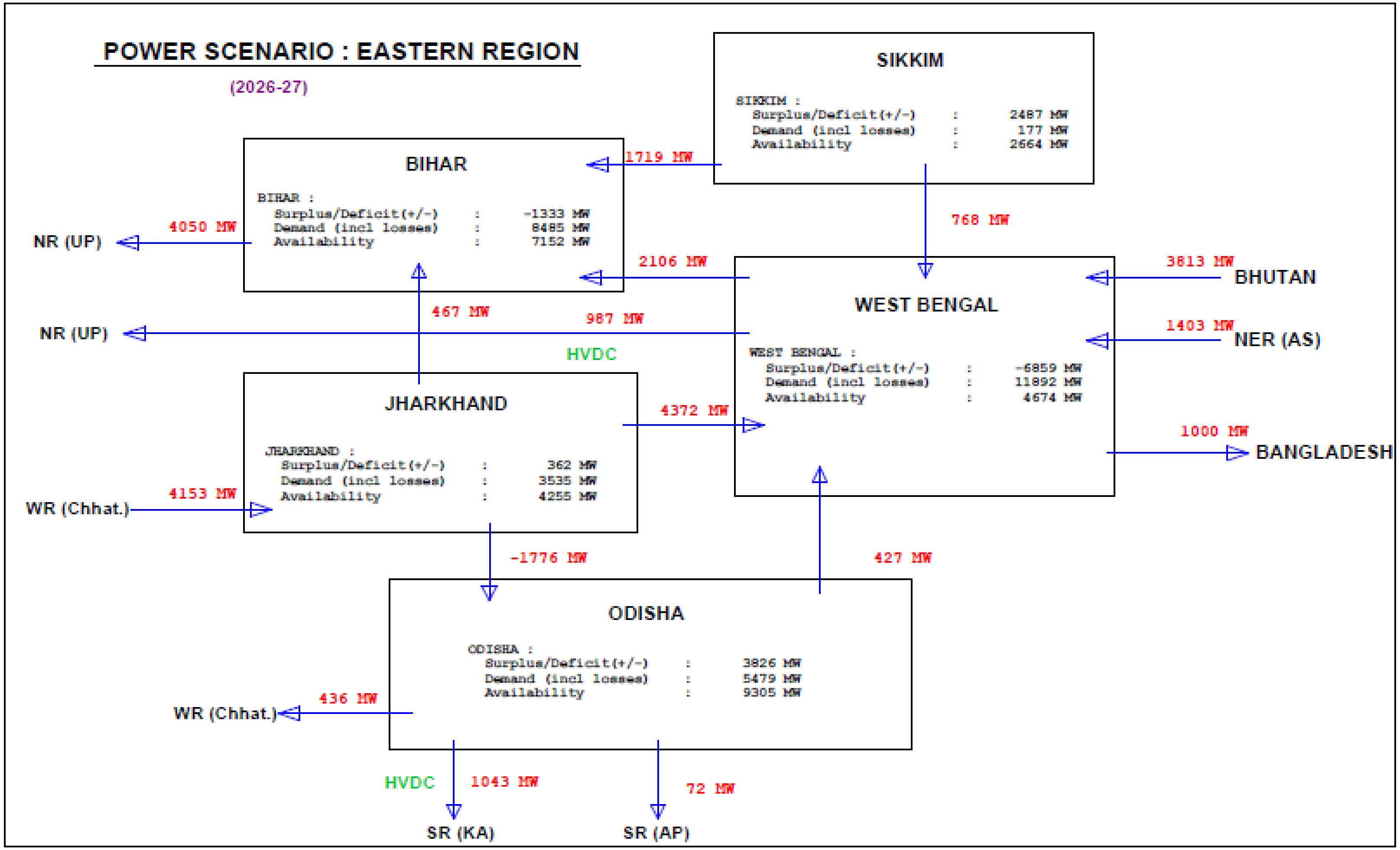
June Evening Peak (Western Region) **ANNEX: 5.4b**



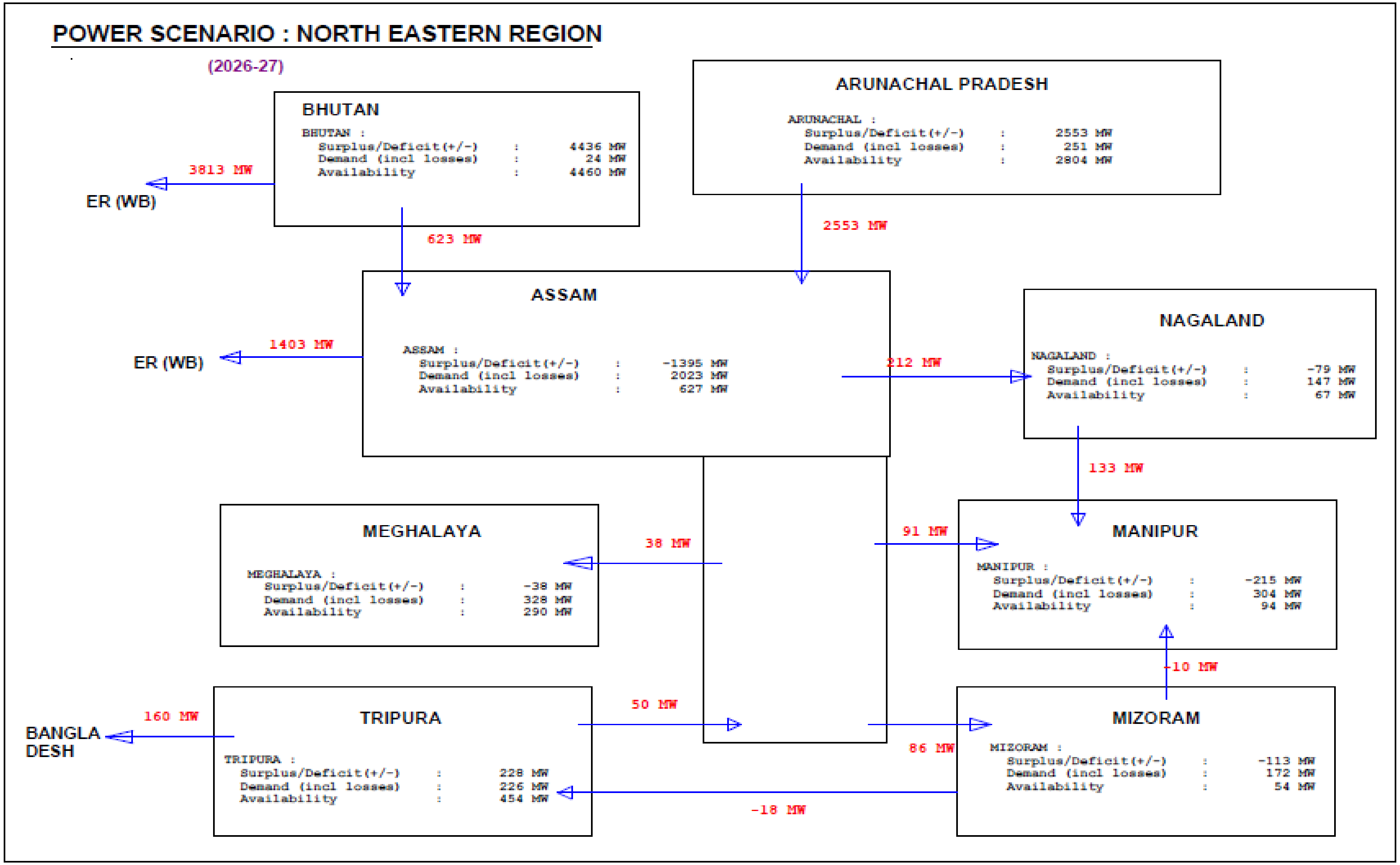
June Evening Peak (Southern Region) **ANNEX: 5.4c**



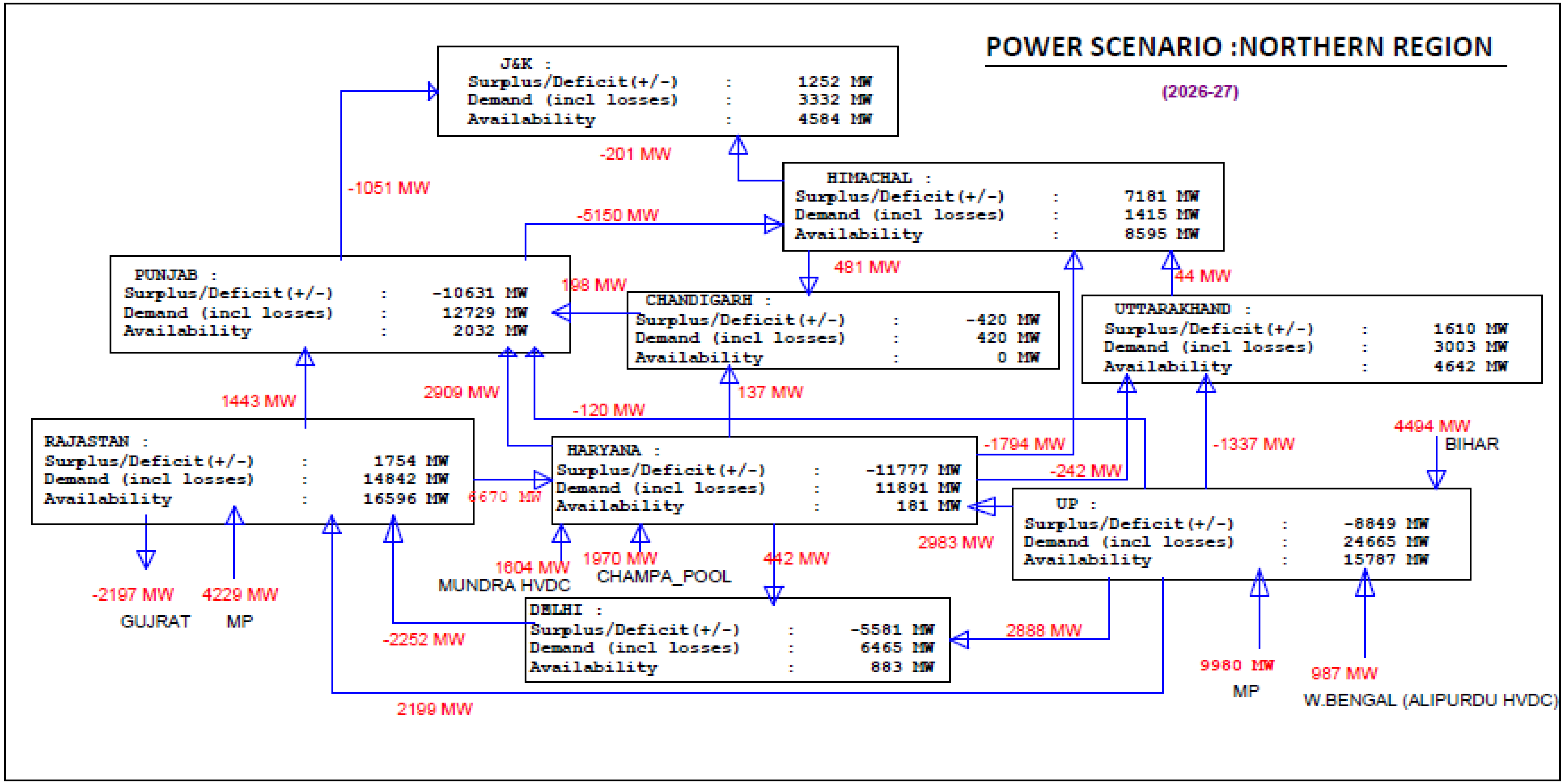
June Evening Peak (Eastern Region) **ANNEX: 5.4d**



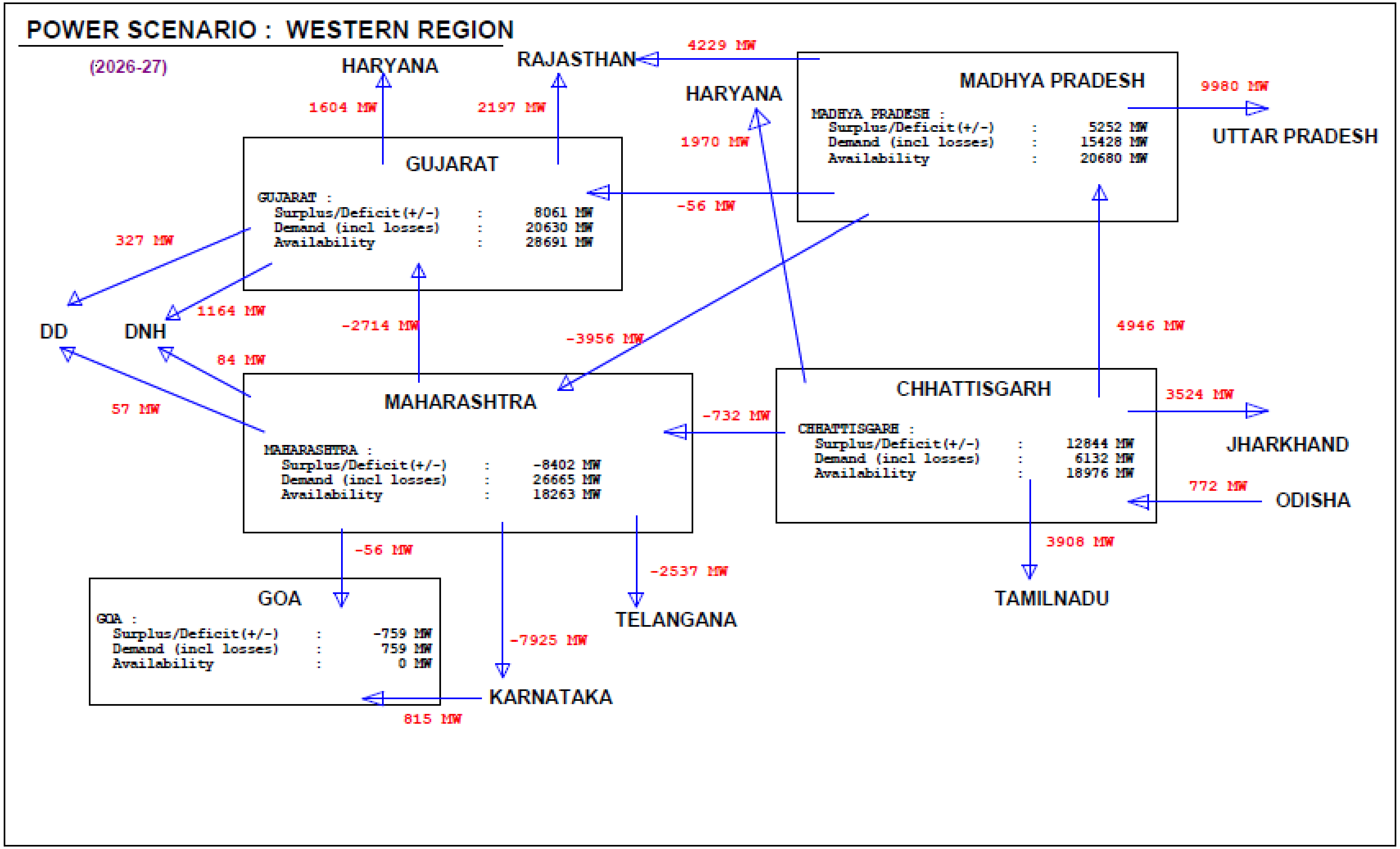
June Evening Peak (North Eastern Region) **ANNEX: 5.4e**



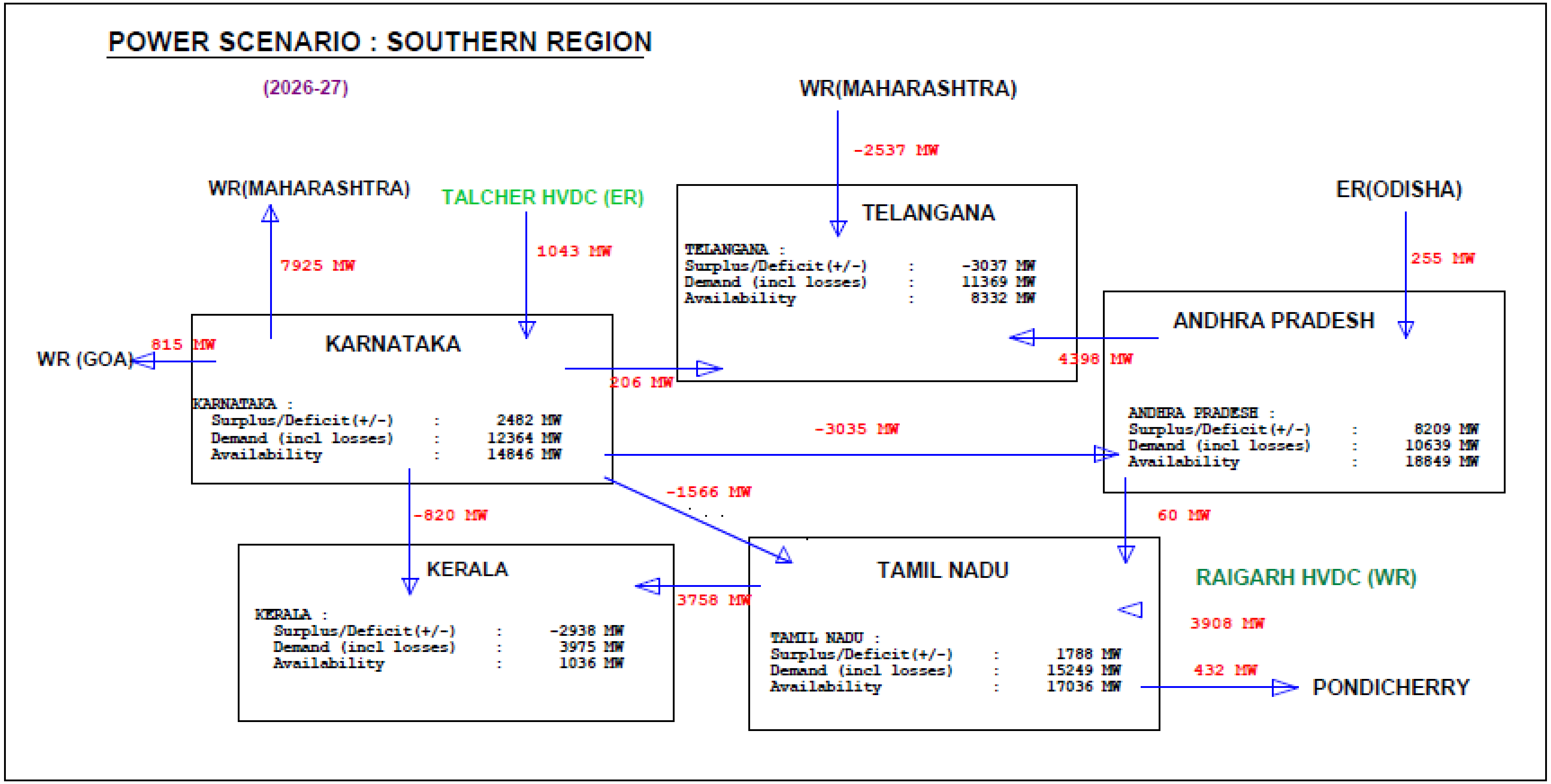
June Night Off-Peak (Northern Region) **ANNEX: 5.5a**



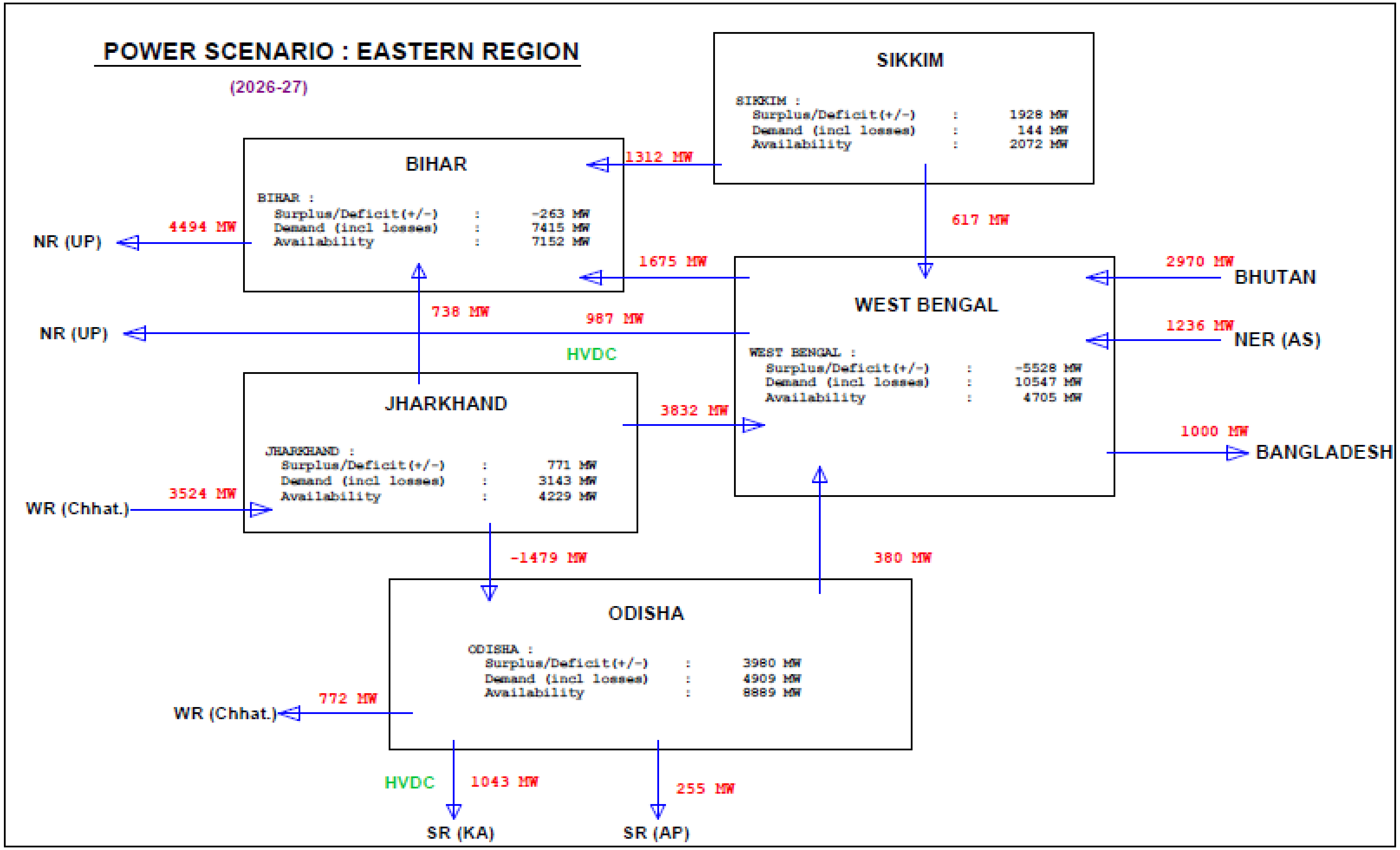
June Night Off-Peak (Western Region) **ANNEX: 5.5b**



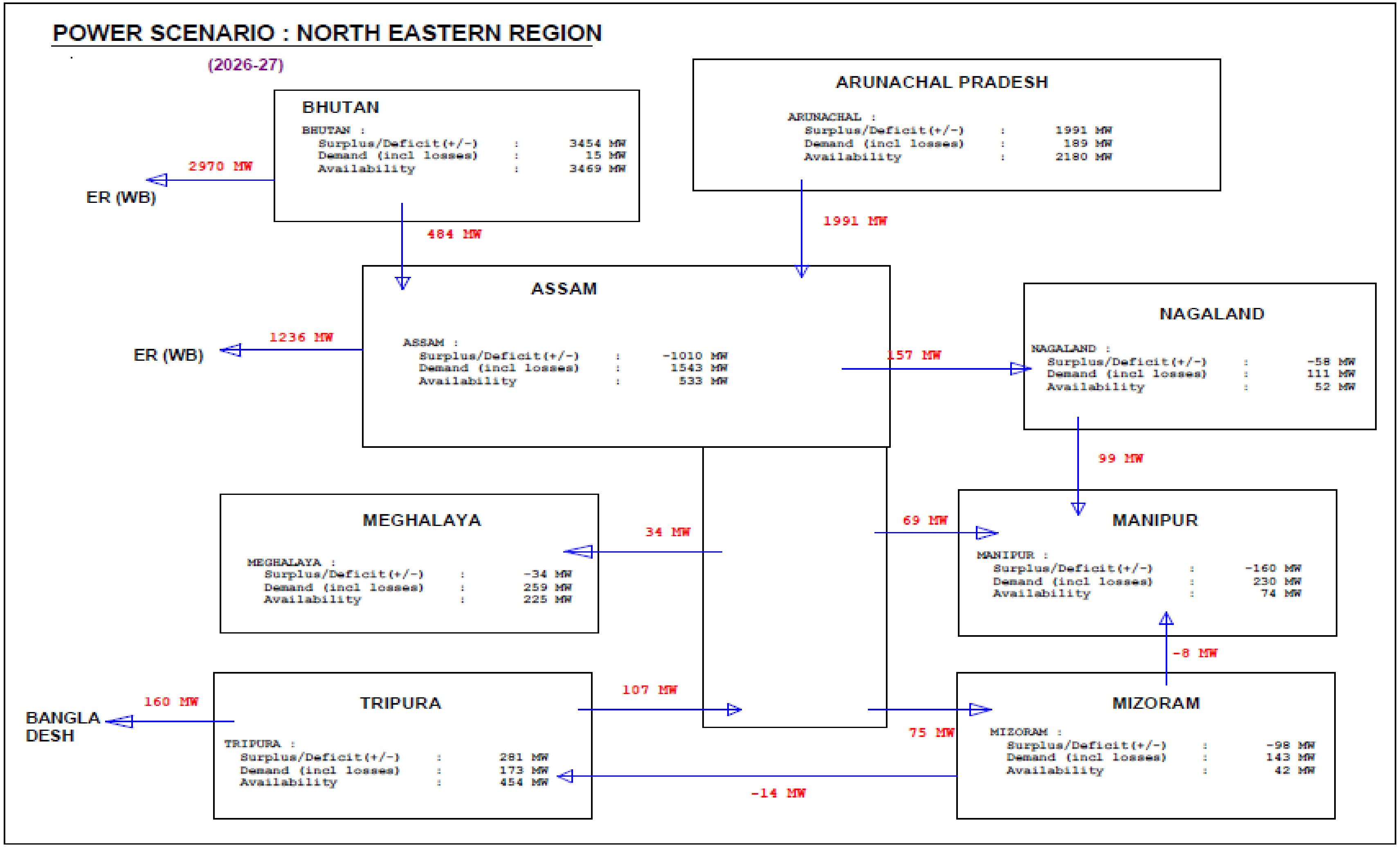
June Night Off-Peak (Southern Region) ANNEX: 5.5c



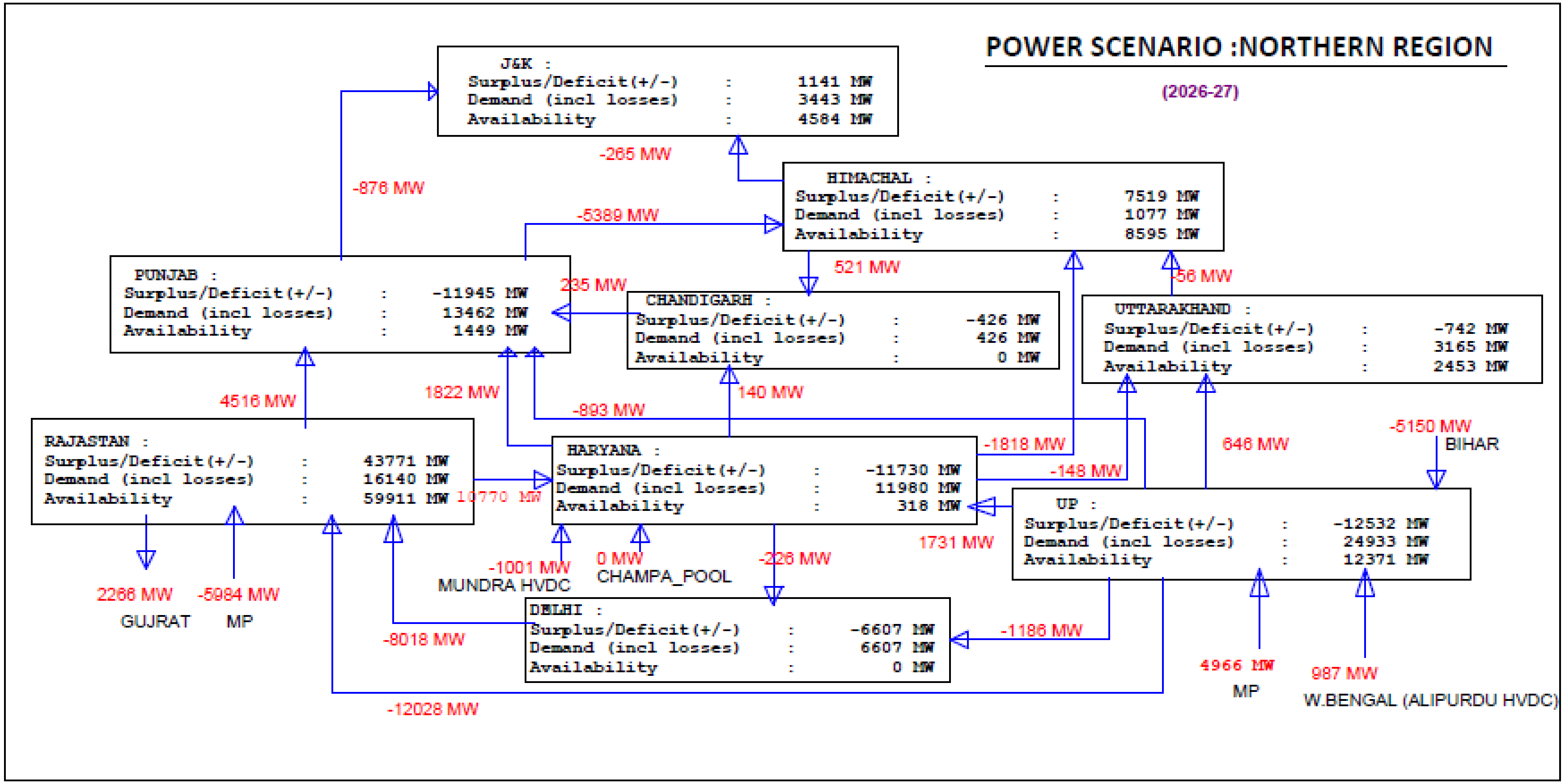
June Night Off-Peak (Eastern Region) ANNEX: 5.5d



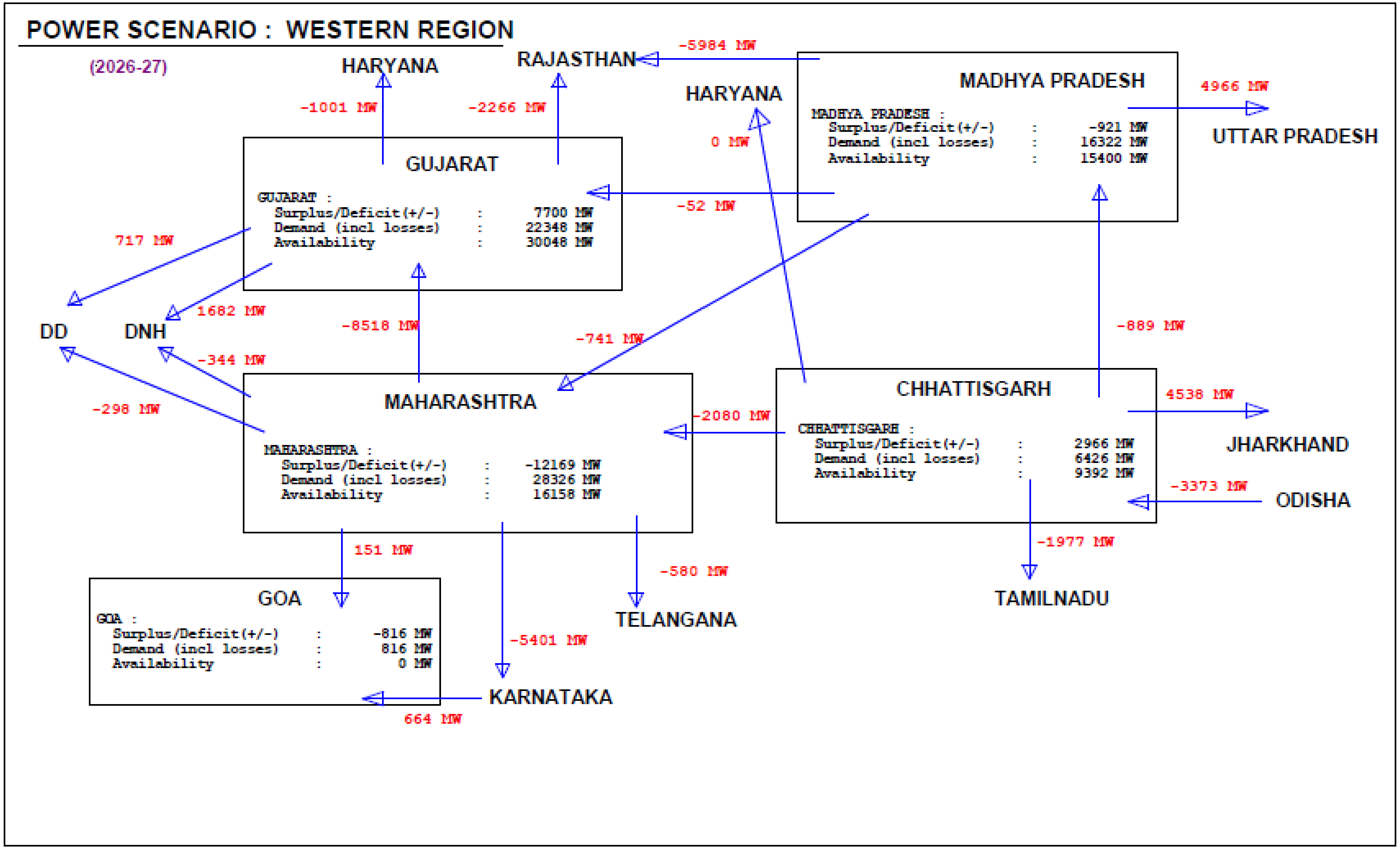
June Night Off-Peak (North Eastern Region) ANNEX: 5.5e



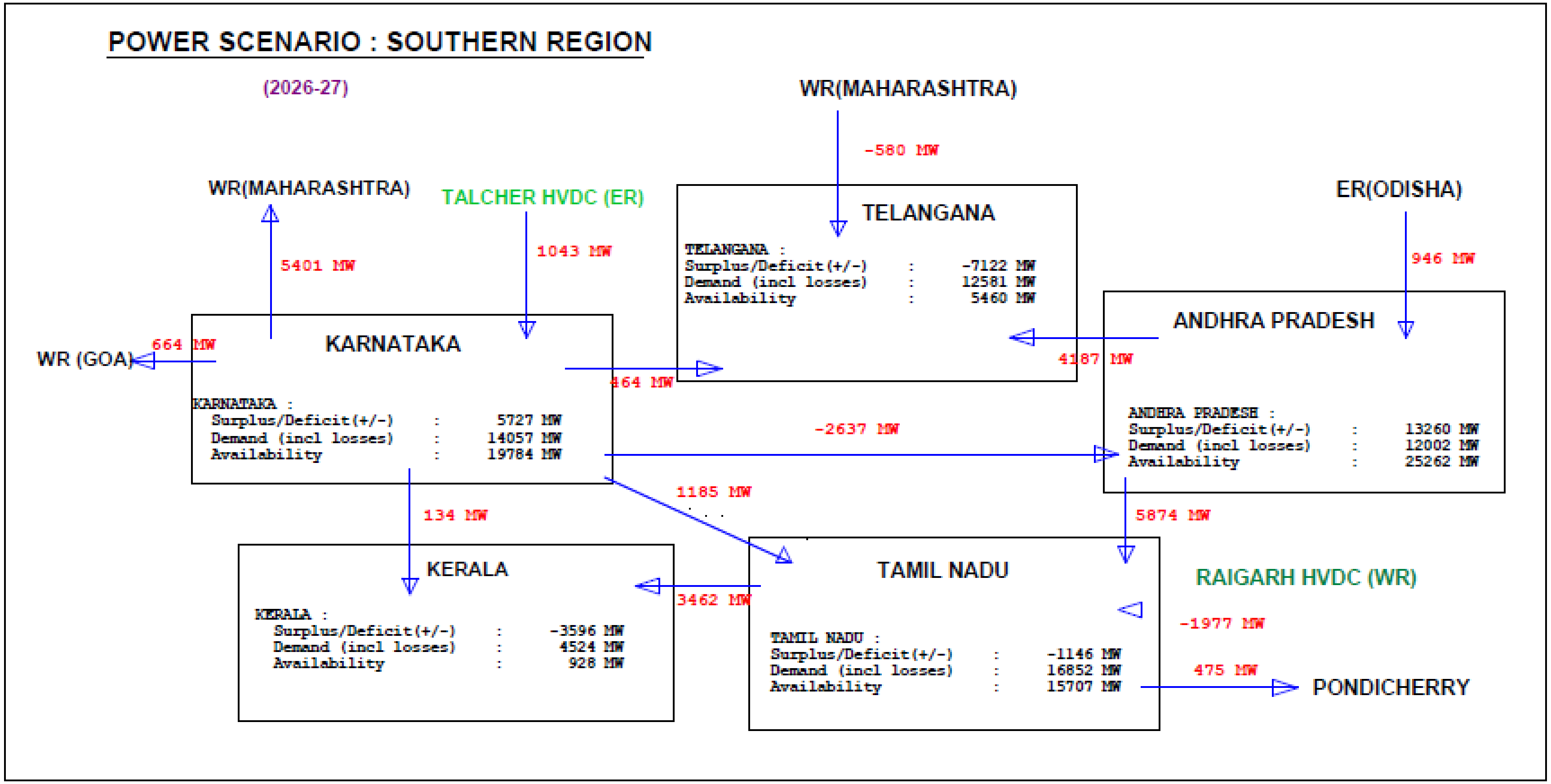
June Solar Peak (Northern Region) **ANNEX: 5.6a**



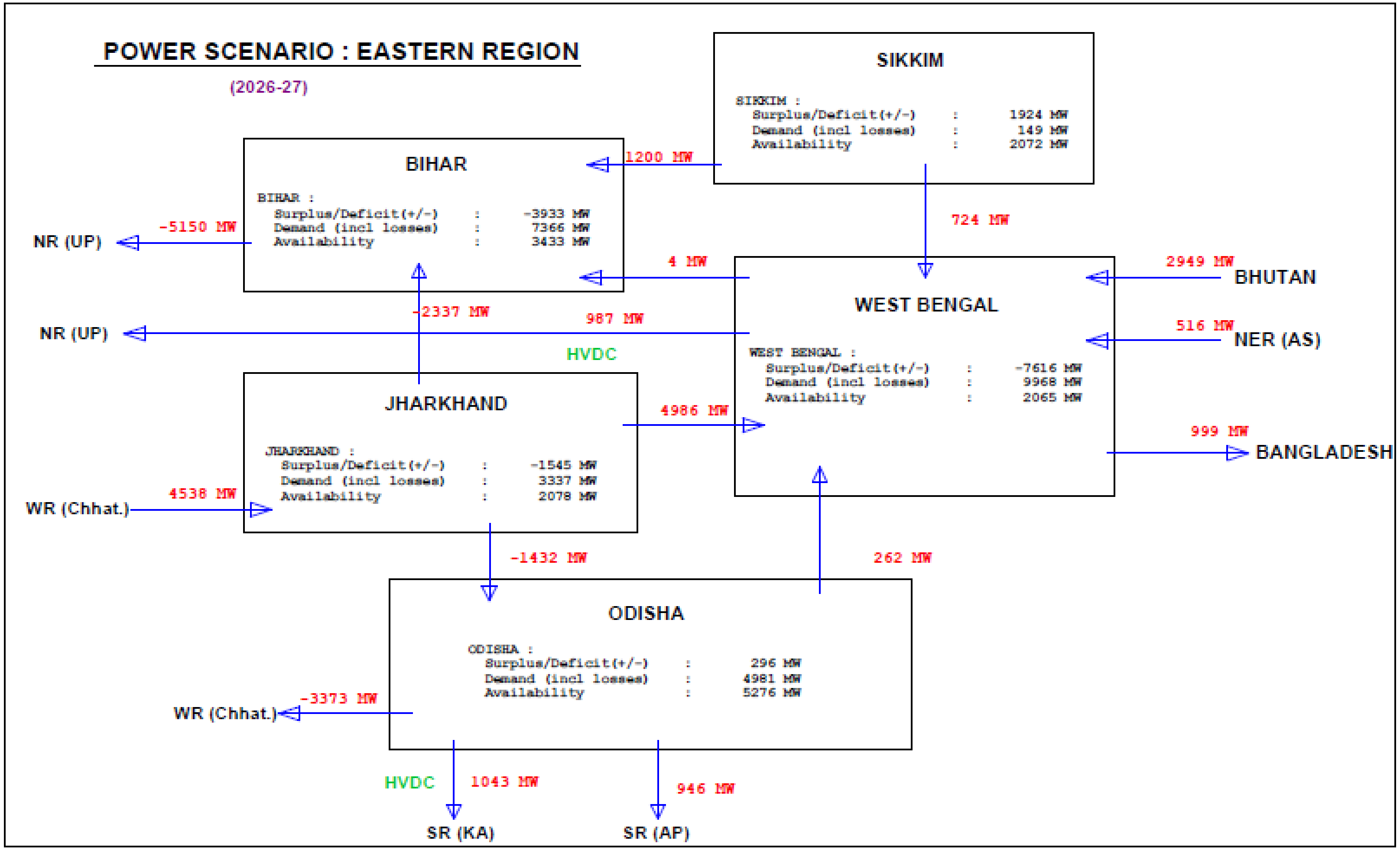
June Solar Peak (Western Region) ANNEX: 5.6b



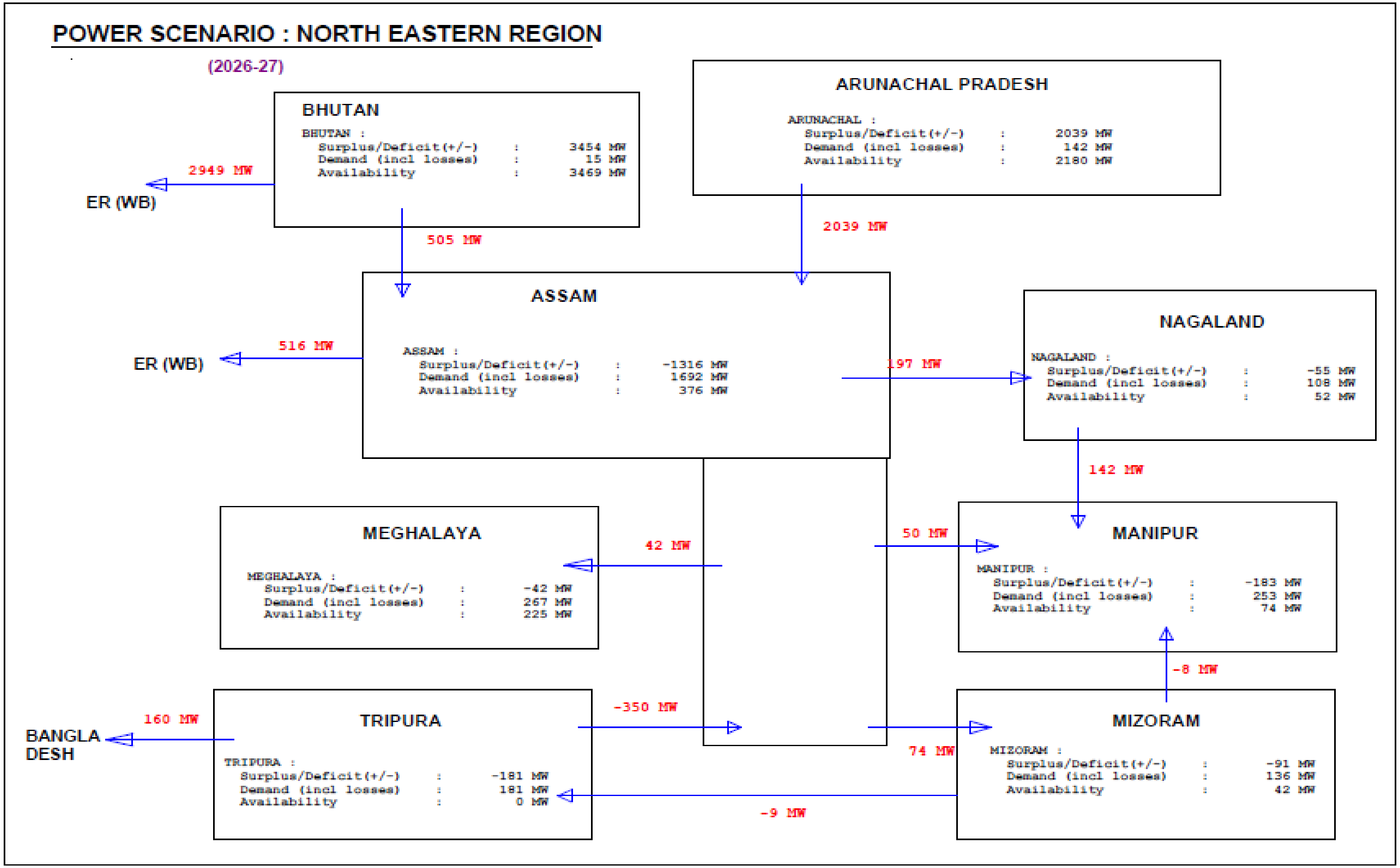
June Solar Peak (Southern Region) **ANNEX: 5.6c**



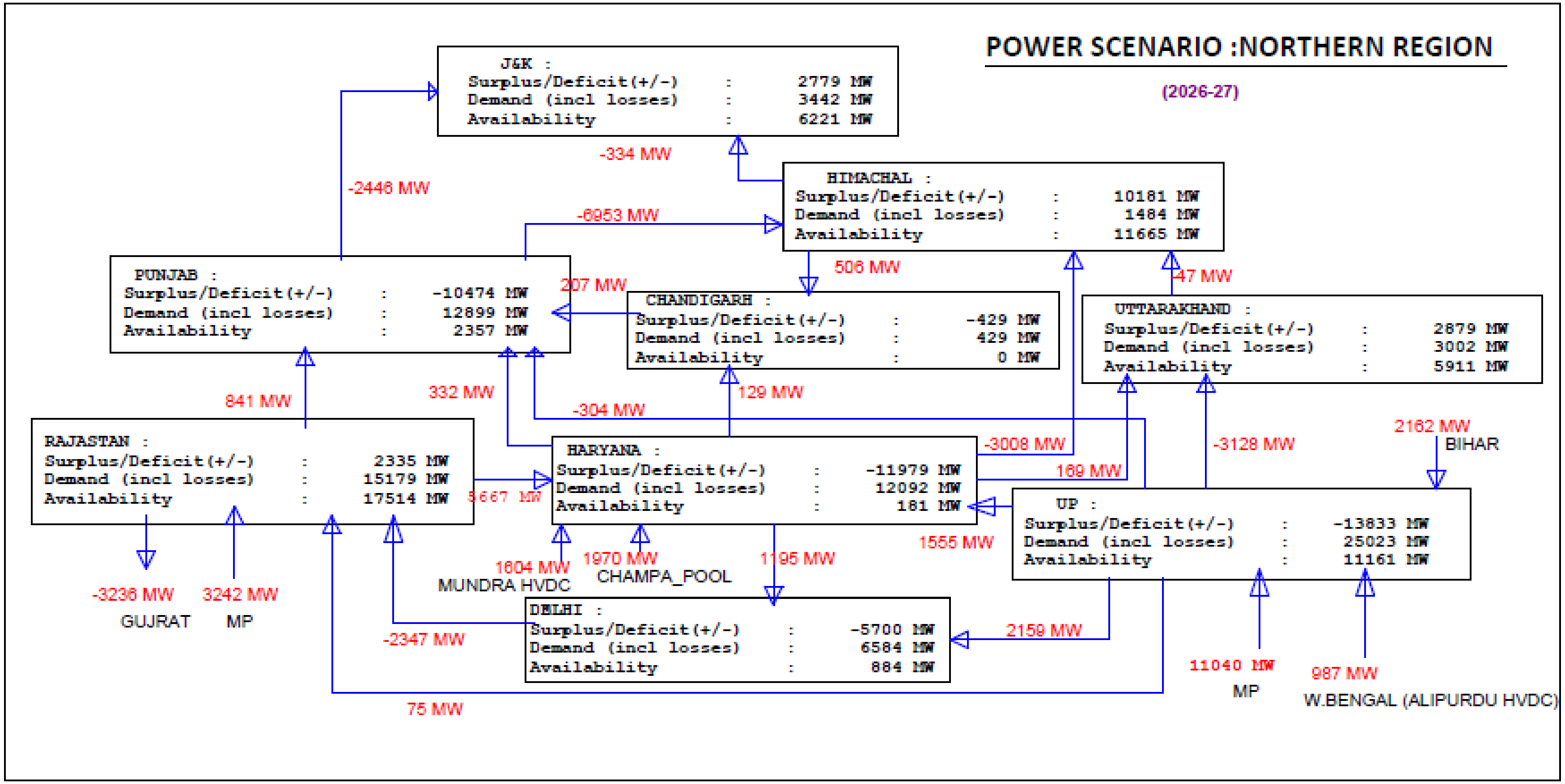
June Solar Peak (Eastern Region) **ANNEX: 5.6d**



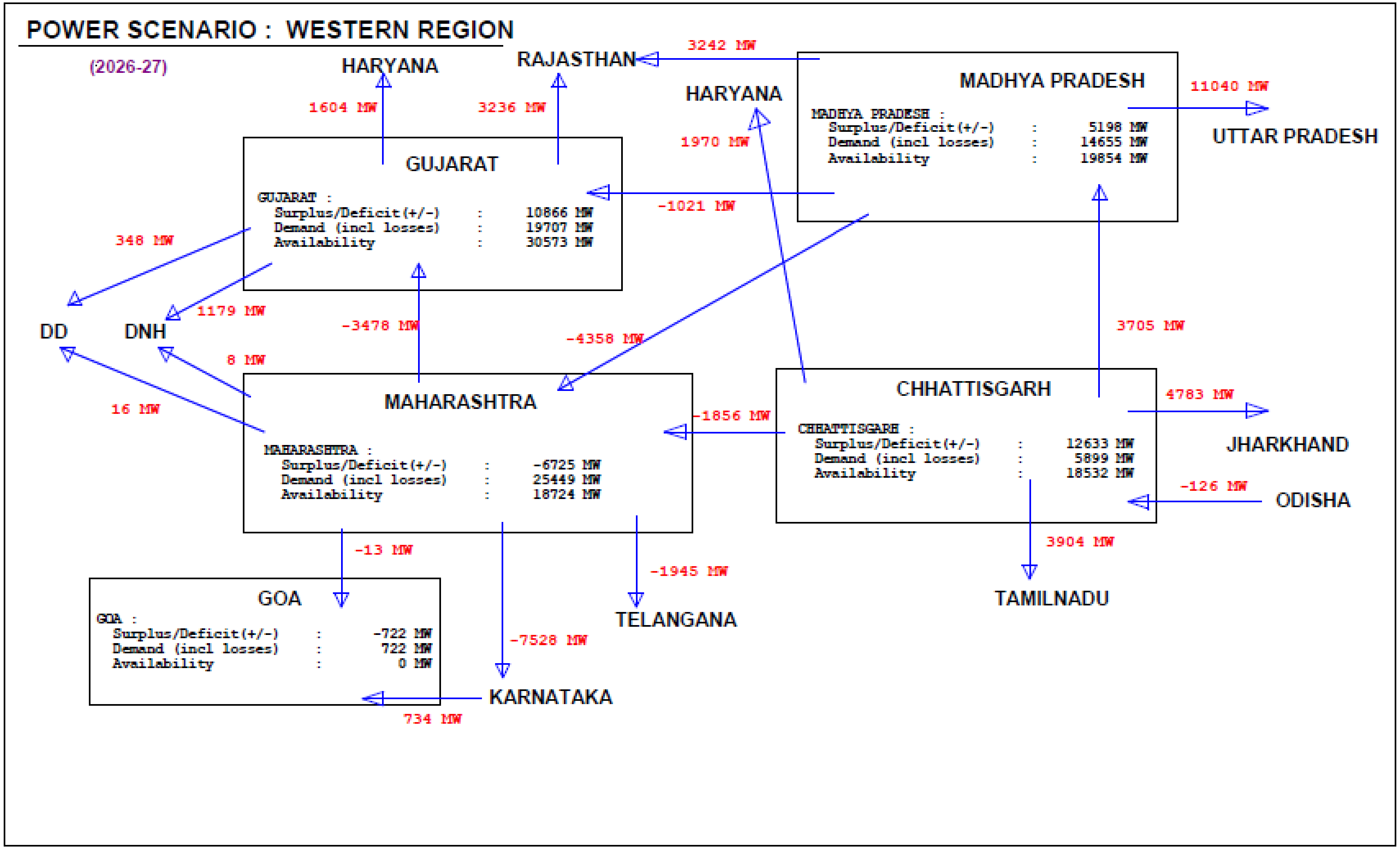
June Solar Peak (North Eastern Region) ANNEX: 5.6e



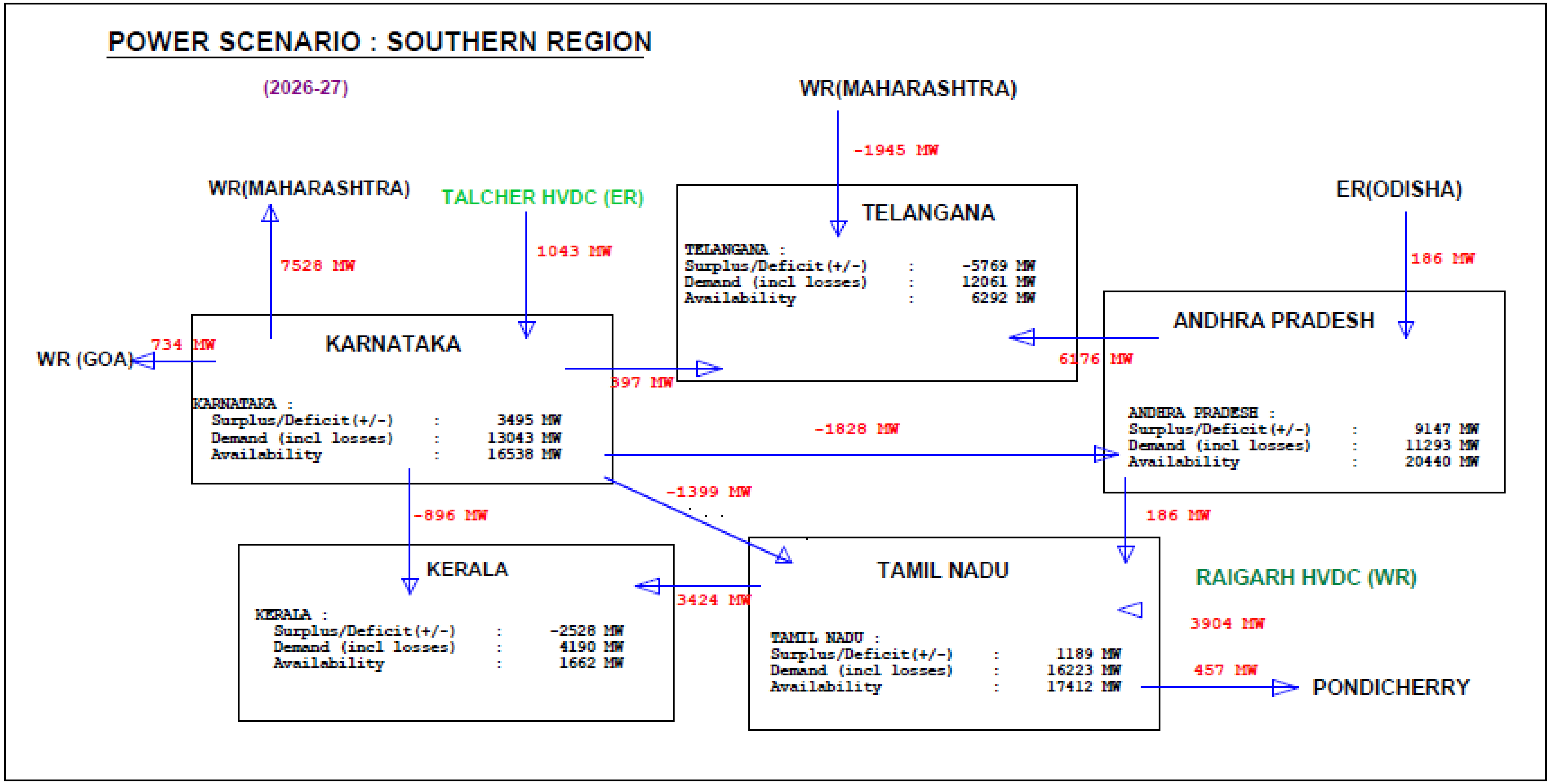
August Evening Peak (Northern Region) ANNEX: 5.7a



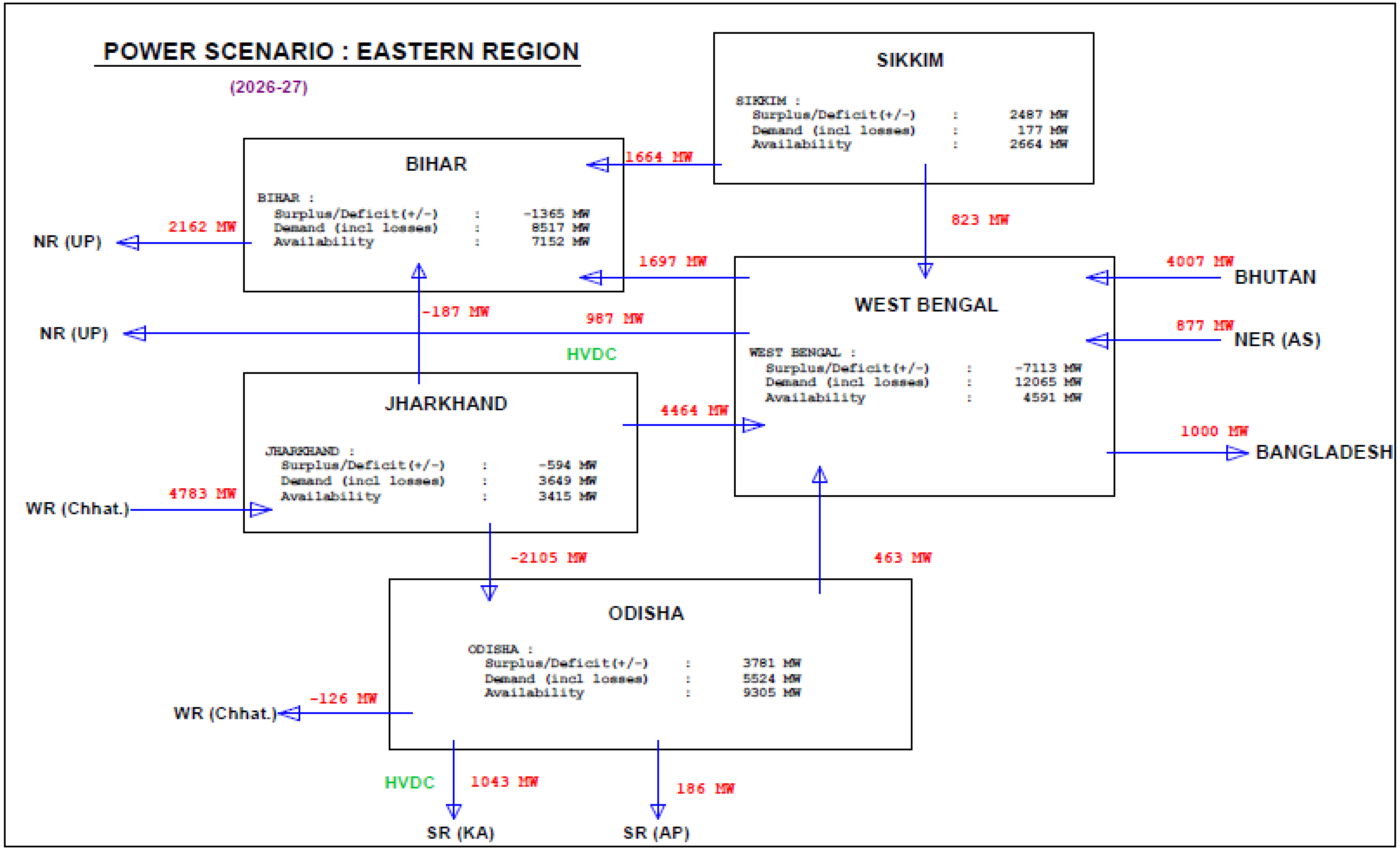
August Evening Peak (Western Region) **ANNEX: 5.7b**



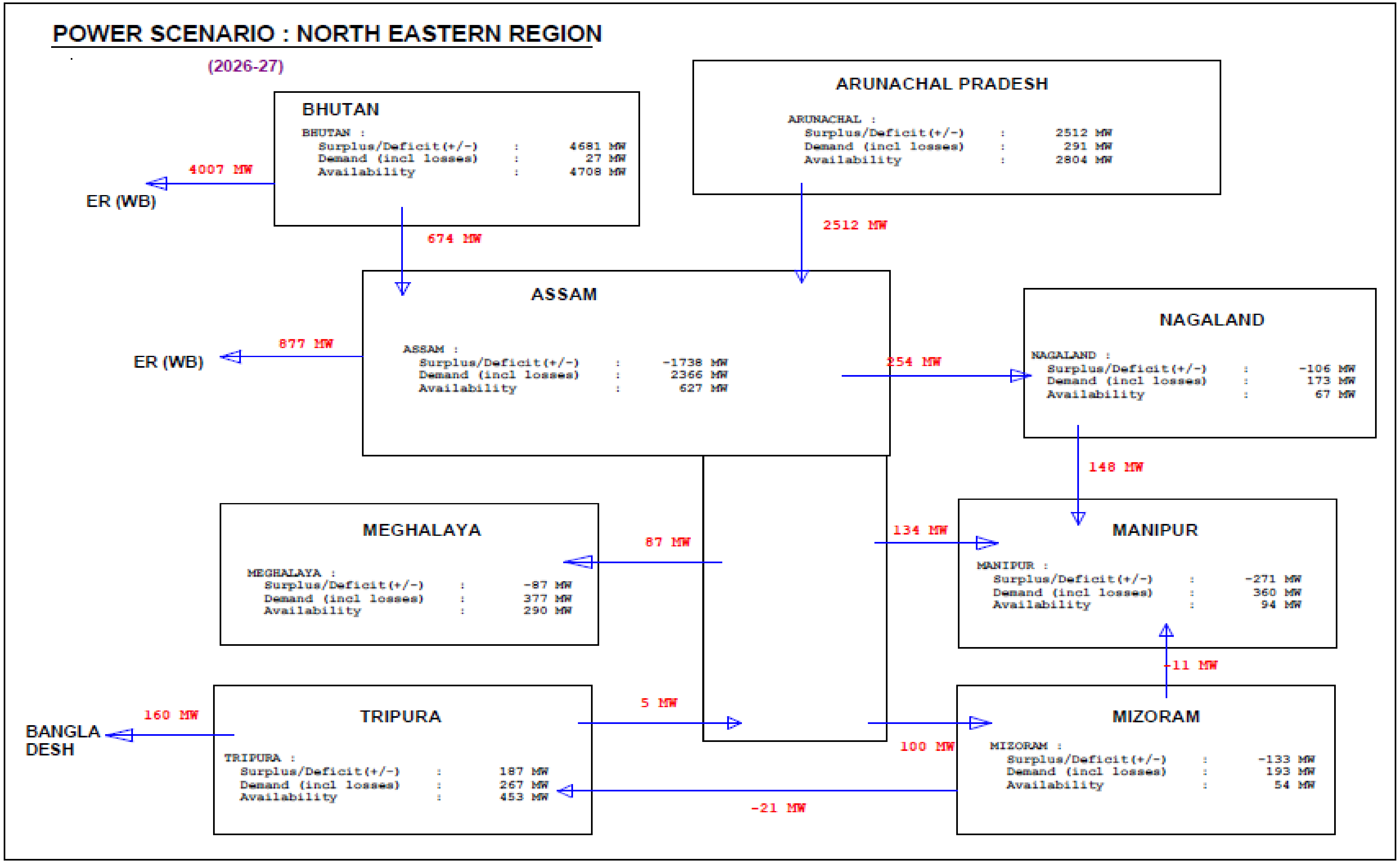
August Evening Peak (Southern Region) **ANNEX: 5.7c**



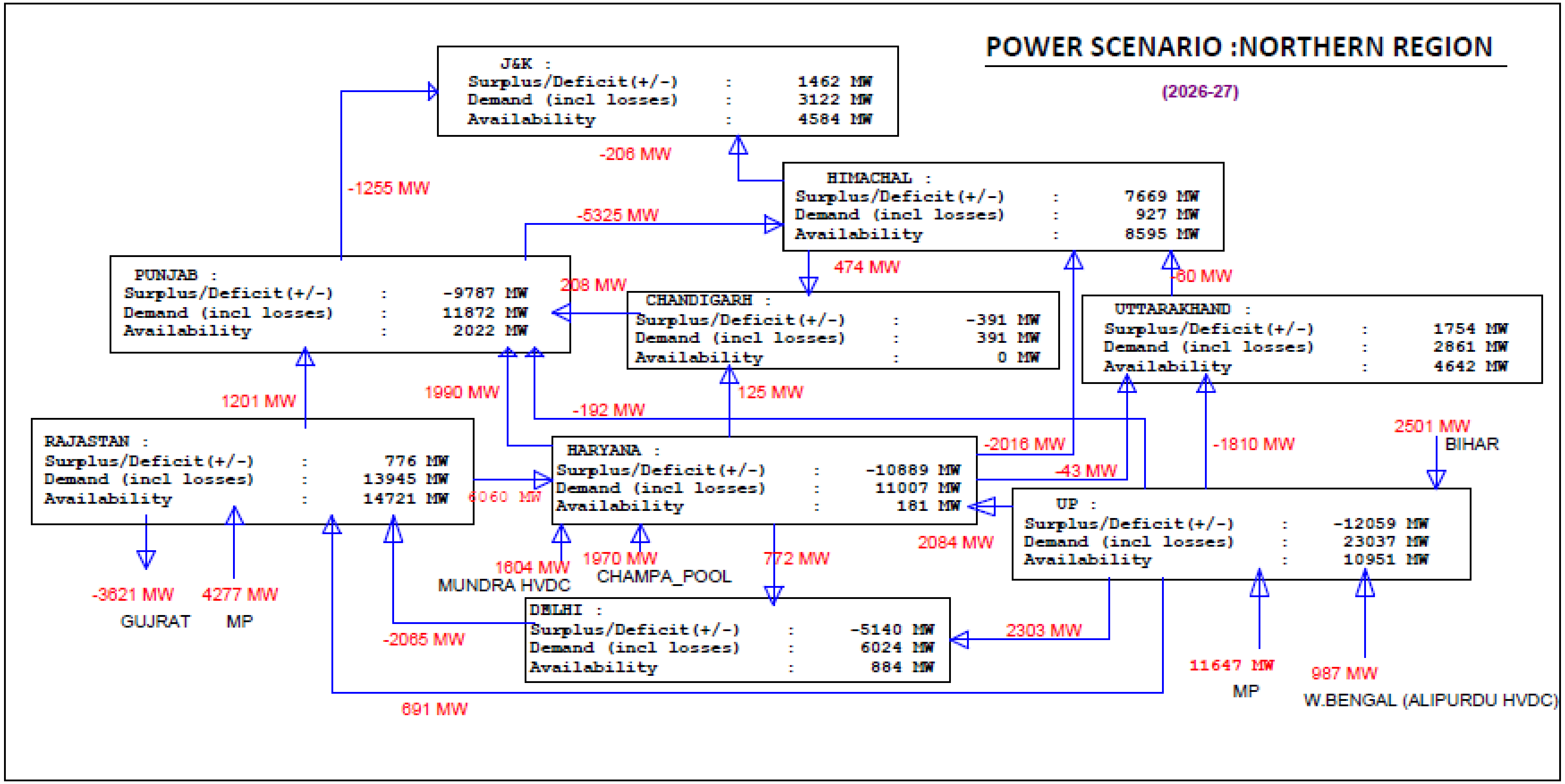
August Evening Peak (Eastern Region) **ANNEX: 5.7d**

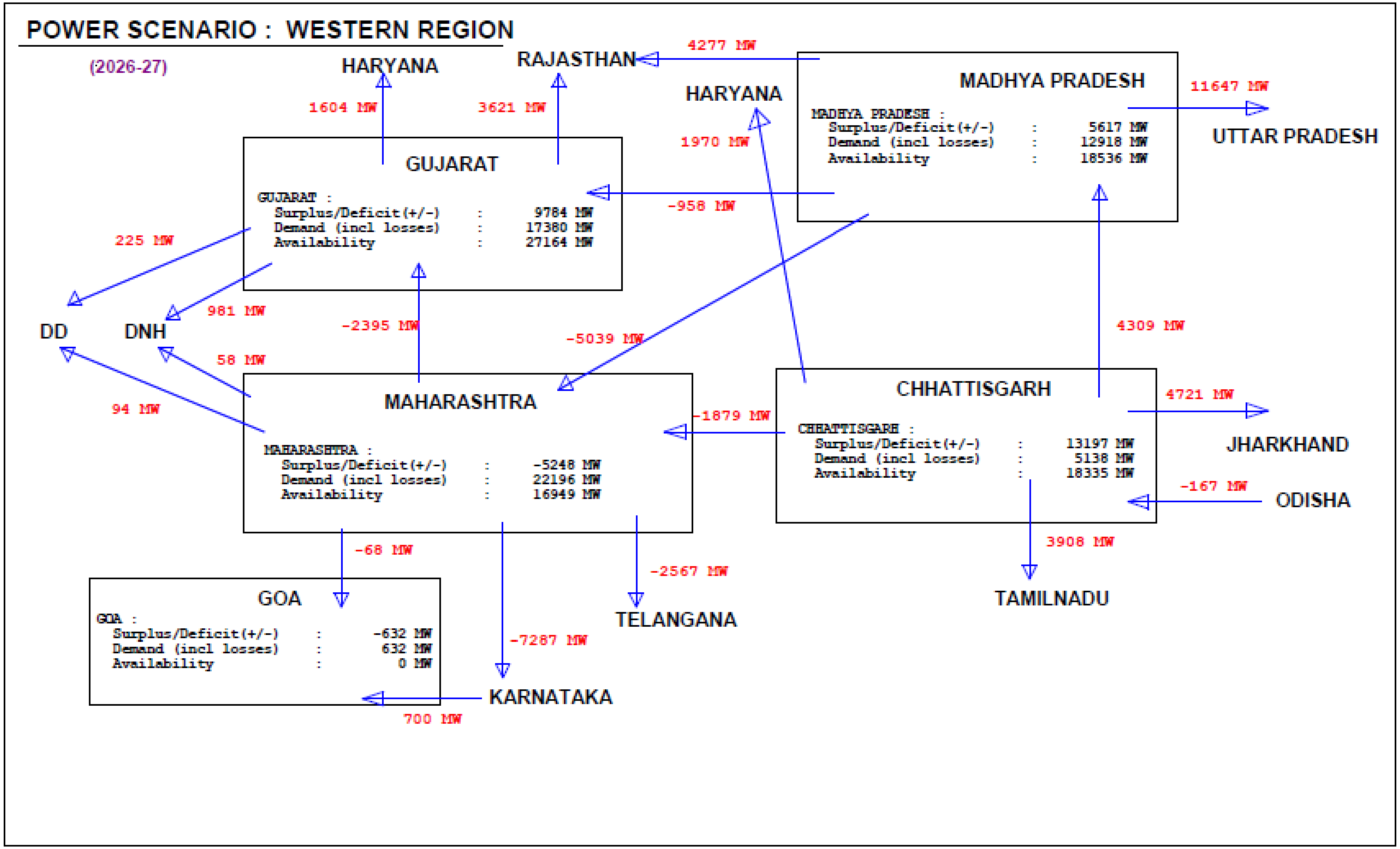


August Evening Peak (North Eastern Region) ANNEX: 5.7e

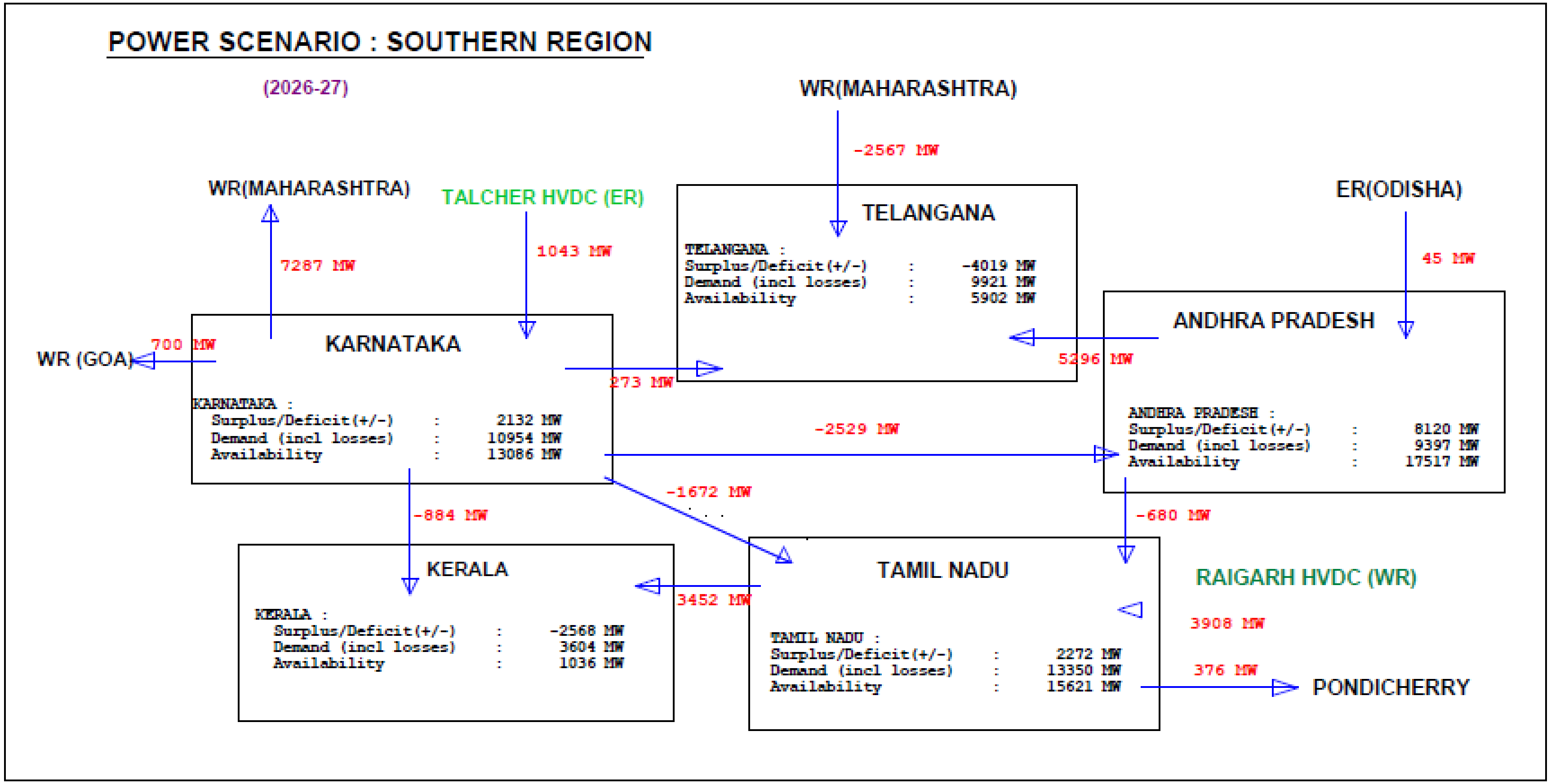


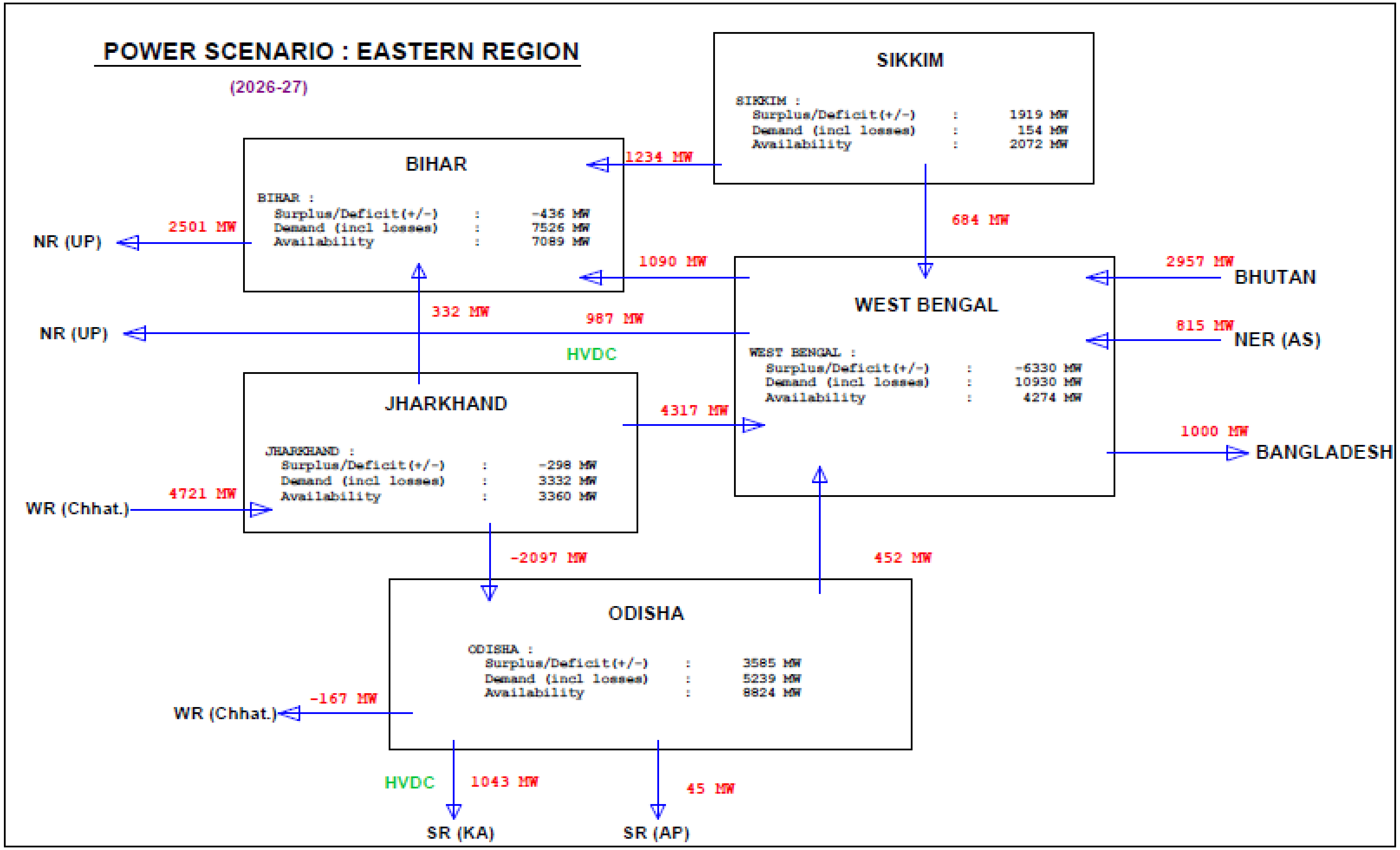
August Night Off-Peak (Northern region) **ANNEX: 5.8a**



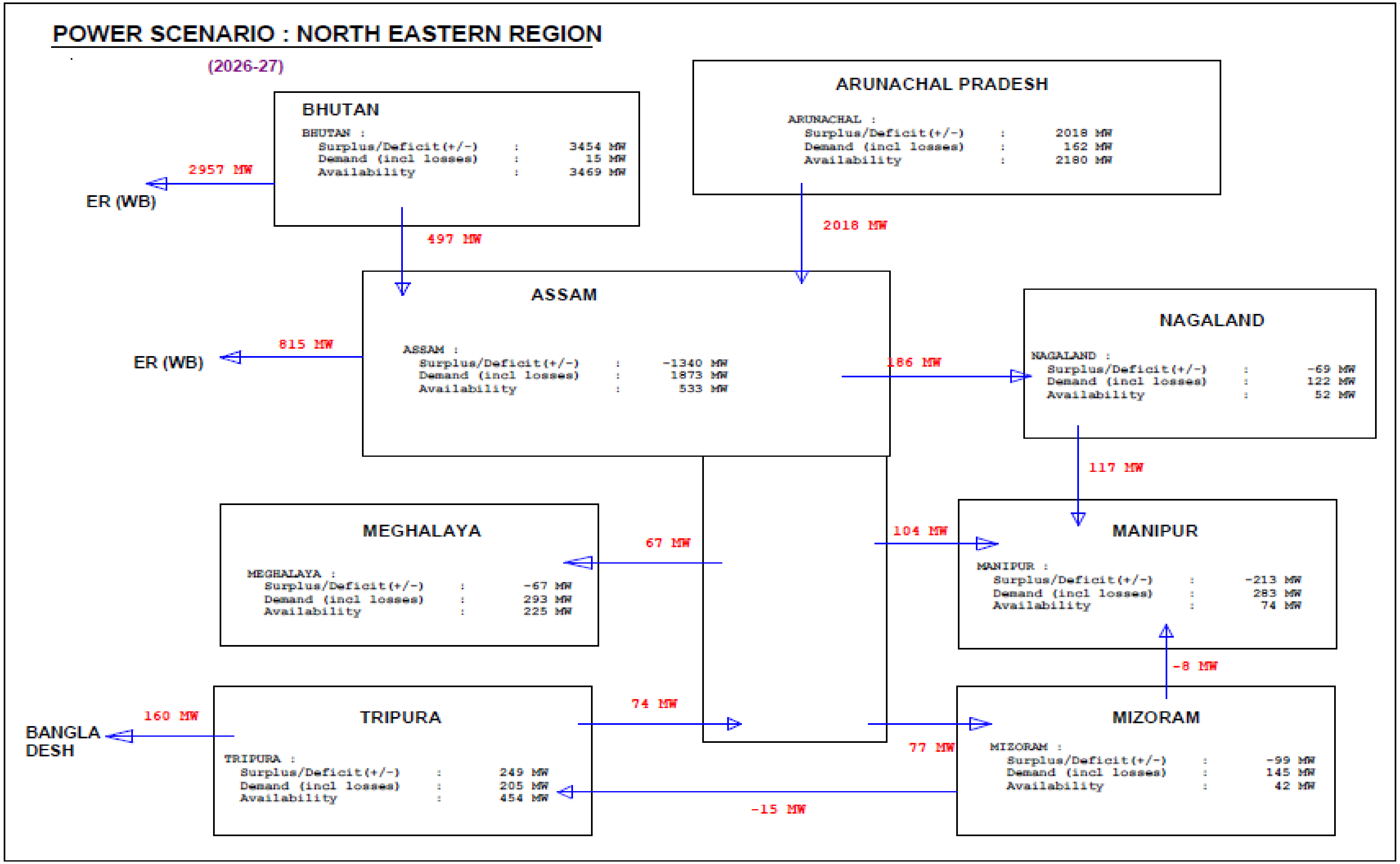

POWER SCENARIO : WESTERN REGION
(2026-27)
HARYANA
RAJASTHAN
4277 MW
HARYANA
MADHYA PRADESH
11647 MW
1604 MW
3621 MW
1970 MW
MADHYA PRADESH :
Surplus/Deficit(+/-) : 5617 MW
Demand (incl losses) : 12918 MW
Availability : 18536 MW
UTTAR PRADESH
GUJARAT
GUJARAT :
Surplus/Deficit(+/-) : 9784 MW
Demand (incl losses) : 17380 MW
Availability : 27164 MW
-958 MW
225 MW
981 MW
DD
DNH
-2395 MW
-5039 MW
4309 MW
58 MW
94 MW
MAHARASHTRA
MAHARASHTRA :
Surplus/Deficit(+/-) : -5248 MW
Demand (incl losses) : 22196 MW
Availability : 16949 MW
-1879 MW
CHHATTISGARH
CHHATTISGARH :
Surplus/Deficit(+/-) : 13197 MW
Demand (incl losses) : 5138 MW
Availability : 18335 MW
4721 MW
JHARKHAND
-167 MW
ODISHA
3908 MW
TAMILNADU
-68 MW
-2567 MW
GOA
GOA :
Surplus/Deficit(+/-) : -632 MW
Demand (incl losses) : 632 MW
Availability : 0 MW
TELANGANA
-7287 MW
KARNATAKA
700 MW

August Night Off-Peak (Southern region) **ANNEX: 5.8c**

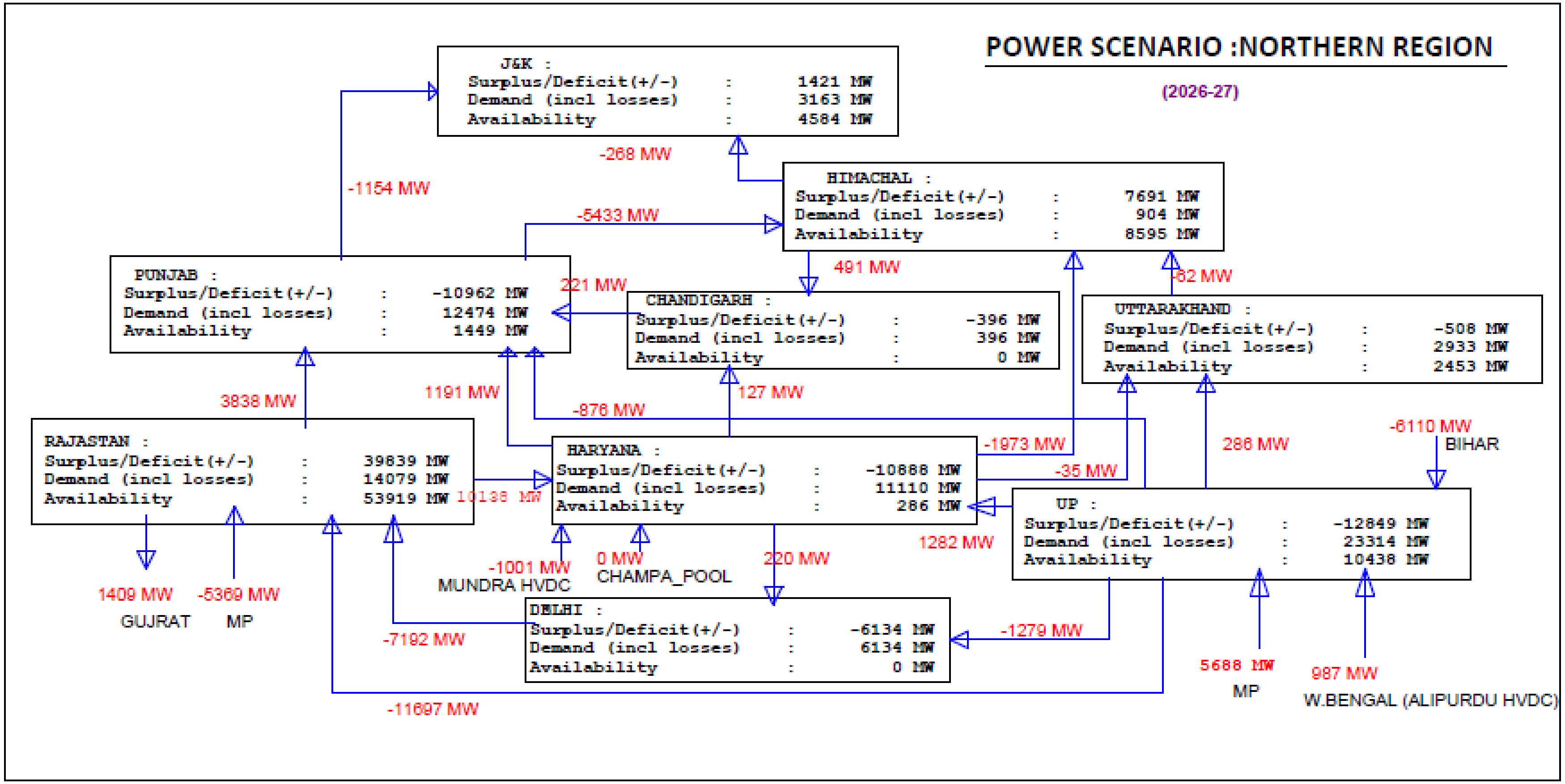



POWER SCENARIO : EASTERN REGION
(2026-27)
SIKKIM
SIKKIM :
Surplus/Deficit(+/-) : 1919 MW
Demand (incl losses) : 154 MW
Availability : 2072 MW
BIHAR
BIHAR :
Surplus/Deficit(+/-) : -436 MW
Demand (incl losses) : 7526 MW
Availability : 7089 MW
1234 MW
2501 MW
NR (UP)
684 MW
1090 MW
2957 MW
BHUTAN
WEST BENGAL
332 MW
987 MW
NR (UP)
HVDC
815 MW
NER (AS)
WEST BENGAL :
Surplus/Deficit(+/-) : -6330 MW
Demand (incl losses) : 10930 MW
Availability : 4274 MW
JHARKHAND
4317 MW
1000 MW
BANGLADESH
JHARKHAND :
Surplus/Deficit(+/-) : -298 MW
Demand (incl losses) : 3332 MW
Availability : 3360 MW
4721 MW
WR (Chhat.)
-2097 MW
452 MW
ODISHA
ODISHA :
Surplus/Deficit(+/-) : 3585 MW
Demand (incl losses) : 5239 MW
Availability : 8824 MW
-167 MW
WR (Chhat.)
HVDC
1043 MW
45 MW
SR (KA)
SR (AP)

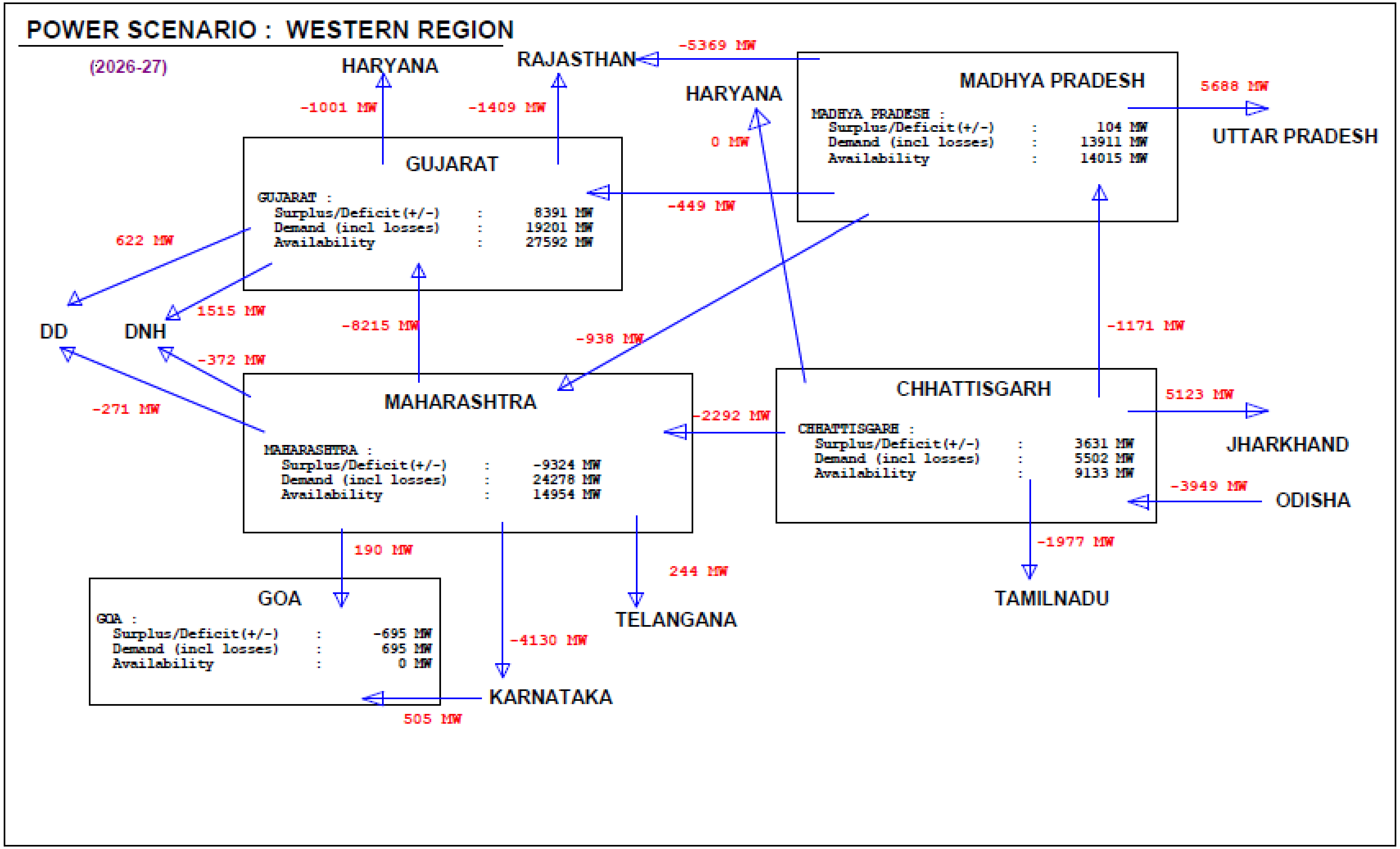
August Night Off-Peak (North Eastern region) **ANNEX: 5.8e**



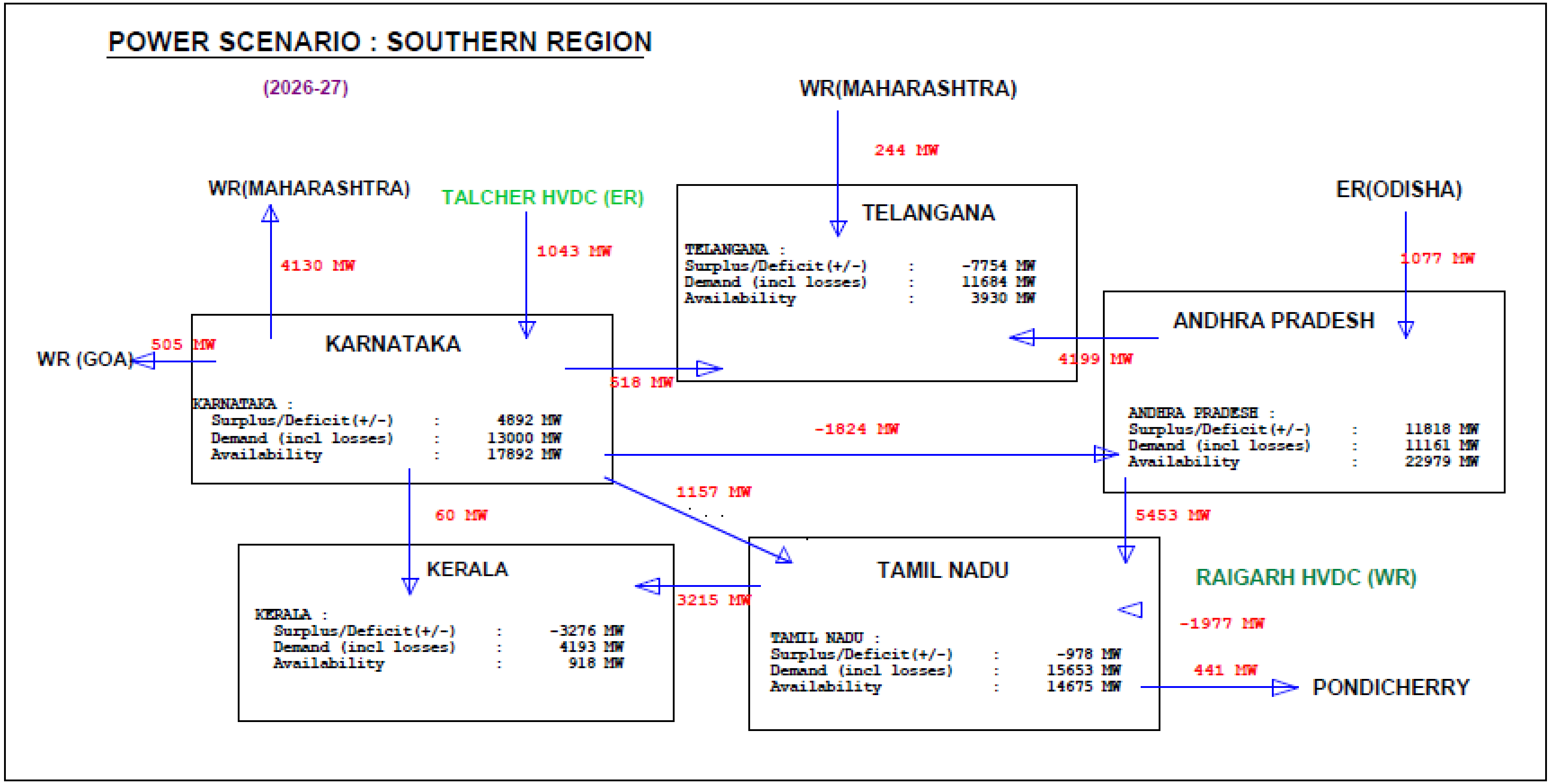
August Solar Peak (Northern region) ANNEX: 5.9a



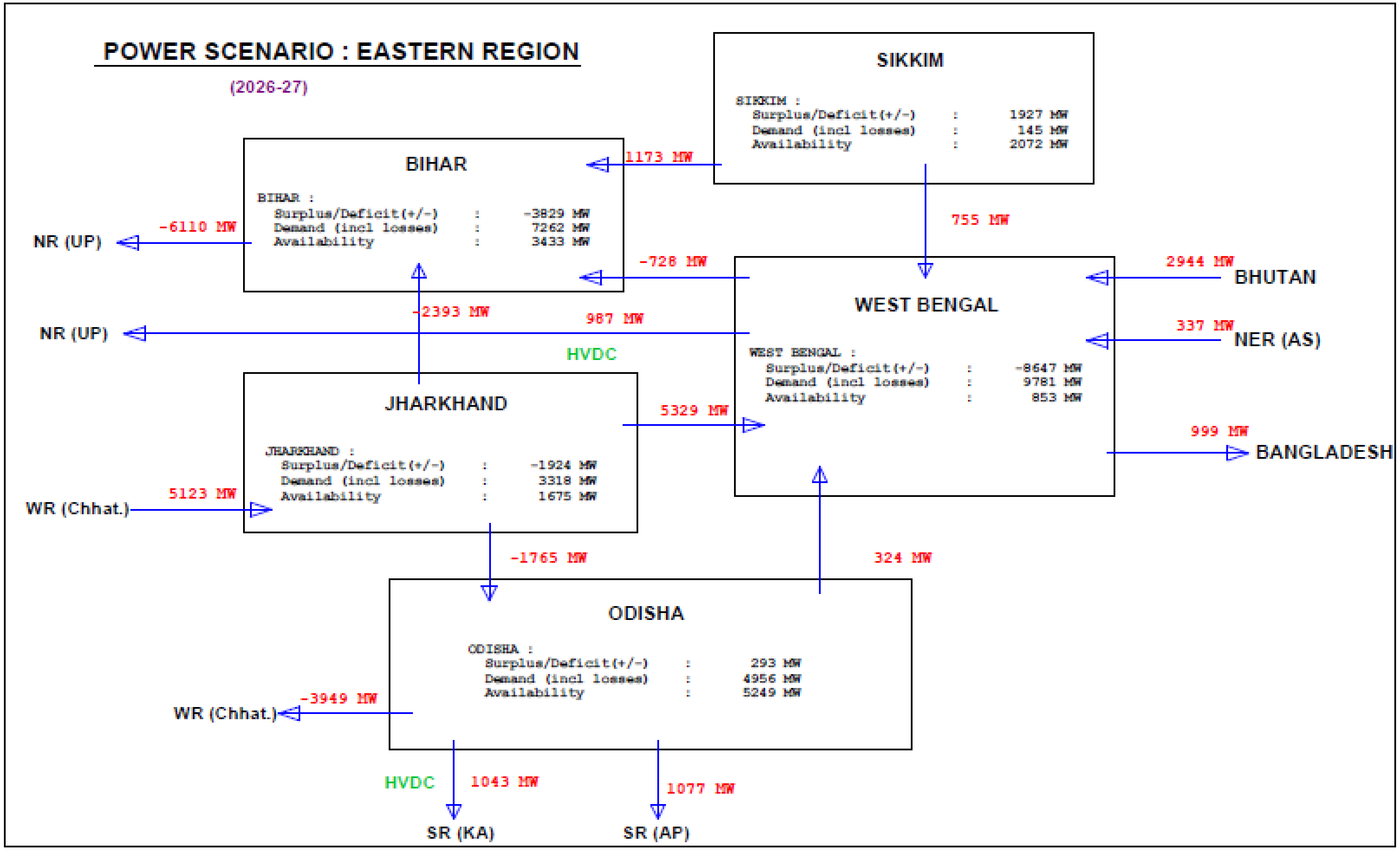
August Solar Peak (Western region) **ANNEX: 5.9b**



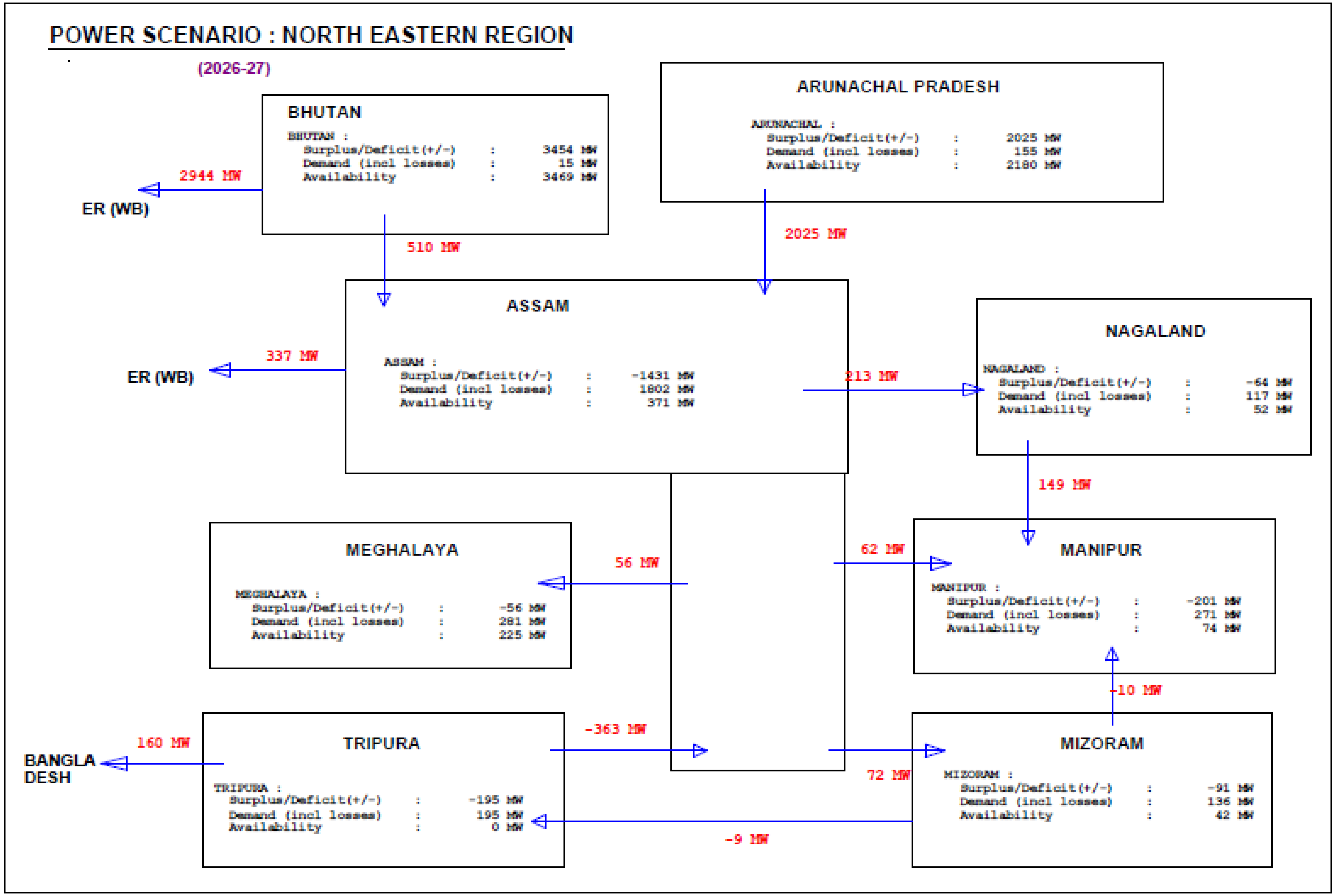
August Solar Peak (Southern region) **ANNEX: 5.9c**



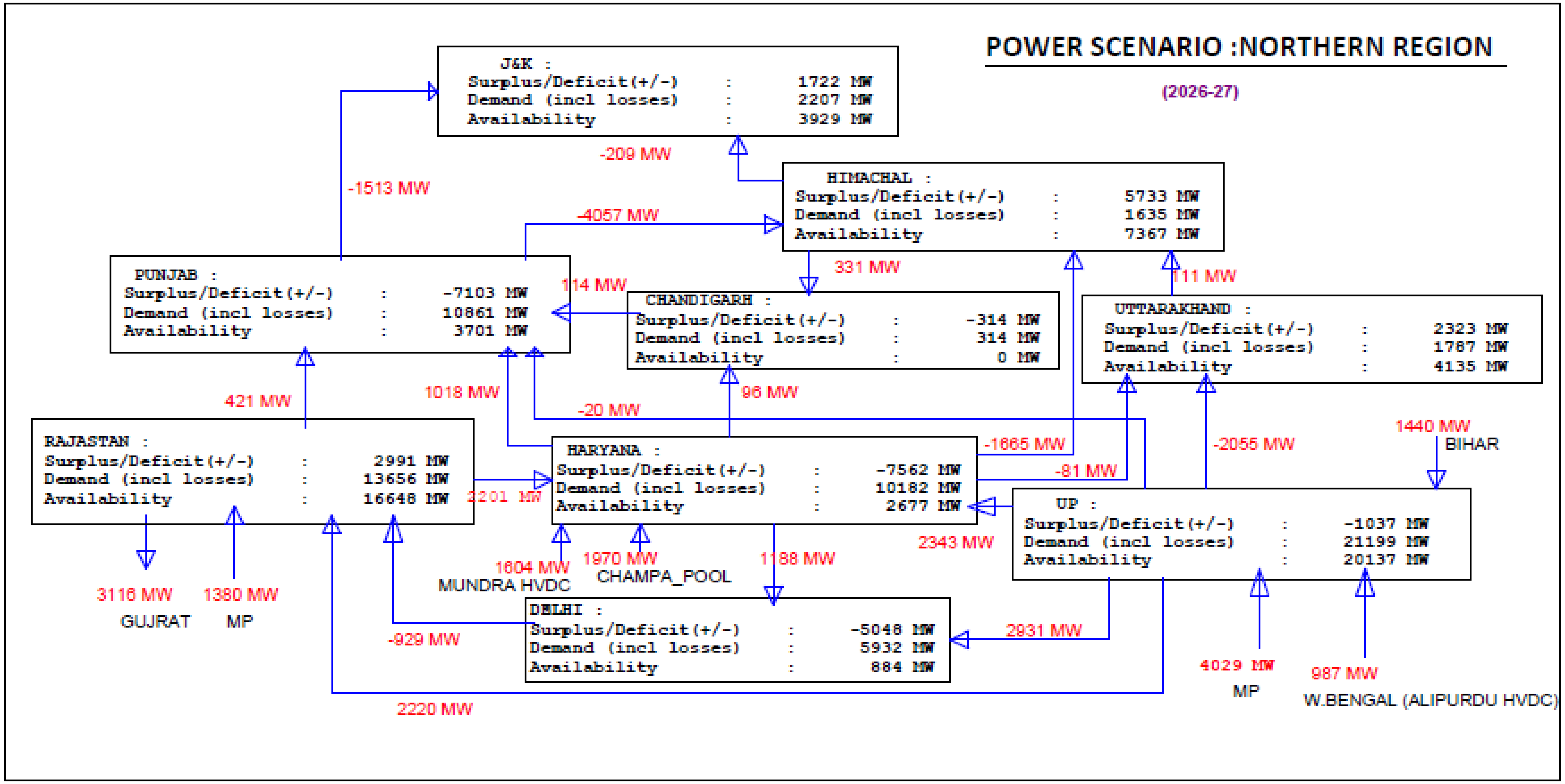
August Solar Peak (Eastern region) ANNEX: 5.9d



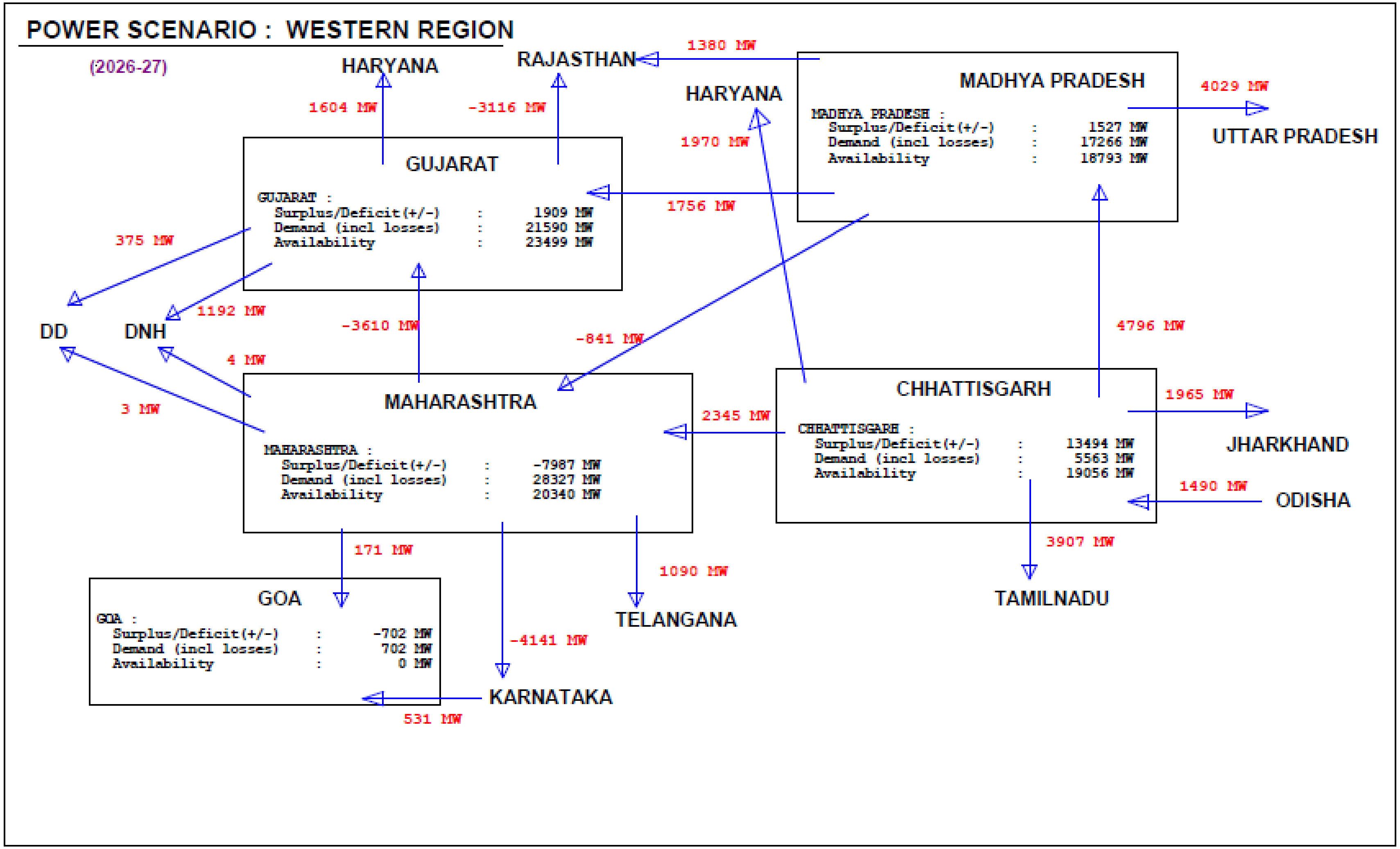
August Solar Peak (North Eastern region) ANNEX: 5.9e



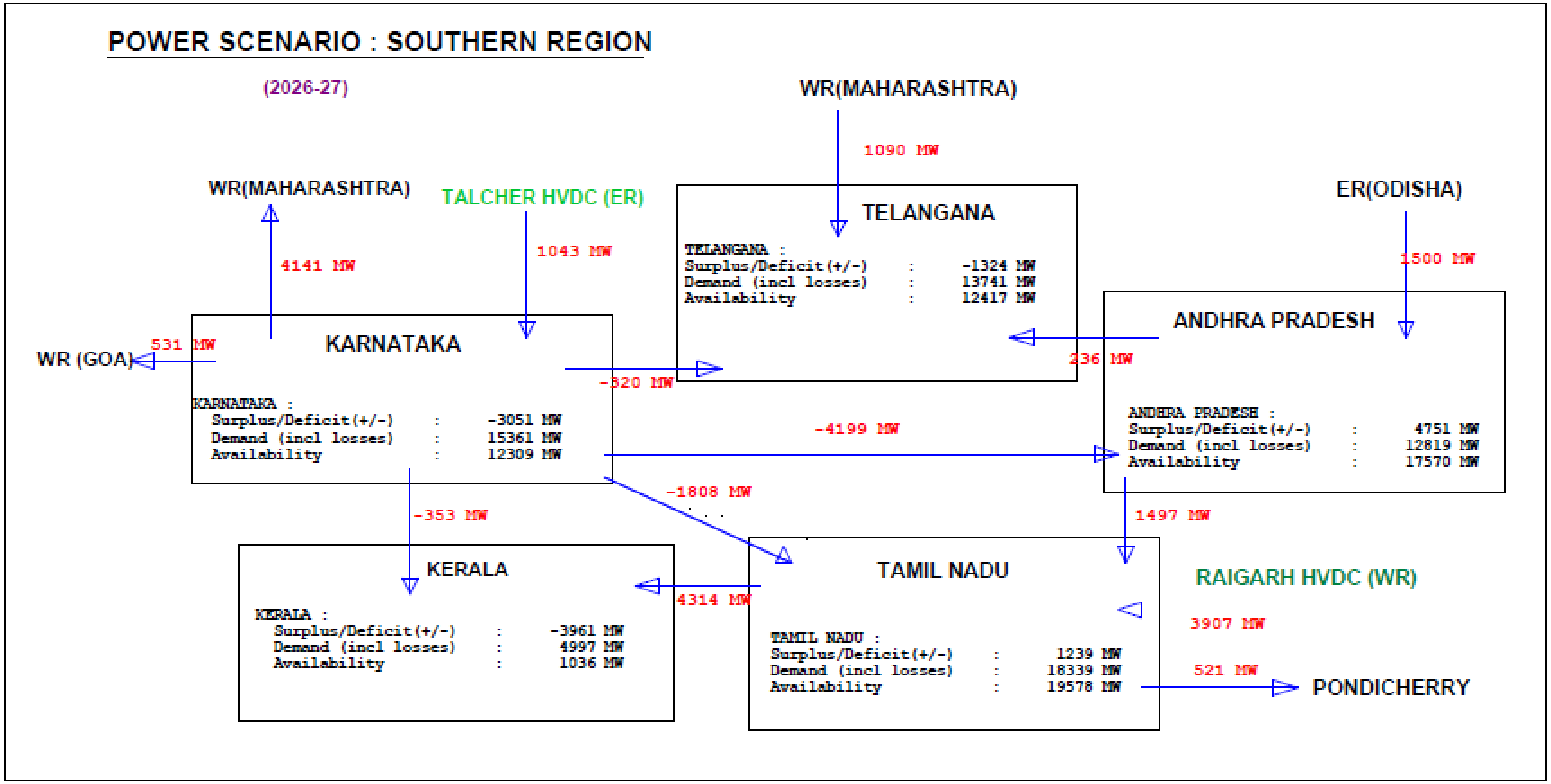
February Evening Peak (Northern region) ANNEX: 5.10a



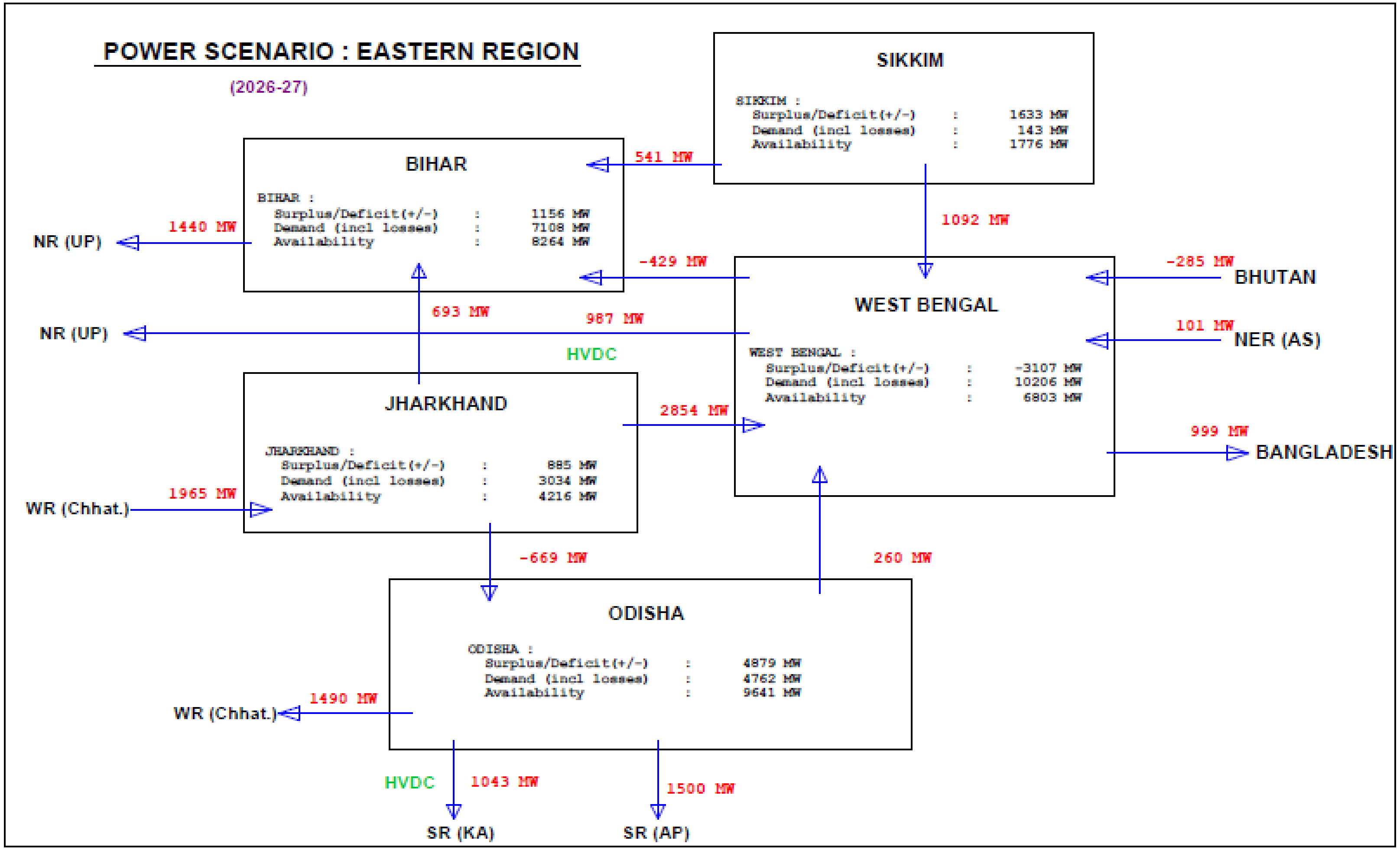
February Evening Peak (Western region) ANNEX: 5.10b



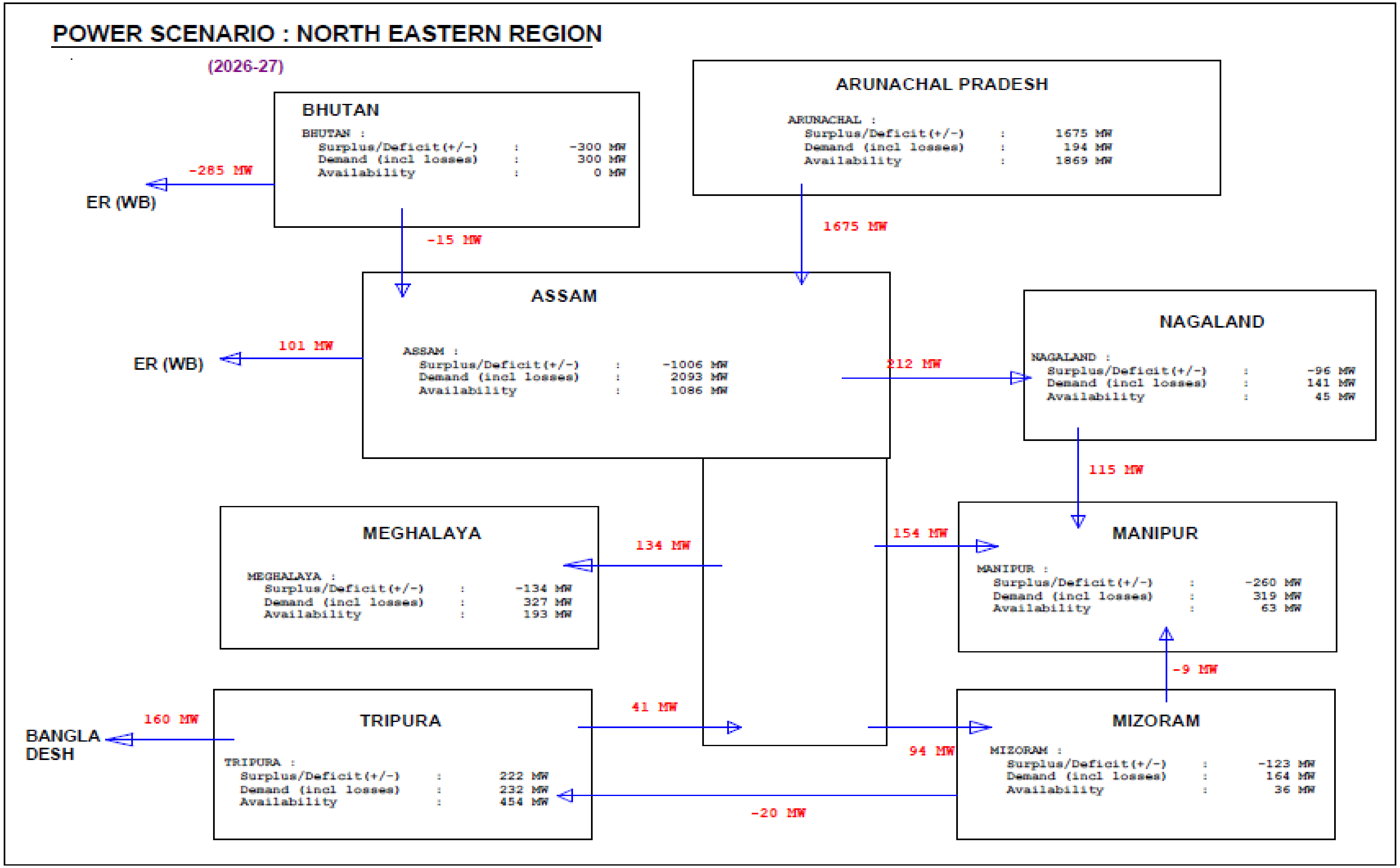
February Evening Peak (Southern region) **ANNEX: 5.10c**



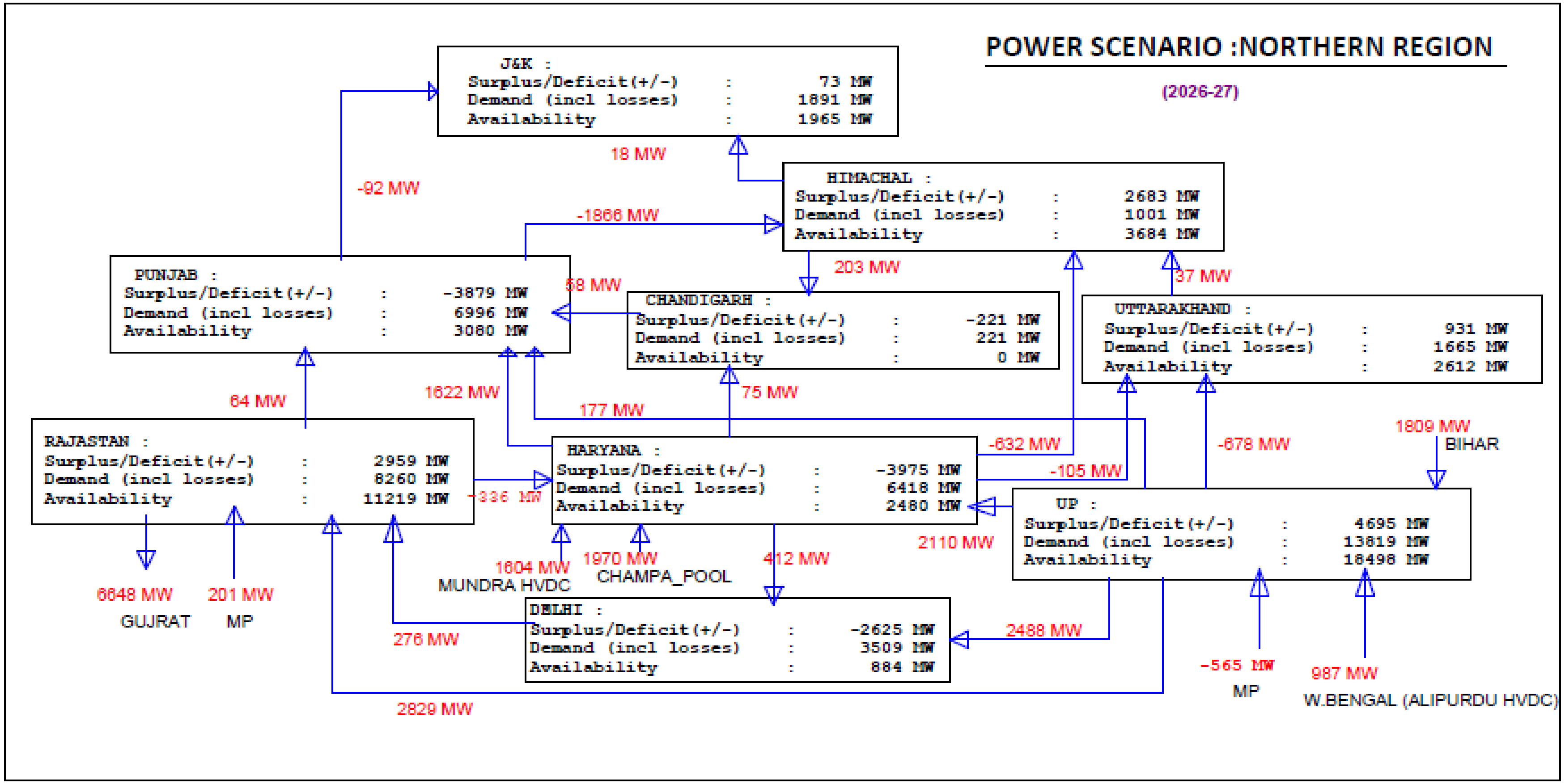
February Evening Peak (Eastern region) **ANNEX: 5.10d**

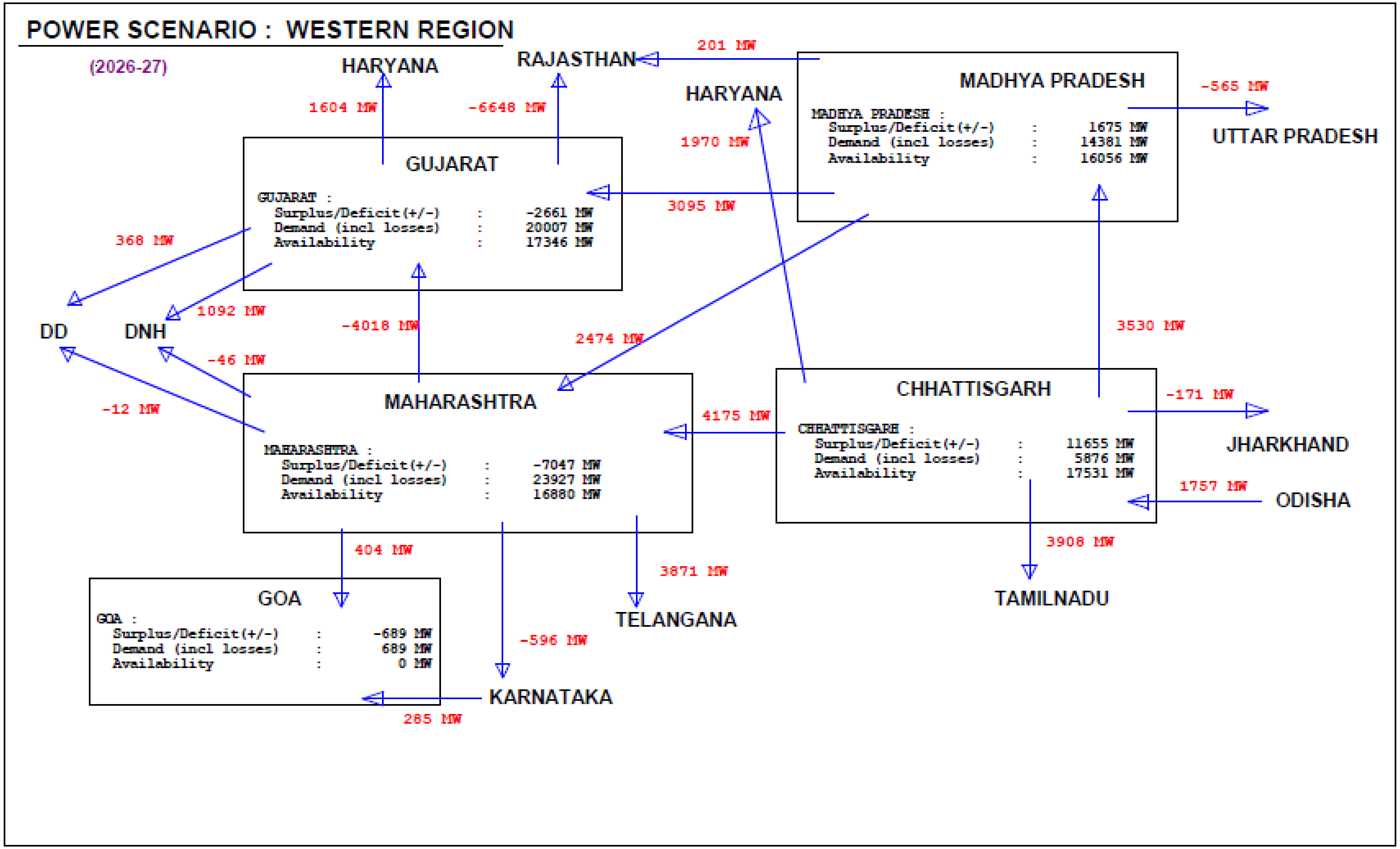


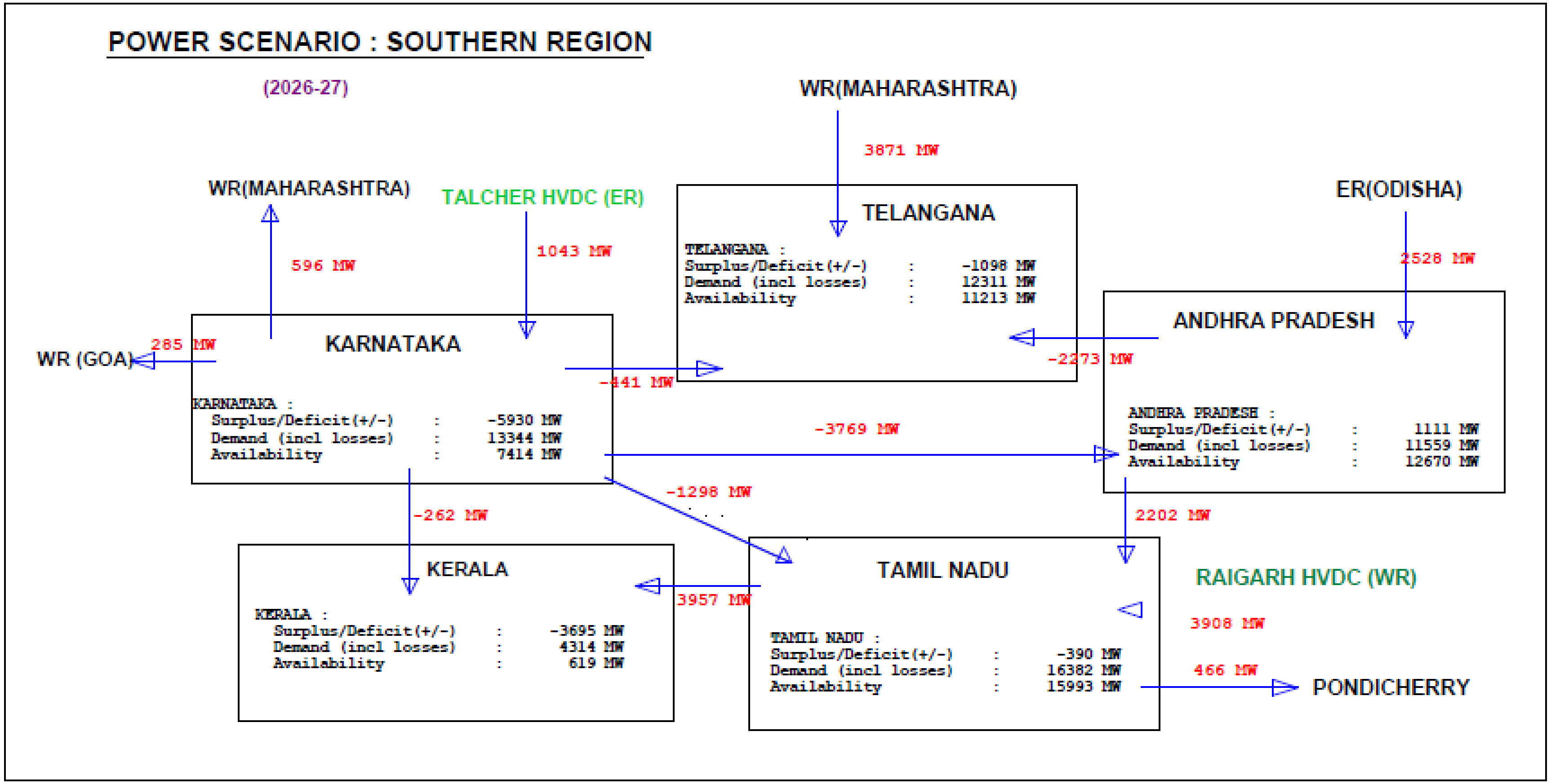
February Evening Peak (North Eastern region) **ANNEX: 5.10e**



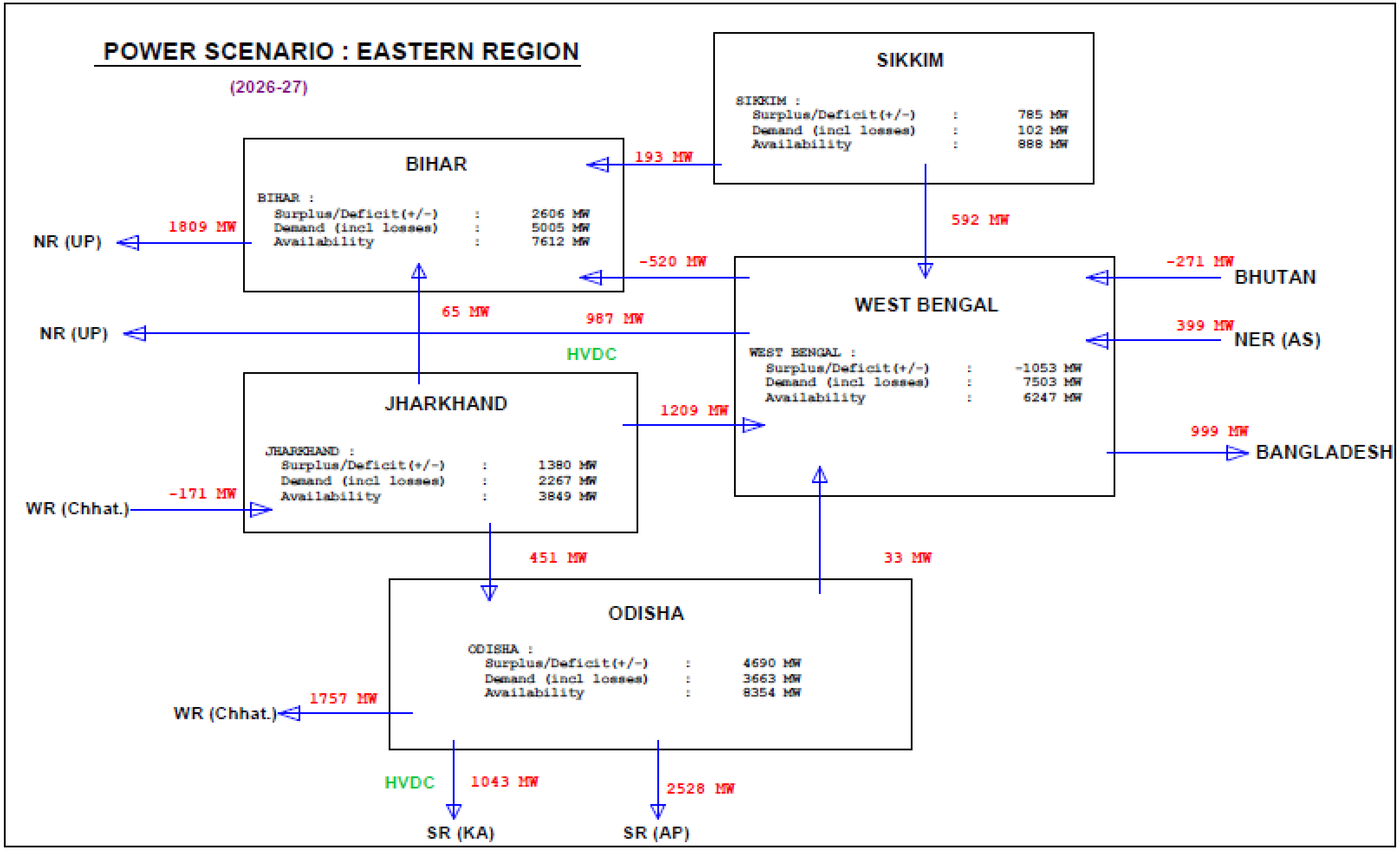
February Night Off-Peak (Northern region) **ANNEX: 5.11a**



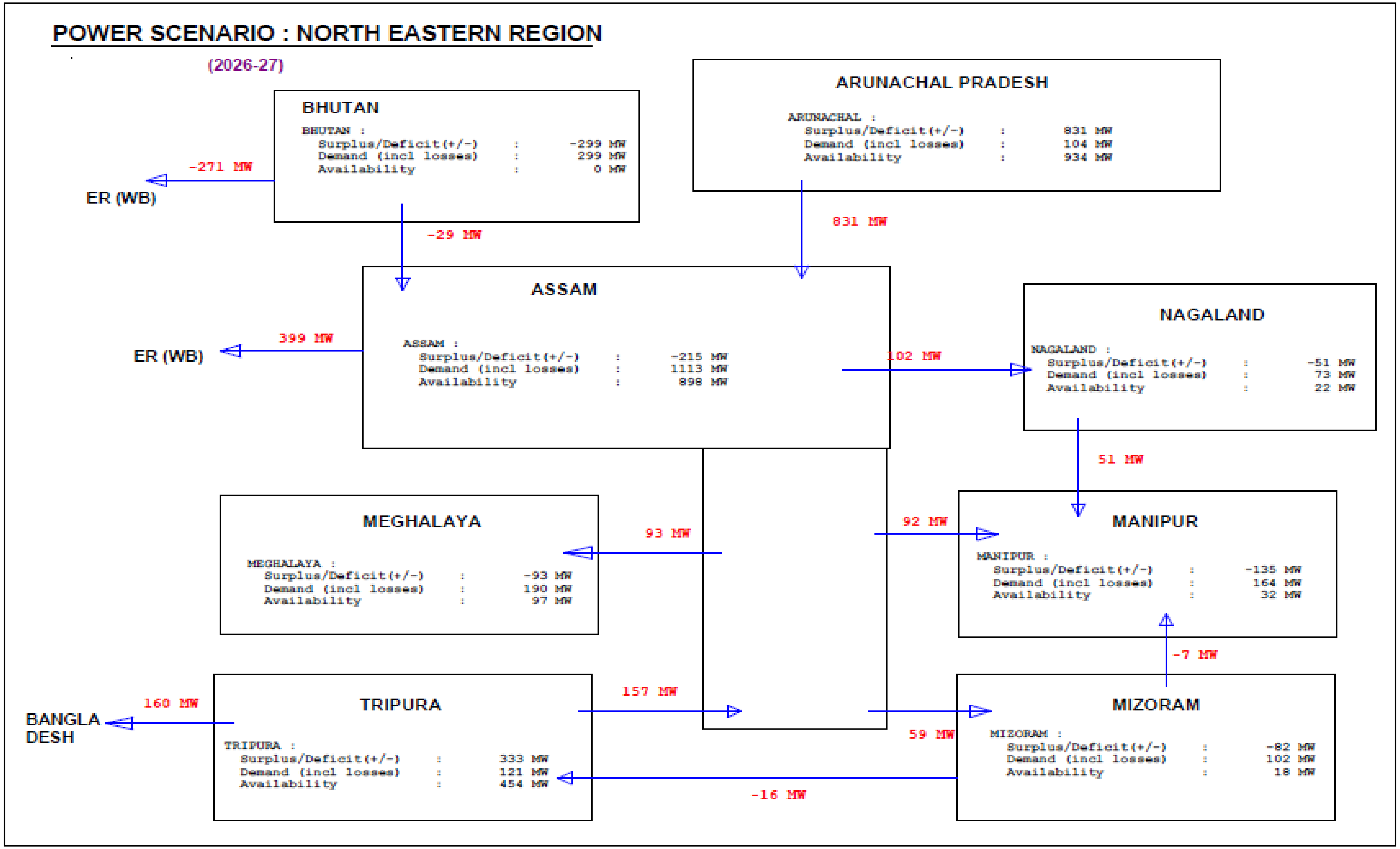

POWER SCENARIO : WESTERN REGION
(2026-27)
HARYANA
RAJASTHAN
201 MW
HARYANA
MADHYA PRADESH
MADHYA PRADESH :
Surplus/Deficit(+/-) : 1675 MW
Demand (incl losses) : 14381 MW
Availability : 16056 MW
-565 MW
UTTAR PRADESH
1604 MW
-6648 MW
1970 MW
GUJARAT
GUJARAT :
Surplus/Deficit(+/-) : -2661 MW
Demand (incl losses) : 20007 MW
Availability : 17346 MW
3095 MW
368 MW
1092 MW
DD
DNH
-4018 MW
2474 MW
3530 MW
-46 MW
-12 MW
MAHARASHTRA
MAHARASHTRA :
Surplus/Deficit(+/-) : -7047 MW
Demand (incl losses) : 23927 MW
Availability : 16880 MW
4175 MW
CHHATTISGARH
CHHATTISGARH :
Surplus/Deficit(+/-) : 11655 MW
Demand (incl losses) : 5876 MW
Availability : 17531 MW
-171 MW
JHARKHAND
1757 MW
ODISHA
404 MW
3871 MW
3908 MW
GOA
GOA :
Surplus/Deficit(+/-) : -689 MW
Demand (incl losses) : 689 MW
Availability : 0 MW
TELANGANA
TAMILNADU
-596 MW
KARNATAKA
285 MW


POWER SCENARIO : SOUTHERN REGION
(2026-27)
WR(MAHARASHTRA)
3871 MW
WR(MAHARASHTRA)
596 MW
TALCHER HVDC (ER)
1043 MW
ER(ODISHA)
2528 MW
TELANGANA
TELANGANA :
Surplus/Deficit(+/-) : -1098 MW
Demand (incl losses) : 12311 MW
Availability : 11213 MW
ANDHRA PRADESH
-2273 MW
WR (GOA)
285 MW
KARNATAKA
-441 MW
KARNATAKA :
Surplus/Deficit(+/-) : -5930 MW
Demand (incl losses) : 13344 MW
Availability : 7414 MW
-3769 MW
ANDHRA PRADESH :
Surplus/Deficit(+/-) : 1111 MW
Demand (incl losses) : 11559 MW
Availability : 12670 MW
-1298 MW
-262 MW
2202 MW
KERALA
3957 MW
TAMIL NADU
RAIGARH HVDC (WR)
KERALA :
Surplus/Deficit(+/-) : -3695 MW
Demand (incl losses) : 4314 MW
Availability : 619 MW
3908 MW
TAMIL NADU :
Surplus/Deficit(+/-) : -390 MW
Demand (incl losses) : 16382 MW
Availability : 15993 MW
466 MW
PONDICHERRY

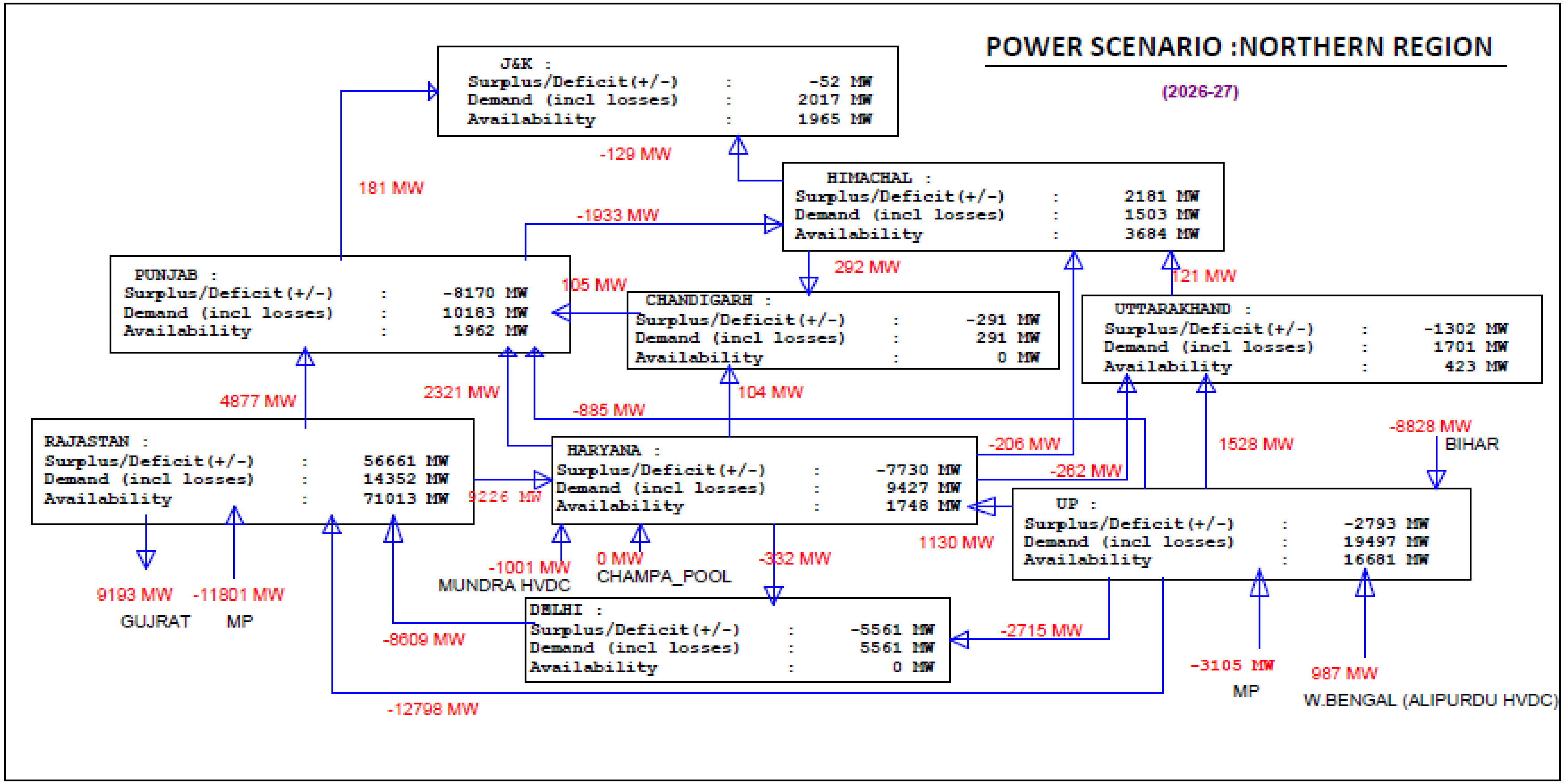
February Night Off-Peak (Eastern region) **ANNEX: 5.11d**



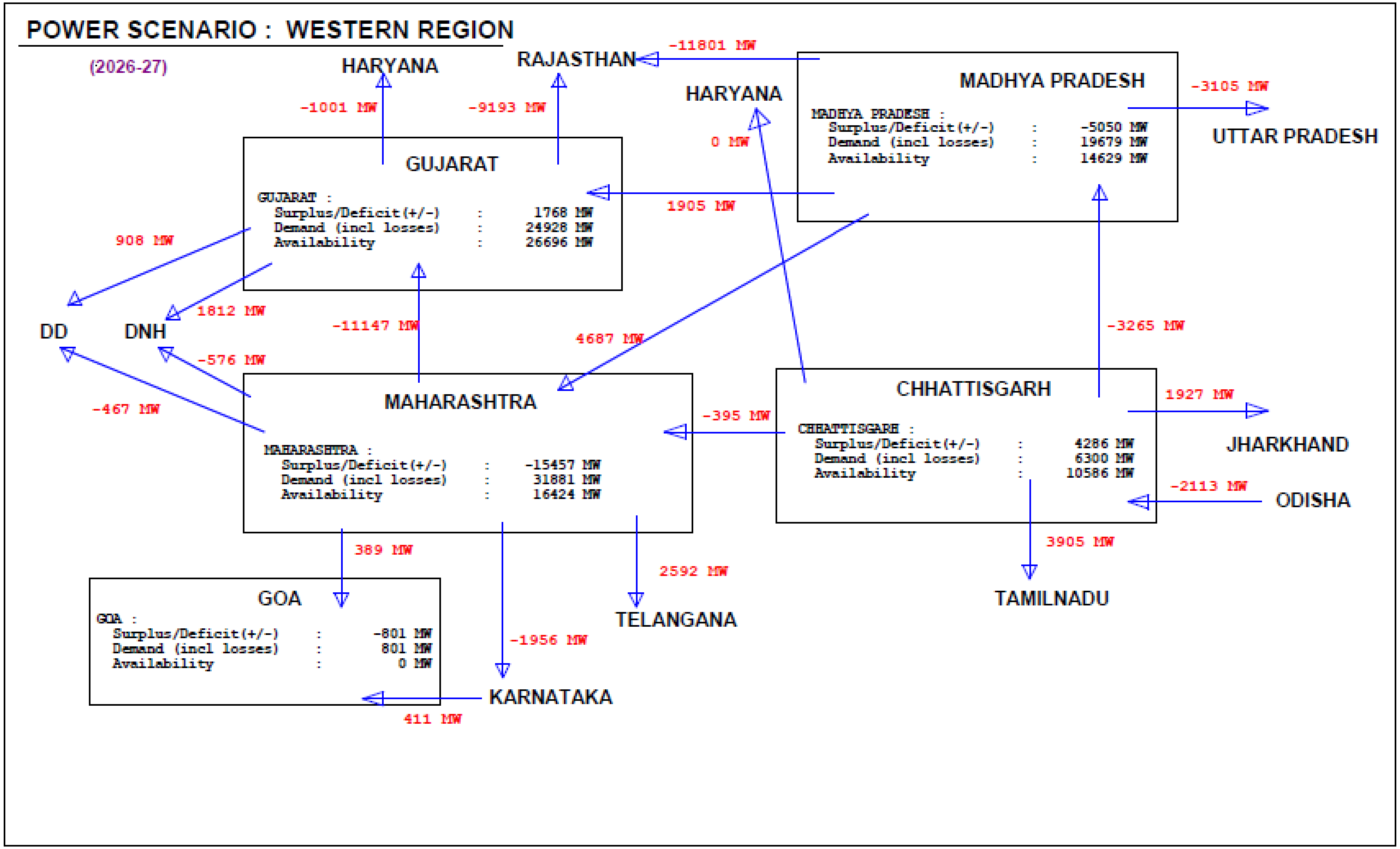
February Night Off-Peak (North Eastern Region) **ANNEX: 5.11e**



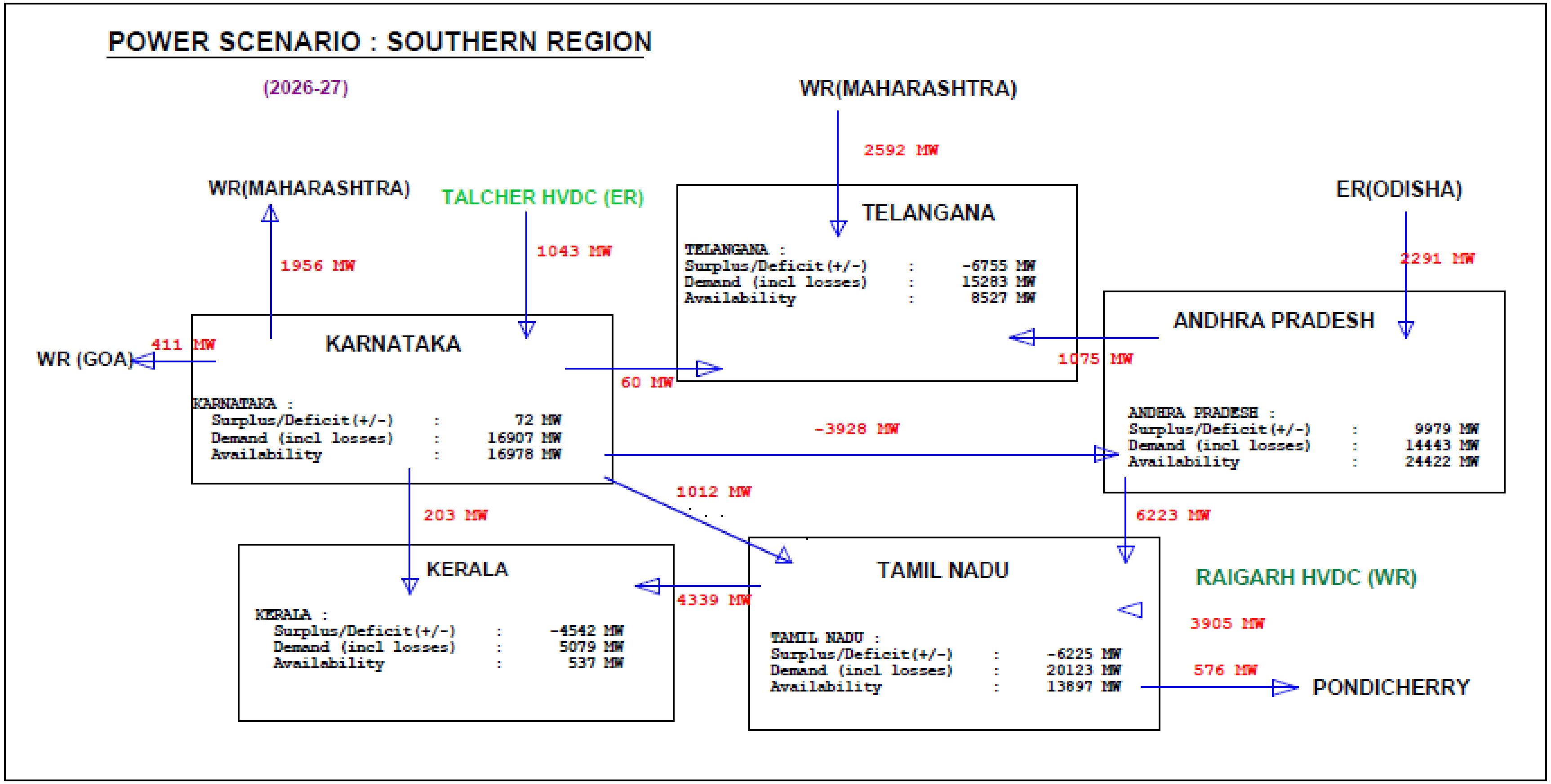
February Solar Peak (Northern region) **ANNEX: 5.12a**



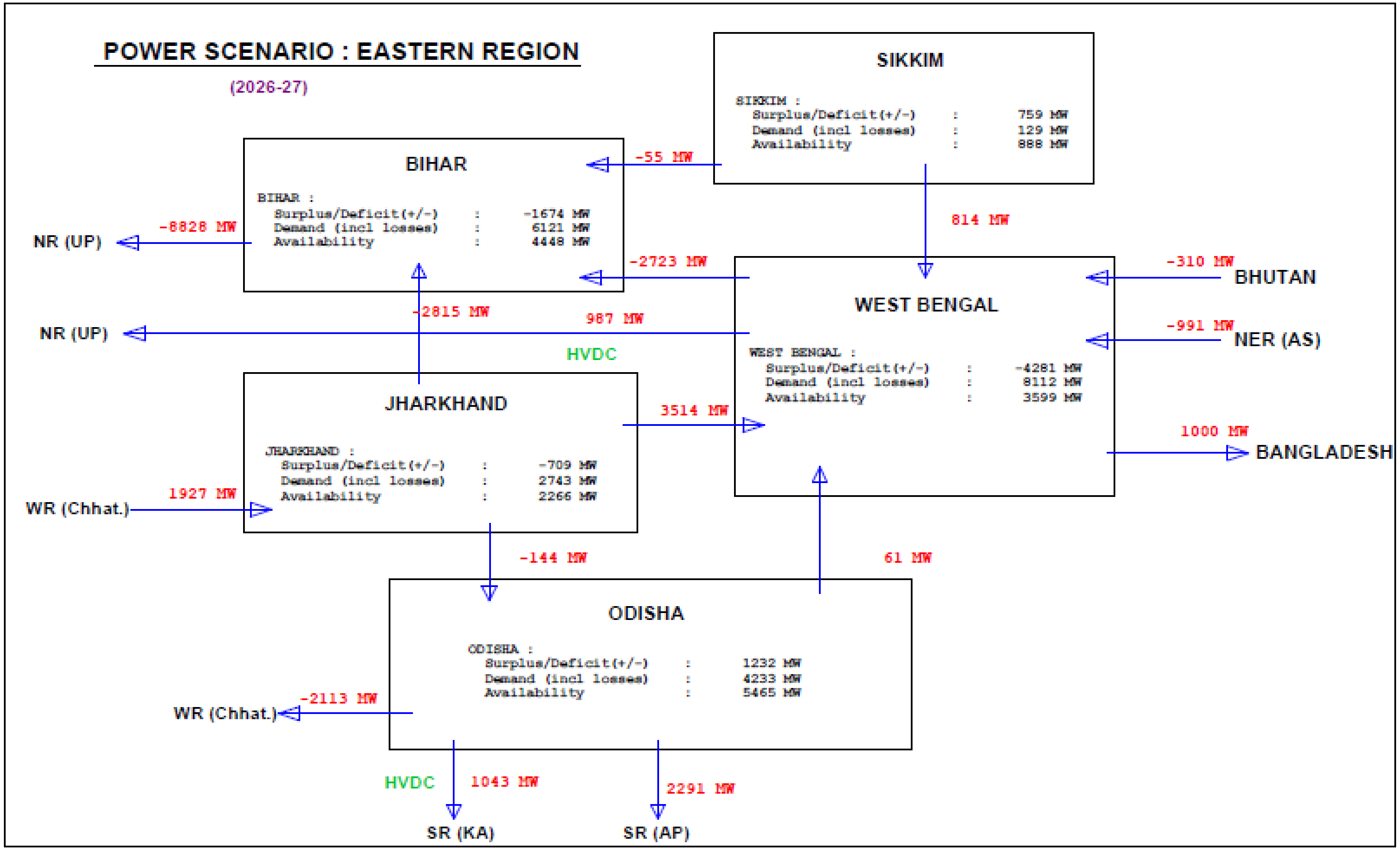
February Solar Peak (Western region) **ANNEX: 5.12b**



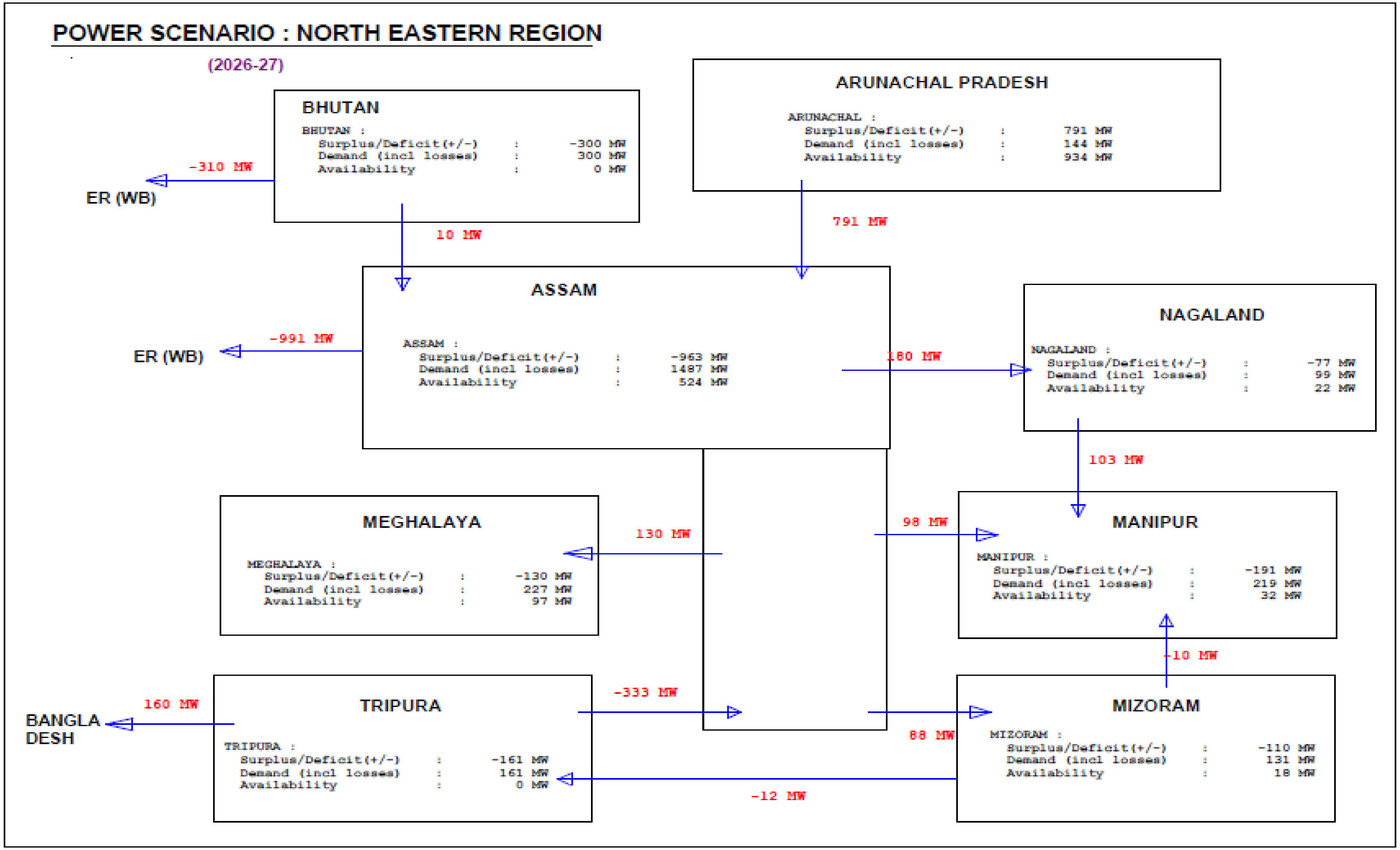
February Solar Peak (Southern region) ANNEX: 5.12c



February Solar Peak (Eastern region) **ANNEX: 5.12d**



February Solar Peak (North Eastern region) ANNEX: 5.12e



Annex 6.1

List of 765 kV Transmission lines and Sub-stations

765 kV Transmission Lines

Name of Transmission Lines	No. of circuits	Executing Agency	At end of 2016-17 (ckm)	Addition during 2017-22 (ckm)	At the end of 2021-22 (ckm)
Anpara-Unnao	S/C	UPPCL	409		409
Kishenpur-Moga line –I	S/C	PGCIL	275		275
Kishenpur-Moga line- II	S/C	PGCIL	287		287
Tehri-Meerut Line-I	S/C	PGCIL	186		186
Tehri-Meerut Line-II	S/C	PGCIL	184		184
Agra-Gwalior	D/C	PGCIL	256		256
Gwalior-Bina Line-I	S/C	PGCIL	235		235
Gwalior-Bina Line-II	S/C	PGCIL	233		233
Gwalior-Bina Line - III	S/C	PGCIL	231		231
Gaya-Balia	S/C	PGCIL	228		228
Balia-Lucknow	S/C	PGCIL	320		320
Sipat-Seoni Line-I	S/C	PGCIL	351		351
Sipat-Seoni Line-II	S/C	PGCIL	354		354
Seoni – Bina	S/C	PGCIL	293		293
Seoni-Wardha Line-I	S/C	PGCIL	269		269
Seoni-Wardha Line-II	S/C	PGCIL	261		261
LILO of Tehri –Meerut D/C line at Tehri Pooling Point	D/C	PGCIL	21		21
LILO of Sipat - Seoni Line-II at WR Pooling station Near Sipat	D/C	PGCIL	16		16
Sasaram-Fatehpur Line-I	S/C	PGCIL	337		337
Sasaram-Fatehpur Line-II	S/C	PGCIL	355		355
Satna-Bina Line-1	S/C	PGCIL	274		274
Satna - Bina Line -II	S/C	PGCIL	276		276
Bina- Indore	S/C	PGCIL	311		311
Gaya- Sasaram	S/C	PGCIL	148		148
Shifting of Anpara-B -Unnao point from Anpara- B to Anpara-C	S/C	UPPCL	1		1
Shifting of Anpara-B -Unnao termaination point at Unnao	S/C	UPPCL	1		1
Bhiwani - Moga	S/C	PGCIL	273		273
Fatehpur- Agra	D/C	PGCIL	334		668
Jhatikara - Bhiwani	S/C	PGCIL	85		85
Sasan - Satna Line -I	S/C	PGCIL	241		241
Sasan - Satna Line -II	S/C	PGCIL	242		242

Name of Transmission Lines	No. of circuits	Executing Agency	At end of 2016-17 (ckm)	Addition during 2017-22 (ckm)	At the end of 2021-22 (ckm)
Agra – Jhatikara	S/C	PGCIL	252		252
Meerut – Agra	S/C	PGCIL	268		268
Raigarh PS (Kotra) - Raigarh PS (Tammar)	D/C	PGCIL	98		98
Jabalpur PS - Bina	D/C	PGCIL	459		459
Raichur - Sholapur	S/C	PGCIL	208		208
Raichur - Sholapur	S/C	RSTCL	208		208
Meerut - Bhiwani	S/C	PGCIL	174		174
Raigarh PS (Kotra) - Raipur PS	D/C	PGCIL	480		480
Satna - Gwalior Line-I	S/C	PGCIL	337		337
Satna - Gwalior Line-II (60 Km D/C Portion)	D/C+S/C	PGCIL	300		300
LILO of Ranchi - Dharamjaygarh at Korba.	D/C	PGCIL	10		10
Lucknow - Bareilly	S/C	PGCIL	252		252
Ranchi - Dharamjaygarh	S/C	PGCIL	381		381
Anta - Phagi (Jaipur South) Line -I)	S/C	RVPNL	212		212
Anta - Phagi (Jaipur South) Line -II	S/C	RVPNL	214		214
Champa PS - Dharamjaygarh / Near Korba Switching Station	S/C	PGCIL	62		62
Champa PS - Raipur PS	D/C	PGCIL	298		298
Indore - Vadodara	S/C	PGCIL	320		320
Kurnool - Raichur Line-I	S/C	PGCIL	120		120
Kurnool - Raichur Line - II	S/C	PGCIL	118		118
Rihand - Vindhyachal PS	D/C	PGCIL	62		62
Jharsuguda PS - Dharamjaygarh	D/C	PGCIL	300		300
Wardha – Aurangabad Line-I	D/C	PGCIL	690		690
Wardha - Aurangabad Line-II	D/C	PGCIL	701		701
Kurnool - Nellore	D/C	PGCIL	602		602
Kurnool - Thiruvalam	D/C	PGCIL	710		710
Raipur PS - Wardha	D/C	PGCIL	736		736
Sholapur - Pune	S/C	PGCIL	268		268
Angul - Jharsuguda Line-I	S/C	PGCIL	274		274
Angul - Jharsuguda Line-II	S/C	PGCIL	284		284

Name of Transmission Lines	No. of circuits	Executing Agency	At end of 2016-17 (ckm)	Addition during 2017-22 (ckm)	At the end of 2021-22 (ckm)
Vindhyachal PS - Satna	D/C	PGCIL	542		542
Akola - Aurangabad Line - I	S/C	APL	219		219
Tiroda - Koradi - Akola - Aurangabad line Line-II	S/C	APL	575		575
Tiroda - Akola Line - I	S/C	APL	361		361
Aurangabad - Dhule	S/C	SGL	192		192
Bhopal - Indore	S/C	SGL	176		176
Dhule - Vadodara	S/C	SGL	263		263
Anpara C - Anpara D	S/C	UPPTCL	3		3
Sasan - Vindhyachal (PS)	S/C	PGCIL	6		6
Meerut - Moga	S/C	PGCIL	337		337
Raigarh PS (Kotra) - Champa PS	S/C	PGCIL	96		96
Gwalior - Jaipur Line-I	S/C	PGCIL	305		305
Gwalior - Jaipur Line -II	S/C	PGCIL	311		311
Jaipur - Bhiwani Line-I	S/C	PGCIL	272		272
Jaipur - Bhiwani Line-II	S/C	PGCIL	277		277
Aurangabad - Solapur	D/C	PGCIL	556		556
Dharamjaygarh - Jabalpur PS	D/C	PGCIL	848		848
Narendra (New) - Kolhapur (New)	D/C	PGCIL	374		374
Ranchi (New) - Dharamjaygarh (Near Korba)	S/C	PGCIL	341		341
Balia - Varanasi	S/C	PGCIL	165		165
LILO of Gaya - Fatehpur at Varanasi	S/C	PGCIL	7		7
Jabalpur - Bhopal	S/C	SGL	274		274
Jabalpur - Bina	S/C	SGL	245		245
Dhramjaygarh - Jabalpur	D/C	SGL	758		758
Gaya - Varanasi	S/C	PGCIL	273		273
Kanpur - Jhatikara	S/C	PGCIL	466		466
Varanasi - Kanpur	D/C	PGCIL	652		652
Srikakulam - Vemagiri	D/C	PGCIL	668		668

Name of Transmission Lines	No. of circuits	Executing Agency	At end of 2016-17 (ckm)	Addition during 2017-22 (ckm)	At the end of 2021-22 (ckm)
Nagapattinam PS - Salem	D/C	PGCIL	406		406
Tuticorin PS - Salem PS	D/C	PGCIL	731		731
Srikakulam - Angul	D/C	PGCIL	552		552
LILO of Seoni-Bina at Gadarwara STPP	D/C	PGCIL	16		16
Raipur PS - Wardha	D/C	PGCIL	714		714
Wardha - Nizamabad (Part of Wardha - Hyderabad line)	D/C	PGCIL	576		576
LILO of Agra - Meerut line at Greater Noida	2xS/C	WUPPTCL	11		11
Mainpuri-Greater Noida	S/C	WUPPTCL	181		181
Narendra (New) - Madhugiri	D/C	KPTCL	758		758
Mainpuri - Bara Line-II	S/C	SEUPPTCL	377		377
Lalitpur TPS - Fatehabad (Agra (UP)) Line -I	S/C	UPPTCL	337		337
Lalitpur TPS - Fatehabad (Agra (UP)) Line -II	S/C	UPPTCL		335	335
Ghatampur TPS-Hapur	S/C	ADANI		411	411
Khandwa Pool – Dhule	D/C	STERLITE		383	383
Ariyalur - Thiruvalam	D/C	TANTRAN SCO		347	347
North Chennai PS - Ariyalur	D/C	TANTRAN SCO		548	548
LILO of Fatehgarh -Bhadla at Fatehgarh-II PS	D/C	PGCIL		80	80
LILO of Fatehgarh -Bhadla at Fatehgarh-II PS (Loop in of Line-I)	D/C	PGCIL		40	40
LILO of Fatehgarh-Bhadla at Fatehgarh-II PS (Loop in of Line-II)	D/C	PGCIL		39	39
Anpara-D – Unnao line	S/C	UPPTCL		426	426
Ajmer - Bikaner	D/C	PGCIL		526	526
LILO of Ajmer-Bikaner line at Bhadla-II PS	D/C	PGCIL		527	527
Khetri– Jhatikara	D/C	PGCIL		292	292
Medinipur - Jeerat (New)	D/C	PGCIL		338	338
Bikaner (PG) –Khetri S/s	D/C	ADANI		481	481
Fatehgarh - II - Bhadla -II	D/C	PGCIL		374	374

Name of Transmission Lines	No. of circuits	Executing Agency	At end of 2016-17 (ckm)	Addition during 2017-22 (ckm)	At the end of 2021-22 (ckm)
Vindhyachal - Varansai	D/C	PGCIL		379	379
Ajmer - Phagi	D/C	PGCIL		268	268
Agra (UP)-Greater Noida (WUPPTCL)	S/C	APL		159	159
Fatehgarh PS - Bhadla	D/C	APL		292	292
Ghatampur TPS-Agra (UP)	S/C	APL		229	229
LILO of Anpara D - Unnao (Quad) Line-I at Obra - CTPS	D/C	APL		17	17
Ranchi - Medinipur	D/C	PGCIL		538	538
Part of Tehri PS - Meerut	D/C	PGCIL		2	2
Bikaner - Moga	D/C	PGCIL		734	734
Khandwa Pool - Indore	D/C	SGL		180	180
Chilkaluripeta - Cudappah	D/C	PGCIL		577	577
Vemagiri - Chilkaluripeta	D/C	PGCIL		558	558
Bhadla - Bikaner	D/C	PGCIL		340	340
LILO of one line of Aurangabad - Padghe D/C line at Pune	D/C	APL		129	129
Bilaspur - Rajnandgaon	D/C	APL		324	324
Raipur PS - Rajnandgaon	D/C	APL		80	80
Rajnandgaon - Warora PS	D/C	APL		532	532
Banaskanta - Chittorgarh	D/C	PGCIL		604	604
Bhuj - Banaskanta	D/C	PGCIL		578	578
Salem - Madhugiri Line - I	S/C	PGCIL		219	219
Salem - Madhugiri Line - II	S/C	PGCIL		243	243
Vindhyachal PS - Jabalpur PS	D/C	PGCIL		749	749
Jharsuguda (Sundargarh) - Raipur	D/C	SGL		610	610
Angul - Jharsauguda	D/C	PGCIL		590	590
Jharsuguda - Dharamjaygarh	D/C	PGCIL		296	296
LILO of Kurnool - Thirvualam line at Cuddapah	D/C	PGCIL		190	190
Raigarh (Kotra) - Champa PS	S/C	APL		97	97
Sipat STPS - Bilaspur	S/C	APL		24	24

Name of Transmission Lines	No. of circuits	Executing Agency	At end of 2016-17 (ckm)	Addition during 2017-22 (ckm)	At the end of 2021-22 (ckm)
Champa PS - Dharamiaygarh	S/C	APL		51	51
Gadarwara - Warora PS	D/C	PGCIL		627	627
Warora PS - Parli	D/C	PGCIL		694	694
Parli - Solapur	D/C	PGCIL		236	236
Sasan UMPP - Vindhyachal PS	S/C	APL		6	6
LILO of Agra - Meerut at Aligarh	S/C	PGCIL		22	22
LILO of Kanpur - Jhatikara at Aligarh	S/C	PGCIL		22	22
LILO of one line of Satna-Gwalior 2xS/C line at Orai	2xS/C	PGCIL		73	73
Orai - Aligarh	D/C	PGCIL		664	664
Aurangabad - Padghe	D/C	PGCIL		570	570
Chittorgarh - Ajmer	D/C	PGCIL		422	422
Jabalpur PS - Orai	D/C	PGCIL		714	714
Nizamabad - Hyderabad (Part of Wardha - Hyderabad line)	D/C	PGCIL		486	486
Gadarwara - Jabalpor PS (Balance Portion of LILO of Seoni - Bina at Jabalpur)	D/C	PGCIL		187	187
Hapur-Greater Noida	S/C	WUPPTCL		66	66
Mainpuri-Hapur	S/C	WUPPTCL		217	217
Darlipalli TPS - Jharsuguda (Sundergarh)	D/C	PGCIL		41	41
TOTAL			**31240**	**19783**	**51023**

765 kV Sub-Stations

Name of Sub-stations	Executing agency	At end of 2016-17 (MVA)	Addition during 2017-22 (MVA)	At end of 2021-22 (MVA)
Seoni	PGCIL	4500		4500
Fatehpur	PGCIL	3000		3000
Gaya	PGCIL	4500		4500
Sipat	PGCIL	4500		4500
Balia	PGCIL	3000		3000
Lucknow	PGCIL	3000		3000
Wardha	PGCIL	4500		4500

Name of Sub-stations	**Executing agency**	**At end of 2016-17 (MVA)**	**Addition during 2017-22 (MVA)**	**At end of 2021-22 (MVA)**
Unnao	UPPTCL	2000		2000
Agra	PGCIL	3000		3000
Bhiwani	PGCIL	2000		2000
Moga	PGCIL	3000		3000
Satna	PGCIL	2000		2000
Bina	PGCIL	2000		2000
Jhatikara	PGCIL	6000		6000
Gwalior	PGCIL	3000		3000
Meerut	PGCIL	3000		3000
Sasaram	PGCIL	1500		1500
Indore	PGCIL	3000		3000
Raigarh Pooling Station (Kotra)	PGCIL	6000		6000
Raigarh Pooling Station(Tamnar)	PGCIL	6000		6000
Raichur	PGCIL	3000		3000
Raipur	PGCIL	3000		3000
Solapur	PGCIL	3000		3000
Jabalpur (ICT-II)	PGCIL	1500		1500
Ranchi	PGCIL	3000		3000
Akola -II	APL	1500		1500
Tiroda	APL	1500		1500
Dharamjaygarh/ Korba Pooling station	PGCIL	3000		3000
Kurnool	PGCIL	3000		3000
Aurangabad (ICT-II)	PGCIL	1500		1500
Jharsuguda (Sundargarh)	PGCIL	3000		3000
Nellore	PGCIL	3000		3000
Sholapur	PGCIL	3000		3000
Angul	PGCIL	6000		6000
Bareilly	PGCIL	3000		3000
Thiruvalam	PGCIL	3000		3000
Vindhyachal Pooling Station	PGCIL	3000		3000
Agaria (Bhopal)	SGL	3000		3000
Dhule (BDTCL)	SGL	3000		3000
Koradi - III	APL	3000		3000
Anpara D.	UPPTCL	1000		1000
Anta	RVPNL	3000		3000
Phagi (Jaipur South)	RVPNL	3000		3000
Champa Pooling Station	PGCIL	9000		9000
Vadodara	PGCIL	3000		3000

Name of Sub-stations	Executing agency	At end of 2016-17 (MVA)	Addition during 2017-22 (MVA)	At end of 2021-22 (MVA)
Varanasi	PGCIL	3000		3000
Aurangabad - III (Ektuni)	MSETCL	3000		3000
Pune	PGCIL	3000		3000
Kanpur	PGCIL	3000		3000
Vemagiri	PGCIL	3000		3000
Nizamabad	PGCIL	1500		1500
Greater Noida	WUPPTCL	1000		1000
Mainpuri	SEUPPTCL	1500		1500
Agra (Fatehabad)	UPPTCL	3000		3000
Bhiwani	PGCIL		1000	1000
Fatehgarh-II	PGCIL		3000	3000
Khetri	PGCIL		3000	3000
Bhadla-II	PGCIL		3000	3000
Jeerat (New)	PGCIL		3000	3000
Extension at 765/400/220 kV Fathehgarh -II PS (Jaisalmer)	PGCIL		1000	1000
Eastablishment of 765/400 Fathehgarh -II PS	PGCIL		1500	1500
Bhuj	PGCIL		6000	6000
Medinipur	PGCIL		3000	3000
Meerut (Addl. ICT)	PGCIL		1500	1500
Tehri	PGCIL		3200	3200
Khandwa	SGL		3000	3000
Chilakaluripeta	PGCIL		3000	3000
Aligarh (PG)	PGCIL		3000	3000
Jharsuguda (Sundargarh) (Addl. ICT)	PGCIL		3000	3000
Bhadla	PGCIL		4500	4500
Bikaner	PGCIL		3000	3000
Lucknow ICT	PGCIL		500	500
Banaskanta	PGCIL		3000	3000
Gaya (Addl. ICT)	PGCIL		1500	1500
Cuddapah	PGCIL		3000	3000
Srikakulam	PGCIL		3000	3000
Warora	PGCIL		3000	3000
Parli	PGCIL		3000	3000
Orai (ICT-II)	PGCIL		2000	2000
Greater Noida (New) ICT-II	UPPTCL		1500	1500
Hapur	WUPPTCL		3000	3000
Chittorgarh	PGCIL		3000	3000
Padghe	PGCIL		3000	3000
Ajmer	PGCIL		3000	3000
Hyderabad (Maheshwaram)	PGCIL		3000	3000
Vindhyachal Pooling Station	PGCIL		1500	1500
Unnao (ICT- III)	UPPTCL		1000	1000

Name of Sub-stations	Executing agency	At end of 2016-17 (MVA)	Addition during 2017-22 (MVA)	At end of 2021-22 (MVA)
Nizamabad (ICT-II)	PGCIL		1500	1500
Anta (ICT-III)	RVPNL		1500	1500
Total		**167500**	**89700**	**257200**

Annex 6.2

List of transmission lines (220 kV and above voltage level) slipped from 2017-22

Sl. No.	Name of transmission line	Executing Agency	ckm	Voltage (kV)	Original schedule	Actual/ Anticipated commissioning	Reason for delay
1	Jeerat (New) – Subhasgram 400 kV D/C line	PGCIL	214	400	July'2020/ December, 2020	August, 22	1.Severe RoW 2.Cyclone Amphan in May'20. 3.COVID-19
2	Reconfiguration of Bhuj PS – Lakadia PS 765 kV D/c line so as to establish Bhuj-II –Lakadia 765 kV D/C line as well as Bhuj-Bhuj-II 765 kV D/C line	PGCIL	212	765	December, 20/ August, 21	August, 22	1.Severe RoW 2. Extension of 8 months due to impact of COVID-19
3	LILO of one ckt of Narendra (Existing) - Narendra (New) 400 kV D/C Quad line at Xeldem	Sterlite	187.4	400	November,21/ July,22	May, 25	1. Court case 2. Extension of 8 months due to impact of COVID-19
4	Xeldem - Mapusa 400 kV D/C Quad Line	Sterlite	109.6	400	May, 21 /January, 22	June, 24	1. Court case 2. Extension of 8 months due to impact of COVID-19
5	Dharamjaygarh Pool Section B - Raigarh (Tamnar) Pool 765 kV D/C line	Sterlite	137	765	July '21 /March, 22*	June'22	1.Severe RoW 2. Extension of 8 months due to impact of COVID-19
6	Xeldem (existing) – Xeldem (new) 220 kV D/C line	Sterlite	40	220	May'21 /Jan'22*	June, 24	1. Court case 2. Extension of 8 months due to impact of COVID-19
7	Lakadia – Vadodara 765 kV D/c line	Sterlite	658	765	Dec'20 /Aug'21*	January'23	1.Severe RoW 2.Court case 3. Extension of 8 months due to impact of COVID-19
8	Warora (Pool) – Warangal (New) 765 kV D/C line	Adani	664	765	Nov'19	October'23	1.Severe RoW (CIL) 2.Court case 3.COVID-19
9	Warangal (New) – Hyderabad 765 kV D/C line	Adani	268	765	Nov'19	August'23	1.Severe RoW 2.Court case 3.COVID-19
10	Hyderabad- Kurnool 765 kV D/C line	Adani	337	765	Nov'19	July'23	1.Severe RoW 2.Court case 3.COVID-19
11	Warangal (New) – Chilakaluripeta 765 kV D/C line	Adani	390	765	Nov'19	September'23	1.Severe RoW 2.Court case 3.COVID-19
12	Koteshwar Pooling Station - Rishikesh 400 kV D/C (HTLS) line	Essel Infra	81	400	Dec'19	December, 24	1.Severe RoW 2. NoC from IDPL 3. NoC from PTCUL
13	Babai (RRVPNL) – Bhiwani (PG) D/C line	Essel Infra	221	400	June'19	October '23	1.Severe RoW
14	North Karanpura – Chandwa (Jharkhand) Pooling Station 400 kV D/c line	Adani	102	400	Sep'19	October'22	1.Severe RoW (CIL) 2.Delay in grant of forest clearance.
15	North Karanpura – Gaya 400 kV D/C line	Adani	196	400	Sep'19	June'24	1.Severe RoW (CIL) 2.Delay in grant of forest clearance.
16	Bhuj PS – Lakadia PS 765 kV D/C line	Adani	214	765	Dec'20/Aug'21	October'22	1.Severe RoW 2. Extension of 8 months due to impact of COVID-19
17	LILO of Bhachau – EPGL line 400 kV D/C (triple) line at Lakadia PS	Adani	76	400	Dec'20/Aug'21	September'22	1.Severe RoW 2. Extension of 8 months due to impact of COVID-19
18	765 kV Fatehgarh Pooling sub-station - Bhadla (PG) D/C line (to be operated at 400 kV)	Adani	292	765	Sep'19	July'21	1. Re-routing on account of GIB area and due to height restrictions laid in Defence Aviation.

Sl. No.	Name of transmission line	Executing Agency	ckm	Voltage (kV)	Original schedule	Actual/ Anticipated commissioning	Reason for delay
19	400 kV D/C Lower Subhansiri - Biswanath Chariyali line -II	PGCIL	371	400	March'22	February'23	1.Severe RoW
20	400 kV D/C Jigmeling - Alipurduar line (Q) (India Side)	PGCIL	326	400	March'19	June'21	1.Delay in Forest Clearance
21	800 kV Raigarh (HVDC Stn.) - Pugalur (HVDC Stn.) HVDC Bipole link	PGCIL	3531	800	Nov'19	September'20	1.Severe RoW
22	LILO of both ckt of Bawana - Mandola 400 kV D/C line at Maharanibagh	PGCIL	120	400	May'17	March'22	1.Severe RoW 2.Work affected due to Construction Ban in Delhi/ NCR to curb pollution.
23	LILO of one ckt of Bamnauli - Jhattikalan 400 kV D/C line at Dwarka	PGCIL	17	400	May'17	February'22	1.Severe RoW 2.Work affected due to Construction Ban in Delhi/ NCR to curb pollution.
24	400 kV D/C Mohindergarh - Bhiwani line	PGCIL	122	400	Aug'18	March'23	1.Work in progress
25	220 kV D/C UT Chandigarh S/S - Panchkula (PG) S/S line (incl. 9.7 Kms underground cable).	PGCIL	48	220	Feb'19	January'23	1.Severe RoW 2. Court Case
26	LILO of both circuits of 765 kV D/C (op. at 400 kV) Fatehgarh (TBCB)-Bhadla (PG) at Fatehgarh-II PS	PGCIL	158	765	Dec'20	March'22	1.Severe RoW 2. COVID-19
27	220 kV D/C Navsari (PG) – Bhestan line	PGCIL	37	220	Dec'20	February'22	1.Severe RoW 2. COVID-19
28	320 kV Pugalur - North Trichur (Kerala) HVDC line	PGCIL	288	320	April'20	March'21	1.Severe RoW
29	400 kV D/C NNTPS Sw. Yd. - Ariyalur (Villupuram) line	PGCIL	147	400	July'19	July'20	1.Severe RoW
30	400 kV D/C Pugalur HVDC Station - Edayarpalayam (TANTRANSCO) line (Q)	PGCIL	105	400	Feb'20	July'21	1.Severe RoW
31	400 kV D/C Edayarpalayam (TANTRANSCO)-Udumulpet line (Q)	PGCIL	94	400	Feb'20	July'21	1.Severe RoW
32	LILO of 2nd ckt of Teesta III - Kishanganj 400 kV D/C line at Rangpo (Q)-Twin HTLS cond.	PGCIL	24	400	June'20	February'22	1.Severe RoW
33	LILO of Kishanganj (POWERGRID) – Darbhanga (DMTCL) 400 kV D/C (Quad) line at Saharsa (New)	PGCIL	78	400	June'21	October'21	1.Severe RoW
34	Additional 400 kV D/C line at Palatana S/stn. & Surajmaninagar S/stn. end for termination of Palatana - Surajmaninagar 400 kV D/C line	PGCIL	24	400	April'20	July'21	1.Change in location of SS (Under TBCB) 2.COVID-19

Sl. No.	Name of transmission line	Executing Agency	ckm	Voltage (kV)	Original schedule	Actual/ Anticipated commissioning	Reason for delay
35	Additional 400 kV D/C line at P.K.Bari S/stn. & Silchar S/stn. end for termination of P.K. Bari - Silchar 400 kV D/C line	PGCIL	22	400	April'20	March'21	1.Change in location of SS (Under TBCB) 2.COVID-19
36	(Extension of Essar-Lakadia/Bhachau 400 kV D/C (triple snowbird) line up to Jam Khambhaliya PS	Adani	38	400	Nov’21	Apr’22	1.Severe RoW issue
37	Lakadia PS – Banaskantha PS 765kV D/c line	Adani	352	765	Feb’22	Oct’22	1.Severe RoW issue
38	Bikaner II- Khetri 400kV D/C line	PGCIL	550	400	Dec’22	June’23	1.Severe RoW issue
39	Khetri - Bhiwadi 400kV D/C line	PGCIL	251	400	Dec’22	June’23	1.Severe RoW issue

List of sub-stations (220 kV and above voltage level) slipped from 2017-22

Sl. No.	Name of Sub-station	Executing Agency	Capacity (MVA)	Voltage Ratio (kV)	Original schedule	Actual/ Anticipated commissioning	Reasons for delay
1	Khandwa (M.P)	Sterlite	3000	765/400 kV	July’19	March’20	Severe RoW issue
2	Xeldem (Goa)	Sterlite	1000	400/220 kV	May’21/ Jan’22	June’24	1.Severe RoW issue 2. Extension of 8 months due to impact of COVID-19
3	Warangal (New)	Adani	3000	765/400 kV	Nov’19	August ’23	1.Severe RoW issue 2. COVID-19
4	Dhanbad	Adani	1000	400/220 kV	May'19	September'21	1.Severe RoW issue 2.COVID-19
5	Lakadia PS	Adani	3000	765/400 kV	Dec'20/Aug'21	September'22	1.Severe RoW issue 2. Extension of 8 months due to impact of COVID-19
6	800 kV HVDC Raigarh Station with 6000 MW HVDC Terminal	PGCIL	6000	800 kV	Nov'19	October'21	1.Severe RoW issue 2.COVID-19
7	800 kV HVDC Pugalur Station with 6000 MW HVDC Terminal	PGCIL	6000	800 kV	Nov'19	October'21	1.Severe RoW issue 2.COVID-19
8	Bhadla-II PS	PGCIL	3000	765/400 kV	Dec'20	October'22	1.Severe RoW issue 2.COVID-19
9	Fatehgarh-II PS	PGCIL	3000	765/400 kV	Dec'20	May'22	1.Severe RoW issue 2.COVID-19
10	320 kV VSC based HVDC Terminal at Pugalur (2000 MW)	PGCIL	2000	320 kV	Apr'20	June'21	1.Severe RoW issue 2.COVID-19

Sl. No.	Name of Sub-station	Executing Agency	Capacity (MVA)	Voltage Ratio (kV)	Original schedule	Actual/ Anticipated commissioning	Reasons for delay
11	320 kV VSC based HVDC Terminal at North Trichur (2000 MW)	PGCIL	2000	320 kV	Apr'20	June'21	1.Severe RoW issue 2.COVID-19
12	Mokokchung (PG) GIS S/S	PGCIL	30	220/132 kV	Mar'21	March'22	1.Severe RoW issue 2.COVID-19
13	Jam Khambhaliya PS (GIS)	Adani	2000	400/220 kV	Nov’21	Apr’22	1.Severe RoW issue
14	1x500 MVA, ICT at CGPL Mundra switchyard	Adani	500	400/220 kV	Nov’21	Nov’22	1.RoW issue (in Space constraint issue)

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Annex – 7.1

Inter- State Transmission System addition requirement for the period 2022-27

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
Northern Region										
NR-1	**NRSS-XXXVI (Part Scheme)**									
	Koteshwar Pooling Station-Rishikesh 400 kV D/c (HTLS) line	400 kV	Line	D/c	81		TBCB	UC (SPV transfer: 22.08.2016)	Dec-24	Uttarakhand
NR-2	**Establishment of 220/66 kV, 2x160 MVA GIS S/s at UT Chandigarh along with 220 kV D/c line from Chandigarh to 400/220 kV Panchkula(PG) substation**									
	Creation of 2x160MVA, 220/66 kV GIS S/s at UT Chandigarh	220/66 kV	S/s			320	RTM	Commissioned		Chandigarh
	220 kV D/c line from UT, Chandigarh to 400/220 kV Panchkula(PG) substation- 56 km	220 kV	Line	D/c	48		RTM	Commissioned		Chandigarh, Haryana
NR-3	**NRSS XXXVII**									
	Creation of 400/220 kV, 7x105 MVA GIS S/s at Jauljivi under ISTS	400/220 kV	S/s			630	RTM	Commissioned		Uttarakhand
	LILO of both ckt. of 400 kV Dhauliganga-Bareilly(PG) D/c line (presently charged at 220 kV) at 400/220 kV Jauljivi S/s	400 kV	Line	2xD/c	6		RTM	Commissioned		Uttarakhand, Uttar Pradesh
	Charging of Jauljivi –Bareilly D/c line at 400 kV level	400 kV	Line	D/c			RTM	Commissioned		Uttarakhand, Uttar Pradesh
	Diversion of Dhauliganga-Bareilly 400 kV D/c line(operated at 220 kV) at Bareilly end from CB Ganj to 400 kV Bareilly(PG) S/s	400 kV	Line	D/c	16		RTM	Commissioned		Uttarakhand, Uttar Pradesh

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	125 MVAr (420 kV) Bus Reactor at Jauljivi 400/220 kV S/s	400 kV	S/s				RTM	Commissioned		Uttarakhand
	Disconnection of 220 kV LILO arrangement of Dhauliganga-Bareilly at Pithoragarh and connecting it to Jauljivi 400/220 kV S/s	220 kV	Line	D/c	48		RTM	Commissioned		Uttarakhand, Uttar Pradesh
	Shifting of 25 MVAr line reactor already available in 220 kV Dhauliganga –Bareilly line at Dhauliganga end, to Jauljibi S/s as a bus reactor	220 kV	S/s				RTM	Commissioned		Uttarakhand, Uttar Pradesh
NR-4	**NR System Strengthening Scheme-XXXV**									
	Mohindergarh – Bhiwani 400 kV D/c line	400 kV	Line	D/c	122		TBCB	Commissioned		Haryana
NR-5	**Transmission system for providing connectivity to RE projects in Fatehgarh-II**									
	Additional (4th) 765/400kV transformer at Fatehgarh-II	765/400 kV	S/s			1500	RTM	Commissioned		Rajasthan
NR-6	**Transmission system for providing connectivity to RE projects in Bhadla-II**									
	Additional (3rd) 765/400kV transformer at Bhadla-II	765/400 kV	S/s			1500	RTM	Commissioned		Rajasthan
NR-7	**Transmission system strengthening scheme for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase II –Part A**									
	Establishment of 400/220 kV, 4x500 MVA at Fatehgarh III with 420 kV (2x125 MVAR) bus reactor	400/220 kV	S/s			2000	TBCB	UC (SPV transfer: 09.03.2021)	Nov-23	Rajasthan
	Fatehgarh III – Fatehgarh- II PS 400 kV D/c line (Twin HTLS)	400 kV	Line	D/c	300		TBCB	UC (SPV transfer: 09.03.2021)	Nov-23	Rajasthan
	Fatehgarh III– Jaisalmer II (RVPN) 400 kV D/c line (Twin HTLS)	400 kV	Line	D/c	120		TBCB	UC (SPV transfer: 09.03.2021)	Nov-23	Rajasthan

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
NR-8	**Transmission system strengthening for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase II –Part A1**									
	Augmentation with 765/400 kV, 1x1500MVA transformer (5th) at Fatehgarh II PS.	765/400 kV	S/s			1500	RTM	UC (Allocation date: 23.01.2020)	Mar-24	Rajasthan
NR-9	**Transmission system strengthening for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase II –Part B**									
	Fatehgarh-II PS – Bhadla-II PS 765 kV D/c line (2nd)	765 kV	Line	D/c	400		TBCB	UC (SPV Transfer: 04.06.2021)	Mar-24	Rajasthan
	1x240 MVAr Switchable line reactor for each circuit at each end of Fatehgarh-II – Bhadla- II 765 kV D/c line (2nd)	765 kV	S/s				TBCB	UC (SPV Transfer: 04.06.2021)	Mar-24	Rajasthan
NR-10	**Transmission system strengthening Scheme for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase II –Part B1**									
	Augmentation with 765/400 kV, 1x1500MVA transformer (6th) at Fatehgarh-II PS	765/400 kV	S/s			1500	RTM	UC (Allocation date: 23.01.2020)	Dec-23	Rajasthan
	Augmentation with 400/220 kV, 4x500MVA Transformer (6th to 9th) at Fatehgarh-II PS with suitable Bus sectionalisation at 400 and 220 kV level.	400/220 kV	S/s			2000	RTM	Commissioned		Rajasthan
	Augmentation with 400/220 kV, 3x500MVA Transformer (6th to 8th) at Bhadla-II PS with suitable Bus sectionalisation at 400 and 220 kV level	400/220 kV	S/s			1500	RTM	UC (Allocation date: 23.01.2020)	Dec-23	Rajasthan
	Augmentation with 765/400 kV ,1x1500 MVA transformer (4th) at Bhadla-II PS.	765/400 kV	S/s			1500	RTM	UC (Allocation	Dec-23	Rajasthan

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
								date: 23.01.2020)		
	STATCOM at Fatehgarh-II S/s	400 kV	S/s				RTM	Commissioned		Rajasthan
	STATCOM at Bhadla–II S/s	400 kV	S/s				RTM	Commissioned		Rajasthan
NR-11	**Transmission system strengthening scheme for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under phase-II- Part C**									
	Establishment of 765/400 kV, 2x1500 MVA at Sikar – II with 400 kV (1x125 MVAR) and 765 kV (2x330 MVAr) bus reactor	765/400 kV	S/s			3000	TBCB	UC (SPV Transfer: 04.06.2021)	Jun-24	Rajasthan
	Bhadla-II PS – Sikar-II 765 kV D/c line	765 kV	Line	D/c	620		TBCB	UC (SPV Transfer: 04.06.2021)	Jun-24	Rajasthan
	1x330 MVAr switchable line reactor for each circuit at Sikar-II end of Bhadla-II PS – Sikar-II 765 kV D/c line	765 kV	S/s				TBCB	UC (SPV Transfer: 04.06.2021)	Jun-24	Rajasthan
	1x240MVAr switchable line reactor for each circuit at Bhadla-II end of BhadlaII PS – Sikar-II 765 kV D/c line	765 kV	S/s				TBCB	UC (SPV Transfer: 04.06.2021)	Jun-24	Rajasthan
	Sikar-II – Neemrana 400 kV D/c line (Twin HTLS)	400 kV	Line	D/c	280		TBCB	UC (SPV Transfer: 04.06.2021)	Jun-24	Rajasthan
NR-12	**Transmission system strengthening scheme for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase-II- Part D**									
	Sikar-II – Aligarh 765 kV D/c line	765 kV	Line	D/c	660		TBCB	UC (SPV Transfer: 08.06.2021)	Jun-24	Rajasthan, Uttar Pradesh
	1x330 MVAr switchable line reactor for each circuit at each end of Sikar-II – Aligarh 765 kV D/c line	765 kV	S/s				TBCB	UC (SPV Transfer: 08.06.2021)	Jun-24	Rajasthan, Uttar Pradesh

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
NR-13	**Transmission system strengthening scheme for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase-II- Part E**									
	Bhadla-II PS – Sikar-II 765 kV D/c line(2nd)	765 kV	Line	D/c	620		TBCB	UC (SPV Transfer: 28.03.2023)	Sep-24	Rajasthan
	1x330 MVAr switchable line reactor for each circuit at Sikar-II end of Bhadla-II PS – Sikar-II 765 kV D/c line	765 kV	S/s				TBCB	UC (SPV Transfer: 28.03.2023)	Sep-24	Rajasthan
	1x240MVAr switchable line reactor for each circuit at Bhadla-II end of BhadlaII PS – Sikar-II 765 kV D/c line	765 kV	S/s				TBCB	UC (SPV Transfer: 28.03.2023)	Sep-24	Rajasthan
NR-14	**Transmission system strengthening scheme for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase-II- Part F**									
	Establishment of 400/220 kV, 2x500 MVA Pooling Station at Bikaner –II PS with 420kV (2x125 MVAR) bus reactor	400/220 kV	S/s			1000	TBCB	Commissioned		Rajasthan
	Bikaner-II PS – Khetri 400 kV 2xD/c line (Twin HTLS on M/c Tower)	400 kV	Line	D/c	540		TBCB	Commissioned		Rajasthan
	1x80MVAr switchable Line reactor on each circuit at Khetri end of Bikaner-II – Khetri 400 kV 2xD/c Line	400 kV	S/s				TBCB	Commissioned		Rajasthan
	Khetri- Bhiwadi 400 kV D/c line (Twin HTLS)	400 kV	Line	D/c	240		TBCB	Commissioned		Rajasthan
	STATCOM at Bikaner–II S/s	400 kV	S/s				TBCB	Commissioned		Rajasthan
NR-15	**Transmission system strengthening scheme for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase-II- Part F1**									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Removal of LILO of one circuit of Bhadla-Bikaner (RVPN) 400 kV D/c (Quad) line at Bikaner(PG). Extension of above LILO section from Bikaner(PG) up to Bikaner-II PS to form Bikaner-II PS – Bikaner (PG) 400 kV D/c(Quad) line	400 kV	Line	D/c	50		RTM	Commissioned		Rajasthan
NR-16	**Transmission system strengthening scheme for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase-II- Part G**									
	Establishment of 765/400 kV, 3X1500 MVA GIS substation at Narela with 765 kV (2x330 MVAr) bus reactor and 400 kV (1x125 MVAR) bus reactor	765/400 kV	S/s			4500	TBCB	UC (SPV Transfer: 11.05.2022)	Mar-24	Delhi
	Khetri – Narela 765 kV D/c line with 1x330MVAr Switchable line reactor for each circuit at Narela end of Khetri – Narela 765 kV D/c line	765 kV	Line	D/c	360		TBCB	UC (SPV Transfer: 11.05.2022)	Mar-24	Rajasthan, Delhi
	LILO of 765 kV Meerut-Bhiwani S/c line at Narela	765 kV	Line	D/c	50		TBCB	UC (SPV Transfer: 11.05.2022)	Mar-24	Haryana, Delhi, Uttar Pradesh
NR-17	**Transmission system strengthening scheme for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase-II- Part G1 (Maharanibagh/Gopalpur- Narela 765/400 kV substation 400 kV interconnection)**									
	Removal of LILO of Bawana – Mandola 400 kV D/c(Quad) line at Maharani Bagh /Gopalpur S/s. Extension of above LILO section from Maharani Bagh/ Gopalpur upto Narela S/s so as to form Maharanibagh – Narela 400 kV D/c(Quad) and Maharanibagh -Gopalpur-Narela 400 kV D/c(Quad)lines	400 kV	Line	2xD/c	28		RTM	UC (Allocation date: 23.01.2020)	Mar-24	Delhi

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
NR-18	**Transmission system strengthening scheme for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase-II- Power reversal in Balia-Bhiwadi HVDC line**									
	Power reversal on ±500 KV, 2500 Balia- Bhiwadi HVDC line upto 2000 MW from Bhiwadi to Balia	500 kV					RTM	Commissioned		Rajasthan, Uttar Pradesh
NR-19	**Transmission system for evacuation of power from Pakaldul (1000MW), Kiru (624MW) and Kwar (540 MW) HEPs**									
	Establishment of 2x200 MVA, 400/132 kV pooling station at Kishtwar (GIS) with 125 MVAR, 420 kV bus reactor	400/132 kV	S/s			400	TBCB	UC (SPV Transfer: 06.12.2022)	Apr-25	Jammu & Kashmir
	LILO one circuit of Kishenpur – Dulhasti 400 kV D/c (Quad) line (Single Circuit Strung)	400 kV	Line	D/c	30		TBCB	UC (SPV Transfer: 06.12.2022)	Apr-25	Jammu & Kashmir
	Kishtwar switching station - Kishenpur400kV S/c (Quad) line (stringing of second circuit of Dulhasti–Kishenpur400kV from Kishtwar upto Kishenpur)	400 kV	Line	S/c	15		TBCB	UC (SPV Transfer: 06.12.2022)	Apr-25	Jammu & Kashmir
NR-20	**Additional 1x500 MVA, 400/220 kV ICT (8th) at Bhadla Pooling Station**									
	1x500 MVA, 400/220 kV ICT (8th) at Bhadla Pooling Station	400/220 kV	S/s			500	RTM	Commissioned		Rajasthan
NR-21	**Transmission works to be implemented in Jammu and Kashmir Region**									
	Addition of new 1x315 MVA(or 1x500 MVA if possible), 400/220 kV ICT at Amargarh to be taken up under ISTS	400/220 kV	S/s			315	RTM	Planned		Jammu & Kashmir
NR-22	**ICT augmentation**									
	1x500 MVA, 400/220 kV ICT augmentation (3rd) at Sohawal (PG)	400/220 kV	S/s			500	RTM	Commissioned		Uttar Pradesh

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
NR-23	**Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part A1**									
	Establishment of 2x500 MVA 400/220 kV pooling station at Fatehgarh-4 along with 2x125 MVAr Bus Reactor	400/220 kV	S/s			1000	TBCB	UC (SPV Transfer: 02.08.2023)	Feb-25	Rajasthan
	Fatehgarh-4- Fatehgarh-3 400 kV D/c twin HLTS line (50 km)	400 kV	Line	D/c	100		TBCB	UC (SPV Transfer: 02.08.2023)	Feb-25	Rajasthan
NR-24	**Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part A2**									
	Augmentation of 3x500 MVA, 400/220 kV pooling station at Fatehgarh-4	400/220 kV	S/s			1500	RTM	Planned		Rajasthan
NR-25	**Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part A3**									
	Fatehgarh 3- Bhadla-3 400 kV D/c line(Quad) along with 50 MVAr Switchable line reactor for each circuit at both ends	400 kV	Line	D/c	400		TBCB	UC (SPV Transfer: 02.08.2023)	Feb-25	Rajasthan
NR-26	**Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part B1**									
	Establishment of 2x1500 MVA 765/400 kV & 3x500 MVA 400/220 kV pooling station at Bhadla-3 along with 2x330 MVAr (765 kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor	765/400/220 kV	S/s			4500	TBCB	UC (SPV Transfer: 27.09.2023)	Mar-25	Rajasthan
	Fatehgarh-2 – Bhadla-3 400 kV D/c line (Quad moose) along with 50 MVAr Switchable line reactor for each circuit at both ends	400 kV	Line	D/c	400		TBCB	UC (SPV Transfer: 27.09.2023)	Mar-25	Rajasthan

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Bhadla-3 – Sikar-II 765 kV D/c line along with 330 MVAr Switchable line reactor for each circuit at each end	765 kV	Line	D/c	760		TBCB	UC (SPV Transfer: 27.09.2023)	Mar-25	Rajasthan
NR-27	**Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part B2**									
	Augmentation of 7x500 MVA 400/220 kV transformation capacity at Bhadla-3	400/220 kV	S/s			3500	RTM	Planned		Rajasthan
NR-28	**Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part C1**									
	Establishment of 2x1500 MVA 765/400 kV & 2x500 MVA 400/220 kV pooling station at Ramgarh along with 2x240 MVAr (765 kV) Bus Reactor & 2x125 MVAr (420kV) Bus reactor	765/400/220 kV	S/s			4000	TBCB	UC (SPV Transfer: 26.10.2023)	Nov-25	Rajasthan
	Ramgarh – Bhadla-3 765 kV D/c line (180 km) along with 240 MVAr switchable line reactor at each circuit at Ramgarh end of Ramgarh – Bhadla-3 765kV D/c line	765 kV	Line	D/c	360		TBCB	UC (SPV Transfer: 26.10.2023)	Nov-25	Rajasthan
NR-29	**Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part C2**									
	Augmentation of 1x1500 MVA 765/400 kV at Ramgarh	765/400 kV	S/s			1500	RTM	Planned		Rajasthan
NR-30	**Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part C3**									
	Ramgarh S/s : STATCOM : ± 2x300MVAr, 4x125 MVAr MSC, 2x125 MVAr MSR	400 kV	S/s				RTM	Planned		Rajasthan
NR-31	**Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part D**									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Sikar-II – Khetri 765 kV D/c line	765 kV	Line	D/c	180		TBCB	Under Bidding		Rajasthan
	Sikar-II – Narela 765 kV D/c line along with 240 MVAr Switchable line reactor for each circuit at each end of Sikar-II – Narela 765 kV D/c line	765 kV	Line	D/c	520		TBCB	Under Bidding		Rajasthan, Delhi
	Jhatikara – Dwarka 400 kV D/c line (Quad) (20km)	400 kV	Line	D/c	40		TBCB	Under Bidding		Delhi
NR-32	**Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part E1**									
	Establishment of 3x1500 MVA 765/400 kV &3x500 MVA 400/220 kV pooling station at Fatehgarh-3 (new section) (In addition to 4x500 MVA ICT proposed under Rajasthan SEZ Ph-II-of Section-1) along with 2x330 MVAr, 765 kV & 2x125 MVAr, 420kV Bus Reactors	765/400/220 kV	S/s			6000	RTM	UC (Allocation date: 01.12.2021)	Jan-25	Rajasthan
NR-33	**Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part E2**									
	Augmentation of 3x1500 MVA 765/400 kV & 2x500 MVA 400/220 kV pooling station at Fatehgarh-3 (new section)	765/400/220 kV	S/s			5500	RTM	UC (Allocation date: 01.12.2021)	To be finalized	Rajasthan
NR-34	**Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III: Part E3**									
	Fatehgarh – III S/s : STATCOM : ± 2x300 MVAr, 4x125 MVAr MSC, 2x125 MVAr MSR	400 kV	S/s					Planned		Rajasthan
NR-35	**Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part F**									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Impleme ntation	Present Status (as on 31.10.2023)	Anticipate d Commissio ning schedule	State
	Establishment of 2x1500MVA 765/400 kV Substation at suitable location near Beawar along with 2x330 MVAr 765 kV Bus Reactor & 2x125 MVAr 420kV Bus Reactor	765/400 kV	S/s			3000	TBCB	UC (SPV Transfer: 20.09.2023)	Mar-25	Rajasthan
	LILO of both circuit of Ajmer-Chittorgarh 765 kV D/c at Beawar	765 kV	Line	2xD/c	180		TBCB	UC (SPV Transfer: 20.09.2023)	Mar-25	Rajasthan
	LILO of 400 kV Kota –Merta line at Beawar	400 kV	Line	D/c	40		TBCB	UC (SPV Transfer: 20.09.2023)	Mar-25	Rajasthan
	Fatehgarh-3– Beawar 765 kV D/c along with 330 MVAr Switchable line reactor for each circuit at each end of Fatehgarh-3– Beawar 765 kV D/c line	765 kV	Line	D/c	700		TBCB	UC (SPV Transfer: 20.09.2023)	Mar-25	Rajasthan
NR-36	**Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part G**									
	Fatehgarh-3– Beawar 765 kV D/c(2nd) along with 330 MVAr Switchable line reactor for each circuit at each end of Fatehgarh-3– Beawar 765 kV D/c line	765 kV	Line	D/c	700		TBCB	UC (SPV Transfer: 01.08.2023)	Mar-25	Rajasthan
NR-37	**Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part H**									
	Establishment of 2x1500 MVA 765/400 kV substation at suitable location near Dausa along with 2x330 MVAr, 765 kV Bus Reactor & 2x125 MVAr, 420 kV bus Reactor	765/400 kV	S/s			3000	TBCB	UC (SPV Transfer: 30.10.2023)	Apr-25	Rajasthan
	LILO of both circuits of Jaipur(Phagi)-Gwalior 765 kV D/c at Dausa along with 240 MVAr Switchable line reactor for each circuit at Dausa end of Dausa – Gwalior 765 kV D/c line	765 kV	Line	2xD/c	160		TBCB	UC (SPV Transfer: 30.10.2023)	Apr-25	Rajasthan, Madhya Pradesh

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	LILO of both circuits of Agra – Jaipur(south) 400 kV D/c at Dausa along with 50 MVAr Switchable line reactor for each circuit at Dausa end of Dausa – Agra 400 kV D/c line	400 kV	Line	2xD/c	120		TBCB	UC (SPV Transfer: 30.10.2023)	Apr-25	Rajasthan, Uttar Pradesh
	Beawar – Dausa 765 kV D/c line (240 km) along with 240 MVAr Switchable line reactor for each circuit at each end	765 kV	Line	D/c	480		TBCB	UC (SPV Transfer: 30.10.2023)	Apr-25	Rajasthan
NR-38	**Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part I**									
	Establishment of 6000MW, ±800KV Bhadla(HVDC) terminal station at a suitable location near Bhadla-3 substation	800 kV	S/s				TBCB	Under Bidding		Rajasthan
	Establishment of 6000MW, ±800KV Fatehpur(HVDC) terminal station at suitable location near Fatehpur (UP)	800 kV	S/s				TBCB	Under Bidding		Uttar Pradesh
	Bhadla-3 - Bhadla(HVDC) 400 kV 2xD/c quad moose line along with the line bays at both substations	400 kV	Line	2xD/c	8		TBCB	Under Bidding		Rajasthan
	±800KV HVDC line (Hexa lapwing)(4x1500 MW) between Bhadla-3 & Fatehpur (950km)	800 kV	Line	D/c	1900		TBCB	Under Bidding		Rajasthan, Uttar Pradesh
	Establishment of 5x1500MVA, 765/400KV ICTs at Fatehpur (HVDC) along with 2x330MVAr (765 kV) bus reactor	765/400 kV	S/s			7500	TBCB	Under Bidding		Uttar Pradesh
	LILO of both ckts of 765 kV Varanasi – Kanpur (GIS) D/c at Fatehpur(30km)	765 kV	Line	2xD/c	120		TBCB	Under Bidding		Uttar Pradesh
NR-39	**Transformer augmentation at various substations for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part J**									
	Augmentation with 400/220 kV, 1x500MVA Transformer (10th) at Fatehgarh-2 PS	400/220 kV	S/s			500	RTM	UC (Allocation	To be finalized	Rajasthan

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
								date: 01.12.2021)		
	Augmentation with 765/400 kV, 1x1500MVA 3 Transformer (5th) at Bhadla-2 PS	765/400 kV	S/s			1500	RTM	UC (Allocation date: 01.12.2021)	To be finalized	Rajasthan
	Augmentation with 765/400 kV, 1x1500MVA 4 Transformer (3rd) at Bikaner (PG)	765/400 kV	S/s			1500	RTM	Commissioned		Rajasthan
	Augmentation of 1x500 MVA ICT (5th), 400/220 kV ICT at Fatehgarh-3 Substation (section-1)	400/220 kV	S/s			500	RTM	UC (Allocation date: 01.12.2021)	To be finalized	Rajasthan
	Augmentation of 1x1500MVA ICT at 765/400 kV Kanpur(GIS) substation	765/400 kV	S/s			1500	RTM	UC (Allocation date: 01.12.2021)	To be finalized	Uttar Pradesh
	Augmentation of 1x1500 MVA ICT (3rd), 765/400 kV ICT at Jhatikara Substation (Bamnoli/Dwarka section)	765/400 kV	S/s			1500	RTM	UC (Allocation date: 01.12.2021)	To be finalized	Delhi
NR-40	**Establishment of 400/220 kV Nange Pooling Plant Luhri Stage-I, II & Sunni DamStation for proposed SJVN Hydro Power**									
	Establishment of 7x105MVA (single phase units, 400/220 kV Nange GIS Pooling Station (tentatively Identified near Luhri Stage-II HEP)	400/220 kV	S/s			630	TBCB	Under Bidding		Himachal Pradesh
	Nange GIS Pooling Station – Koldam 400 kV D/c line along with associated bays at both ends	400 kV	Line	D/c	140		TBCB	Under Bidding		Himachal Pradesh

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Bypassing one ckt of Koldam – Ropar/Ludhiana 400 kV D/c line (Triple snowbird) at Koldam and connecting it with one of the circuit of Nange-Koldam 400 kV D/c line (Triple snowbird), thus forming Nange- Ropar/Ludhiana one line (Triple snowbird)	400 kV	Line				TBCB	Under Bidding		Himachal Pradesh, Punjab
	125 MVAR Bus Reactor at Nange GIS PS	400 kV	S/s				TBCB	Under Bidding		Himachal Pradesh
	125 MVAR (420kV) Bus Reactor at Koldam S/s (1-Ph units along with one spare unit)	400 kV	S/s				TBCB	Under Bidding		Himachal Pradesh
NR-41	**Implementation of Transmission System Strengthening for 'Srinagar – Leh Transmission System'**									
	Laying of cable about 15 km between Minamarg and Zojila Top section of Alusteng –Drass 220 kV section	220 kV	Line	S/c	15		RTM	UC (Allocation date: 21.12.2021)	Dec-24	Ladakh
	2x25 MVAR, 220 kV bus reactors at 220/66kV Drass S/s	220 kV	S/s				RTM	UC (Allocation date: 21.12.2021)	Dec-24	Ladakh
	1x25 MVAR, 220 kV bus reactors at 220/66kV Alusteng S/s	220 kV	S/s				RTM	UC (Allocation date: 21.12.2021)	Dec-24	Ladakh
NR-42	**Requirement of 30 MW power supply at eastern portal, Zojila tunnel**									
	50 MVA 220/66 kV ICT augmentation at Drass substation.	220/66 kV	S/s			50	RTM	Planned		Ladakh
NR-43	**Enhancement of ATC/TTC for Punjab due to unprecedented load growth of summer**									
	Augmentation of 1x315 MVA, 400/220 kV ICT to 1x 500 MVA at Ludhiana	400/220 kV	S/s			500	RTM	Commissioned		Punjab

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Augmentation of 1x315 MVA, 400/220 kV ICT to 1x 500 MVA at Pataila	400/220 kV	S/s			500	RTM	Commissioned		Punjab
NR-44	**ICT augmentation at Moga S/s**									
	Replacement of 1x250 MVA, 400/220 kV ICT at 765/400/220 kV Moga S/s with 1x500 MVA 400/220 kV ICT	400/220 kV	S/s			500	RTM	Commissioned		Punjab
NR-45	**ICT augmentation at Bikaner-II PS to cater N-1 contingency**									
	Implementation of 1x500 MVA, 400/220 kV ICT (3rd) at Bikaner-II	400/220 kV	S/s			500	RTM	UC (Allocation date: 14.10.2022)	Jan-24	Rajasthan
NR-46	**ICT augmentation at Fatehgarh-II PS to cater N-1 contingency**									
	Implementation of 1x500 MVA, 400/220 kV ICT (6th) at Fatehgarh-II	400/220 kV	S/s			500	RTM	UC (Allocation date: 14.10.2022)	Jan-24	Rajasthan
NR-47	**400 kV D/c Khandukhal(Srinagar)-Rampura (Kashipur) line (Quad Bersimis)**									
	400 kV D/c Khandukhal(Srinagar)-Rampura (Kashipur) line (Quad Bersimis)	400 kV	Line	D/c	390		TBCB	UC (SPV Transfer: 07.10.2022)	Sep-24	Uttarakhand
	1x80MVAr switchable line reactor at Rampura (Kashipur) end on each ckt of Khandukhal(Srinagar) -Rampura (Kashipur) line	400 kV	S/s				TBCB	UC (SPV Transfer: 07.10.2022)	Sep-24	Uttarakhand
NR-48	**Creation of 400/220 kV, 2x315 MVA S/S at Siot (earlierAkhnoor/Rajouri)**									
	Establishment of 7x105 MVA, 400/220 kV Siot S/s with 1x80 MVAR (420 kV) bus reactors	400/220 kV	S/s			630	TBCB	Under Bidding		Jammu & Kashmir
	LILO of both circuits of 400 kV D/c Amargarh (Kunzer)- Samba line at 400/220 kV Siot S/s	400 kV	Line	2xD/c	60		TBCB	Under Bidding		Jammu & Kashmir
NR-49	**Additional ICT at Kurukshetra (PG)**									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Installation of 3rd 500 MVA, 400/220 kV ICT at Kurukshetra	400/220 kV	S/s			500	RTM	UC (Allocation date: 16.11.2022)	Dec-23	Haryana
NR-50	**400 kV ISTS elements involving inter-connection HVPNL's Intra-State transmission network**									
	400/220 kV, 500 MVA ICT augmentation at Bahadurgarh (PG)	400/220 kV	S/s			500	RTM	UC (Allocation date: 15.11.2022)	Jul-24	Haryana
	1x500 MVA 400/220 kV ICT (3rd) augmentation at Jind (PG)	400/220 kV	S/s			500	RTM	UC (Allocation date: 15.11.2022)	Feb-24	Haryana
NR-51	**ICT augmentation at Patran S/s**									
	400/220 kV, 500 MVA ICT augmentation at Patran GIS S/s	400/220 kV	S/s			500	RTM	UC (Allocation date: 28.11.2022)	Aug-24	Punjab
NR-52	**Transmission system for evacuation of power from Shongtong Karcham HEP (450 MW) and Tidong HEP (150 MW)**									
	Establishment of 2x315 MVA (7x105 MVA 1-ph units including a spare unit) 400/220 kV GIS Pooling Station at Jhangi	400/220 kV	S/s			630	TBCB	Under Bidding		Himachal Pradesh
	Jhangi PS – Wangtoo 400 kV D/c line (Quad)	400 kV	Line	D/c	108		TBCB	Under Bidding		Himachal Pradesh
	LILO of one circuit of Jhangi PS - Wangtoo (HPPTCL) 400 kV D/c (Quad) line at generation switchyard of Shongtong HEP	400 kV	Line	D/c	2		TBCB	Under Bidding		Himachal Pradesh

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Wangtoo (HPPTCL) - Panchkula (PG) 400 kV D/c line (Twin HTLS)	400 kV	Line	D/c	420		TBCB	Under Bidding		Himachal Pradesh, Haryana
NR-53	**Transmission Schemes for evacuation of power from Rajasthan REZ in Bikaner (part of 181.5 GW)**									
	6x1500 MVA, 765/400 kV & 4x500 MVA, 400/220 kV Bikaner-III Pooling Station along with 2x330 MVAr (765 kV) Bus Reactor & 2x125 MVAr (420 kV) Bus Reactor at a suitable location near Bikaner (2 GW injection at 220 kV level and 2 GW injection at 400 kV level)	765/400/220 kV	S/s			11000	TBCB	Under Bidding		Rajasthan
	LILO of both ckts of Bikaner (PG)-Bikaner-II D/c line at Bikaner-III PS (~20 km)	400 kV	Line	2xD/c	80		TBCB	Under Bidding		Rajasthan
	Bikaner-II PS – Bikaner-III PS 400 kV D/c line (QM equivalent) (~30 km)	400 kV	Line	D/c	60		TBCB	Under Bidding		Rajasthan
	Bikaner-III PS – Bhadla-III PS 400 kV D/c line (QM equivalent) (~200 km)	400 kV	Line	D/c	400		TBCB	Under Bidding		Rajasthan
	Establishment of 765/400 kV, 4x1500 MVA Neemrana-II S/s along with 2x330 MVAr (765 kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor at a suitable location near Neemrana.	765/400 kV	S/s			6000	TBCB	Under Bidding		Rajasthan
	Bikaner-III - Neemrana-II 765 kV 2xD/c line (~350 km) along with 330 MVAr switchable line reactor for each circuit at each end	765 kV	Line	2xD/c	1400		TBCB	Under Bidding		Rajasthan
	Neemrana-II- Bareilly(PG) 765 kV D/c line (~350 km) along with 330 MVAr switchable line reactor for each circuit at each end	765 kV	Line	D/c	700		TBCB	Under Bidding		Rajasthan, Uttar Pradesh
	Neemrana-II -Kotputli 400 kV D/c line (QM equivalent)(~70 km)	400 kV	Line	D/c	140		TBCB	Under Bidding		Rajasthan
	Augmentation by 400/220 kV, 1x500 MVA (3rd) ICT at Kotputli (PG)	400/220 kV	S/s			500		Planned		Rajasthan

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	LILO of both ckts of 400 kV Sohna Road(GPTL)-Gurgaon(PG) D/c line at Neemrana-II S/s (~85 km)	400 kV	Line	2xD/c	340		TBCB	Under Bidding		Rajasthan, Haryana
	Augmentation by 400/220 kV, 5x500 MVA ICT at Bikaner -II PS	400/220 kV	S/s			2500		Planned		Rajasthan
NR-54	**Transmission Schemes for evacuation of power from Rajasthan REZ in Ramgarh (part of 181.5 GW)**									
	Augmentation by 2x1500MVA, 765/400 kV ICTs at Ramgarh PS	765/400 kV	S/s			3000		Planned		Rajasthan
	Augmentation by 400/220 kV, 4x500 MVA ICTs at Ramgarh PS	400/220 kV	S/s			2000		Planned		Rajasthan
	Establishment of 2x1500 MVA, 765/400 kV S/s along with 2x330 MVAr (765 kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor near Hanumangarh in Rajasthan	765/400 kV	S/s			3000		Planned		Rajasthan
	Establishment of 2x1500 MVA, 765/400 kV S/s along with 2x330 MVAr (765 kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor near Sangrur in Punjab	765/400 kV	S/s			3000		Planned		Punjab
	Ramgarh PS- Bhadla-3 PS 765 kV D/c line (2nd) along with 240 MVAr switchable line reactor for each circuit at each end (~200 km)	765 kV	Line	D/c	400			Planned		Rajasthan
	Bhadla-3 PS – Hamumangarh 765 kV D/c line along with 330 MVAr switchable line reactor for each circuit at each end (~300 km)	765 kV	Line	D/c	600			Planned		Rajasthan
	Hamumangarh - Sangrur 765 kV D/c line along with 240 MVAr switchable line reactor for each circuit at each end (~200 km)	765 kV	Line	D/c	400			Planned		Rajasthan, Punjab
	Hanumangarh – Fatehabad 400 kV D/c line along with 80 MVAr switchable line reactor for each circuit at Hanumangarh end (QM equivalent) (~130 km)	400 kV	Line	D/c	260			Planned		Rajasthan, Haryana

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	LILO of Kurukshetra – Jallandhar/Dhanansu 400 kV line at Sangrur S/s (~40 km)	400 kV	Line	D/c	80			Planned		Punjab, Haryana
NR-55	**Transmission Schemes for evacuation of power from Rajasthan REZ in Fatehgarh & Barmer (part of 181.5 GW)**									
	Establishment of 5x1500 MVA, 765/400 kV & 4x500 MVA, 400/220 kV Fatehgarh- 4 (Section-2) Pooling Station along with 2x330 MVAr (765 kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor (1 GW injection at 220 kV level and 1 GW injection at 400 kV level)	765/400/220 kV	S/s			9500	TBCB	Under Bidding		Rajasthan
	Fatehgarh-4(Section-2) – Bhinmal(PG) 400 kV D/c line(Quad) (~200 km)	400 kV	Line	D/c	400		TBCB	Under Bidding		Rajasthan
	LILO of both ckts of 2nd D/c 765 kV Fatehgarh-3-Beawar 2xD/c line at Fatehgarh-4 (Section-2) PS along with 330 MVAr switchable line reactor at Fatehgarh-IV PS end of each ckt of 765 kV Fatehgarh-IV – Beawar D/c line	765 kV	Line	2xD/c	60		TBCB	Under Bidding		Rajasthan
	Beawar- Mandsaur 765 kV D/c line along with 240 MVAr switchable line reactor for each circuit at each end (~260 km)	765 kV	Line	D/c	520		TBCB	Under Bidding		Rajasthan, Madhya Pradesh
	Establishment of 3x1500 MVA, 765/400 kV & 4x500 MVA, 400/220 kV Barmer-I Pooling Station along with2x330 MVAR (765 kV), 2x125 MVAr (420kV) Bus Reactor (1.5 GW injection at 220 kV level and 1.5 GW injection at 400 kV level)	765/400/220 kV	S/s			6500	TBCB	Under Bidding		Rajasthan
	Fatehgarh-III (Section-2) PS – Barmer-I PS 400 kV D/c line (Quad)(~50 km)	400 kV	Line	D/c	100		TBCB	Under Bidding		Rajasthan
	Establishment of 2x1500 MVA, 765/400 kV & 2x500 MVA 400/220 kV substation along with 2x330 MVAr (765kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor near Sirohi	765/400/220 kV	S/s			4000	TBCB	Under Bidding		Rajasthan

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Establishment of 765 kV switching station at suitable location near Rishabdeo (Distt. Udaipur) along with 2x240 MVAr (765 kV) Bus Reactor	765 kV	S/s				TBCB	Under Bidding		Rajasthan
	Fatehgarh-IV (Section-2) PS – Sirohi PS 765 kV D/c line along with 240 MVAr switchable line reactor for each circuit at each end (~240 km)	765 kV	Line	D/c	480		TBCB	Under Bidding		Rajasthan
	Barmer-I PS– Sirohi PS 765 kV D/c line along with 240 MVAr switchable line reactor for each circuit at each end (~200 km)	765 kV	Line	D/c	400		TBCB	Under Bidding		Rajasthan
	Sirohi PS-Chittorgarh (PG) 400 kV D/c line along with 80 MVAr switchable line reactor for each circuit at Sirohi PS end (Quad) (~160 km)	400 kV	Line	D/c	320		TBCB	Under Bidding		Rajasthan
	Sirohi PS- Rishabdeo 765 kV D/c line along with 330 MVAr switchable line reactor for each circuit at Sirohi end	765 kV	Line	D/c	340		TBCB	Under Bidding		Rajasthan
	Rishabdeo - Mandsaur PS 765 kV D/c line along with 330 MVAr switchable line reactor for each circuit at Rishabdeo end (~160 km)	765 kV	Line	D/c	320		TBCB	Under Bidding		Rajasthan, Madhya Pradesh
	LILO of one circuit of 765 kV Chittorgarh-Banaskanta D/c line at Rishabdeo/Salumbar S/s (20 km)	765 kV	Line	D/c	40		TBCB	Under Bidding		Rajasthan, Gujarat
	Establishment of 3x1500 MVA, 765/400 kV & 5x500 MVA, 400/220 kV Mandsaur Pooling Station along with 2x330 MVAR (765 kV) Bus Reactors & 2x125 MVAR, 420 kV Bus Reactor	765/400/220 kV	S/s			7000	TBCB	Under Bidding		Madhya Pradesh
	Mandsaur PS – Indore (PG) 765 kV D/c line (200 km) along with 1x330 MVAr switchable line reactor (SLR) on each ckt at Mandsaur end	765 kV	Line	D/c	400		TBCB	Under Bidding		Madhya Pradesh

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Establishment of 765/400 kV (2x1500 MVA) 400/220 kV (2x500 MVA) and 220/132 kV (3x200 MVA) Kurawar S/s (with 1x500 MVA spare single phase transformer unit) with 2x330 MVAr, 765 kV bus reactor and 1x125 MVAr, 420 kV bus reactor (with 1x110 MVAr and 1x80 MVAr, 765 kV spare single phase reactor unit for line/bus reactor)	765/400/220/132 kV	S/s			4600	TBCB	Under Bidding		Madhya Pradesh
	Mandsaur – Kurawar 765 kV D/c line (~235 km) with 240 MVAr switchable line reactors at both ends	765 kV	Line	D/c	470		TBCB	Under Bidding		Madhya Pradesh
	LILO of Indore – Bhopal 765 kV S/c line at Kurawar (LILO route length ~15 km)	765 kV	Line	D/c	30		TBCB	Under Bidding		Madhya Pradesh
	Kurawar – Ashtha 400 kV D/c (Quad ACSR/AAAC/AL59 moose equivalent) line (~65 km)	400 kV	Line	D/c	130		TBCB	Under Bidding		Madhya Pradesh
	LILO of one circuit of Indore – Itarsi 400 kV D/c line at Astha (LILO route length ~ 30 km)	400 kV	Line	D/c	60		TBCB	Under Bidding		Madhya Pradesh
	Shujalpur – Kurawar 400 kV D/c (Quad ACSR/AAAC/AL59 moose equivalent) line (~40 km)	400 kV	Line	D/c	80		TBCB	Under Bidding		Madhya Pradesh
	Sirohi PS- Rishabdeo 765 kV D/c line (2nd) along with 330 MVAr switchable line reactor for each circuit at Sirohi end	765 kV	Line	D/c	340		TBCB	Planned		Rajasthan
	Augmentation by 1x1500 MVA, 765/400 kV ICT at Fatehgarh-3 PS(7th)	765/400 kV	S/s			1500		Planned		Rajasthan
	Augmentation by 1x1500 MVA, 765/400 kV ICT at Fatehgarh-2 PS(7th)	765/400 kV	S/s			1500		Planned		Rajasthan
	Establishment of 3x500 MVA, 400/220 kV Barmer-II Pooling Station along with 2x125 MVAr (420kV) Bus Reactor (about 1 GW injection at 220 kV level and 1 GW injection at 400 kV level)	400/220 kV	S/s			1500		Planned		Rajasthan

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Fatehgarh- 4 - Barmer-II 400 kV D/c Line (QM equivalent) (~30 km)	400 kV	Line	D/c	60			Planned		Rajasthan
	Barmer-I- Barmer-II 400 kV D/c line (Quad)(~30 km)	400 kV	Line	D/c	60			Planned		Rajasthan
	Rishabdeo – Ahmedabad 765 kV D/c line (QM equivalent) (~200 km) with 240 MVAr switchable line reactor for each circuit at each Ahmedabad end	765 kV	Line	D/c	400			Planned		Rajasthan, Gujarat
	Rishabdeo – Prantij (GETCO) 400 kV D/c line (QM equivalent) (~150 km) with 50MVAr switchable line reactor for each circuit at Prantij end	400 kV	Line	D/c	300			Planned		Rajasthan, Gujarat
	LILO of Soja – Wanakbori 400 kV 2nd line at Prantij(GETCO) S/s	400 kV	Line	D/c	60			Planned		Gujarat
NR-56	**Transmission Schemes for evacuation of power from Rajasthan REZ in Ajmer (part of 181.5 GW)**									
	Establishment of 2x1500 MVA, 765/400 kV & 2x500 MVA, 400/220 kV Ajmer -2 Pooling Station along with 2x330 MVAr (765 kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor (0.5 GW injection at 220 kV level and 0.5 GW injection at 400 kV level)	765/400/220 kV	S/s			4000		Planned		Rajasthan
	Ajmer -2 – Beawar 400 kV D/c line (QM equivalent) (~50 km)	400 kV	Line	D/c	100			Planned		Rajasthan
	Establishment of 765/400 kV, 2x1500 MVA Kota (New) Pooling Station along with 2x330 MVAr (765 kV) Bus Reactor & 2x125 MVAr (400 kV) Bus Reactor	765/400 kV	S/s			3000		Planned		Rajasthan
	765 kV Ajmer (New) — Kota (New) D/c line (~200 km) along with 240 MVAr switchable line reactor for each circuit at each end	765 kV	Line	D/c	400			Planned		Rajasthan

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Kota (New) – Kota (PG) 400 kV D/c line (Quad Moose equivalent) (~50 km)	400 kV	Line	D/c	100			Planned		Rajasthan
	Kota (New) – Kurawar 765 kV D/c line (~250 km) along with 240 MVAr switchable line reactor for each circuit at each end	765 kV	Line	D/c	500			Planned		Rajasthan
NR-57	**Transmission scheme for evacuation of 4000 MW solar generation in Bundelkhand area of UP**									
	1500 MVA 765/400 kV ICT augmentation at Orai (PG) substation	765/400 kV	S/s			1500		Planned		Uttar Pradesh
NR-58	**Cross Border link with Nepal**									
	Gorakhpur (India) – New Butwal (Nepal) 400 kV D/c (Quad) line (only Indian portion)	400 kV	Line	D/c	240			Planned		Uttar Pradesh, Nepal
NR-59	**Scheme to relieve high loading of WR-NR Inter Regional Corridor (400 kV Bhinmal-Zerda line**									
	Bypassing of 400 kV Kankroli - Bhinmal-Zerda line at Bhinmal to form 400 kV Kankroli – Zerda (direct) line (with necessary arrangement for bypassing Kankroli- Zerda line at Bhinmal with suitable switching equipment inside the Bhinmal substation)	400 kV	Line				RTM	UC (Allocation date: 15.11.2022)	Dec-23	Rajasthan, Gujarat
	Reconductoring of 400 kV Jodhpur (Surpura)(RVPN) – Kankroli S/c line with twin HTLS conductor [with minimum capacity of 1940 MVA/ckt at nominal voltage (line length is about 188 km); Upgradation of existing 400kV bay equipment's each at Jodhpur (Surpura)(RVPN) and Kankroli S/s (3150 A)]	400 kV	Line				RTM	UC (Allocation date: 15.11.2022)	May-24	Rajasthan
Western Region										
WR-1	**Western Region System Strengthening -V**									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	LILO of 400 kV Lonikhand - Kalwa line at Navi Mumbai	400 kV	Line	D/c	16		RTM	UC		Maharashtra
	Establishment of 400/220 kV, 2 x 315 MVA new S/s (GIS) at Navi Mumbai	400/220 kV	S/s			630	RTM	UC		Maharashtra
WR-2	**Additional 400 kV Feed to Goa**									
	LILO of one ckt. of Narendra (existing) – Narendra (New) 400 kV D/c quad line at Xeldem	400 kV	Line	D/c	120		TBCB	UC (SPV transfer: 14.03.2018)		Karnataka, Goa
	Xeldem – Mapusa 400 kV D/c (quad) line	400 kV	Line	D/c	80		TBCB	UC (SPV transfer: 14.03.2018)		Goa
	Establishment of 2x500MVA, 400/220 kV substation at Xeldem	400/220 kV	S/s			1000	TBCB	UC (SPV transfer: 14.03.2018)		Goa
	1x80 MVAR switchable line reactor along with 500 Ohms NGR and its auxiliaries at Narendra (New) S/s (for Narendra (New) –Xeldem 400 kV (quad) line formed after LILO of one ckt of Narendra (existing) – Narendra (New) 400 kV D/c quad line at Xeldem)	400 kV	S/s				TBCB	UC (SPV transfer: 14.03.2018)		Goa
	Dharamjaygarh Pool Section B - Raigarh (Tamnar) Pool 765 kV D/c Line	765 kV	Line	D/c	137		TBCB	Commissioned		Chhattisgarh
WR-3	**Transmission System for providing connectivity to RE Projects at Bhuj-II (2000 MW) in Gujarat**									
	Establishment of 2×1500 MVA (765/400 kV), 4×500 MVA (400/220 kV) Bhuj-II PS (GIS) with 765 kV (1×330 MVAR) and 420kV (1×125 MVAR) bus reactor	765/400/220 kV	S/s			5000	TBCB	Commissioned		Gujarat
	Reconfiguration of Bhuj PS – Lakadia PS 765 kV D/c line so as to establish Bhuj-II – Lakadia 765 kV D/c line as well as Bhuj-Bhuj-II 765 kV D/c line	765 kV	Line	2xD/c	40		TBCB	Commissioned		Gujarat

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
WR-4	**Transmission System for Jam Khambaliya Pooling Station and Interconnection of Jam Khambaliya Pooling Station for Providing Connectivity to RE Projects (1500 MW) in Dwarka (Gujarat) and Installation of 400/220 kV ICT along with Associated Bays at CGPL Switchyard**									
	Establishment of 4x500MVA, 400/220 kV Jam Khambhaliya PS (GIS) along with 1x125MVAr, 420 kV Bus reactor at Jam Khabhaliya PS	400/220 kV	S/s			2000	TBCB	Commissioned		Gujarat
	Extension of Essar–Lakadia/Bhachau 400 kV D/c (triple) line up to Jam Khambhaliya PS	400 kV	Line	D/c	40		TBCB	Commissioned		Gujarat
	63MVAr switchable Line Reactor at both ends of Lakadia/Bhachau – Jam Khambhaliya 400 kV D/c line	400 kV	S/s				TBCB	Commissioned		Gujarat
WR-5	**Transmission System for Transmission System Associated with RE Generations at Bhuj-II, Dwarka & Lakadia**									
	Lakadia PS – Banaskantha PS 765 kV D/c line	765 kV	Line	D/c	400		TBCB	Commissioned		Gujarat
	2x240MVAr switchable Line reactor along with bays at Banaskantha end of Lakadia PS – Banaskantha PS 765 kV D/c line and 1x80 MVAr, 765 kV, 1 ph switchable line reactor (Spare unit) at Banaskantha end	765 kV	S/s				TBCB	Commissioned		Gujarat
WR-6	**Transmission System for Western Region Strengthening Scheme - 21 (WRSS – 21) Part – A – Trasnsmission System Strengthening for Relieving Over Loadings Observed in Gujarat Intra-State System Due to Re-injections in Bhuj PS**									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Establishment of 2x1500 MVA, 765/400 kV Lakadia PS with 765 kV (1x330 MVAR) & 420 kV (1x125 MVAR) bus reactor	765/400 kV	S/s			3000	TBCB	Commissioned		Gujarat
	LILO of Bhachau – EPGL line 400 kV D/c (triple) line at Lakadia PS	400 kV	Line	D/c	20		TBCB	Commissioned		Gujarat
	Bhuj PS – Lakadia PS 765 kV D/c line	765 kV	Line	D/c	200		TBCB	Commissioned		Gujarat
WR-7	**Transmission System for Western Region Strengthening Scheme - 21 (WRSS – 21) Part – B – Trasnsmission System Strengthening for Relieving Over Loadings Observed in Gujarat Intra-State System Due to Re-injections in Bhuj PS**									
	Lakadia – Vadodara 765 kV D/c line	765 kV	Line	D/c	700		TBCB	Commissioned		Gujarat
	330MVAr switchable line reactors at both ends of Lakadia – Vadodara 765 kV D/c line along with 500 ohms NGR at both ends of Lakadia – Vadodara 765 kV D/c line (330 MVAR line reactor - 4 nos. & 765 kV Reactor bay - 4 nos.)	765 kV	S/s				TBCB	Commissioned		Gujarat
WR-8	**Transmission system for evacuation of power from RE projects in Solapur (1500 MW) SEZ**									
	Establishment of 400/220 kV, 4x500 MVA at Solapur PS	400/220 kV	S/s			2000	TBCB	Under Bidding		Maharashtra
	Solapur pooling point - Solapur (PG) 400 kV D/c line (twin HTLS) (with minimum capacity of 2100 MVA/ckt at nominal voltage)	400 kV	Line	D/c	100		TBCB	Under Bidding		Maharashtra
	1x125 MVAR, 420 kV Bus Reactor at Solapur PS	400 kV	S/s				TBCB	Under Bidding		Maharashtra
WR-9	**Transmission system for evacuation of power from RE projects in wind energy zones in Osmanabad area of Maharashtra (1 GW)**									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Establishment of 2x500MVA, 400/220 kV near Kallam PS	400/220 kV	S/s			1000	TBCB	UC (SPV transfer: 28.10.2021)	Dec-23	Maharashtra
	1x125MVAr bus reactor at Kallam PS	400 kV	S/s				TBCB	UC (SPV transfer: 28.10.2021)	Dec-23	Maharashtra
	LILO of both circuits of Parli(PG) – Pune(GIS) 400 kV D/c line at Kallam PS	400 kV	Line	2xD/c	68		TBCB	UC (SPV transfer: 28.10.2021)	Dec-23	Maharashtra
WR-10	**Transmission system for evacuation of power from RE projects in Wardha (2500 MW) SEZ in Maharastra**									
	Establishment of 400/220 kV, 5X500 MVA at Wardha SEZ PP with 400 kV (125 MVAR) bus reactor	400/220 kV	S/s			2500		Planned		Maharashtra
	LILO of Wardha - Warora Pool 400 kV D/c (Quad) line at Wardha SEZ PP	400 kV	Line	2xD/c	170			Planned		Maharashtra
WR-11	**Transmission system for evacuation of power from RE projects in Rajgarh (1500 MW) SEZ in Madhya Pradesh : Phase-I**									
	Establishment of 400/220 kV, 3X500 MVA at Pachora SEZ PP with 420 kV (125 MVAR) bus reactor	400/220 kV	S/s			1500	TBCB	UC (SPV transfer: 30.05.2022)	Dec-23	Madhya Pradesh
	Pachora SEZ PP -Bhopal (Sterlite) 400 kV D/c line (Quad/HTLS) (with minimum capacity of 2100 MVA/ckt at nominal voltage) along with 80MVAr switchable line reactors on each circuit at Pachora end	400 kV	Line	D/c	320		TBCB	UC (SPV transfer: 30.05.2022)	Dec-23	Madhya Pradesh
WR-12	**Transmission system for evacuation of power from RE projects in Rajgarh (1000 MW) SEZ in Madhya Pradesh: Phase- II**									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Augementation of 400/220 kV, 3X500 MVA at Pachora SEZ PP with 420 kV (125 MVAR) bus reactor	400/220 kV	S/s			1500	TBCB	Under Bidding		Madhya Pradesh
	Pachora – Ujjain 400 kV D/c line line (Quad/HTLS) (with minimum capacity of 2100 MVA/ckt at nominal voltage)	400 kV	Line	D/c	120		TBCB	Under Bidding		Madhya Pradesh
WR-13	**Transmission system for evacuation of power from Chhatarpur SEZ (1500 MW)**									
	Establishment of 3x500 MVA, 400/220 kV Pooling Station at Chhatarpur	400/220 kV	S/s			1500	TBCB	Under Bidding		Madhya Pradesh
	LILO of Satna - Bina 400 kV (1st) D/c line at Chhatarpur PS	220 kV	Line	2xD/c	240		TBCB	Under Bidding		Madhya Pradesh
WR-14	**Establishment of Khavda pooling station and associated transmission lines for evacuation of 8 GW (Phase I & II)**									
	Establishment of Khavda pooling station 1 (KPS1) 3x1500 MVA, 765/400 kV ICT with 1x330 MVAR, 765 kV bus reactor and 1x125 MVAR, 400 kV bus reactor	765/400 kV	S/s			4500	TBCB	UC (SPV transfer: 18.01.2022)	Feb-24	Gujarat
	Khavda PS (GIS) – Bhuj PS 765 kV D/c line	765 kV	Line	D/c	120		TBCB	UC (SPV transfer: 18.01.2022)	Jan-24	Gujarat
	Establishment of 765/400 kV, 4x1500MVA, KPS2 (GIS) with 2x330 MVAR 765 kV bus reactor and 2x125 MVAR 400 kV bus reactor	765/400 kV	S/s			6000	TBCB	UC (SPV transfer: 21.03.2023)	Dec-24	Gujarat
	Establishment of 765/400 kV, 3x1500 MVA, KPS3 (GIS) with 1x330 MVAR 765 kV bus reactor and 1x125 MVAR 400 kV bus reactor	765/400 kV	S/s			4500	TBCB	UC (SPV transfer: 21.03.2023)	Dec-24	Gujarat
	KPS3- KPS2 765 kV D/c line	765 kV	Line	D/c	40		TBCB	UC (SPV transfer: 21.03.2023)	Dec-24	Gujarat

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	KPS2 (GIS) – Lakadia 765 kV D/c line with 330 MVAR switchable line reactors at Khavda end	765 kV	Line	D/c	320		TBCB	UC (SPV transfer: 28.03.2023)	Mar-25	Gujarat
	Augmentation of Khavda PS1 by 765/400 kV transformation capacity by 4x1500 MVA ICT and 1x330 MVAR 765 kV bus reactor and 1x125 MVAR 420 kV bus reactor on 2nd 765 kV and 400 kV bus respectively	765/400 kV	S/s			6000	TBCB	UC (SPV transfer: 20.04.2023)	Jan-25	Gujarat
	KPS1-Khavda PS-2 (KPS2) GIS 765 kV D/c line	765 kV	Line	D/c	40		TBCB	UC (SPV transfer: 20.04.2023)	Jan-25	Gujarat
	Lakadia PS – Ahmedabad 765 kV D/c line with 240 MVAR switchable line reactors on both ends	765 kV	Line	D/c	500		TBCB	UC (SPV transfer: 21.03.2023)	Mar-25	Gujarat
	Establishment of 3x1500 MVA, 765/400 kV Ahmedabad S/s with 1x330 MVAR 765 kV bus reactor and 1x125 MVAR 420 kV bus reactor (towards eastern side of Ahmedabad)	765/400 kV	S/s			4500	TBCB	UC (SPV transfer: 21.03.2023)	Mar-25	Gujarat
	LILO of Pirana (PG) – Pirana (T) 400 kV D/c line at Ahmedabad S/s with twin HTLS along with reconductoring of Pirana (PG) – Pirana (T) line with twin HTLS conductor with minimum capacity of 2100 MVA per circuit at nominal voltage and bay upgradation works at Pirana (PG) and Pirana (T)).	400 kV	Line	2xD/c	88		RTM	UC (Allocation date: 16.02.2023)	Mar-25	Gujarat
	Ahemdabad-South Gujrat (New Navsari) 765 kV D/C line along with 240MVAR Line Reactor on each ckt at each end of 765KV D/C Ahemdabad-South Gujrat (New Navsari) line	765 kV	Line	D/c	440		TBCB	UC (SPV transfer: 21.03.2023)	Mar-25	Gujarat
WR-15	**Transmission system for evacuation of power from Neemuch SEZ (1000 MW)**									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Establishment of 2x500 MVA, 400/220 kV Pooling Station at Neemuch with 1x125 MVAr Bus Reactor	400/220 kV	S/s			1000	TBCB	UC (SPV transfer: 24.08.2022)	Feb-24	Madhya Pradesh
	Neemuch PS – Chhittorgarh (PG) S/s 400 kV D/c line (conductor with minimum capacity of 2100 MVA/Ckt at nominal voltage)	400 kV	Line	D/c	260		TBCB	UC (SPV transfer: 24.08.2022)	Feb-24	Madhya Pradesh
	Neemuch PS- Mandsaur S/stn 400 kV D/c line (conductor with minimum capacity of 2100 MVA/Ckt at nominal voltage)	400 kV	Line	D/c	240		TBCB	UC (SPV transfer: 24.08.2022)	Feb-24	Madhya Pradesh
WR-16	**System Strengthening at Shujalpur on account of operational constraints ('n-1' non-compliance)**									
	1x500 MVA, 400/220 kV ICT augmentation at Shujalpur (PG)	400/220 kV	S/s			500	RTM	Commissioned		Madhya Pradesh
	Reconductoring of Shujalpur (PG)-Shujalpur (MP) 220 kV D/c line (conductor with ampacity equivalent to ACSR twin moose at nominal voltage)	220 kV	Line	D/c			RTM	Commissioned		Madhya Pradesh
WR-17	**Re-conductoring of Kolhapur (PG) – Kolhapur 400 kV D/c line**									
	Re-conductoring of Kolhapur (PG) – Kolhapur 400 kV D/c line with conductor of minimum capacity of 2100 MVA/Ckt at nominal voltage along with bay upgradation work at Kolhapur (MSETCL)	440 kV	Line	D/c			RTM	Commissioned		Maharashtra
WR-18	**Augmentation of 1x500 MVA, 400/220 kV ICT at Bhatapara (PG)**									
	1x500 MVA, 400/220 kV ICT at Bhatapara (PG)	400/220 kV	S/s			500	RTM	UC (Allocation date: 01.12.2021)	Dec-23	Chhattisgarh
WR-19	**Trasnmission System for evacuation of 1 GW of RE power from Osmanabad RE zone**									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Augmentation of 2x500 MVA, 400/220 kV ICTs at Kallam	400/220 kV	S/s			1000	RTM	UC (Allocation date: 15.11.2022)	May-24	Maharashtra
WR-20	**Scheme to control fault level at Indore S/s**									
	Splitting the 400 kV bus of 765/400/220 kV Indore S/s into two sections (A&B) through 400 kV Bus Sectionalizer bays (GIS) & GIS Bus duct	400 kV	S/s				RTM	Planned		Madhya Pradesh
WR-21	**Transmission Network Expansion in Gujarat to increase its ATC from ISTS Part A**									
	Augmentation of transformation capacity at Vadodara 765/400/220 kV S/s by 1x1500 MVA, 765/400 kV ICT (3rd) along with associated 765 kV ICT bay	765/400 kV	S/s			1500	RTM	Commissioned		Gujarat
WR-22	**Transmission Network Expansion in Gujarat to increase its ATC from ISTS Part B**									
	Establishment of 2x1500 MVA, 765/400 kV & 3x500 MVA, 400/220 kV Navsari(New) (South Gujarat) S/s (GIS) with 2x330 MVAr 765 kV and 1x125 MVAr 400 kV Bus reactor. [with 110MVAr 765 kV single phase reactor units (spare units for bus/line reactor) and 1x500 MVA, 765/400 kV single phase spare transformer].	765/400/220 kV	S/s			4500	RTM	UC (Allocation date: 13.01.2022)	Jun-24	Gujarat
	Navsari(New) (South Gujarat) (GIS) - Kala (GIS) 400 kV D/c line (conductor with minimum capacity of 2100 MVA/Ckt at nominal voltage) with 63MVAr switchable line reactor on each ckt at Kala (GIS) end	400 kV	Line	D/c	220		RTM	UC (Allocation date: 13.01.2022)	Jun-24	Gujarat, Dadra & Nagar Haveli
	Navsari(New) (South Gujarat) (GIS) – Magarwada (GIS) 400 kV D/c line (conductor with minimum capacity of 2100 MVA/Ckt at nominal voltage)	400 kV	Line	D/c	160		RTM	UC (Allocation date: 13.01.2022)	Jun-24	Gujarat, Daman & Diu

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Navsari(New) (South Gujarat) (GIS) – Padghe (GIS) 765 kV D/c line with 330 MVAr, 765 kV Switchable line reactor on each ckt at Navsari(New) (South Gujarat) end.	765 kV	Line	D/c	400		RTM	UC (Allocation date: 13.01.2022)	Jun-24	Gujarat, Maharashtra
	Augmentation of transformation capacity at Padghe (GIS) 765/400 kV substation by 1x1500 MVA ICT (3rd)	765/400 kV	S/s			1500	RTM	UC (Allocation date: 13.01.2022)	Jun-24	Maharashtra
WR-23	**Transmission Network Expansion in Gujarat to increase its ATC from ISTS Part C**									
	Banaskantha to Sankhari portion of Banaskantha – Prantij 400 kV D/c line	400 kV	Line	D/c	52		RTM	UC (Allocation date: 22.12.2021)	Mar-25	Gujarat
	Augmentation of transformation capacity at Banaskantha 765/400 kV S/s by 1x1500 MVA ICT	765/400 kV	S/s			1500	RTM	UC (Allocation date: 22.12.2021)	Mar-25	Gujarat
WR-24	**Transmission Network Expansion in Gujarat associated with integration of RE projects from Khavda potential RE zone**									
	Banaskantha – Ahmedabad 765 kV D/c line (~200 km length) with 330 MVAr, 765 kV Switchable line reactor on each ckt at Ahmedabad S/s end	765 kV	Line	D/c	400		TBCB	UC (SPV transfer: 21.03.2023)	Mar-25	Gujarat
WR-25	**Western Region Expansion Scheme-XXIV (WRES-XXIV)**									
	Jeypore – Jagdalpur 400 kV D/c line (conductor with minimum capacity of 2100 MVA/Ckt at nominal voltage) with associated bays at both ends	400 kV	Line	D/c	160		TBCB	UC (SPV transfer: 21.03.2023)	Mar-25	Chhattisgarh, Orissa

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Impleme ntation	Present Status (as on 31.10.2023)	Anticipate d Commissio ning schedule	State
WR-26	**ISTS Network Expansion scheme in Western Region & Southern Region for export of surplus power during high RE scenario in Southern Region**									
	Narendra (New) – Pune (PG) GIS 765 kV D/c line	765 kV	Line	D/c	680		TBCB	UC (SPV transfer: 17.01.2023)	Jul-24	Karnataka, Maharashtra
	Upgradation of Narendra (New) (GIS) to its rated voltage of 765 kV level alongwith 4x1500 MVA transformer and 2x330 MVAr Bus Reactor.	765/400 kV	S/s			6000	TBCB	UC (SPV transfer: 17.01.2023)	Jul-24	Karnataka
WR-27	**Western Region Expansion Scheme-XXV (WRES-XXV)**									
	Augmentation of transformation capacity at Raigarh(Kotra) by 1x1500MVA, 765/400 kV ICT at Section-A (3rd ICT on Section A) and by 2x1500MVA, 765/400 kV ICTs at Section-B (3rd & 4th ICTs on Section B) along with associated ICT bays.	765/400 kv	S/s			4500	RTM	UC (Allocation date: 24.06.2022)	Dec-23	Chhattisgarh
WR-28	**Western Region Expansion Scheme-XXVI (WRES-XXVI)**									
	Creation of 220 kV level (GIS) at 765/400 kV Shikrapur (PGCIL) Substation with 2x500 MVA, 400/220 kV ICTs and 4 nos. of 220 kV line bays	400/220 kV	S/s			1000	RTM	UC (Allocation date: 03.02.2022)	Jun-24	Maharashtra
WR-29	**Western Region Expansion Scheme-XXVII (WRES-XXVII)**									
	Raipur Pool – Dhamtari 400 kV D/c line (conductor with minimum capacity of 2100 MVA/Ckt at nominal voltage) with associated bays at both ends	400 kV	Line	D/c	160		TBCB	UC (SPV transfer: 28.03.2023)	Sep-24	Chhattisgarh
WR-30	**Scheme for fault level control at Dehgam (PG) & Ranchhodpura (GETCO) S/s**									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Bypassing of Rachhodpura(GETCO) – Dehgam(PG) 400 kV D/c line at Dehgam(PG) S/s and connecting it with Dehgam(PG) – Pirana 400 kV D/c line (one circuit via Nicol) so as to form Ranchhodpura(GETCO) – Pirana(PG) 400 kV D/c line (one circuit via Nicol).	400 kV	Line				RTM	Commissioned		Gujarat
WR-31	**Western Region Expansion Scheme-XXVIII (WRES-XXVIII)**									
	Creation of 220 kV level (GIS) at 765/400 kV Raipur Pool S/s with Installation of 2x500 MVA, 400/220 kV ICTs along with associated ICT bays (220 kV-GIS)	400/220 kV	S/s			1000	TBCB	UC (SPV transfer: 28.03.2023)	Mar-25	Chhattisgarh
	2 nos. 220 kV line bays (GIS) at Raipur Pool S/s for termination of Raipur Pool – Rajnandgaon 220 kV D/c line	220 kV	S/s				TBCB	UC (SPV transfer: 28.03.2023)	Mar-25	Chhattisgarh
	Augmentation of 1x500 MVA, 400/220 kV ICT at Raipur Pool S/s along with associated ICT bays (220 kV-GIS)	400/220 kV	S/s			500	TBCB	UC (SPV transfer: 28.03.2023)	Mar-25	Chhattisgarh
	6 nos. 220 kV line bays (GIS) at Raipur Pool S/s for termination of various lines planned by CSPTCL	220 kV	S/s				TBCB	UC (SPV transfer: 28.03.2023)	Mar-25	Chhattisgarh
	Conversion of 2x240MVAr Non-switchable line reactors at Raipur PS (associated with Raipur PS – Champa PS 765 kV ckts 1 & 2) into Switchable line reactors along with NGR bypass arrangement	765 kV	S/s				TBCB	UC (SPV transfer: 28.03.2023)	Mar-25	Chhattisgarh
WR-32	**Western Region Expansion Scheme-XXIX (WRES-XXIX)**									
	Creation of 220 kV level at 765/400 kV Dharamjaigarh S/s with Installation of 2x500 MVA, 400/220 kV ICTs along with associated ICT bays	400/220 kV	S/s			1000	TBCB	UC (SPV transfer: 28.03.2023)	Mar-25	Chhattisgarh

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	2 nos. 220 kV line bays at Dharamjaigarh S/s (for termination of Dharamjaigarh – Chhuri 220 kV D/c line)	220 kV	S/s				TBCB	UC (SPV transfer: 28.03.2023)	Mar-25	Chhattisgarh
	2 nos. 220 kV line bays at Dharamjaigarh S/s (for termination of Dharamjaigarh – Dharamjaigarh CSP 220 kV D/c line)	220 kV	S/s				TBCB	UC (SPV transfer: 28.03.2023)	Mar-25	Chhattisgarh
WR-33	**Augmentation of Transformation capacity at Raigarh(PG) S/s**									
	Augmentation of 1x500 MVA, 400/220 kV ICT (3rd) at Raigarh(PG) S/s along with associated ICT bays	400/220 kV	S/s			500	RTM	UC (Allocation date: 25.08.2022)	Dec-23	Chhattisgarh
WR-34	**Western Region Expansion Scheme-XXX (WRES-XXX):**									
	Bypassing of Parli(PG) – Parli(M) 400 kV D/c line and Parli(PG) – Parli(New) 400 kV D/c (quad) line at Parli(PG) S/s at outskirts of the Parli(PG) S/s so as to form Parli(M) – Parli(New) 400 kV D/c direct line	400 kV	Line				RTM	Commissioned		Maharashtra
	Reconductoring of Parli(PG) – Parli(M) 400 kV D/c line section of above line (at Sl. 1) with twin HTLS conductor with minimum capacity of 1940MVA per circuit at nominal voltage	400 kV	Line				RTM	UC (Allocation date: 25.08.2022)	Dec-23	Maharashtra
	400 kV Bay Upgradation work at Parli(M) S/s *(Parli(M) S/s has DMT scheme. Current rating of existing bays is 2000A which would be upgraded to 3150A to suit the re-conductoring with Twin HTLS conductor*	400 kV	S/s				RTM	UC (Allocation date: 25.08.2022)	Dec-23	Maharashtra
WR-35	**Western Region Expansion Scheme XXXI (WRES-XXXI): Part A**									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	LILO of Tarapur/Velgaon – Padghe (M) 400 kV D/c line at Kudus(M) S/s in a manner so as to form Padghe(PG)(GIS) – Padghe(M) 400 kV D/c line and Tarapur/Velgaon - Kudus(M) 400 kV D/c line	400 kV	Line	2xD/c	10		RTM	Planned		Maharashtra
	Shifting of Padghe(PG)(GIS) – Padghe(M) 400 kV D/c line from 400 kV Section A to Section B and termination into 2 nos. 400 kV line bays to be constructed at Padghe(M) Section B	400 kV	S/s				RTM	Planned		Maharashtra
WR-36	**Western Region Expansion Scheme XXXI (WRES-XXXI): Part B**									
	Augmentation of transformation capacity at Padghe (GIS) 765/400 kV substation by 1x1500 MVA ICT (4th)	765/400 kV	S/s			1500	RTM	Planned		Maharashtra
WR-37	**Western Region Expansion Scheme XXXI (WRES-XXXI): Part C**									
	Augmentation of transformation capacity at Pune (GIS) 765/400 kV substation by 1x1500 MVA ICT (3rd)	765/400 kV	S/s			1500	RTM	UC (Allocation date: 28.11.2022)	Aug-24	Maharashtra
WR-38	**Western Region Expansion Scheme XXXII (WRES-XXXII)**									
	Establishment of 2x500MVA, 400/220 kV GIS S/s at a suitable location between Hazira & Dahej with 2x125MVAr, 420 kV bus reactors (with associated ICT & reactor bays)	400/220 kV	S/s			1000		Planned		Gujarat
	New substation (between Hazira & Dahej) – Navsari (New) (GIS) (POWERGRID) 400 kV D/c line (twin HTLS with minimum capacity of 2100MVA/ckt at nominal voltage) along with associated line bays at both ends	400 kV	Line	D/c	120		TBCB	Planned		Gujarat

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
WR-39	**Western Region Expansion Scheme XXXIII (WRES-XXXIII): Part A**									
	Creation of 220 kV level at 765/400 kV Jabalpur PS with Installation of 2x500 MVA, 400/220 kV ICTs along with associated ICT bays and 4 No. of 220 kV line bays	400/220 kV	S/s			1000	RTM	UC (Allocation date: 16.02.2023)	May-24	Madhya Pradesh
WR-40	**Western Region Expansion Scheme XXXIII (WRES-XXXIII): Part B**									
	Establishment of 765/400 kV, 2X1500MVA (1X500MVA spare unit) ICTs & 400/220 kV, 2X500MVA ICTs at Karera (near Datiya) along with 1x330 MVAr (765 kV) (110MVAr spare unit) & 1X125MVAr, 420 kV bus reactor	765/400/220 kV	S/s			4000	TBCB	Under Bidding		Madhya Pradesh
	LILO of Satna-Gwalior 765 kV S/c line at Karera	765 kV	Line	D/c	80		TBCB	Under Bidding		Madhya Pradesh
	Conversion of 1x240MVAr, 765 kV Fixed line reactor at Gwalior end to Switchable line reactor (with NGR bypass arrangement) along with implementation of Inter-tripping scheme (for tripping of the switchable shunt reactor at Gwalior end along with the main line breaker)	765 kV	S/s				RTM	UC (Allocation date: 16.02.2023)	May-24	Madhya Pradesh
	Installation of 1x330MVAr, switchable line reactor at Karera end of Karera– Satna 765 kV line	765 kV	S/s				TBCB	Under Bidding		Madhya Pradesh
WR-41	**Western Region Expansion Scheme XXXIII (WRES-XXXIII): Part C**									
	Establishment of 765/400 kV, 2x1500MVA ICT (1x500MVA spare unit) and 400/220 kV, 2x500MVA ICTs at Ishanagar (New) along with 1x330 MVAr (765 kV) (110MVAr spare unit) & 1X125MVAr, 420 kV bus reactor	765/400/220 kV	S/s			4000	TBCB	Under Bidding		Madhya Pradesh
	LILO of Jabalpur - Orai 765 kV S/c line at Ishanagar 765 kV S/s (New)	765 kV	Line	D/c	80		TBCB	Under Bidding		Madhya Pradesh

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Conversion of 1x330MVAr, 765 kV Fixed line reactor at Orai end to Switchable line reactor (with NGR bypass arrangement) along with implementation of Inter-tripping scheme (for tripping of the switchable shunt reactor at Orai end along with the main line breaker)	765 kV	S/s				RTM	UC (Allocation date: 16.02.2023)	Aug-24	Madhya Pradesh
WR-42	**Western Region Expansion Scheme XXXIII (WRES-XXXIII): Part D**									
	Installation of 1x500 MVA, 400/220 kV ICT (4th) along with associated ICT bays and 2 No. of 220 kV line bays at Satna	400/220 kV	S/s			500	RTM	UC (Allocation date: 28.11.2022)	May-24	Madhya Pradesh
WR-43	**Transmission system for evacuation of additional 7 GW RE power from Khavda RE park Phase III**									
	Establishment of 765 kV Halvad switching station with 765 kV, 2x330 MVAr bus reactors (with 110 MVAr & 80 MVAr 765 kV single phase reactor (spare unit for bus/line reactors at Halvad)	765 kV	S/s				TBCB	Under Bidding		Gujarat
	KPS2- Halvad 765 kV D/c line with 240 MVAr switchable line reactor at both ends and 80 MVAr single phase spare reactor unit at KPS2 end	765 kV	Line	D/c	440		TBCB	Under Bidding		Gujarat
	LILO of Lakadia – Ahmedabad 765 kV D/c line at Halvad	765 kV	Line	2xD/c	200		TBCB	Under Bidding		Gujarat
	240 MVAr 765 kV switchable line reactor on each ckt at Halvad end of Halvad – Ahmedabad 765 kV D/c line	765 kV	S/s				TBCB	Under Bidding		Gujarat
	Halvad – Vataman 765 kV D/c line with 1x330 MVAr switchable line reactor at Vatman end on each ckt.	765 kV	Line	D/c	340		TBCB	Under Bidding		Gujarat

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Establishment of 765 kV switching station near Vataman with 2x330 MVAr, 765 kV bus reactor (with 110 MVAr 765 kV single phase reactor (spare unit for bus/line reactor)	765 kV	S/s				TBCB	Under Bidding		Gujarat
	LILO of Lakadia – Vadodara 765 kV D/c line at Vataman 765 kV switching station	765 kV	Line	2xD/c	40		TBCB	Under Bidding		Gujarat
	Vataman switching station – Navsari (New) 765 kV D/c line with 330 MVAr switchable line reactors on each ckt at Kosamba end.	765 kV	Line	D/c	400		TBCB	Under Bidding		Gujarat
	Conversion of 330 MVAr 765 kV switchable line reactor on each ckt at Vadodara end of Lakadia – Vadodara 765 kV D/c line (being LILOed at Vataman) into bus reactors with NGR bypassing arrangement.	765 kV	S/s				RTM	Planned		Gujarat
	Augmentation of transformation capacity at Navsari (New) 765/400 kV by 1x1500 MVA (ICT-IV)	765/400 kV	S/s			1500	RTM	Planned		Gujarat
WR-44	**Provision of Dynamic Reactive Compcnsation at KPSI and KPS3**									
	± 300MVAr STATCOM with 1x125 MVAr MSC, 2x125 MVAr MSR at KPS1 400 kV Bus section-1	400 kV	S/s				TBCB	Under Bidding		Gujarat
	± 300MVAr STATCOM with 1x125 MVAr MSC, 2x125 MVAr MSR at KPS1 400 kV Bus section-2	400 kV	S/s				TBCB	Under Bidding		Gujarat
	± 300MVAr STATCOM with 1x125 MVAr MSC, 2x125 MVAr MSR at KPS3 400 kV Bus section-1	400 kV	S/s				TBCB	Under Bidding		Gujarat
WR-45	**Trasnmission System for evacuation of additional 7 GW of RE power from Khavda RE Park Phase-IV**									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Creation of 765kV bus section-II at KPS3 (GIS) along with 765kV Bus Sectionaliser & 1x330MVAr, 765kV Bus Reactors on Bus Section-II (Bus section – II shall be created at 765 kV & 400 kV level both with 3x1500 MVA, 765/400 kV ICTs at Bus Section-II)	765/400 kV	S/s			4500	TBCB	Under Bidding		Gujarat
	Creation of 400 kV bus section-II at KPS3 (GIS) along with 400 kV Bus Sectionaliser & 1x125 MVAr, 400 kV Bus Reactors on Bus Section-II	400 kV	S/s				TBCB	Under Bidding		Gujarat
	KPS3 (GIS) – Lakadia 765 kV D/c line along with 330 MVAR switchable line reactors at KPS3 end of KPS3 (GIS) – Lakadia 765 kV D/c line (with NGR bypass arrangement)	765 kV	Line	D/c	370		TBCB	Under Bidding		Gujarat
	±300MVAr STATCOM with 1x125 MVAr MSC, 2x125 MVAr MSR at KPS3 400 kV Bus section-2	400 kV	S/s				TBCB	Under Bidding		Gujarat
	KPS1 – Bhuj 765 kV 2nd D/c line	765 kV	Line	D/c	120		TBCB	Under Bidding		Gujarat
	Establishment of 2x1500 MVA, 765/400 kV & 2x500 MVA, 400/220 kV GIS S/s at a suitable location South of Olpad (between Olpad and Ichhapore) with 2x330 MVAR, 765 kV & 1x125 MVAR, 420 kV bus reactors	765/400 kV	S/s			4000	TBCB	Under Bidding		Gujarat
	Vadodara – South Olpad 765 kV D/c line with 240 MVAR switchable line reactors at Vadodara(GIS) end of Vadodara(GIS) – Navsari(New)(GIS) 765 kV D/c line (with NGR bypass arrangement)	765 kV	Line	D/c	240		TBCB	Under Bidding		Gujarat
	LILO of Gandhar – Hazira 400 kV D/c line at South Olpad (GIS) using twin HTLS conductor with minimum capacity of 1700 MVA per ckt at nominal voltage	400 kV	Line	2xD/c	40		TBCB	Under Bidding		Gujarat

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Ahmedabad – South Olpad (GIS) 765 kV D/c line along with 240 MVAR switchable line reactors on each ckt at Ahmedabad & South Olpad (GIS) end of Ahmedabad – South Olpad (GIS) 765 kV D/c line (with NGR bypass arrangement)	765 kV	Line	D/c	500		TBCB	Under Bidding		Gujarat
	Establishment of 765/400/220 kV Boisar-II (GIS) S/s (2x1500, 765/400 kV & 2x500MVA, 400/220 kV) with 2x330MVAr 765 kV and 2x125MVAr 420kV bus reactors	765/400/220 kV	S/s			4000	TBCB	Under Bidding		Maharashtra
	Navsari(New) – Boisar-II 765 kV D/c line with 330 MVAR switchable line reactors at Navsari(New) end of Navsari(New) – Boisar-II 765 kV D/c line (with NGR bypass arrangement)	765 kV	Line	D/c	450		TBCB	Under Bidding		Gujarat, Maharashtra
	LILO of Navsari (New) – Padghe(PG) 765 kV D/c line at Boisar-II	765 kV	Line	2xD/c	100		TBCB	Under Bidding		Maharashtra
	Boisar-II – Velgaon(MH) 400 kV D/c (Quad ACSR/AAAC/AL59 moose equivalent) line	400 kV	Line	D/c	20		TBCB	Under Bidding		Maharashtra
	LILO of Babhaleswar – Padghe(M) 400 kV D/c line at Bosar-II using twin HTLS conductor with minimum capacity of 1700MVA per ckt at nominal voltage (LILO route length 65km.) and with 80 MVAR switchable line reactors at Bosar-II end of Boisar-II – Babhaleswar 400 kV D/c line (with NGR bypass arrangement)	400 kV	Line	2xD/c	260		TBCB	Under Bidding		Maharashtra
	±200 MVAR STATCOM with 2x125 MVAR MSC, 1x125 MVAR MSR at 400 kV bus section-I of Boisar-II and ±200 MVAR STATCOM with 2x125 MVAR MSC, 1x125 MVAR MSR at 400 kV bus section-II of Boisar-II	400 kV	S/s				TBCB	Under Bidding		Maharashtra
	± 300 MVAR STATCOM with 3x125 MVAR MSC, 1x125 MVAR MSR at 400 kV level of Navsari (New)(PG) S/s with 1 No. of 400 kV bay (GIS)	400 kV	S/s				TBCB	Under Bidding		Gujarat

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Establishment of 765/400/220 kV Pune-III (GIS) S/s (2x1500, 765/400 kV & 3x500 MVA, 400/220 kV) with 2x330MVAr 765 kV and 2x125 MVAr 420kV bus reactors	765/400/220 kV	S/s			4500	TBCB	Under Bidding		Maharashtra
	Boisar-II – Pune-III 765 kV D/c line along with 330 MVAR switchable line reactors at Pune-III end of Boisar-II – Pune-III 765 kV D/c line (with NGR bypass arrangement)	765 kV	Line	D/c	400		TBCB	Under Bidding		Maharashtra
	LILO of Narendra(New) – Pune(GIS) 765 kV D/c line at Pune-III along with 330 MVAR switchable line reactors at Pune-III end of Narendra(New) – Pune-III(GIS) 765 kV D/c line (with NGR bypass arrangement)	765 kV	Line	2xD/c	40		TBCB	Under Bidding		Maharashtra
	Inter tripping scheme on 330 MVAr SW LR at Pune(GIS) end of Pune(GIS) – Pune-III(GIS) 765 kV D/c line	765 kV	S/s				RTM	Planned		Maharashtra
	LILO of Hinjewadi-Koyna 400 kV line at Pune-III(GIS) S/s along with 80MVAr, 420 kV switchable Line Reactors on each ckt at Pune-III(GIS) end of Pune-III(GIS) – Koyna 400 kV line	400 kV	Line	D/c	160		TBCB	Under Bidding		Maharashtra
	Augmentation of transformation capacity at KPS1(GIS) by 1x1500MVA, 765/400 kV ICT (8th)	765/400 kV	S/s			1500	RTM	Planned		Gujarat
	Augmentation of transformation capacity at KPS2(GIS) by 1x1500MVA, 765/400 kV ICT (5th, 6th, 7th & 8th) on Bus section-II	765/400 kV	S/s			6000	RTM	Planned		Gujarat
	Augmentation of transformation capacity at KPS3(GIS) by 1x1500MVA, 765/400 kV ICT (7th) on Bus section-I	765/400 kV	S/s			1500	RTM	Planned		Gujarat
	Augmentation of transformation capacity at Padghe(PG) (GIS) by 1x1500MVA, 765/400 kV ICT (4th)	765/400 kV	S/s			1500	RTM	Planned		Maharashtra

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
WR-46	**Trasnmission System for evacuation of additional 8 GW of RE power from Khavda RE Park Phase-V**									
	Establishment of 6000 MW, ± 800 kV KPS2 (HVDC) [LCC] terminal station (4x1500 MW) along with associated interconnections with 400 kV HVAC Switchyard	800 kV	S/s				TBCB	Under Bidding		Gujarat
	Establishment of 6000 MW, ± 800 kV Nagpur (HVDC) [LCC] terminal station (4x1500 MW) along with associated interconnections with 400 kV HVAC Switchyard	800 kV	S/s				TBCB	Under Bidding		Maharashtra
	±800 kV HVDC Bipole line (Hexa lapwing) between KPS2 (HVDC) and Nagpur (HVDC) (1200 km) (with Dedicated Metallic Return) (capable to evacuate 6000 MW with overload as specified)	800 kV	Line	D/c	2400		TBCB	Under Bidding		Gujarat, Maharashtra
	Establishment of 6x1500 MVA, 765/400 kV ICTs at Nagpur S/s along with 2x330 MVAR (765 kV) & 2x125 MVAR, 420 kV bus reactors along with associated interconnections with HVDC Switchyard. The 400 kV bus shall be established in 2 sections through 1 set of 400 kV bus sectionaliser so that 3x1500 MVA ICTs are placed in each section. The bus sectionaliser shall be normally closed and may be opened based on Grid requirement	765/400 kV	S/s			9000	TBCB	Under Bidding		Maharashtra
	LILO of Wardha – Raipur 765 kV one D/c line (out of 2xD/c lines) at Nagpur along with 240 MVAR switchable line reactor at Nagpur end on each ckt of Nagpur – Raipur 765 kV D/c line	765 kV	Line	2xD/c	120		TBCB	Under Bidding		Maharashtra

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Establishment of 2500 MW, ± 500 kV KPS3 (HVDC) [VSC] terminal station (2x1250 MW) at a suitable location near KPS3 substation with associated interconnections with 400 kV HVAC Switchyard	500 kV	S/s				TBCB	Under Bidding		Gujarat
	Establishment of 2500 MW, ± 500 kV South Olpad (HVDC) [VSC] terminal station (2x1250 MW) along with associated interconnections with 400 kV HVAC Switchyard of South Olpad S/s	500 kV	S/s				TBCB	Under Bidding		Gujarat
	Establishment of KPS3 (HVDC) S/s along with 2x125 MVAR, 420 kV bus reactors along with associated interconnections with HVDC Switchyard*. The 400 kV bus shall be established in 2 sections through 1 set of 400 kV bus sectionaliser to be kept normally OPEN (400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal.)	400/33 kV	S/s			100	TBCB	Under Bidding		Gujarat
	KPS3 – KPS3 (HVDC) 400 kV 2xD/c (Quad ACSR/AAAC/AL59 moose equivalent) line along with the line bays at both substations	400 kV	Line	2xD/c			TBCB	Under Bidding		Gujarat
	±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return) (capable to evacuate 2500 MW)	500 kV	Line				TBCB	Under Bidding		Gujarat
WR-47	**Scheme for drawal of 4000MW power by MPSEZ UTILITIES LIMITED (MUL)**									
	Establishment of 4x1500MVA, 765/400 kV Navinal(Mundra) S/s (GIS) with 2x330 MVAr, 765 kV & 1x125MVAr, 420kV bus reactors [with associated ICT & reactor bays as well as 1x110MVAr single phase spare unit for bus / line reactor as well as 1x500 MVA, 765/400 kV (single phase) spare transformer unit]	765/400 kV	S/s			6000		Planned		Gujarat

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	LILO of Bhuj-II – Lakadia 765 kV D/c line at Navinal (Mundra) (GIS) S/s with associated bays at Navinal (Mundra) (GIS) S/s	765 kV	Line	2xD/c	293			Planned		Gujarat
	Installation of 1x330 MVAr switchable line reactor on each ckt at Navinal end of Lakadia – Navinal 765 kV D/c line (formed after above LILO)	765 kV	S/s					Planned		Gujarat
WR-48	**Transmission scheme for evacuation of power from Dholera UMSP**									
	Establishment of 3x1500MVA, 765/400 kV Dholera Pooling Station with 1x330 MVAr, 765 kV bus reactor & 1x125 MVAr 400 kV bus reactor	765/400 kV	S/s			4500		Planned		Gujarat
	Dholera PS – Vataman switching station 765 kV D/c line	765 kV	Line	D/c	80			Planned		Gujarat
	400 kV line bays for termination of lines from solar park	400 kV	S/s					Planned		Gujarat
WR-49	**Transmission scheme for evacuation of power from Neemuch 2GW WEZ**									
	The transmission scheme has already been mentioned at NR-55 under the transmission scheme “Transmission Schemes for evacuation of power from Rajasthan REZ in Fatehgarh & Barmer”	765/400/220 kV								Madhya Pradesh
WR-50	**Transmission scheme for evacuation of power from Dhule 2GW REZ**									
	Establishment of 4x500 MVA, 400/220 kV Pooling Station near Dhule along with 2x125 MVAr (420kV) Bus Reactor	400/220 kV	S/s			2000	TBCB	Under Bidding		Maharashtra
	Dhule PS – Dhule (BDTCL) 400 kV D/c Line (Quad ACSR/AAAC/AL59 Moose equivalent)	400 kV	Line	D/c	120		TBCB	Under Bidding		Maharashtra
WR-51	**Transmission Schemes for evacuation of power from Off-shore Wind Farm in Gujarat (1 GW Offshore wind - Mahuva)**									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Establishment of 3x500 MVA, 400/220 kV Mahuva Onshore Pooling Station (Mahuva PS) alongwith bus reactor (with space provision for upgradation to 765 kV level so as to cater to future Offshore Wind Projects adjacent to B3, B4, B5 pockets in future)	400/220 kV	S/s			1500		Planned		Gujarat
	Off Shore Sub-Station (OSS) B3 – Mahuva Onshore PS 220 kV 2xS/c Submarine cable	220 kV	Line	2xS/c	90			Planned		Gujarat
	Installation of 2x1500MVA, 765/400 kV ICTs at Vataman along with 2x125 MVAr (400 kV) Bus Reactor	765/400 kV	S/s			3000		Planned		Gujarat
	Mahuva Onshore PS – Vataman 400 kV D/c line (Quad Moose) with 63MVAr & 50MVAr, 400 kV switchable line reactors on each ckt at Mahuva & Vataman ends respectively	400 kV	Line	D/c	380			Planned		Gujarat
WR-52	**Transmission Schemes for evacuation of power from 1.5 GW REZ from Morena REZ**									
	Establishment of 4x500 MVA, 400/220 kV Pooling Station along with 1x125 MVAr (400 kV) Bus Reactor near Morena	400/220 kV	S/s			2000		Planned		Madhya Pradesh
	Morena PS – South Gwalior (near Datia) 400 kV D/c (quad moose) line with 50MVAr switchable line reactors on each ckt at Morena PS end	400 kV	Line	D/c	200			Planned		Madhya Pradesh
WR-53	**Western Region Network Expansion scheme in Kallam area of Maharashtra**									
	LILO of both circuits of Parli(M) – Karjat(M)/Lonikand-II (M) 400 kV D/c line (twin moose) at Kallam PS along with 63 MVAR, 420 kV switchable line reactor (with NGR bypassing arrangement) on each ckt at Kallam PS end of Karjat – Kallam 400 kV D/c line	400 kV	Line	2xD/c	60		TBCB	Under Bidding		Maharashtra

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
WR-54	**Network Expansion scheme in Gujarat for drawl of about 3.6 GW load under Phase-I in Jamnagar area**									
	Establishment of 2x1500 MVA 765/400 kV Jamnagar (GIS) PS with 2x330 MVAR 765 kV bus reactor and 2x125 MVAR 420 kV bus reactor	765/400 kV	S/s			3000	TBCB	Under Bidding		Gujarat
	Halvad – Jamnagar 765 kV D/c line along with 330 MVAr switchable line reactors on each ckt at Jamnagar end of Halvad – Jamnagar 765 kV D/c line (with NGR bypass arrangement)	765 kV	Line	D/c	340		TBCB	Under Bidding		Gujarat
	LILO of Jam Khambhaliya PS – Lakadia 400 kV D/c (triple snowbird) line at Jamnagar along with 50 MVAr, 420 kV switchable line reactors on each ckt at Jamnagar end of Jamnagar – Lakadia 400kV D/c line (with NGR bypass arrangement)	400 kV	Line	2xD/c	20		TBCB	Under Bidding		Gujarat
	Jamnagar – Jam Khambhaliya 400 kV D/c (Quad ACSR/AAAC/AL59 moose equivalent) line	400 kV	Line	D/c	100		TBCB	Under Bidding		Gujarat
	LILO of CGPL – Jetpur 400kV D/c (triple snowbird) line at Jamnagar along with 80MVAr, 420kV switchable line reactors on each ckt at Jamnagar end of Jamnagar – CGPL 400kV D/c line (with NGR bypass arrangement)	400 kV	Line	2xD/c	260		TBCB	Under Bidding		Gujarat
	LILO of both ckts of Kalavad – Bhogat 400kV D/c line (Twin AL-59) at Jam Khambhaliya PS	400 kV	Line	2xD/c	40		TBCB	Under Bidding		Gujarat
	±400 MVAr STATCOM with 3x125 MVAr MSC & 2x125 MVAr MSR at Jamnagar 400kV Bus section	400 kV	S/s				TBCB	Under Bidding		Gujarat
Southern Region										
SR-1	**Additional inter-regional AC link for import into SR i.e. Warora – Warangal and Chilakaluripeta - Hyderabad - Kurnool 765 kV link”**									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Establishment of 765/400 kV substation at Warangal (New) with 2x1500 MVA transformer	765/400 kV	S/s			3000	TBCB	Commissioned		Telangana
	2x240 MVAR bus reactors at Warangal (New) 765/400 kV S/S	765 kV	S/s				TBCB	Commissioned		Telangana
	Warora Pool -Warangal (New) 765 kV D/c line	765 kV	Line	D/c	666		TBCB	Commissioned		Maharashtra,Telangana
	240 MVAR switchable line reactor at both ends.	765 kV	S/s				TBCB	Commissioned		Maharashtra,Telangana
	Warangal (New) –Hyderabad 765 kV D/c line	765 kV	Line	D/c	270		TBCB	Commissioned		Telangana
	240 MVAR switchable line reactor at Warangal end	765 kV	S/s				TBCB	Commissioned		Telangana
	Warangal (New) – Warangal (existing) 400 kV (quad) D/c line.	400 kV	Line	D/c	100		TBCB	Commissioned		Telangana
	Hyderabad– Kurnool 765 kV D/c line	765 kV	Line	D/c	370		TBCB	Commissioned		Telangana, Andhra Pradesh
	240 MVAR switchable line reactor at Kurnool end	765 kV	S/s				TBCB	Commissioned		Andhra Pradesh
	Warangal (New) – Chilakaluripeta 765 kV D/c line	765 kV	Line	D/c	478		TBCB	Commissioned		Telangana, Andhra Pradesh
	240 MVAR switchable line reactor at both ends.	765 kV	S/s				TBCB	Commissioned		Telangana, Andhra Pradesh
SR-2	**Mangalore (UPCL)–Kasargode-Kozhikode 400 kV link**									
	Mangalore (UPCL)–Kasargode 400 kV D/c Quad line	400 kV	Line	D/c	220		TBCB	UC (SPV transfer: 12.09.2019)	Dec-24	Karnataka, Kerala

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Establishment of 2x500 MVA, 400/220 kV GIS substation at Kasargode	400/220 kV	S/s			1000	TBCB	UC (SPV transfer: 12.09.2019)	Dec-24	Kerala
SR-3	**Augmentation of Transformation capacity in Southern Region**									
	400/220 kV, 1x500 MVA ICT at Kochi (PG)	400/220 kV	S/s			500	RTM	Commissioned		Kerala
	400/220 kV, 1x500 MVA ICT at Hiriyur (PG)	400/220 kV	S/s			500	RTM	Commissioned		Karnataka
	400/220 kV, 1x500 MVA ICT (3rd) at Palakkad (PG)	400/220 kV	S/s			500	RTM	UC (Allocation date: 21.12.2021)	Dec-23	Kerala
	400/220 kV, 1x500 MVA ICT (3rd) at Kolar (PG)	400/220 kV	S/s			500	RTM	UC (Allocation date: 21.12.2021)	Dec-23	Karnataka
	765/400 kV, 1x1500 MVA ICT (3rd) at Nizamabad (PG)	765/400 kV	S/s			1500	RTM	UC (Allocation date: 21.12.2021)	Dec-23	Telangana
	400/220 kV, 1x500 MVA ICT (4th) ICT at Arasur	400/220 kV	S/s			500	RTM	UC (Allocation date: 21.12.2021)	Dec-23	Tamilnadu
	400/220 kV, 1x500 MVA ICT (4th) ICT at Hosur	400/220 kV	S/s			500	RTM	UC (Allocation date: 21.12.2021)	Dec-23	Tamilnadu
	400/220 kV, 1x500 MVA ICT (4th) ICT at Mysore	400/220 kV	S/s			500	RTM	UC (Allocation date: 31.01.2023)	Mar-24	Karnataka
	400/220 kV,1x500 MVA ICT (3rd) ICT at Hassan	400/220 kV	S/s			500	RTM	Planned		Karnataka

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	765/400 kV, 1x1500 MVA ICT (3rd) at Maheshwaram (PG)	765/400 kV	S/s			1500	RTM	UC (Allocation date: 07.07.2023)	Apr-25	Telangana
	400/220 kV,1x500 MVA ICT (6th) ICT at Pavagada	400/220 kV	S/s			500	RTM	UC (Allocation date: 24.06.2022)	Dec-23	Karnataka
SR-4	**Composite scheme for Solar & Wind Energy Zone in Andhra Pradesh (3500 MW)**									
	1. Ananthpuram SEZ (2500 MW) & Kurnool SEZ (1000 MW), AP									Andhra Pradesh
	Establishment of 400/220 kV 7x500 MVA Pooling station at suitable border location between Ananthpuram & Kurnool Distt.	400/220 kV	S/s			3500	TBCB	UC (SPV transfer: 04.10.2023)	Apr-25	Andhra Pradesh
	Ananthpuram PS- Kurnool III PS 400 kV (Quad) D/c line	765 kV	Line	D/c	100		TBCB	UC (SPV transfer: 04.10.2023)	Apr-25	Andhra Pradesh
	Ananthpuram PS- Cuddapah 400 kV (Quad) D/c line	765 kV	Line	D/c	150		TBCB	UC (SPV transfer: 04.10.2023)	Apr-25	Andhra Pradesh
	220 kV line bays for interconnection of wind projects (12 nos)	220 kV	S/s				TBCB	UC (SPV transfer: 04.10.2023)	Apr-25	Andhra Pradesh
	2x125 MVAr (400 kV) bus reactors at Ananthpuram PS	400 kV	S/s				TBCB	UC (SPV transfer: 04.10.2023)	Apr-25	Andhra Pradesh
	80 MVar Switchable line reactor for Ananthpuram PS- Cuddapah 400 kV D/c line	400 kV	S/s				TBCB	UC (SPV transfer: 04.10.2023)	Apr-25	Andhra Pradesh
SR-5	**Wind Energy Zone in Koppal, Karnataka (2500 MW)**									
	Koppal WEZ (2500MW), Karnataka						TBCB			Karnataka

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Establishment of 400/220 kV 5x500 MVA pooling Substation in a suitable location in Koppal distt.	400/220 kV	S/s			2500	TBCB	UC (SPV transfer: 13.12.2021)	Dec-23	Karnataka
	Koppal PS - Narendra (New) 400 kV D/c (Quad) Line	400 kV	Line	D/c	250		TBCB	UC (SPV transfer: 13.12.2021)	Dec-23	Karnataka
	220 kV line bays for interconnection of RE projects (9 nos)	220 kV	S/s				TBCB	UC (SPV transfer: 13.12.2021)	Dec-23	Karnataka
	2x125 MVAr bus reactor at Koppal PS	400 kV	S/s				TBCB	UC (SPV transfer: 13.12.2021)	Dec-23	Karnataka
SR-6	**Wind Energy Zone in Tamil Nadu(2500 MW)**									
	1. Karur WEZ (1000MW) Phase-I, Tamil Nadu									
	Establishment of 2x500 MVA, 400/230 kV Karur Pooling Station	400/230 kV	S/s			1000	TBCB	UC (SPV transfer: 18.01.2022)	Oct-23	Tamilnadu
	LILO of Pugalur - Pugalur(HVDC) 400 kV D/c (Quad) line at Karur PS	400 kV	Line	D/c	100		TBCB	UC (SPV transfer: 18.01.2022)	Oct-23	Tamilnadu
	230kV line bays for interconnection of wind projects (4 nos)	230 kV	S/s				TBCB	UC (SPV transfer: 18.01.2022)	Oct-23	Tamilnadu
	2x125 MVAr Bus reactor at Karur PS	400 kV	S/s				TBCB	UC (SPV transfer: 18.01.2022)	Oct-23	Tamilnadu
	2. Karur WEZ (1500MW) Phase-II, Tamil Nadu									
	Augmentation by 3x500 MVA, 400/230 kV ICT at Karur Pooling Station	400/230 kV	S/s			1500		Planned		Tamilnadu
	230kV line bays for interconnection of wind projects (5 nos)	230 kV	S/s					Planned		Tamilnadu
SR-7	**Wind Energy Zones in Tamil Nadu (500 MW)**									
	Tirunelveli WEZ (500 MW), Tamil Nadu									Tamilnadu

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Augmentation of transformation capacity with 400/230kV, 1x500MVA ICT at Tirunelveli Pool	400/230 kV	S/s			500	RTM	UC (Allocation date: 26.11.2021)	Dec-23	Tamilnadu
	220 kV line bays (GIS) for interconnection of wind projects (2 nos.)	220 kV	S/s				RTM	UC (Allocation date: 26.11.2021)	Dec-23	Tamilnadu
SR-8	**Solar Energy Zone in Karnataka (5000 MW)**									
	(a) Gadag SEZ (1000 MW) -Phase I									
	Establishment of 400/220 kV 2x500 MVA Gadag Pooling Station	400/220 kV	S/s			1000	TBCB	UC (SPV transfer: 17.03.2022)	Dec-23	Karnataka
	Gadag PS-Narendra (New) PS 400 kV D/c Line(capacity equivalent to quad moose)	400 kV	Line	D/c	200		TBCB	UC (SPV transfer: 17.03.2022)	Dec-23	Karnataka
	220 kV line bays for interconnection of solar projects (4 nos)	220 kV	S/s				TBCB	UC (SPV transfer: 17.03.2022)	Dec-23	Karnataka
	1x125MVAr (400 kV) bus reactor at Gadag PS	400 kV	S/s				TBCB	UC (SPV transfer: 17.03.2022)	Dec-23	Karnataka
	(b) Gadag SEZ (1500 MW) -Phase II									
	400/220 kV 3x500 MVA ICT augmentation at Gadag Pooling Station	400/220 kV	S/s			1500	TBCB	UC (SPV transfer: 19.12.2022)	May-24	Karnataka
	Gadag PS-Koppal PS 400 kV D/c Line (capacity equivalent to quad moose)	400 kV	Line	D/c	120		TBCB	UC (SPV transfer: 19.12.2022)	May-24	Karnataka
	220 kV line bays for interconnection of solar projects (4 nos)	220 kV	S/s				TBCB	UC (SPV transfer: 19.12.2022)	May-24	Karnataka
	(c) Bidar SEZ (2500 MW)									Karnataka

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Establishment of 765/400 kV, 3x1500 MVA & 400/220, 5x500 MVA Bidar Pooling Station	765/400/220 kV	S/s			7000	TBCB	Under Bidding		Karnataka
	Bidar PS- Maheshwaram (PG) 765 kV D/c Line	765 kV	Line	D/c	320		TBCB	Under Bidding		Karnataka, Telangana
	220 kV line bays for interconnection of solar projects (8 nos)	220 kV	S/s				TBCB	Under Bidding		Karnataka
	1x240 MVAr (765 kV) bus reactor at Bidar PS	765 kV	S/s				TBCB	Under Bidding		Karnataka
	1x125MVAr (400 kV) bus reactor at Bidar PS	400 kV	S/s				TBCB	Under Bidding		Karnataka
	4x240 MVAr (765 kV) switchable line reactor at Bidar PS end & Maheshwaram (PG) end (1x240 MVAr) for each circuit	765 kV	S/s				TBCB	Under Bidding		Telangana
SR-9	**Additional strengthening schemes**									
	Re-conductoring of NPKunta-Kolar 400 kV S/c (Twin Moose) line with high capacity conductor (twin HTLS or Quad Moose)	400 kV	Line	S/c			RTM	Commissioned		Andhra Pradesh,Karnataka
SR-10	**Transmission Scheme for evacuation of power from**									
	RE sources in Kurnool Wind Energy Zone (3000 MW)/									
	Solar Energy Zone (AP) (1500MW) - Part-A & B									
	Establishment of 765/400 kV, 3x1500 MVA & 400/220 kV, 9x500 MVATransformers Pooling Station at suitable location in Kurnool Distt (Kurnool-III)	765/400/220 kV	S/s			9000		Planned		Andhra Pradesh
	1x330 MVAr (765 kV) Bus reactor	765 kV	S/s					Planned		Andhra Pradesh
	1x125 MVAr (400 kV) bus reactors	400 kV	S/s					Planned		Andhra Pradesh

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Kurnool–III PS – Kurnool (New) 765 kV D/c Line	765 kV	Line	D/C	200			Planned		Andhra Pradesh
	Kurnool- III PS – Maheshwaram (PG) 765 kV D/c line	765 kV	Line	D/C	500			Planned		Andhra Pradesh, Telangana
	240 MVAr Switchable line reactor both ends	765 kV	S/s					Planned		Andhra Pradesh, Telangana
SR-11	**Transmission Schemes for evacuation of power from Kurnool REZ-I, Andhra Pradesh (7.5 GW Solar, 4 GW Wind, 3 GW BESS) (part of 181.5 GW)**									
	Transmission System for integration of Kurnool REZ-I (2.5 GW Solar, 2 GW Wind) under Phase-I									
	Establishment of 765/400 kV, 4x1500 MVA & 400/220 kV,5x500 MVA, Kurnool-IV Pooling Station near Kurnool, Andhra Pradesh	765/400/220 kV	S/s			8500		Planned		Andhra Pradesh
	Kurnool-IV – Kurnool-III PS 765 kV D/c line	765 kV	Line	D/c	200			Planned		Andhra Pradesh
	2x330 MVAr (765 kV) bus reactors at Kurnool-IV PS	765 kV	S/s					Planned		Andhra Pradesh
	2x125MVAr (400 kV) bus reactors at Kurnool-IV PS	400 kV	S/s							Andhra Pradesh
	Transmission System for integration of Kurnool REZ-I (2 GW Solar, 2 GW Wind, 3 BESS) under Phase-II									
	Augmentation of 765/400 kV, 1x1500 MVA & 400/220 kV, 2x500 MVA at Kurnool-IV Pooling Station	765/400/220 kV	S/s			2500		Planned		Andhra Pradesh

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Kurnool-IV – Bidar PS 765 kV D/c line with 240 MVAr SLR at both ends	765 kV	Line	D/c	560			Planned		Andhra Pradesh, Karnataka
SR-12	**Transmission System for integration of Kurnool REZ-II (7.5 GW Solar, 4 GW Wind, 3 GW BESS) (part of 181.5 GW)**									
	Transmission System for integration of Kurnool REZ-II (4.5 GW Solar, 1 GW Wind, 2 BESS) under Phase-II									
	Establishment of 765/400 kV, 3x1500 MVA & 400/220 kV, 5x500 MVA, Kurnool-V Pooling Station near Kurnool, Andhra Pradesh	765/400/220 kV	S/s			7000		Planned		Andhra Pradesh
	Kurnool-V – Kurnool-IV 765 kV D/c line	765 kV	Line	D/c	200			Planned		Andhra Pradesh
	Augmentation by 2x1500 MVA, 765/400 kV ICTs at Maheshwaram	765/400 kV	S/s			3000		Planned		Telangana
	2x330 MVAr (765 kV) & 2x125 MVAr (400 kV) bus reactors at Kurnool-V PS	765 kV	S/s					Planned		Andhra Pradesh
SR-13	**Transmission System for integration of Anantapur REZ (8 GW Solar, 8 GW Wind, 4 GW BESS) (part of 181.5 GW)**									
	Transmission System for integration of Anantapur REZ (2 GW Wind, 1.5 GW solar integrated with already planned Anantapur pooling station under 66.5 GW) under Phase I									Andhra Pradesh
	Augmentation of 3x500 MVA, 400/220 kV ICTs at Anantapur (Additional 1 GW injection at 220 kV level and 1 GW injection at 400 kV level)	400/220 kV	S/s			1500		Planned		Andhra Pradesh
	Transmission System for integration of Anantapur REZ (4 GW Solar) under Phase I									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Establishment of 765/400, 4x1500 MVA, & 400/220 kV,5x500 MVA at Anantapur-II Pooling Station near Kurnool, Andhra Pradesh	765/400/220 kV	S/s			8500		Planned		Andhra Pradesh
	Anantapur-II – Cuddapah 765 kV D/c line with 240 MVAr SLR at Anantapur-II PS	765 kV	Line	D/c	500			Planned		Andhra Pradesh
	2x330 MVAr (765 kV) bus reactors at Anantapur-II PS	765 kV	S/s					Planned		Andhra Pradesh
	2x125MVAr (400 kV) bus reactors at Anantapur-II PS	400 kV	S/s					Planned		Andhra Pradesh
	Transmission System for integration of Anantapur REZ (1 GW Solar, 4 GW Wind, 2 BESS) under Phase II									
	Augmentation of 765/400 kV, 1x1500 MVA, & 400/220 kV, 2x500 MVA Anantapur-II Pooling Station near Kurnool, Andhra Pradesh (4 GW injection at 220 kV level and 4 GW injection at 400 kV level)	765/400/220 kV	S/s			2500		Planned		Andhra Pradesh
	Anantapur-II – Kurnool-V PS 765 kV D/c line	765 kV	Line		200			Planned		Andhra Pradesh
SR-14	**Transmission System for integration of Kadapa REZ (8 GW Solar, 3 GW BESS), (part of 181.5 GW)**									
	Transmission System for integration of Kadapa REZ (4 GW Solar, 1.5 BESS) Phase II									
	Establishment of 765/400 kV, 3x1500 MVA & 400/220 kV, 4x500 MVA Pooling Station near Kadapa (Kadapa II PS), Andhra Pradesh (2.5 GW injection at 220 kV level and 2.5 GW injection at 400 kV level)	765/400/220 kV	S/s			6500		Planned		Andhra Pradesh
	LILO of both circuits of Anantapur-II – Cuddapah 765 kV D/c line at Kadapa-II PS	765 kV	Line	2xD/c	20			Planned		Andhra Pradesh

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	2x330 MVAr (765 kV) bus reactors at Kadapa-II PS	765 kV	S/s					Planned		Andhra Pradesh
	2x125 MVAr (400 kV) bus reactors at Kadapa-II PS	400 kV	S/s					Planned		Andhra Pradesh
SR-15	**Transmission System for integration of Koppal REZ (2 GW Wind, 2 GW Solar, 1 GW BESS), (part of 181.5 GW) under Phase -I**									
	Establishment of 765/400 kV, 4x1500 MVA & 400/220 kV, 4x500 MVA Pooling Station near Koppal, Karnataka (1 GW injection at 220 kV level and 1 GW injection at 400 kV level)	765/400/220 kV	S/s			8000	TBCB	Under Bidding		Karnataka
	Augmentation of 765/400 kV, 2x1500 MVA at Koppal-II					3000		Planned		Karnataka
	Koppal-II PS – Narendra (New) 765 kV D/c line with 330 MVAr SLR at Koppal-II PS end	765 kV	Line	D/c	300		TBCB	Under Bidding		Karnataka
	Koppal-II PS – Raichur 765 kV D/c line with 330 MVAr SLR at Koppal-II PS end	765 kV	Line	D/C	380		TBCB	Under Bidding		Karnataka
	2x330 MVAr (765 kV) & 2x125MVAr (400 kV) bus reactors at Koppal-II PS	765 kV	S/s				TBCB	Under Bidding		Karnataka
SR-16	**Transmission System for integration of Gadag REZ (2 GW Wind, 2 GW Solar, 1 GW Storage) (part of 181.5 GW) under Phase -I**									
	Establishment of 400/220 kV, 3x500 MVA Pooling Station near Gadag, Karnataka (1 GW injection at 220 kV level and 1 GW injection at 400 kV level)	400/220 kV	S/s			1500	TBCB	Under Bidding		Karnataka
	Gadag-II PS – Koppal-II PS 400 kV (QM equivalent) D/c line	400 kV	Line	D/C	130		TBCB	Under Bidding		Karnataka
	2x125MVAr 420kV bus reactors at Gadag-II PS	400 kV	S/s				TBCB	Under Bidding		Karnataka

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
SR-17	**Transmission System for integration of Devanagere/Chitragurga REZ (2 GW Wind, 2 GW Solar, 1 GW BESS) (part of 181.5 GW) under Phase -I**									
	Establishment of 400/220 kV 3x500 MVA Pooling Station near Devanagere/ Chitragurga, Karnataka (1 GW injection at 220 kV level and 1 GW injection at 400 kV level)	400/220 kV	S/s			1500		Planned		Karnataka
	Devanagere / Chitragurga PS – Koppal-II PS 400 kV (QM equivalent) D/c line	400 kV	Line	D/C	200			Planned		Karnataka
	2x125MVAr (400 kV) bus reactors at Devanagere / Chitragurga PS	400 kV	S/s					Planned		Karnataka
SR-18	**Transmission System for integration of Bijapur REZ (2 GW Wind) (part of 181.5 GW)**									
	Transmission System for integration of Bijapur REZ (1 GW Wind) under Phase-I									
	Establishment of 400/220 kV 2x500 MVA Pooling Station near Bijapur (Vijayapura), Karnataka (0.5 GW injection at 400 kV level and 0.5 GW injection at 220 kV level)	400/220 kV	S/s			1000		Planned		Karnataka
	Bijapur PS – Koppal-II PS 400 kV (QM equivalent) D/c line	400 kV	Line	D/c	200			Planned		Karnataka
	2x125 MVAr (400 kV) bus reactors at Bijapur PS	400 kV	S/s					Planned		Karnataka
	Transmission System for integration of Bijapur REZ (1 GW Wind) under Phase-II									
	Augmentation of 400/220 kV, 1x500 MVA ICTs at Bijapur (Vijayapura) PS (0.5 GW injection at 400 kV level and 0.5 GW injection at 220 kV level)	400/220 kV	S/s			500		Planned		Karnataka
SR-19	**Transmission System for integration of Tumkur REZ (1.5 GW Solar) (part of 181.5 GW)**									
	Transmission System for integration of Tumkur REZ (1.5 GW Solar) under Phase-II									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Establishment of 4x500 MVA, 400/220 kV Pooling Station near Tumkur, Karnataka	400/220 kV	S/s			2000	TBCB	Under Bidding		Karnataka
	Tumkur-II PS – Tumkur(Pavagada) 400 kV (QM equivalent) D/c line	400 kV	Line	D/c	200		TBCB	Under Bidding		Karnataka
	2x125MVAr (400 kV) bus reactors at Tumkur-II PS	400 kV	S/s				TBCB	Under Bidding		Karnataka
SR-20	**Transmission System for integration of Bellary REZ (1.5 GW Solar) (part of 181.5 GW)**									
	Transmission System for integration of Bellary REZ (1.5 GW Solar)) under Phase-II									
	Establishment of 4x500 MVA, 400/220 kV Pooling Station near Bellary, Karnataka	400/220 kV	S/s			2000		Planned		Karnataka
	Bellary PS – Koppal-II PS 400 kV (QM equivalent) D/c line	400 kV	Line	D/c	200			Planned		Karnataka
	2x125MVAr (400 kV) bus reactors at Bellary PS	400 kV	S/s					Planned		Karnataka
SR-21	**Transmission System for integration of Nizamabad REZ (1 GW Wind, 2.5 GW Solar, 1 GW BESS) (part of 181.5 GW)**									
	Transmission System for integration of Nizamabad REZ (1 GW Wind, 1 GW Solar) under Phase-I									
	Establishment of 765/400 kV, 4x1500 MVA & 400/220 kV, 2x500 MVA Pooling Station near Nizamabad (Nizamabad-II)	765/400/220 kV	S/s			7000		Planned		Telangana
	Nizamabad-II PS – Nizamabad(PG) 765 kV 2x D/c line	765 kV	Line	D/c	60			Planned		Telangana
	2x330 MVAr (765 kV) bus reactors at Nizamabad-II PS	765 kV	S/s					Planned		Telangana
	2x125MVAr (400 kV) bus reactors at Nizamabad-II PS	400 kV	S/s							Telangana

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Transmission System for integration of Nizamabad REZ (1.5 GW Solar, 1 GW BESS) under Phase-II									
	Augmentation of 765/400 kV, 2x1500 MVA & 400/220 kV, 1x500 MVA ICTs at Nizamabad-II PS (0.5 GW injection at 220 kV level)	765/400/220 kV	S/s			3500		Planned		Telangana
	Augmentation by 1x1500 MVA, 765/400 kV ICT at Nizamabad (PG) S/s	765/400 kV	S/s			1500		Planned		Telangana
	Nizamabad-II PS – Warangal (New) 765 kV D/c line with 330 MVAr SLR at Nizamabad-II PS	765 kV	Line	D/c	360			Planned		Telangana
SR-22	**Transmission System for integration of Medak REZ (1 GW Wind, 2.5 GW Solar, 1 GW BESS) (part of 181.5 GW)**									
	Transmission System for integration of Medak REZ (1 GW Wind, 0.5 GW Solar) under Phase-I									
	Establishment of 2x500 MVA, 400/220 kV Pooling Station near Medak (Medak PS)	400/220 kV	S/s			1000		Planned		Telangana
	Medak PS – Nizamabad-II 400 kV (QM equivalent) D/c line	400 kV	Line	D/c	120			Planned		Telangana
	2x125 MVAr (400 kV) bus reactors at Medak PS	400 kV	S/s					Planned		Telangana
	Transmission System for integration of Medak REZ (2 GW Solar, 1 GW BESS) under Phase-II									
	Augmentation of 400/220 kV, 1x500 MVA ICT at Medak PS (0.5 GW injection at 220 kV level)	400/220 kV	S/s			500		Planned		Telangana
SR-23	**Transmission System for integration of Rangareddy REZ (1 GW Wind, 2.5 GW Solar, 1 GW BESS)) (part of 181.5 GW)**									
	Transmission System for integration of Rangareddy REZ (1 GW Wind, 0.5 GW Solar) under Phase-I									
	Establishment of 2x500 MVA, 400/220 kV Pooling Station near Rangareddy (Rangareddy PS)	400/220 kV	S/s			1000		Planned		Telangana

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Rangareddy PS – Nizamabad-II 400 kV (QM equivalent) D/c line with 80 MVAr SLR at Rangareddy PS	400 kV	Line	D/c	310			Planned		Telangana
	2x125 MVAr (400 kV) bus reactors at Rangareddy PS	400 kV	S/s					Planned		Telangana
	Transmission System for integration of Rangareddy REZ (2 GW Solar, 1 GW BESS) under Phase-II									
	Augmentation of 400/220 kV, 1x500 MVA ICTs at Rangareddy PS (0.5 GW injection at 220 kV level)	400/220 kV	S/s			500		Planned		Telangana
SR-24	**Transmission System for integration of Karimnagar REZ (2.5 GW Solar)) (part of 181.5 GW)**									
	Transmission System for integration of Karimnagar REZ (2 GW Solar) under Phase-II									
	Establishment of 3x500 MVA, 400/220 kV Pooling Station near Karimnagar (Karimnagar PS) (1.5 GW injection at 220 kV level and 1 GW injection at 400 kV level)	400/220 kV	S/s			1500		Planned		Telangana
	Karimnagar PS – Nizamabad-II 400 kV (Quad) D/c line	400 kV	Line	D/c	200			Planned		Telangana
	2x125 MVAr bus reactors at Karimnagar PS	400 kV	S/s					Planned		Telangana
SR-25	**Transmission System for 5 GW Offshore wind farm (Sub Zone B1 to B4 & G1 to G3) in Tamil Nadu) (part of 181.5 GW)**									
	Transmission system for 2 GW off shore wind under Phase II:									
	A. Onshore pooling station and Transmission System from Onshore Pooling Station									
	Establishment of 5x500 MVA, 400/230kV Onshore Pooling Station near Avaraikulam, Tirunelveli District in Tamil Nadu	400 /230kV	S/s			2500		Planned		Tamilnadu

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Avaraikulam Onshore PS – Pugalur (HVDC) 400 kV D/c line with 125 MVAr switchable reactors at both ends (with Quad Moose equivalent)	400 kV	Line	D/c	600			Planned		Tamilnadu
	Suitable Static Compensation / Dynamic Compensation with MSR	400 kV						Planned		Tamilnadu
	B. Transmission System for integration of Offshore Wind Farms with Onshore PS									
	OSS G1 – Avaraikulam Onshore PS 230kV 2xS/c Submarine cable	230 kV	Line	S/c	80			Planned		Tamilnadu
	OSS G2 – Avaraikulam Onshore PS 230kV S/c Submarine cable	230 kV	Line	S/c	35			Planned		Tamilnadu
	OSS G3 – Avaraikulam Onshore PS 230kV 2xS/c Submarine cable	230 kV	Line	S/c	72			Planned		Tamilnadu
	5 nos. of 230kV line bays for interconnection of Offshore wind projects	220 kV	S/s					Planned		Tamilnadu
Eastern Region										
ER-1	**ERSS-XVII (Part-B)**									
	Reconductoring of Maithon RB - Maithon 400 kV D/c line	400 kV	Line	D/c			RTM	Commissioned		West Bengal
ER-2	**Immediate evacuation for North Karanpura (3x660 MW) generation project of NTPC**									
	NKSTPP – Jharkhand Pool 400 kV D/c (quad) line	400 kV	Line	D/c	76		TBCB	Commissioned		Jharlhand
	NKSTPP – Gaya 400 kV D/c (quad) line	400 kV	Line	D/c	185		TBCB	UC (SPV transfer: 08.07.2016)	Nov-25	Jharkhand-Bihar
ER-3	**ERSS-XXII**									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Modification of 132 kV SMT bus scheme to DM bus scheme in GIS and 2 no additional 132 kV GIS line bays at Malda (400/220/132 kV)	132 kV	S/s				RTM	UC	Jan-24	West Bengal
ER-4	**Transmission system for power evacuation from Arun-3 (900MW) HEP, Nepal of M/s SAPDC - Indian Portion**									
	Sitamarhi (POWERGRID) - Dhalkebar (Nepal) 400 kV D/c (Quad) line (Indian portion)	400 kV	Line	D/c	80		RTM	Commissioned		Bihar
ER-5	**ERSS-XXIV**									
	Shifting of 400 kV side of 400/220 kV, 315MVA ICT-l from Durgapur-A section to Durgapur-B section without physical shifting of ICT such that all three ICTs are on same 400 kV bus section (if required, GIS bus duct could be used)	400/220 kV	S/s			0	RTM	Commissioned		West Bengal
ER-6	**ERSS-XXV**									
	400/220 kV, 2x500MVA ICTs along with associated bays (220 kV bays in GIS and 400 kV bays in AIS) at Banka	400/220 kV	S/s			1000	TBCB	UC (SPV transfer: 10.10.2022)	Oct-25	Bihar
	Creation of 220 kV GIS bus at Banka (POWERGRID) S/s	220 kV	S/s				TBCB	UC (SPV transfer: 10.10.2022)	Oct-25	Bihar
	400 kV Bus extension works at Banka (PGCIL) 400/132 kV Substation	400 kV	S/s				TBCB	UC (SPV transfer: 10.10.2022)	Oct-25	Bihar
ER-7	**ERSS-XXVI**									
	400/220 kV, 500MVA (3rd ICT) at Ranchi New S/s	400/220 kV				500	RTM	Commissioned		Jharlhand
ER-8	**ERSS-XXVII**									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Installation of 420 kV, 63 MVAr switchable line reactor with 500 Ohm NGR at Kahalagaon (NTPC) end, one each in both circuits of Kahalgaon (NTPC) – Durgapur (POWERGRID) 400 kV D/c line.	400 kV	S/s				RTM	UC (Allocation date: 14.10.2022)	Apr-24	Bihar
	1x125 MVAr Bus Reactor at Alipurduar (3rd)	400 kV	S/s				RTM	UC (Allocation date: 26.04.2022 & 26.06.2022))	Mar-24	West Bengal
ER-9	**Eastern Region Expansion Scheme-XXVIII - (ERES-XXVIII)**									
	Installation of 420 kV, 1x125MVAr bus reactor along with associated bay at Biharsharif (POWERGRID) S/s in the bus section having 1x80MVAr existing bus reactor.	400 kV	S/s				RTM	UC (Allocation date: 24.06.2022)	Dec-23	Bihar
ER-10	**Eastern Region Expansion Scheme-XXIX- (ERES-XXIX)**									
	Reconductoring of Jharsuguda/Sundargarh (POWERGRID) – Rourkela (POWERGRID) 400 kV 2xD/c Twin Moose line with Twin HTLS conductor (with ampacity Single HTLS as 1228 A at nominal voltage).	400 kV	Line	2xD/c			RTM	UC (Allocation date: 15.11.2022)	Nov-25	Odisha
	Bay upgradation at Rourkela (POWERGRID) end for 315 0A rating – 04 nos. diameters in one and half breaker scheme (except 09 nos. existing circuit breakers which are of minimum 3150 A rating).	400 kV	S/s				RTM	UC (Allocation date: 15.11.2022)	Nov-25	Odisha
ER-11	**Eastern Region Expansion Scheme-XXX- (ERES-XXX)**									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Installation of existing spare 132/66 kV, 1x50MVA ICT (already stationed at Gangtok) as 3rd ICT at Gangtok (POWERGRID) S/s along with conversion of existing 132 kV TBC bay as 132 kV ICT bay for 3rd ICT and construction of new 66kV ICT bay in Hybrid/Outdoor GIS with suitable modification in the gantry structure of 66kV side.	132/66 kV	S/s				RTM	UC (Allocation date: 28.11.2022)	Aug-24	Sikkim
	Construction of new 132 kV TBC bay in Hybrid/Outdoor GIS.	132 kV	S/s				RTM	UC (Allocation date: 28.11.2022)	Aug-24	Sikkim
ER-12	**Eastern Region Expansion Scheme-XXXI-(ERES-XXXI)**									
	Installation of new 420 kV, 1x125MVAr bus reactor along with associated bay at Jamshedpur (POWERGRID) S/s	400 kV	S/s				RTM	UC (Allocation date: 14.10.2022)	Apr-24	Jharlhand
	Installation of new 420 kV, 1x63MVAr line reactor at Maithon-A end of Maithon-A – Kahalgaon-B ckt-1 400 kV line along with new 500 ohm NGR (with NGR bypass arrangement for operation of line reactor as a bus reactor	400 kV	S/s				RTM	UC (Allocation date: 14.10.2022)	Apr-24	West Bengal
ER-13	**Eastern Region Expansion Scheme-XXXIII-(ERES-XXXIII)**									
	Reconductoring of Rangpo-Gangtok 132 kV D/c line	132 kV	Line				RTM	UC (Allocation date: 28.11.2022)	Nov-24	Sikkim
	Upgradation of CTs at Gangtok end in both circuits of Rangpo – Gangtok 132 kV D/c line from 600A to rating commensurate with rating of HTLS conductor(800A)	132 kV	S/s				RTM	UC (Allocation date: 28.11.2022)	Nov-24	Sikkim

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
ER-14	**Eastern Region Expansion Scheme-XXXIV (ERES-XXXIV):**									
	Establishment of Paradeep 765/400 kV, 2x1500 MVA GIS substation	765/400 kV	S/s			3000	TBCB	Under Bidding		Odisha
	Angul (POWERGRID) – Paradeep 765 kV D/c line along with 765kV, 1x330 MVAr switchable line reactor with 500ohm NGR (with NGR bypass arrangement) at Paradeep end in both circuits	765 kV	Line	D/c	380		TBCB	Under Bidding		Odisha
	Paradeep–Paradeep (OPTCL) 400 kV D/c (Quad) line	400 kV	Line	D/c	20		TBCB	Under Bidding		Odisha
ER-15	**Eastern Region Expansion Scheme-XXXVII (ERES-XXXVII)**									
	Creation of 220 kV level in GIS (in Double Main Switching Scheme including 1 no. bus coupler bay) at Lakhisarai (POWERGRID) 400/132 kV S/s along with 2 no. 220 kV line bays [for termination of Lakhisarai – Haveli Kharagpur 220 kV D/c line to be implemented by BSPTCL under intra-state]	220 kV	S/s				RTM	UC (Allocation date: 19.05.2023)	May-25	Bihar
	Installation of 400/220 kV, 2x500 MVA ICTs along with associated bays at Lakhisarai (POWERGRID) 400/132 kV S/s	400/220 kV	S/s			1000	RTM	UC (Allocation date: 19.05.2023)	May-25	Bihar
North Eastern Region										
NER-1	**NER System Strengthening-III**									
	Replacement of existing 60 MVA, 220/132 kV ICT by 1x160 MVA 220/132 kV ICT at Kopili HEP	220/132 kV	S/s			100	RTM	UC	Dec-23	Assam

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
								(Allocation date: 23.08.2015)		
NER-2	**North East - Northern / Western Interconnector - I (Part-C)**									
	Lower Subansiri – Biswanath Chariyali 400 kV 2 x D/c (Twin Lapwing) line (341.5km): Matching with Lower Subansiri (2000MW) HEP	400 kV	Line	2 x D/c	730		RTM	UC (Allocation date: 06.01.2009)	Dec-23	Arunanchal Pradesh, Assam
NER-3	**NER System Strengthening-IX**									
	Pare HEP – North Lakhimpur (AEGCL) 132 kV D/c line (with ACSR Zebra conductor)	132 kV	Line	D/c	110		TBCB	Commissioned		Arunanchal Pradesh, Assam
	LILO of one circuit of Pare HEP – North Lakhimpur (AEGCL) 132 kV D/c line ar Nirjuli	132 kV	Line	D/c	10		TBCB	Commissioned		Arunanchal Pradesh
	Reconductoring of LILO portion at Pare end (of Ranganadi – Naharlagun / Nirjuli 132 kV S/c line) with HTLS (HTLS equivalent to ACSR Zebra) along with modification of 132 kV bay equipments at Pare HEP. 2 no. 132 kV GIS bays at Nirjuli S/s for termination of LILO of one circuit of Pare HEP - North Lakhimpur (AEGCL) 132 kV D/c line (with ACSR Zebra) to be provided by Powergrid.	132 kV	Line	D/c			TBCB	Commissioned		Arunanchal Pradesh
	To bypass LILO of Ranganadi - Naharlagun / Nirjuli at Pare HEP so as to form direct Ranganadi - Naharlagun / Nirjuli 132 kV S/c line	132 kV	Line	D/c			TBCB	Commissioned		Arunanchal Pradesh
NER-4	**NER System Strengthening-X**									
	Roing (POWERGRID) – Chapakhowa (Assam) 132 kV D/c line	132 kV	Line	D/c	67		RTM	Commissioned		Arunanchal Pradesh, Assam

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	132 kV line bays at Roing (POWERGRID) S/s	132 kV	S/s				RTM	Commissioned		Arunanchal Pradesh
	132 kV line bays at Chapakhowa (Assam)	132 kV	S/s				RTM	Commissioned		Assam
NER-5	**NER System Strengthening-XI**									
	Installation of 400 kV, 2x63MVAr switchable line reactors, one in each circuit of Silchar (POWERGRID) – Imphal (POWERGRID) 400 kV D/c line at Imphal end	400 kV	S/s				RTM	Commissioned		Assam, Manipur
	Installation of 3rd ICT of 220/132 kV , 1x100MVA at Salakati alongwith associated bays at both levels	220/132 kV	S/s			100	RTM	Commissioned		Assam
NER-6	**NER System Strengthening-XII**									
	400 kV D/c Siliguri-Bongaigaon line (Twin ACSR Moose)	400 kV	Line	D/c			RTM	UC (Allocation date: 25.09.2020)	Feb-24	Assam
	220 kV D/c Alipurduar-Salakati line (Single ACSR Zebra)	220 kV	Line	D/c			RTM	Commissioned		Assam
	220 kV D/c BPTS-Salakati line (Single ACSR Zebra)	220 kV	Line	D/c			RTM	Commissioned		Assam
	132 kV S/c Dimapur-Imphal line (Single ACSR Panther)	132 kV	Line	S/c			RTM	Commissioned		Nagaland, Manipur
	132 kV S/c Loktak-Jiribam line (Single ACSR Panther)	132 kV	Line	S/c			RTM	Commissioned		Manipur
NER-7	**NERSS-XIII**									

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Conversion of 132 kV level of 400/132 kV Imphal S/s to Double Main Transfer Bus Scheme preferably with Bus Sectionalisation on AIS depending on layout or alternatively on GIS/ Hybrid GIS if layout does not permit AIS Bus sectionalisation	132 kV	S/s				RTM	UC	Feb-24	Manipur
	Conversion of 132 kV level of 132/33kV Nirjuli S/s to Double Main Transfer Bus Scheme preferably with Bus Sectionalisation on AIS depending on layout or alternatively on GIS/ Hybrid GIS if layout does not permit AIS Bus sectionalisation	132 kV	S/s				RTM	Commissioned		Arunanchal Pradesh
NER-8	**NERSS-XIV**									
	LILO of Palatana – Surajmaninagar (ISTS) 400 kV D/c line at 400/132 kV Surajmaninagar (TSECL) S/s along with associated 4 no. 400 kV line bays – In matching timeframe of upgradation of 400/132 kV Surajmaninagar (TSECL) substation	400 kV		D/c	12		RTM	Commissioned		Tripura
NER-9	**NER System Strengthening-XV**									
	Upgradation of existing 132 kV Namsai (POWERGRID) S/s to 220 kV (with 220 kV side as GIS)	220/132 kV	S/s			320	TBCB	UC(SPV Transfer: 10.10.2022)	Oct-25	Arunanchal Pradesh
	Kathalguri (NEEPCO) – Namsai (POWERGRID) 220 kV D/c line	220 kV	Line	D/c	150		TBCB	UC(SPV Transfer: 10.10.2022)	Oct-25	Assam, Arunanchal Pradesh
	Extension at Kathalguri (NEEPCO) switchyard: 2 nos. of GIS line bays for termination of Kathalguri (NEEPCO) – Namsai (POWERGRID) 220 kV D/c line	220 kV	S/s				TBCB	UC(SPV Transfer: 10.10.2022)	Oct-25	Assam
	1 no 50MVAr Bus reactor at Namsai	220 kV	S/s				TBCB	UC(SPV Transfer: 10.10.2022)	Oct-25	Arunanchal Pradesh

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Impleme ntation	Present Status (as on 31.10.2023)	Anticipate d Commissio ning schedule	State
NER-10	**Establishment of new 220/132 kV substation at Nangalbibra**									
	Bongaigaon (POWERGRID) – Nangalbibra 400 kV D/c line (initially operated at 220 kV) – 280ckm	400 kV		D/c	280		TBCB	UC (SPV Transfer: 16.12.2021)	Jun-24	Assam, Meghalaya
	Hatsinghmari (Assam) – Ampati (Meghalaya) 132 kV D/c line – 60 ckm	132 kV		D/c	60		TBCB	UC (SPV Transfer: 16.12.2021)	Jun-24	Asssam, Meghalaya
	Establishment of new 220/132 kV , 2x160MVA substation at Nangalbibra	220/132 kV	S/s			320	TBCB	UC (SPV Transfer: 16.12.2021)	Jun-24	Meghalaya
	Extension at Bongaigaon (POWERGRID) S/s: 2 no. of line bays for termination of Bongaigaon (POWERGRID) – Nangalbibra 400 kV D/c line (initiated operated at 220 kV)	220 kV	S/s				TBCB	UC (SPV Transfer: 16.12.2021)	Jun-24	Assam
	Extension at Hatsinghmari (Assam) S/s: 2 no. of 132 kV line bays for termination of Hatsinghmari (Assam) – Ampati (Meghalaya) 132 kV D/c line.	132 kV	S/s				TBCB	UC (SPV Transfer: 16.12.2021)	Jun-24	Assam
	Extension at Ampati (Meghalaya) S/s: 2 no. of 132 kV line bays for termination of Hatsinghmari (Assam) – Ampati (Meghalaya) 132 kV D/c line.	132 kV	S/s				TBCB	UC (SPV Transfer: 16.12.2021)	Jun-24	Meghalaya
	2 nos 31.5MVAr Bus reactor at Nangalbibra	220/132 kV	S/s				TBCB	UC (SPV Transfer: 16.12.2021)	Jun-24	Meghalaya
NER-11	**NERSS-XVI**									
	Gogamukh - Gerukamukh 132 kV D/c line	132 kV	Line	D/c	40		TBCB	Under Bidding		Assam
	LILO of one D/c (ckt-1 & ckt-2 of line-1) of Lower Subansiri – Biswanath Chariali 400 kV (Twin Lapwing) 2xD/c lines at Gogamukh S/s	400 kV	Line	2xD/c	40		TBCB	Under Bidding		Assam
	400/220 kV, 2x500MVA ICTs at Gogamukh	400/220 kV	S/s			1000	TBCB	Under Bidding		Assam

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	220/132 kV , 2x200MVA ICTs at Gogamukh	220/132 kV	S/s			400	TBCB	Under Bidding		Assam
	2x125 MVAr, 400 kV Bus reactors at Gogoamukh	400 kV	S/s				TBCB	Under Bidding		Assam
NER-12	**Transmission system for providing Connectivity to Dibang HEP**									
	Dibang - Gogamukh 400 kV 2xD/c line	400 kV		2xD/c	860			Planned		Arunanchal Pradesh, Assam
NER-13	**Transmission system for power evacuation from Dibang HEP**									
	Gogamukh- Lower Subansiri 400 kV D/c line alongwith 80MVAr line reactor in each circuit at Lower Subansiri end	400 kV		D/c	350			Planned		Assam, Arunanchal Pradesh
NER-14	**North Eastern Region Expansion Scheme-XVII (NERES-XVII)**									
	Upgradation of 33kV system of 400/132/33kV Imphal (POWERGRID) S/s to handle 20MW per feeder: Upgradation/modification of 33kV panels of 4 nos. outgoing feeders including CT, change of suitable HT cables & accessories and structure etc., as required.	33 kV	S/s				RTM	UC (Allocation date: 16.11.2021)	Feb-24	Manipur
NER-15	**North Eastern Region Expansion Scheme-XVIII (NERES-XVIII)**									
	Reconductoring of Melriat (POWERGRID) – Zuangtui (Mizoram) 132 kV ACSR Panther S/c line with Single HTLS rating of HTLS conductor of 900A (at nominal voltage level) along with new one (1) 132 kV line bay at Melriat (POWERGRID) S/s (of rating commensurate with rating of HTLS) for termination of this HTLS line	132 kV	Line	S/c			RTM	UC (Allocation date: 28.11.2022)	Apr-25	Mizoram

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Replacement of existing CT of 600/1A at Zuangtui (Mizoram) end in Melriat (POWERGRID) – Zuangtui (Mizoram) 132 kV S/c line with rating commensurate with ampacity (900A) of HTLS conductor	132 kV	S/s				RTM	UC (Allocation date: 28.11.2022)	Apr-25	Mizoram
	Reconductoring of Aizawl (POWERGRID) – Luangmual (Mizoram) 132 kV ACSR Panther S/c line with Single HTLS rating of HTLS conductor of 800A (at nominal voltage level) along with upgradation of line bay equipment at Aizawl (POWERGRID) end commensurate with rating of HTLS, as required	132 kV	Line	S/c			RTM	UC (Allocation date: 28.11.2022)	Apr-25	Mizoram
	Replacement of existing CT of 600/1A at Luangmual (Mizoram) end in Aizawl (POWERGRID) – Luangmual (Mizoram) 132 kV S/c line with rating commensurate with ampacity (800A) of HTLS conductor	132 kV	S/s				RTM	UC (Allocation date: 28.11.2022)	Apr-25	Mizoram
	Installation of OPGW in Aizawl (POWERGRID) – Luangmual (Mizoram) 132 kV S/c line	132 kV	Line				RTM	UC (Allocation date: 28.11.2022)	Apr-25	Mizoram
NER-16	**North Eastern Region Expansion Scheme-XIX (NERES-XIX)**									
	Reconductoring of Loktak (NHPC) – Imphal (POWERGRID) 132 kV S/c line with HTLS conductor (with Ampacity of single HTLS as 800A at nominal voltage) along with strengthening of associated structure in NHPC switchyard, if necessary	132 kV	Line				RTM	UC (Allocation date: 14.10.2022)	Apr-24	Manipur

Sl. No.	Scheme /details	Voltage (kV)	Type of Work	No. of Circuits	ckm	MVA	Mode of Implementation	Present Status (as on 31.10.2023)	Anticipated Commissioning schedule	State
	Replacement of existing CT of 600-400-200/1A at Loktak HEP end in Loktak – Imphal 132 kV S/c line with rating commensurate with ampacity (800A) of HTLS conductor	132 kV	S/s				RTM	UC (Allocation date: 14.10.2022)	Apr-24	Manipur
NER-17	**North Eastern Region Generation Scheme-I (NERGS-I)**									
	Establishment of new 400 kV switching station (to be upgraded to 400/220 kV level in future) at Bokajan in Assam	400 kV	S/s				TBCB	Under Bidding		Assam
	LILO of both circuits of Misa (POWERGRID) – New Mariani (POWERGRID) 400 kV D/c line at Bokajan	400 kV	Line	D/c	40		TBCB	Under Bidding		Assam
	*UC-Under-construction, RTM-Regulated Tariff Mechanism, TBCB-Tariff Based Competitive Bidding									

Annex – 7.2

Intra State Transmission system addition requirement for the period 2022-27

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
	Delhi						
(A)	**New sub-stations / ICT augmentation**						
1	Gopalpur 400 kV GIS S/s (Central Delhi)	Delhi	400/220 kV	S/s			2000
2	Tikri Khurd 400 kV GIS S/s (North Delhi)	Delhi	400/220/66 kV	S/s			1980
3	Timarpur 220 kV GIS S/s (Central Delhi)	Delhi	220/33 kV	S/s			300
4	Dev Nagar 220 kV GIS S/s (Central Delhi)	Delhi	220/33 kV	S/s			400
5	Budella 220 kV GIS S/s (Central West Delhi)	Delhi	220/66 kV	S/s			480
6	ICT augmentation at BTPS (South Delhi)	Delhi	220/66 kV	S/s			480
7	Maharanibagh 220 kV (South Delhi)	Delhi	220/66/33 kV	S/s			620
8	Bharthal 220 kV GIS S/s (West Delhi)	Delhi	220/66 kV	S/s			480
9	Sarojini Nagar 220 kV GIS S/s (Central Delhi)	Delhi	220/33 kV	S/s			300
10	Mangol Puri 220 kV GIS S/s	Delhi	220/66/33 kV	S/s			780
11	Punjabi Bagh 220 kV GIS S/s(Vishal) (Central -West Delhi)	Delhi	220/66 kV	S/s			300
12	Nehru Place 220 kV GIS S/s (South Delhi)	Delhi	220/33 kV	S/s			300
13	Dilshad Garden 220 kV GIS S/s (East Delhi)	Delhi	220/66 kV	S/s			480
14	Seelam Pur/Rathi Mill/Dwarka Puri 220 kV GIS S/s (East Delhi)	Delhi	220/33 kV	S/s			300
15	Nathu Pura 220 kV GIS S/s (North Delhi)	Delhi	220/66 kV	S/s			480
16	Maidan Garhi 220 kV GIS S/s (South Delhi)	Delhi	220/66 kV	S/s			480
17	ICT augmentation at Dwarka	Delhi	220/66 kV	S/s			480
18	ICT augmentation at Mundka (Tikri Kalan)	Delhi	400/220 kV	S/s			870
19	ICT augmentation at at Bamnauli (Hot Reserve)	Delhi	400/220 kV	S/s			500

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
20	315 MVA ICT replacement with 500 MVA at Bawana	Delhi	400/220 kV	S/s			185
21	315 MVA ICT replacement with 315 MVA at Bawana	Delhi	400/220 kV	S/s			0
22	ICT augmentation at Shalimarbagh	Delhi	220/33 kV	S/s			100
23	ICT augmentation at Mundka (Tikri Kalan) (as a hot reserve)	Delhi	220/66 kV	S/s			160
24	ICT augmentation at Mehrauli (as a hot reserve)	Delhi	220/66 kV	S/s			160
25	ICT augmentation at Okhla (as a hot reserve)	Delhi	220/33 kV	S/s			100
26	ICT augmentation at Patparganj (as a hot reserve)	Delhi	220/33 kV	S/s			100
27	ICT augmentation at PPK-I (as a hot reserve)	Delhi	220/66 kV	S/s			160
28	ICT augmentation at PPK-III	Delhi	220/66 kV	S/s			160
29	ICT augmentation at Geeta colony	Delhi	220/33 kV	S/s			100
30	ICT augmentation at AIIMS	Delhi	220/33 kV	S/s			100
31	ICT augmentation at Gopal Pur	Delhi	220/66 kV	S/s			60
32	ICT augmentation at Narela	Delhi	220/66 kV	S/s			60
33	ICT augmentation at Shalimarbagh	Delhi	220/66 kV	S/s			60
34	ICT augmentation at Okhla	Delhi	220/66 kV	S/s			60
35	ICT augmentation at Mehrauli	Delhi	220/66 kV	S/s			60
36	ICT augmentation at Parkstreet	Delhi	220/66 kV	S/s			120
37	ICT augmentation at Rohini-I	Delhi	220/66 kV	S/s			120
38	ICT augmentation at Wazirabad	Delhi	220/66 kV	S/s			60
(B)	**Transmission Lines**						
1	LILO of Bawana- Maharanibagh 400 kV D/c line at Gopalpur	Delhi	400 kV	Line	2xD/c	14	
2	LILO of Bawana -Maharanibagh 400 kV D/c line at Tikri Khurd	Delhi	400 kV	Line	2xD/c	1	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
3	Lodhi Road -Park street-Electric Lane-Lodhi Road 220 kV S/c line	Delhi	220 kV	Line	S/c	18	
4	LILO of Electric Lane -Park Street 220 kV S/c line at Dev Nagar	Delhi	220 kV	Line	D/c	10	
5	Kashmirigate – Timarpur 220 kV D/c line (underground cable)	Delhi	220 kV	Line	D/c	10	
6	Dwarka - PPK-II 220 kV D/c line (underground cable)	Delhi	220 kV	Line	D/c	11	
7	Tughlakabad - Masjid Moth 220 kV D/c line (underground cable)	Delhi	220 kV	Line	D/c	14	
8	Tuglakabad - R.K Puram 220 kV D/c line (underground cable)	Delhi	220 kV	Line	D/c	27	
9	IP Rajghat extension -New RPH 220 kV D/c line	Delhi	220 kV	Line	D/c	2.6	
10	Kashmiri Gate- new Rajghat 220 kV 2xD/c line	Delhi	220 kV	Line	2xD/c	16	
11	LILO of both circuits of Bamnauli-DIAL 220 kV D/c line at Bharthal	Delhi	220 kV	Line	2xD/c	0.8	
12	Dev Nagar - Subzi Mandi 220 kV D/c line (underground cable)	Delhi	220 kV	Line	D/c	10	
13	Ridge Valley- Naraina 220 kV D/c line (underground cable)	Delhi	220 kV	Line	D/c	9	
14	LILO of both circuits AIIMS - R.K. Puram 220 kV D/c line (underground cable) at Sarojini Nagar	Delhi	220 kV	Line	2xD/c	6	
15	Tikri Kalan - Mangol Puri 220 kV D/c line (underground cable)	Delhi	220 kV	Line	D/c	26	
16	LILO of both circuits of Peera Garhi -Wazir Pur 220 kV D/c line (underground cable) at Mangol Puri	Delhi	220 kV	Line	2xD/c	6	
17	Budella -Punjabi Bagh (Vishal) 220 kV D/c line (underground cable)	Delhi	220 kV	Line	D/c	20	
18	Punjabi Bagh (Vishal)- Dev Nagar 220 kV D/c line (underground cable)	Delhi	220 kV	Line	D/c	20	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
19	LILO of one circuit of Maharanibagh-Masjid Moth 220 kV D/c line (underground cable) at Nehru Place	Delhi	220 kV	Line	D/c	4	
20	Seelam Pur/Rathi Mill/Dwarka Puri - Geeta Colony 220 kV D/c line (underground cable)	Delhi	220 kV	Line	D/c	6	
21	Harsh Vihar - Dilshad Garden 220 kV D/c line (underground cable)	Delhi	220 kV	Line	D/c	11	
22	Dilshad Garden - Seelam Pur/Rathi Mill/Dwarka Puri 220 kV D/c line (underground cable)	Delhi	220 kV	Line	D/c	11	
23	LILO of both circuits of Mandola -Gopal Pur 220 kV D/c line at Nathu Pura	Delhi	220 kV	Line	2xD/c	8	
24	LILO of both circuits of Tuglakhabad –Mehrauli 220 kV D/c line at Maidan Garhi	Delhi	220 kV	Line	2xD/c	12	
25	HTLS conductoring (with polymer insulator) on the old portion of the Bamnauli-Mundaka-Bawana 220 kV D/c line	Delhi	220 kV	Line	D/c	50	
26	HTLS conductoring of Sabji Mandi-Gopal Pur 220 kV D/c line	Delhi	220 kV	Line	D/c	14.6	
27	HTLS conductoring of Narela-Mandola 220 kV D/c line	Delhi	220 kV	Line	D/c	41.2	
28	HTLS conductoring of Bawana-DSIIDC Bawana 220 kV D/c line	Delhi	220 kV	Line	D/c	11.2	
29	HTLS conductoring of IP-Patparganj 220 kV D/c line	Delhi	220 kV	Line	D/c	7.9	
30	HTLS conductoring of Geeta Colony-Patparganj 220 kV D/c line	Delhi	220 kV	Line	D/c	8.8	
	Haryana						
(A)	**New sub-stations / ICT augmentation**						
1	ICT augmentation at Kaboolpur	Haryana	400/220 kV	S/s			315
(B)	**Transmission Lines**						

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
1	LILO of Kabulpur - Rohtak 220 kV S/c line at Nonand	Haryana	220 kV	Line	D/c	2	
2	LILO of Kabulpur – Sampla 220 kV S/c line at Nonand	Haryana	220 kV	Line	D/c	16	
3	Farukh Nagar - M/S METL 220 kV D/c line	Haryana	220 kV	Line	D/c	29.78	
4	LILO of both circuits of Badshahpur-Panchgaon (PGCIL) 220 kV D/c line (Now Sohna Road - Panchgaon 220 kV D/c Line) at Gurgaon Sector-75 A	Haryana	220 kV	Line	2xD/c	16.16	
5	LILO of both the circuits of Narwana-Mund 220 kV D/c line at Jind PGCIL	Haryana	220 kV	Line	2xD/c	176	
6	Bhadana - M/S METL 220 kV D/c line	Haryana	220 kV	Line	D/c	43.1	
7	LILO of both the circuits of Fatehabad –Chormar 220 kV D/c line at Hukmawali.	Haryana	220 kV	Line	2xD/c	84	
8	Bhiwani (765 kV PGCIL) - Isharwal 220 kV D/c line	Haryana	220 kV	Line	D/c	130	
9	Bhiwani (765 kV PGCIL) - Bhiwani (220 kV HVPNL) 220 kV D/c line	Haryana	220 kV	Line	D/c	30	
10	Dhanonda -Deroli Ahir 220 kV D/c line	Haryana	220 kV	Line	D/c	50	
11	Deroli Ahir-Narnaul 220 kV D/c line	Haryana	220 kV	Line	D/c	28	
12	Panchgaon (400 kV PGCIL) - Panchgaon (220 kV HVPNL) 220 kV D/c line	Haryana	220 kV	Line	D/c	0.2	
13	LILO of 220 kV Madanpur-Kunihar D/c line at Sector-32 and Naggal (400 kV PGCIL).	Haryana	220 kV	Line	D/c	39.25	
14	LILO of both circuits of DCRTPP – Salempur 220 kV D/c line at Bakana	Haryana	220 kV	Line	2xD/c	60	
15	Replacement of existing conductor of Khanpur (PGCIL) - Kaithal 220 kV D/c line with HTLS conductor	Haryana	220 kV	Line	D/c	32	
16	Khatkar-Mund 220 kV D/c line	Haryana	220 kV	Line	D/c	70	
17	Mund-IOCL 220 kV D/c line.	Haryana	220 kV	Line	D/c	84	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
18	LILO of both circuits of Mohana – Samalkha 220 kV D/c Line at Jajji (PGCIL) substation	Haryana	220 kV	Line	2xD/c	12	
19	LILO of one circuit of Nuna Majra -Daultabad 220 kV D/c line at Bahadurgarh (PGCIL)	Haryana	220 kV	Line	D/c	4	
20	LILO of one circuit of Hukmawali-Chormar 220 kV D/c line at Sirsa	Haryana	220 kV	Line	D/c	26	
21	LILO of both circuit of Daultabad-Mau 220 kV D/c line at Transport Hub Gurgaon.	Haryana	220 kV	Line	2xD/c	20	
22	Augmentation of existing 3 Nos 220 kV S/c link between 400 kV Sector-72 Gurgaon (PGCIL) & 220 kV Sector-72 Gurgaon (HVPNL) from single moose ACSR to single HTLS conductor.(0.25 km)	Haryana	220 kV	Line	S/c	0.75	
23	LILO of both circuits of Pali-Sector-56 220 kV D/c line at Kadarpur	Haryana	220 kV	Line	2xD/c	74	
24	LILO of both circuits of Sector-65-Pali D/c line at Kadarpur	Haryana	220 kV	Line	2xD/c	58	
25	Augmentation of 220 kV Kadarpur-Sector 65 D/c line with AL-59 conductor	Haryana	220 kV	Line	D/c	17	
26	LILO of both circuit of Sector-72 - Rangla Rajpur 220 kV D/c line at Roj-ka-Meo	Haryana	220 kV	Line	2xD/c	6.9	
27	Transport Hub IMT manesar - MSIL S/s 220 kV D/c line.	Haryana	220 kV	Line	D/c	9	
28	Prithla - sector-78 Faridabad 220 kV D/c line	Haryana	220 kV	Line	D/c	44	
29	Augmentation of conductor of existing Palli – Badshapur 220 kV D/c line from ACSR to conductor with capacity equivalent to twin moose.	Haryana	220 kV	Line	D/c	46	
30	LILO of one circuit of A-4 to A-5 220 kV D/c line at NTPC Faridabad	Haryana	220 kV	Line	D/c	7.4	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
31	Augmentation of Badshapur- Sohna Road 220 kV D/c line (created after LILO of both ckt. of Badshahpur-Sector-77 220 kV D/c line at Sohna Road) from ACSR conductor to AL-59 conductor.	Haryana	220 kV	Line	D/c	10	
32	Prithla -Harfali 220 kV D/c line	Haryana	220 kV	Line	D/c	80	
33	LILO of one circuit Prithla -Harfali 220 kV D/c line at Meerpur Kurali	Haryana	220 kV	Line	D/c	30	
34	LILO of one Circuit of Samaypur-Palwal 220 kV D/c line at Harfali	Haryana	220 kV	Line	D/c	2	
	Himachal Pradesh						
(A)	**New sub-stations / ICT augmentation**						
1	Sunda 220 kV S/s	Himachal Pradesh	220/132 kV	S/s			200
2	Sunda 220 kV S/s	Himachal Pradesh	220/66 kV	S/s			100
3	Charor 220 kV S/s	Himachal Pradesh	220/132 kV	S/s			100
4	Charor 220 kV S/s	Himachal Pradesh	220/33 kV	S/s			100
5	Mazra 220 kV S/s	Himachal Pradesh	220/132 kV	S/s			200
6	Dehan 220 kV S/s	Himachal Pradesh	220/132 kV	S/s			200
7	220/33 kV Transformer in the yard of AD Hydro at Prini.	Himachal Pradesh	220/33 kV	S/s			31.5
8	Heiling 220 kV S/s Substation	Himachal Pradesh	220/66 kV	S/s			100
9	Kala Amb 220 kV S/s Substation	Himachal Pradesh	220/132/33 kV	S/s			200

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
10	Paonta Sahib 220 kV S/s S/Stn	Himachal Pradesh	220/132 kV	S/s			200
11	Kangoo 220 kV S/s	Himachal Pradesh	220/132/33 kV	S/s			200
12	Girinagar 220 kV S/s	Himachal Pradesh	220/132/33 kV	S/s			100
13	Tahliwala 220 kV S/s	Himachal Pradesh	220/132 kV	S/s			200
(B)	**Transmission Lines**						
1	Lahal - Chamera Pooling 400 kV D/c line	Himachal Pradesh	400 kV	Line	D/c	70	
2	Bajoli Holi HEP - Lahal 220 kV D/c line	Himachal Pradesh	220 kV	Line	D/c	37	
3	Mazra - Karian 220 kV D/c line	Himachal Pradesh	220 kV	Line	D/c	36	
4	Dehan - Hamirpur (PG) 220 kV D/c line	Himachal Pradesh	220 kV	Line	D/c	115	
5	Kala Amb (PG) - Kala Amb (HP) 220 kV D/c line	Himachal Pradesh	220 kV	Line	D/c	5.6	
6	LILO of one circuit of Baspa - Karcham Wangtoo 400 kV D/c line at Shongtong HEP	Himachal Pradesh	400 kV	Line	D/c	12	
7	LILO of Khodri - Mazri 220 kV S/c line at Paonta Sahib	Himachal Pradesh	220 kV	Line	D/c	4	
8	Kunihar - Uperla Nangal 220 kV S/c line	Himachal Pradesh	220 kV	Line	S/c	35	
	Jammu & Kashmir						
(A)	**New sub-stations / ICT augmentation**						
1	Rajouri-II 220 kV S/s	Jammu	220/132 kV	S/s			320
2	Katra-II 220 kV S/s	Jammu	220/132 kV	S/s			320
3	Akhnoor-II (Domana) 220 kV S/s	Jammu	220/132 kV	S/s			320

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
4	Gurah Karyal 220 kV S/s	Jammu	220/33 kV	S/s			100
5	Ramgarh 220 kV S/s	Jammu	220/33 kV	S/s			100
6	Ramnagar 220 kV S/s	Jammu	220/33 kV	S/s			50
7	Kathua-II/Ghatti 220 kV S/s	Jammu	220/66 kV	S/s			160
8	Samba-II 220 kV S/s	Jammu	220/66 kV	S/s			160
9	Chowadi 220 kV S/s	Jammu	220/33 kV	S/s			160
10	Hiranagar 220 kV S/s	Jammu	220/132 kV	S/s			80
11	Barn 220 kV S/s	Jammu	220/132 kV	S/s			160
12	ICT augmentation at Udhampur	Jammu	220/132 kV	S/s			160
13	Wahipora 220 kV S/s	Kashmir	220/132 kV	S/s			160
14	Badampora 220 kV GIS S/s	Kashmir	220/132 kV	S/s			160
15	Mattan 220 kV S/s	Kashmir	220/33 kV	S/s			160
16	Nillow (Kapren) Kulgam 220 kV S/s	Kashmir	220/33 kV	S/s			160
17	ICT augmentation at Budgam	Kashmir	220/132 kV	S/s			150
18	ICT augmentation at Mirbazar	Kashmir	220/132 kV	S/s			155
19	ICT augmentation at Zainkote	Kashmir	220/132 kV	S/s			165
20	Sheeri 220 kV GIS S/s	Kashmir	220/33 kV	S/s			160
21	Batkote (Pahalgam) 220 kV S/s	Kashmir	220/33 kV	S/s			50
22	Gulmarg 220 kV S/s	Kashmir	220/33 kV	S/s			50
23	Tral 220 kV S/s	Kashmir	220/33 kV	S/s			100
24	Piglena (Pulwama) 220 kV S/s	Kashmir	220/33 kV	S/s			160
25	Bijbehara 220 kV S/s	Kashmir	220/33 kV	S/s			100
26	Qazigund 220 kV S/s	Kashmir	220/33 kV	S/s			50
27	Gagangeer (Nilgrar) 220 kV S/s	Kashmir	220/33 kV	S/s			50
28	Khan Sahib (Beerwah) 220 kV S/s	Kashmir	220/33 kV	S/s			50
29	Lollipora (Budgam) 220 kV S/s	Kashmir	220/33 kV	S/s			100
(B)	**Transmission Lines**						
1	Siot - Rajouri-II 220 kV D/c line	Jammu	220 kV	Line	D/c	110	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
2	Siot - Katra-II 220 kV D/c line	Jammu	220 kV	Line	D/c	110	
3	Siot - Akhnoor-II 220 kV D/c line	Jammu	220 kV	Line	D/c	120	
4	Akhnoor-II - Barn 220 kV D/c line	Jammu	220 kV	Line	D/c	30	
5	Samba-II - Chowadi 220 kV D/c line along with S/c LILO of above line at Ramgarh S/s	Jammu	220 kV	Line	D/c	40	
6	Chowadi - Nagrota - Katra-II 220 kV D/c line	Jammu	220 kV	Line	D/c	110	
7	LILO of Gladni - Udhampur 220 kV S/c line at Nagrota	Jammu	220 kV	Line	D/c	10	
8	LILO of Sarna - Udampur 220 kV S/c line at Gurah Karyal	Jammu	220 kV	Line	D/c	4	
9	LILO of Sarna - Udampur 220 kV S/c line at Ramnagar	Jammu	220 kV	Line	D/c	48	
10	Reconductoring of Barn - Kishenpur 220 kV D/c line with HTLS conductor	Jammu	220 kV	Line	D/c	80	
11	LILO of both ckts of Delina - Kishanganga 220 kV D/c line (PGCIL) at Wahipora	Kashmir	220 kV	Line	2xD/c	140	
12	Kunzar- Sheeri 220 kV D/c line	Kashmir	220 kV	Line	D/c	80	
13	LILO of one circuit of Mirbazar - Wagoora 220 kV D/c line at (Pinglena) Pulwama	Kashmir	220 kV	Line	D/c	24	
14	New Wanpoh - Mattan 220 kV D/c line (15km)	Kashmir	220 kV	Line	D/c	30	
15	LILO of one circuit of New Wanpoh - Alusteng 220 kV D/c line at Tral	Kashmir	220 kV	Line	D/c	40	
16	LILO of Alusteng - Leh 220 kV S/c line at Gangangeer(Sonamarg)(Nilgrar)	Kashmir	220 kV	Line	S/c	5	
17	LILO of both ckts of 220 kV Wagoora -Kishenganga 220 kV D/c line at Khansahib (Beerwah)	Kashmir	220 kV	Line	2xD/c	48	
18	LILO of 1st ckt. of Kishenpur - Pampore 220 kV D/c line at Nillow (New Kulgam)	Kashmir	220 kV	Line	D/c	30	
19	LILO of 2nd ckt. of Kishenpur - Pampore 220 kV D/c line at Qazigund	Kashmir	220 kV	Line	D/c	6	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
20	LILO of 1st ckt. of proposed Kunzer - Sheeri 220 kV D/c line at Gulmarg	Kashmir	220 kV	Line	D/c	16	
21	LILO of 2nd ckt. of proposed Kunzer - Sheeri 220 kV D/c line at Loolipora	Kashmir	220 kV	Line	D/c	8	
22	Mattan - Bijbehara (Sallar) 220 kV D/c line	Kashmir	220 kV	Line	D/c	30	
23	Sallar (Bijbehara) - Pahalgam (Batkote) 220 kV D/c line	Kashmir	220 kV	Line	D/c	10	
24	LILO of one ckt. of Zainkote – Alusteng 220 kV line at Badampora GIS	Kashmir	220 kV	Line	D/c	4.8	
	Ladakh						
(A)	**New sub-stations / ICT augmentation**						
1	Padum 220 kV S/s	Ladakh	220/33 kV	S/s			50
2	Diskit 220 kV S/s	Ladakh	220/33 kV	S/s			50
(B)	**Transmission Lines**						
1	Phyang - Diskit (Nubra) 220 kV S/c line on D/c Towers	Ladakh	220 kV	Line	S/c	78	
2	Drass - Padum (Zanaskar) 220 kV S/c line on D/c Towers	Ladakh	220 kV	Line	S/c	189	
	Punjab						
(A)	**New sub-stations / ICT augmentation**						
1	Doraha (Dhanansu) 400 kV S/s	Punjab	400/220 kV	S/s			815
2	Nakodar 400 kV S/s	Punjab	400/220 kV	S/s			1000
3	Rajpura 400 kV S/s	Punjab	400/220 kV	S/s			500
4	Behman Jassa Singh 400 kV S/s	Punjab	400/220 kV	S/s			1000
5	Ropar (New) 400 kV S/s	Punjab	400/220 kV	S/s			1000
(B)	**Transmission Lines**						
1	LILO of both ckts of Jamalpur - Dhandari Kalan-I 220 kV D/c line at Sherpur	Punjab	220 kV	Line	2xD/c	52	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
2	Mansa - Budhlada 220 kV D/c Line	Punjab	220 kV	Line	D/c	80	
3	LILO of one ckt. of Jalandhar-Kurukshetra 400 kV D/c line at Dhanansu	Punjab	400 kV	Line	D/c	10	
4	Banur-Mohali (GMADA) 220 kV D/c line	Punjab	220 kV	Line	D/c	8	
5	LILO of Kohara – Sahnewal 220 kV S/c line at Dhanansu.	Punjab	220 kV	Line	D/c	24	
6	Doraha (400 kV) – Doraha (220 kV) 220 kV D/c line	Punjab	220 kV	Line	D/c	20	
7	LILO of one ckt of Jamalpur (BBMB)- Ganguwal 220 kV D/c line at Dhanansu	Punjab	220 kV	Line	D/c	16	
8	LILO of Mansa - Sunam 220 kV S/c line at Patran	Punjab	220 kV	Line	D/c	80	
9	Gaunsgarh – Ladhowal 220 kV D/c line	Punjab	220 kV	Line	D/c	36	
10	Replacement of existing conductor of Mohali-I - Mohali-II 220 kV S/c line	Punjab	220 kV	Line	S/c	13	
11	Mukatsar -Fazilka 220 kV D/c line	Punjab	220 kV	Line	D/c	50	
12	Jalandhar (PGCIL) –Kartarpur 220 kV D/c line	Punjab	220 kV	Line	D/c	30	
13	Rajpura to Bassi–Pathana 220 kV D/c line	Punjab	220 kV	Line	D/c	40	
14	LILO of both ckt of Ludhina PGCIL–Koldam 400 kV D/c line at Ropar	Punjab	220 kV	Line	2xD/c	60	
15	LILO of 2nd ckt of Jallandhar–Kurukshetra 400 kV D/c line at Dhanansu	Punjab	220 kV	Line	D/c	10	
16	LILO of Gobindgarh-I - Bassi Pathana 220 kV S/c line at Gobindgarh	Punjab	220 kV	Line	D/c	14	
17	LILO of GS/sTP - Gobindgarh-I 220 kV S/c line at Gobindgarh (new)	Punjab	220 kV	Line	D/c	14	
18	LILO of Verpal – Wadala Granthian & Verpal-Udhoke 220 kV S/c lines at Nawanpind	Punjab	220 kV	Line	2xD/c	4	
19	Stringing of IInd ckt. of 220 kV Mukatsar-Ghubaya 220 kV line	Punjab	220 kV	Line	S/c	40.3	
20	Replacement of existing conductor of Gobindgarh - Rajpura 220 kV D/c line	Punjab	220 kV	Line	D/c	66	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
	Uttar Pradesh						
(A)	**New sub-stations / ICT augmentation**						
1	Dataganj 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
2	Sangipur (Pratapgarh) 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
3	Nirpura(Hybrid)/Chhaprauli 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
4	Khatauli 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
5	Vasundhara GIS 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
6	Anandnagar (Gorakhpur) 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
7	Maharajganj 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
8	Faridpur(bareilly) 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			200
9	Tundla 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
10	Satrikh Road(Juggaur), Lucknow (Hybrid) 220 kV S/s	Uttar Pradesh	220/33 kV	S/s			120
11	Modipuram-II 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
12	Balrampur 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
13	Azizpur (Shahjahanpur) 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
14	Ayodhya GIS 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
15	Babina(jhansi) 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
16	Gola 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
17	Mallawan (Hardoi) 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
18	Vrindavan, Mathura 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
19	Badaikala (Muzaffarnagar) 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
20	Deoband 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
21	Jewar (Hybrid) 220 kV S/s	Uttar Pradesh	220/33 kV	S/s			120
22	Amariya (Pilibhit) 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			200
23	Farukkhabad (Bhojpur) 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
24	Dulhipar 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
25	IITGNL 220 kV S/s	Uttar Pradesh	220/33 kV	S/s			240
26	Bhadohi (GIS) 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			400
27	Morta, Gaziabad 220 kV S/s	Uttar Pradesh	220/33 kV	S/s			180
28	Khaga 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
29	G.Noida-II 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
30	Kidwainagar GIS 220 kV S/s	Uttar Pradesh	220/33 kV	S/s			180
31	Chandpur (bijnor) 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
32	Kirawali (Agra) 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			200
33	Bijnore (Lucknow) 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
34	Myorpur 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
35	Noida Sec-123 400 kV S/s	Uttar Pradesh	400/132 kV	S/s			800
36	Jehta (Hardoi Road) 400 kV S/s	Uttar Pradesh	400/220/132 kV	S/s			1320
37	Sahupuri(Chandauli) 400 kV GIS S/s	Uttar Pradesh	400/220 kV	S/s			1000
38	Bhaukhari (Basti) 400 kV GIS S/s	Uttar Pradesh	400/220/132 kV	S/s			1400
39	Machlishear (Jaunpur) 400 kV S/s	Uttar Pradesh	400/220/132 kV	S/s			1345
40	Shamli 400 kV S/s	Uttar Pradesh	400/220/132 kV	S/s			1400
41	Raebareli 400 kV GIS S/s	Uttar Pradesh	400/220/132 kV	S/s			1320
42	Rasra GIS 400 kV GIS S/s	Uttar Pradesh	400/220/132 kV	S/s			1320
43	Firozabad 400 kV S/s	Uttar Pradesh	400/220/132 kV	S/s			1320
44	Badaun 400 kV S/s	Uttar Pradesh	400/220/132 kV	S/s			950
45	Khorabar-Gorakhpur 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
46	Noida (Gr. Noida) 400 kV S/s	Uttar Pradesh	400/220/132 kV	S/s			950
47	Dibiyapur (Auraiya) 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
48	Varanasi Cantt. 220 kV S/s	Uttar Pradesh	220/33 kV	S/s			180
49	Mathura (II) 400 kV S/s	Uttar Pradesh	400/220/132 kV	S/s			950
50	Gharbara(Gautam Budh Nagar) 220 kV S/s	Uttar Pradesh	220/33 kV	S/s			120
51	YEIDA Sec.-18 (Gautam Budh Nagar) 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			120

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
52	YEIDA Sec.-24 (Gautam Budh Nagar) 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			160
53	Noida Sec.-45 (Gautam Budh Nagar) 220 kV GIS S/s	Uttar Pradesh	220/132 kV	S/s			160
54	Mohan Road Lucknow 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
55	Kunduni (Sitapur) 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
56	Mohanlalganj (Lucknow) 400 kV GIS S/s	Uttar Pradesh	400/220/132 kV	S/s			1400
57	Rampur (Moradabad) 765 kV S/s	Uttar Pradesh	765/400/220 kV	S/s			4000
58	Modipuram (Meerut) 765 kV GIS S/s	Uttar Pradesh	765/400/220 kV	S/s			4000
59	Simbholi 400 kV GIS S/s	Uttar Pradesh	400/220/132 kV	S/s			1400
60	Sambhal 400 kV GIS S/s	Uttar Pradesh	400/220/132 kV	S/s			1320
61	Lucknow Awas Vikas Sultanpur Road 220 kV S/s	Uttar Pradesh	220/33 kV	S/s			300
62	Moradabad II 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
63	Loni II 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
64	Mawana 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
65	Nehtaur New 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
66	Saharanpur New 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
67	Naini UPSIDC 220 kV S/s	Uttar Pradesh	220/33 kV	S/s			180
68	Lucknow, Hardoi Road 220 kV S/s	Uttar Pradesh	220/33 kV	S/s			180

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
69	Meerut By Pass 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
70	Sardhana 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
71	Kannauj 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
72	Fatehpur New 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
73	Lalu kheri 400 kV S/s	Uttar Pradesh	400/220/132 kV	S/s			950
74	Bhopa Road 400 kV S/s	Uttar Pradesh	400/220/132 kV	S/s			950
75	Badaun Road 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
76	Mau 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
77	Deoria New 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
78	Kasganj 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
79	Malwan (Fatehpur) 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
80	Anoopsahar 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
81	Jaunpur - II 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
82	Chunar/ Pahari 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
83	Moth 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			160
84	Garautha 400/220 kV S/s	Uttar Pradesh	400/220 kV	S/s			1500
85	Talbehat 765/400/220 kV S/s	Uttar Pradesh	765/400/220 kV	S/s			2500
86	Maheba 400/220/132 kV S/s	Uttar Pradesh	400/220/132 kV	S/s			1320

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
87	Farrukhabad 400/220/132 kV S/s	Uttar Pradesh	400/220/132 kV	S/s			1320
88	Banda 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
89	Hamirpur 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
90	Charkhari 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			160
91	Jaitpur 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
92	Birdha 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
93	Mandwara 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
94	Dakaur 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			160
95	Bamaur 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
96	Bangra 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			320
97	Kabrai 220 kV S/s	Uttar Pradesh	220/132 kV	S/s			160
(B)	**Transmission Lines**						
1	Badaun -Dataganj 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	56	
2	LILO one circuit of Roja-(TPS) – Badaun 220 kv D/c line at Dataganj	Uttar Pradesh	220 kV	Line	D/c	24	
3	Noida-148 - Noida -38 (A) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	47	
4	LILO of Sarnath -Sahupuri 220 kV D/c line at Bhadaura	Uttar Pradesh	220 kV	Line	D/c	170	
5	LILO of one circuit of Jamania-Gazipur 220 kV D/c line at Bhadaura	Uttar Pradesh	220 kV	Line	D/c	50	
6	Kashimabad (Gazipur) -Kundeshar (Gazipur) 220 kV S/c line	Uttar Pradesh	220 kV	Line	S/c	30	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
7	Sultanpur -Sangipur 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	80	
8	Raibarielly PGCIL -Sangipur 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	120	
9	LILO of one circuit of Baraut (Baghpat) - Shamli 220 kV D/c line at Nirpura	Uttar Pradesh	220 kV	Line	D/c	30	
10	LILO of one circuit of Muzaffarnagar – Shamli 220 kV D/c line at Khatauli	Uttar Pradesh	220 kV	Line	D/c	24	
11	LILO of one circuit of Muzaffarnagar - Modipuram 220 kV D/c line at Khatauli	Uttar Pradesh	220 kV	Line	D/c	2	
12	Vasundhara –Indirapuram 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	10	
13	LILO of one circuit of Muradnagar(400) - Sahibabad 220 kV D/c line at Vasundhara	Uttar Pradesh	220 kV	Line	D/c	4	
14	Anandnagar –Sahjanwa PG 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	130	
15	Anandnagar -Dulhipar 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	116	
16	Anandnagar -Maharajganj 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	60	
17	LILO of one circuit of Shahjahanpur- Bareily 220 kV D/c line Faridpur	Uttar Pradesh	220 kV	Line	D/c	40	
18	LILO of one ciruit of Agra (765 kV) (PG) – Firozabad 220 kV D/c line at Tundla	Uttar Pradesh	220 kV	Line	D/c	2	
19	Satrikh Road -Barabanki 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	50	
20	LILO of one circuit of Chinhat - C.G. City 220 kV D/c line at Satrikh Road	Uttar Pradesh	220 kV	Line	D/c	0.6	
21	Modipuram-II -Shamli 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	128	
22	Modipuram-II -Baghpat 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	70	
23	LILO of one circuit of Modipuram - Faridnagar 220 kV D/c line at Modipuram-II	Uttar Pradesh	220 kV	Line	D/c	10	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
24	LILO of one circuit of Gonda - Behraich 220 kV D/c line at Balrampur	Uttar Pradesh	220 kV	Line	D/c	92	
25	Azizpur -Shahjahanpur PG 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	40	
26	Azizpur -Shahjahanpur 220 kV S/c line	Uttar Pradesh	220 kV	Line	S/c	20	
27	LILO of Sohawal (PG)- New Tanda 220 kV D/c line at Ayodhya GIS	Uttar Pradesh	220 kV	Line	D/c	40	
28	Tanda (NTPC)-New Tanda 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	50	
29	LILO of Lalitpur TPS -Dunara 220 kV D/c line at Babina	Uttar Pradesh	220 kV	Line	D/c	20	
30	Gola -Shahjahanpur (PG) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	130	
31	LILO of Shahjahanpur - Nighasan 220 kV D/c line at Gola	Uttar Pradesh	220 kV	Line	D/c	20	
32	Mallawan -Hardoi 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	112	
33	Mallawan -Jehta (400 kV) 220 kV S/c line	Uttar Pradesh	220 kV	Line	S/c	90	
34	LILO of Chatta (Mathura) - Math (400 kV) 220 kV D/c line at Vrindawan	Uttar Pradesh	220 kV	Line	D/c	54	
35	Badaikala (220)-Shamli (400 kV) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	80	
36	LILO of Muzaffarnagar (400 kV) - Nanauta 220 kV D/c line at Badaikala	Uttar Pradesh	220 kV	Line	D/c	20	
37	Deoband -Saharanpur (400 kV) PG 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	60	
38	Deoband -Shamli (400 kV) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	110	
39	LILO of Jahangirpur (765 kV G.Noida) - IITGNL 220 kV D/c line at Jewar	Uttar Pradesh	220 kV	Line	D/c	16	
40	Amriya -Bareilly (400 kV) - Amriya (Pilibhit) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	80	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
41	LILO of Nib Karori-Manpuri (PG) 220 kV D/c line at Farukkhabad	Uttar Pradesh	220 kV	Line	D/c	40	
42	Farukkhabad -Chibra Mau (kanauj) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	60	
43	LILO of Fatehgarh-kainjanj 220 kV D/c line at Farukkhabad	Uttar Pradesh	220 kV	Line	D/c	30	
44	LILO of Gorakhpur (PG) - Bansi (Siddharthnagar 220 kV D/c line at Dulhipar	Uttar Pradesh	220 kV	Line	D/c	30	
45	Dulhipar -Bhaukhari(Basti) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	120	
46	IITGNL -G.Noida (765 kV) WUPPTC 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	90	
47	IITGNL-Sikandrabad (400 kV) WUPPTCL 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	84	
48	Stringing of II ckt of Azamgarh-II - Aurai (400 kV) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	156	
49	Jaunpur(400 kV) -Azamgarh II -Aurai (400 kV) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	100	
50	Bhadohi -Aurai (400 kV) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	10	
51	Extension of U/c Mirzapur - Aurai (400 kV) 220 kV S/c line upto - Bhadohi	Uttar Pradesh	220 kV	Line	S/c	6	
52	Extension of U/c Phoolpur - Aurai (400) 220 kV S/c line upto Bhadohi	Uttar Pradesh	220 kV	Line	S/c	16	
53	Stringing of II ckt of Sahupuri - Raja ka Talab - Chandauli (400 kV) 220 kV S/c line	Uttar Pradesh	220 kV	Line	S/c	63	
54	Stringing of II ckt of U/c Raja ka Talab -Aurai (400 kV) 220 kV S/c line	Uttar Pradesh	220 kV	Line	S/c	17	
55	Bhadohi -Extension of Raja ka Talab -Aurai (400 kV) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	10	
56	Chhaprauli -Sighauli 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	60	
57	LILO of one circuit of Muradnagar II (400 kV) - Madhuban Bapudham 220 kV D/c line at Morta	Uttar Pradesh	220 kV	Line	D/c	1.6	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
58	Fatehpur PG-Khaga 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	100	
59	LILO of Panki - Bhaunti, Kanpur (PG) 220 kV D/c line at Kidwai Nagar GIS	Uttar Pradesh	220 kV	Line	D/c	12	
60	LILO of Meerut- Amroha 220 kV D/c line at Chandpur	Uttar Pradesh	220 kV	Line	D/c	54	
61	Kirawali -Agra(765 kV) PGCIL- Sikandra 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	26	
62	LILO of Sarojninagar –Bachrawan 220 kV D/c line at Bijnore, Lucknow	Uttar Pradesh	220 kV	Line	D/c	2	
63	Obra TPS -Myorpur 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	150	
64	LILO of Ataur - Indirapuram 400 kV D/c line at Noida Sec-123	Uttar Pradesh	400 kV	Line	D/c	40	
65	Noida Sec. 148-Noida Sec. 123 400 kV D/c line	Uttar Pradesh	400 kV	Line	D/c	40	
66	LILO of I ckt of PGCIL Kursi Road Lucknow - Unnao 400 kV D/c line at Jehta	Uttar Pradesh	400 kV	Line	D/c	30	
67	Jehta -Hardoi Road 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	20	
68	Jehta -Mehtabbagh Negupark 400 kV D/c line	Uttar Pradesh	400 kV	Line	D/c	30	
69	LILO of Thathra,Varanasi PG (765 kV)- Bihar Shariff (Bihar) (400 kV) 220 kV S/c line at Sahupuri	Uttar Pradesh	220 kV	Line	D/c	60	
70	Bhaukhari Basti-Tanda(NTPC) Extn. 400 kV D/c line	Uttar Pradesh	400 kV	Line	D/c	96	
71	LILO of 3rd & 4th ckt of Gorakhpur(PG)-Lucknow(PG) 400 kV D/c line at Bhaukhari	Uttar Pradesh	400 kV	Line	D/c	116	
72	LILO of Gonda(220)-Basti(220) 220 kV D/c line at Bhaukhari(400 kV)	Uttar Pradesh	220 kV	Line	D/c	30	
73	Machlishear, Jaunpur -Varanasi (765 kV) PG 400 kV D/c line	Uttar Pradesh	400 kV	Line	D/c	150	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
74	LILO of Obra C - Obra B 400 kV D/c line at Machlishear, Jaunpur	Uttar Pradesh	400 kV	Line	D/c	380	
75	Obra "B" -Obra "C" 400 kV D/c line	Uttar Pradesh	400 kV	Line	D/c	3	
76	LILO of Jaunpur -Gajokhar 220 kV D/c line at Machlishear, Jaunpur (400 kV)	Uttar Pradesh	220 kV	Line	D/c	90	
77	LILO of Azamgarh II - Bhadohi 220 kV D/c line at Machlishear, Jaunpur(400 kV)	Uttar Pradesh	220 kV	Line	D/c	100	
78	Shamli -Aligarh 400 kV D/c line	Uttar Pradesh	400 kV	Line	D/c	470	
79	LILO of Shamli -Nanauta 220 kV D/c line at Shamli(400 kV)	Uttar Pradesh	220 kV	Line	D/c	16	
80	LILO of Moradnagar- Shamli 220 kV D/c line at Shamli(400 kV)	Uttar Pradesh	220 kV	Line	D/c	4	
81	Shamli- Meerut (765 kV) 400 kV D/c line	Uttar Pradesh	400 kV	Line	D/c	150	
82	LILO of Unchahaar (NTPC) -Fatehpur 400 kV D/c line at Raebareli	Uttar Pradesh	400 kV	Line	D/c	76	
83	Raebareli(400 kV) GIS-Amethi (220 kV) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	80	
84	Raebareli(400 kV) GIS-Bachrawn (220) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	70	
85	LILO of Ebrahim Patti, PGCIL(765 kV) - Kasara Mau 400 kV D/c line at Rasra	Uttar Pradesh	400 kV	Line	D/c	76	
86	LILO of Rasra -Gazipur 220 kV D/c line at Rasra (400 kV)	Uttar Pradesh	220 kV	Line	D/c	20	
87	Rasra (400 kV)-Bhadaura (Gazipur) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	94	
88	LILO of one ckt of Fatehabad Agra (765 kV) - Agra South 400 kV D/c line at Firozabad	Uttar Pradesh	400 kV	Line	D/c	40	
89	Firozabad -Jawaharpur (TPS) 400 kV D/c line	Uttar Pradesh	400 kV	Line	D/c	160	
90	LILO of Firozabad - Agra (765 kV) (PG) 220 kV S/c line at Firozabad (400 kV)	Uttar Pradesh	220 kV	Line	S/c	20	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
91	Badaun -Roja TPS B 400 kV D/c line	Uttar Pradesh	400 kV	Line	D/c	200	
92	LILO of CBGanj -Badaun 220 kV D/c line at Badaun (400 kV)	Uttar Pradesh	220 kV	Line	D/c	10	
93	LILO of Pura Chandausi - Badaun 220 kV D/c line at Badaun (400 kV)	Uttar Pradesh	220 kV	Line	D/c	70	
94	LILO of Auraiya (TPS) - Sikandra (Agra) 220 kV D/c line at Dibiyapur, Auraiya	Uttar Pradesh	220 kV	Line	D/c	40	
95	LILO of Varanasi (400 kV) - Varanasi 220 kV D/c line at Varanasi Cantt.	Uttar Pradesh	220 kV	Line	D/c	40	
96	Mathura-II -Fatehabad 400 kV D/c line	Uttar Pradesh	400 kV	Line	D/c	150	
97	Mathura-II -Dasna 400 kV D/c line	Uttar Pradesh	400 kV	Line	D/c	300	
98	Mathura-II -Vrindavan 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	40	
99	Yeida Sector-24 -Greater Noida (765 kV) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	52	
100	Yeida Sector 24 -Yeida Sector 18 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	18	
101	Noida Sec.148 -38A Botenical Garden 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	44	
102	Mohan Road -Jehta 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	56	
103	LILO of Sarojni Nagar - Hardoi Road 220 kV D/c line at Mohan Road	Uttar Pradesh	220 kV	Line	D/c	6	
104	LILO of Sitapur (220)-Nighasan (220) 220 kV D/c line at Kanduni	Uttar Pradesh	220 kV	Line	D/c	40	
105	Kanduni -Kursi road Lucknow PG (400 kV) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	120	
106	LILO of Sitapu - Sahjahanpur (220) 220 kV D/c line at Kanduni	Uttar Pradesh	220 kV	Line	D/c	20	
107	LILO of one circuit of Sarojni Nagar –Unnao 400 kV D/c line at Mohanlalganj	Uttar Pradesh	400 kV	Line	D/c	74	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
108	LILO of Lucknow PG - Sultanpur 400 kV D/c line at Mohanlalganj	Uttar Pradesh	400 kV	Line	D/c	12	
109	LILO of Chinhat - C.G. City 220 kV D/c line at Mohanlalganj (400 kV)	Uttar Pradesh	220 kV	Line	D/c	62	
110	LILO of I ckt of Barabanki - Satrikh Road Lko 220 kV D/c line at Mohanlalganj(400 kV)	Uttar Pradesh	220 kV	Line	D/c	40	
111	Mohanlalganj (400 kV)-Bijnaur Road 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	40	
112	LILO of Ghatampur (TPS) kanpur – Hapur 765 kV D/c line at Rampur	Uttar Pradesh	765 kV	Line	D/c	110	
113	LILO of one circuit of Bareilly PG - Moradabad 400 kV D/c line at Rampur (765 kV)	Uttar Pradesh	400 kV	Line	D/c	6	
114	LILO of one circuit of Moradaba - Rampur 765 kV D/c line at Rampur	Uttar Pradesh	765 kV	Line	D/c	20	
115	Rampur (765 kV)-Moradabad – II 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	140	
116	LILO of one circuit of G. Noida - Hapur 765 kV D/c line at Modipuram, Meerut	Uttar Pradesh	765 kV	Line	D/c	90	
117	Modipuram, Meerut (765 kV)-Jansath 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	90	
118	Modipuram, Meerut (765 kV)-Amroha 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	90	
119	Modipuram, Meerut (765 kV)-G. Noida-II 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	100	
120	Simbhaoli -Moradnagar 400 kV D/c line	Uttar Pradesh	400 kV	Line	D/c	190	
121	Simbhaoli -Meerut 400 kV D/c line	Uttar Pradesh	400 kV	Line	D/c	80	
122	LILO of one circuit of Hapur Hybrid- Simbhaoli 220 kV D/c line at Simbhaoli (400 kV)	Uttar Pradesh	220 kV	Line	D/c	60	
123	Sambhal(400 kV) -Rampur(765 kV) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	160	
124	LILO of one circuit of Chandausi - Sambhal 220 kV D/c line at Sambhal (400 kV)	Uttar Pradesh	220 kV	Line	D/c	40	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
125	LILO of one circuit of Sambhal -Gajraula (Amroha) 220 kV D/c line at Sambhal (400 kV)	Uttar Pradesh	220 kV	Line	D/c	100	
126	Sambhal -Badaun 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	134	
127	Sultanpur Road (Awas Vikas, Lucknow) -Sultanpur Road(400 kV) (underground cable) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	1.6	
128	Varanasi (400 kV)-Varanasi 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	40	
129	Rasra -Balia 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	70	
130	Muradabad -Moradabad II 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	60	
131	Loni II-Ataur -Moradabad I 220 kV S/c line	Uttar Pradesh	220 kV	Line	S/c	30	
132	Mawana -Modipuram II 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	40	
133	Nehtaur New-Bhopa Road 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	100	
134	Saharanpur New -Lalukheri 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	110	
135	Naini UPSIDC -Rewa Road (400 kV) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	40	
136	Hardoi Rd, Lucknow -Hardoi Road (400 kV) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	20	
137	Meerut by Pass -Modipuram(765 kV) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	70	
138	Sardhana -Modipuram (765 kV) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	40	
139	LILO of one circuit of Neebkarori- Mainpuri (PG) 220 kV D/c line at Kannauj	Uttar Pradesh	220 kV	Line	D/c	60	
140	Fatehpur New -Fatehpur (PG) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	40	
141	Lalu kheri -Shamli 400 kV D/c line	Uttar Pradesh	400 kV	Line	D/c	40	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
142	Lalu kheri -Bhopa Road 400 kV D/c line	Uttar Pradesh	400 kV	Line	D/c	40	
143	LILO of one circuit of Vishnu Prayag-Srinagar 220 kV D/c line at Mozaffar Nagar, Bhopa Rd	Uttar Pradesh	220 kV	Line	D/c	40	
144	Mozaffar Nagar, Bhopa Rd -Nehtaur 220 kV S/c line	Uttar Pradesh	220 kV	Line	S/c	50	
145	Badaun Road-Badaun (400 kV) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	100	
146	LILO of Rasra -Deoria 220 kV D/c line at Mau (400 kV)	Uttar Pradesh	220 kV	Line	D/c	90	
147	Rasra -Deoria 220 kV S/c line	Uttar Pradesh	220 kV	Line	S/c	83.4	
148	LILO of one circuit of Deoria-Rasra (400 kV) 220 kV D/c line at Deoria New	Uttar Pradesh	220 kV	Line	D/c	30	
149	LILO of one circuit of Sikandrarao - Jawaharpur TPS 220 kV D/c line at Kasganj	Uttar Pradesh	220 kV	Line	D/c	90	
150	LILO of Fatehpur - Unchahar 220 kV S/c line at Malwan	Uttar Pradesh	220 kV	Line	D/c	30	
151	Anoopsahar -khurja TPS 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	80	
152	LILO of one circuit of Gajokhar - Kirakat 220 kV D/c line at Jaunpur - II (220 kV)	Uttar Pradesh	220 kV	Line	D/c	40	
153	LILO of Paricha (TPS) - Orai 220 kV S/c line at Moth	Uttar Pradesh	220 kV	Line	D/c	40	
154	LILO of both circuits of Orai PG- Orai UPPTCL 400 kV D/c line (Quad Moose) at Garautha	Uttar Pradesh	400 kV	Line	2xD/c	212	
155	LILO of one circuit of Lalitpur TPS – Agra 765 kV D/c line at Talbehat(765) S/s	Uttar Pradesh	765 kV	Line	D/c	37	
156	Talbehat(765 kV) – Lalitpur TPS (HTLS) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	72	
157	LILO of one ckt of Banda (400 kV)-Orai (400 kV) 400 kV D/c line (Quad Moose) at Maheba (Jalaun)	Uttar Pradesh	400 kV	Line	D/c	40	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
158	Maheba – Hamirpur (Sarila) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	208	
159	Maheba (Jalaun) - Farrukhabad 400 kV D/c line	Uttar Pradesh	400 kV	Line	D/c	336	
160	Farrukhabad - Badaun 400 kV D/c line	Uttar Pradesh	400 kV	Line	D/c	180	
161	LILO of Chhibramau- Farrukhabad (220 kV) 220 kV S/c line at Farrukhabad (400 kV)	Uttar Pradesh	220 kV	Line	D/c	30	
162	LILO of Mahoba- Banda 220 kV S/c line at Hamirpur	Uttar Pradesh	220 kV	Line	D/c	70	
163	Charkhari (Mahoba) - Garotha (Jhansi) 220 kV D/c line	Uttar Pradesh	220 kV	Line	D/c	134	
164	Jaitpur (Mahoba) – Charkhari (Mahoba) 220 kV S/c line	Uttar Pradesh	220 kV	Line	S/c	40	
165	Birdha (Lalitpur) – Lalitpur 220 kV S/c line	Uttar Pradesh	220 kV	Line	S/c	30	
166	Mandawra (Lalitpur)- Lalitpur 220 kV S/c line	Uttar Pradesh	220 kV	Line	S/c	55	
167	Dakaur- Maheba 220 kV S/c line	Uttar Pradesh	220 kV	Line	S/c	42	
168	Bamaur (Jhansi)-Garautha 220 kV S/c line	Uttar Pradesh	220 kV	Line	S/c	34	
169	Bangra(Jhansi)- Gurusarai(Jhansi) 220 kV S/c line	Uttar Pradesh	220 kV	Line	S/c	45	
170	Kabrai (Mahoba) – Charkhari (Mahoba) 220 kV S/c line	Uttar Pradesh	220 kV	Line	S/c	40	
	Uttarakhand						
(A)	**New sub-stations / ICT augmentation**						
1	Jafarpur 220 kV S/s	Uttarakhand	220/33 kV	S/s			100
2	Baram 220 kV GIS S/s	Uttarakhand	220/33 kV	S/s			100
3	Landhora 400 kV GIS S/s	Uttarakhand	400/220 kV	S/s			630
4	Manglore 220 kV S/s	Uttarakhand	220/132 kV	S/s			320

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
5	Selaqui (Dehradun) 220 kV GIS S/s	Uttarakhand	220/33 kV	S/s			100
(B)	**Transmission Lines**						
1	Kashipur-Pantnagar to Jafarpur 220 kV D/c line	Uttarakhand	220 kV	Line	D/c	16	
2	Dhauliganga-Pithoragarh to Baram 220 kV D/c line	Uttarakhand	220 kV	Line	D/c	44	
3	LILO of one circuit of Kashipur - Puhana PGCIL 400 kV D/c line at Landhora	Uttarakhand	400 kV	Line	D/c	6	
4	LILO of Roorkee - Manglore (proposed) 220 kV S/c line at Landhora.	Uttarakhand	220 kV	Line	D/c	50	
5	LILO of Roorkee – Nara 220 kV S/c line at proposed 220/132 kV Manglore substation	Uttarakhand	220 kV	Line	D/c	2	
6	LILO of Khodri - Jhajra 220 kV S/c line at proposed 220 kV Selaqui (Dehradun) substation	Uttarakhand	220 kV	Line	D/c	1.4	
	Rajasthan						
(A)	**New sub-stations / ICT augmentation**						
1	Kankani 400 kV S/s (Upgradation)	Rajasthan	765/400 kV	S/s			3000
2	Sawa 220 kV S/s	Rajasthan	220/132 kV	S/s			160
3	Panchu 220 kV S/s	Rajasthan	220/132 kV	S/s			160
4	Lohawat 220 kV S/s	Rajasthan	220/132 kV	S/s			160
5	Rayla 220 kV S/s	Rajasthan	220/132 kV	S/s			160
6	Lakhni 220 kV S/s	Rajasthan	220/132 kV	S/s			160
7	Menar 220 kV S/s	Rajasthan	220/132 kV	S/s			160
8	Udaipur 220 kV S/s	Rajasthan	400/220 kV	S/s			1000
9	Dungarpur 220 kV S/s	Rajasthan	220/132 kV	S/s			160
10	Dholpur 400 kV S/s	Rajasthan	400/220 kV	S/s			1000
11	Jaisalmer 765 kV S/s	Rajasthan	765/400 kV	S/s			4500
12	Bhadla 400 kV S/s	Rajasthan	400/220 kV	S/s			2000
13	Ramgarh 400 kV S/s	Rajasthan	400/220 kV	S/s			2000

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
14	Jaisalmer-II 400 kV S/s	Rajasthan	400/220 kV	S/s			2500
15	Pathredi 220 kV S/s	Rajasthan	220/132 kV	S/s			160
16	Reodar 220 kV S/s	Rajasthan	220/132 kV	S/s			160
17	Karoli 220 kV S/s	Rajasthan	220/132 kV	S/s			160
18	Sangod 400 kV S/s	Rajasthan	400/220 kV	S/s			1000
19	Sangod 400 kV S/s	Rajasthan	220/132 kV	S/s			160
20	ICT augmentation at Kalisindh TPS	Rajasthan	400/220 kV	S/s			185
21	Dholpur 220 kV S/s	Rajasthan	220/132 kV	S/s			160
22	Bap 220 kV S/s	Rajasthan	220/132 kV	S/s			160
23	Pindwara 220 kV S/s	Rajasthan	220/132 kV	S/s			100
24	Goner 220 kV S/s	Rajasthan	220/132 kV	S/s			100
25	Khetri 220 kV S/s	Rajasthan	220/132 kV	S/s			100
26	Banar(Up-gradation) 220 kV S/s	Rajasthan	220/132 kV	S/s			200
27	Hanumangarh 400 kV S/s	Rajasthan	400/220 kV	S/s			1000
28	Kolayat 220 kV S/s	Rajasthan	220/132 kV	S/s			160
29	Raipur 220 kV S/s	Rajasthan	220/132 kV	S/s			160
30	Sheo 220 kV S/s	Rajasthan	220/132 kV	S/s			160
31	Kelwara 220 kV S/s	Rajasthan	220/132 kV	S/s			160
32	Sikri 220 kV S/s	Rajasthan	220/132 kV	S/s			160
33	Bari 220 kV S/s	Rajasthan	220/132 kV	S/s			160
34	Chaksu 220 kV S/s	Rajasthan	220/132 kV	S/s			100
35	Nimbahera 220 kV S/s	Rajasthan	220/132 kV	S/s			160
36	Khinvsar 220 kV S/s	Rajasthan	220/132 kV	S/s			160
37	Jhunjhunu 220 kV S/s	Rajasthan	220/132 kV	S/s			160
38	Sri Dungargarh 220 kV S/s	Rajasthan	220/132 kV	S/s			160
39	Dhorimanna 220 kV S/s	Rajasthan	220/132 kV	S/s			160
40	Balotra 220 kV S/s	Rajasthan	220/132 kV	S/s			160
41	Barmer 400 kV S/s	Rajasthan	220/132 kV	S/s			100

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
42	Suratgarh 220 kV S/s	Rajasthan	220/132 kV	S/s			160
43	Halasar 220 kV S/s	Rajasthan	220/132 kV	S/s			100
44	Dholpur 220 kV S/s	Rajasthan	220/132 kV	S/s			160
45	Pindwara 220 kV S/s	Rajasthan	220/132 kV	S/s			100
46	Chirwa 220 kV S/s	Rajasthan	220/132 kV	S/s			160
47	Sayla 220 kV S/s	Rajasthan	220/132 kV	S/s			160
48	Laxmangarh 220 kV S/s	Rajasthan	220/132 kV	S/s			100
49	Ajmer 400 kV S/s	Rajasthan	400/220 kV	S/s			500
50	Merta 400 kV S/s	Rajasthan	400/220 kV	S/s			500
51	Jodhpur 400 kV S/s	Rajasthan	400/220 kV	S/s			500
52	Bikaner 400 kV S/s	Rajasthan	400/220 kV	S/s			500
(B)	**Transmission Lines**						
1	Jodhpur- Phagi 765 kV D/c line	Rajasthan	765 kV	Line	D/c	600	
2	Barmer – Sawa 220 kV D/c line	Rajasthan	220 kV	Line	D/c	200	
3	LILO of Dhorimanna-Sanchore 220 kV S/c line at 220 kV S/s Sawa	Rajasthan	220 kV	Line	D/c	100	
4	LILO of BLTPS-Khinvsar 220 kV S/c line at 220 kV S/s Panchu	Rajasthan	220 kV	Line	D/c	6	
5	Badisid - Lohawat 220 kV D/c line (HTLS)	Rajasthan	220 kV	Line	D/c	140	
6	LILO of Phalodi-Tinwari 220 kV S/c line at 220 kV S/s Lohawat	Rajasthan	220 kV	Line	D/c	10	
7	Dechu-Tinwari 220 kV S/c line	Rajasthan	220 kV	Line	S/c	72	
8	LILO of one circuit of Kalisindh TPS (400 kV)-Anta (765 kV) 400 kV D/c line at 400 kV S/s Sangod	Rajasthan	400 kV	Line	D/c	40	
9	Sangod (400 kV S/s)-Baran 220 kV D/c line	Rajasthan	220 kV	Line	D/c	70	
10	LILO of Aklera-Jhalawar 220 kV S/c line at 400 kV S/s Sangod	Rajasthan	220 kV	Line	D/c	80	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
11	LILO of Bhiwadi (400 kV S/s)-Neemrana (220 kV S/s) 220 kV S/c line at PGCIL's 400 kV S/s Neemrana	Rajasthan	220 kV	Line	D/c	12	
12	LILO of Bhiwadi (400 kV S/s)-Neemrana (220 kV S/s) 220 kV S/c line at proposed 220 kV S/s Karoli	Rajasthan	220 kV	Line	D/c	12	
13	LILO of Kushkhera-Alwar 220 kV S/c line at proposed 220 kV S/s Karoli	Rajasthan	220 kV	Line	D/c	0.4	
14	400 kV S/s Kotputli (Khelna)-Pathredi 220 kV D/c line (Proposed)	Rajasthan	220 kV	Line	D/c	40	
15	LILO of existing Bhinmal (PG)-Sirohi 220 kV S/c line at 220 kV S/s Reodar	Rajasthan	220 kV	Line	D/c	56	
16	Kolayat- Panchu 220 kV D/c line	Rajasthan	220 kV	Line	D/c	52	
17	Kolayat- Bhadla 220 kV D/c line	Rajasthan	220 kV	Line	D/c	77	
18	LILO of one circuit of STPS-Bikaner (Twin Moose) 400 kV D/c line at 400 kV S/s Hanumangarh	Rajasthan	400 kV	Line	D/c	100	
19	LILO of Hanumangarh (220 kV S/s)- Udhyog Vihar (220 kV S/s) 220 kV S/c line at proposed 400 kV S/s Hanumangarh	Rajasthan	220 kV	Line	D/c	30	
20	LILO of Suratgarh (220 kV S/s) -Padampur (220 kV S/s) 220 kV S/c line at proposed 400 kV S/s Hanumangarh	Rajasthan	220 kV	Line	D/c	25	
21	400 kV S/s Hanumangarh- Rawatsar (220 kV S/s) 220 kV S/c line	Rajasthan	220 kV	Line	S/c	85	
22	LILO of Bhilwara (400 kV S/s)- Baman Ka Tukda 220 kV S/c line at 220 kV S/s Raipur	Rajasthan	220 kV	Line	D/c	35	
23	LILO of Akal-Giral 220 kV S/c line at 220 kV S/s Sheo	Rajasthan	220 kV	Line	D/c	20	
24	LILO of Akal-Barmer 220 kV S/c line at 220 kV S/s Sheo	Rajasthan	220 kV	Line	D/c	20	
25	Alwar (400 kV) - Sikri 220 kV D/c line	Rajasthan	220 kV	Line	D/c	106	
26	Sikri- Bharatpur 220 kV S/c line	Rajasthan	220 kV	Line	S/c	69	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
27	Dholpur(400 kV S/s)-Bari (220 kV S/s) 220 kV D/c line	Rajasthan	220 kV	Line	D/c	60	
28	LILO of Sikar (220 kV S/s)- Dhod 220 kV S/c line at 400 kV Sikar (PGCIL)	Rajasthan	220 kV	Line	D/c	40	
29	Soorpura- Banar 220 kV D/c line	Rajasthan	220 kV	Line	D/c	23	
30	LILO of Bhilwara (220 kV S/s)-Beawer 220 kV S/c line at 220 kV S/s Rayla	Rajasthan	220 kV	Line	D/c	20	
31	LILO of Bhinmal-Dhorimanna 220 kV S/c line at 220 kV S/s Lakhni	Rajasthan	220 kV	Line	D/c	20	
32	LILO of Debari-Chittorgarh 220 kV S/c line at 220 kV S/s Menar	Rajasthan	220 kV	Line	D/c	40	
33	LILO of one circuit of 400 kV D/c Chittorgarh-Bhilwara line (Twin Moose) at 400 kV S/s Udaipur	Rajasthan	400 kV	Line	D/c	180	
34	LILO of Debari-Amberi 220 kV S/c line at 400 kV S/s Udaipur	Rajasthan	220 kV	Line	D/c	5	
35	LILO of Madri-Banswara 220 kV S/c line at 400 kV S/s Udaipur	Rajasthan	220 kV	Line	D/c	22	
36	Udaipur (400 kV S/s)-Dungarpur 220 kV D/c line	Rajasthan	220 kV	Line	D/c	204	
37	400 meter 400 kV S/c line from location no. 780 of existing 400 kV S/c Hindaun-DCCP line to 400 kV S/s Dholpur	Rajasthan	400 kV	Line	S/c	0.4	
38	LILO of Saipau-Bharatpur 220 kV S/c line at 400 kV S/s Dholpur	Rajasthan	220 kV	Line	D/c	60	
39	400 meter 220 kV S/c line from location no. 781 of existing 400 kV S/c Hindaun-DCCP line to 400 kV S/s Dholpur to charge on 220 kV voltage level	Rajasthan	220 kV	Line	S/c	0.4	
40	LILO of Bassi-Agra 400 kV S/c line at 400 kV S/s Dholpur	Rajasthan	400 kV	Line	D/c	130	
41	765 kV S/s Jaisalmer- Kankani 765 kV D/c line	Rajasthan	765 kV	Line	D/c	450	
42	Jaisalmer II - 765 kV S/s Jaisalmer 400 kV D/c line	Rajasthan	400 kV	Line	D/c	140	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
43	LILO of Ramgarh-Akal 400 kV D/c line at 765 kV S/s Jaisalmer	Rajasthan	400 kV	Line	2xD/c	100	
44	LILO of Bhadla-Merta 400 kV S/c line at 400 kV S/s Bhadla (new)	Rajasthan	400 kV	Line	D/c	12	
45	LILO of Bhadla-Jodhpur (Surpura) 400 kV S/c line at 400 kV S/s Bhadla (new)	Rajasthan	400 kV	Line	D/c	12	
46	Bhadla (new)-Bikaner (new) 765 kV D/c line	Rajasthan	765 kV	Line	D/c	360	
47	LILO of Suratgarh SCTPS-Bikaner 400 kV D/c line at 400 kV S/s Bikaner (new)	Rajasthan	400 kV	Line	D/c	56	
	Maharashtra						
(A)	**New sub-stations / ICT augmentation**						
1	3x167MVA 400/220 kV ICT augmentation at 400 kV Taptitanda	Maharashtra	400/220 kV	S/s			500
2	1x500MVA 400/220 kV ICT augmentation at 400 kV Alkud	Maharashtra	400/220 kV	S/s			500
3	1x(500-315)MVA 400/220 kV ICT augmentation at 400 kV Nagothane	Maharashtra	400/220 kV	S/s			195
4	1x(500-315)MVA 400/220 kV ICT augmentation at 400 kV Kharghar	Maharashtra	400/220 kV	S/s			195
5	2x100MVA 220/132 kV ICT augmentation at 220 kV Dhamangaon	Maharashtra	220/132 kV	S/s			200
6	1x100MVA 220/132 kV ICT augmentation at 220 kV NandgaonPeth	Maharashtra	220/132 kV	S/s			100
7	1x100MVA 220/132 kV ICT augmentation at 220 kV Tuljapur	Maharashtra	220/132 kV	S/s			100
8	1x(100-50) MVA 220/132 kV ICT augmentation at 220 kV Gadchiroli	Maharashtra	220/132 kV	S/s			50
9	1X1000 MW, HVDC VSC based Convertor station each at Array & Kudus	Maharashtra	320 kV	HVDC			1000
	Transmission Lines						
1	Koardi I-Koradi II 400 kV S/c line	Maharashtra	400 kV	Line	D/c	8	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
2	Akola(IEPL)-Koradi II 400 kV S/c line	Maharashtra	400 kV	Line	D/c	135	
3	Bhadravati-Chandrapur II 400 kV D/c line	Maharashtra	400 kV	Line	D/c	20	
4	Chandrapur-Chandrapur II 400 kV D/c line	Maharashtra	400 kV	Line	D/c	20	
5	Shikrapur PG-Lonikand II 400 kV D/c line	Maharashtra	400 kV	Line	D/c	50	
6	Padghe-Padghe PG 400 kV D/c line	Maharashtra	400 kV	Line	D/c	10	
7	Yavatmal-Ghatodi 220 kV S/c line	Maharashtra	220 kV	Line	S/c	84	
8	Nagewadi-Bhokardan 220 kV D/c line	Maharashtra	220 kV	Line	D/c	100	
9	Patoda-Sonewadi(AhmedNagar) 220 kV D/c line	Maharashtra	220 kV	Line	D/c	160	
10	Karad-Koyna 220 kV D/c line	Maharashtra	220 kV	Line	D/c	92	
11	Koradi II-Mankapur 220 kV D/c line	Maharashtra	220 kV	Line	D/c	12	
12	Jeur-Paranda 220 kV D/c line	Maharashtra	220 kV	Line	D/c	70	
13	TalegaonPG-Chinchwad 220 kV D/c line	Maharashtra	220 kV	Line	D/c	58	
14	Talegaon PG-Hinjewadi I 220 kV D/c line	Maharashtra	220 kV	Line	D/c	70	
15	Chakan II-Telco 220 kV S/c line	Maharashtra	220 kV	Line	S/c	12	
16	Chinchwad-Chakan II 220 kV S/c line	Maharashtra	220 kV	Line	S/c	15	
17	Pune PG(Shikrapur)-Khedcity 220 kV D/c line	Maharashtra	220 kV	Line	D/c	50	
18	Ranjangaon- Pune PG(Shikrapur) 220 kV D/c line	Maharashtra	220 kV	Line	D/c	36	
19	Talegaon PG-Chakan MIDC 220 kV D/c line	Maharashtra	220 kV	Line	D/c	12	
20	1000 MW HVDC Terminal Stations at Kudus & Aarey and HVDC link	Maharashtra	320 kV	Line	D/c	80	
	Gujarat						
(A)	**New sub-stations / ICT augmentation**						
1	Bhachunda 400 kV S/s	Gujarat	400/220 kV	S/s			1500
2	Bhogat 400 kV S/s	Gujarat	400/220/66 kV	S/s			1820
3	Ukai TPS 400 kV S/s	Gujarat	400/220 kV	S/s			1000
4	Sankhari (Veloda) 400 kV S/s	Gujarat	220/66 kV	S/s			300
5	Mera 220 kV S/s	Gujarat	220/66 kV	S/s			320

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
6	Rah 220 kV S/s	Gujarat	220/66 kV	S/s			320
7	Bhildi 220 kV S/s	Gujarat	220/66 kV	S/s			320
8	Avana 220 kV S/s	Gujarat	220/66 kV	S/s			320
9	Sisrana/Satlasana 220 kV S/s	Gujarat	220/66 kV	S/s			320
10	Bhesan 220 kV S/s	Gujarat	220/66 kV	S/s			320
11	Patkhilori 220 kV S/s	Gujarat	220/66 kV	S/s			320
12	Khodu/Dudhrej 220 kV S/s	Gujarat	220/66 kV	S/s			320
13	Babarzar 220 kV S/s	Gujarat	220/66 kV	S/s			480
14	Kalavad 400 kV S/s	Gujarat	400/220 kV	S/s			1000
15	Wanakbori TPS 400 kV S/s	Gujarat	400/220 kV	S/s			500
16	Khajod 220 kV S/s	Gujarat	220/66 kV	S/s			320
17	Metoda 220 kV S/s	Gujarat	220/66 kV	S/s			320
18	Maglana 220 kV S/s	Gujarat	220/66 kV	S/s			320
19	Kamlapur 220 kV S/s	Gujarat	220/66 kV	S/s			320
20	Sevalia 220 kV S/s	Gujarat	220/66 kV	S/s			320
21	Prantij 400 kV S/s	Gujarat	400/220/66 kV	S/s			1320
22	Olpad 220 kV S/s	Gujarat	220/66 kV	S/s			320
23	Chiloda 220 kV S/s	Gujarat	220/66 kV	S/s			620
24	Gomta 220 kV S/s	Gujarat	220/66 kV	S/s			320
25	Veraval 220 kV S/s	Gujarat	220/66 kV	S/s			320
26	Halol 220 kV S/s	Gujarat	220/66 kV	S/s			320
27	Giyavad 220 kV S/s	Gujarat	220/66 kV	S/s			320
28	Siddheshwar 220 kV S/s	Gujarat	220/66 kV	S/s			480
29	Keshod 400 kV S/s	Gujarat	400/220 kV	S/s			1000
30	Shivlakha 400 kV S/s	Gujarat	400/220/66 kV	S/s			1320
31	Pipavav 400 kV S/s	Gujarat	400/220 kV	S/s			1000
32	Dholera 400 kV S/s	Gujarat	400/220 kV	S/s			1500
33	Bagasara 220 kV S/s	Gujarat	220/66 kV	S/s			320

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
34	Velanja 220 kV S/s	Gujarat	220/66 kV	S/s			320
35	Vijapur 220 kV S/s	Gujarat	220/66 kV	S/s			300
36	Dhama 220 kV S/s	Gujarat	220/66 kV	S/s			320
37	Avaniya 220 kV S/s	Gujarat	220/66 kV	S/s			320
38	Kanbha 220 kV S/s	Gujarat	220/66 kV	S/s			320
39	Balethi 220 kV S/s	Gujarat	220/66 kV	S/s			320
40	Achhalia 400 kV S/s	Gujarat	400/220/66 kV	S/s			1320
41	Saykha 400 kV S/s	Gujarat	400/220/66 kV	S/s			1820
42	Makansar 220 kV S/s	Gujarat	220/66 kV	S/s			320
43	Limzer 220 kV S/s	Gujarat	220/66 kV	S/s			320
44	Kheradi 220 kV S/s	Gujarat	220/66 kV	S/s			320
45	Nichi Mandal (Vankda) 220 kV S/s	Gujarat	220/66 kV	S/s			320
46	Sarvala 220 kV S/s	Gujarat	220/66 kV	S/s			320
47	Mandali 220 kV S/s	Gujarat	220/66 kV	S/s			320
48	Umarpada 220 kV S/s	Gujarat	220/66 kV	S/s			320
49	Dumas 220 kV S/s	Gujarat	220/66 kV	S/s			480
50	400/220 kV ICT augmentation at Veloda 400 kV S/s	Gujarat	400/220 kV	S/s			500
51	400/220 kV ICT augmentation at Zerda(Kansari) 400 kV S/s	Gujarat	400/220 kV	S/s			500
52	400/220 kV ICT augmentation at Jetpur 400 kV S/s	Gujarat	400/220 kV	S/s			185
53	400/220 kV ICT augmentation at Asoj 400 kV S/s	Gujarat	400/220 kV	S/s			500
54	220/132 kV ICT augmentation at Ranavav 220 kV S/s	Gujarat	220/132 kV	S/s			100
55	220/132 kV ICT augmentation at Gondal 220 kV S/s	Gujarat	220/132 kV	S/s			50
56	220/66 kV ICT augmentation at Timbdi 220 kV S/s	Gujarat	220/66 kV	S/s			50

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
57	220/66 kV ICT augmentation at Salejada 220 kV S/s	Gujarat	220/66 kV	S/s			160
58	220/66 kV ICT augmentation at Kansari 220 kV S/s	Gujarat	220/66 kV	S/s			50
59	220/66 kV ICT augmentation at Jambuva 220 kV S/s	Gujarat	220/66 kV	S/s			160
60	220/66 kV ICT augmentation at Kim 220 kV S/s	Gujarat	220/66 kV	S/s			160
61	220/66 kV ICT augmentation at Sadla 220 kV S/s	Gujarat	220/66 kV	S/s			160
62	220/66 kV ICT augmentation at Karamsad 220 kV S/s	Gujarat	220/66 kV	S/s			170
63	220/66 kV ICT augmentation at Asoj 400 kV S/s	Gujarat	220/66 kV	S/s			120
64	220/66 kV ICT augmentation at Kosamba 400 kV S/s	Gujarat	220/66 kV	S/s			120
65	220/66 kV ICT augmentation at Popada 220 kV S/s	Gujarat	220/66 kV	S/s			120
66	220/66 kV ICT augmentation at Jetpur 400 kV S/s	Gujarat	220/66 kV	S/s			120
67	220/66 kV ICT augmentation at Kangashiyali 220 kV S/s	Gujarat	220/66 kV	S/s			60
68	220/66 kV ICT augmentation at Sankhari 220 kV S/s	Gujarat	220/66 kV	S/s			110
69	220/66 kV ICT augmentation at Khanpur 220 kV S/s	Gujarat	220/66 kV	S/s			60
70	220/66 kV ICT augmentation at Vallabhipur 220 kV S/s	Gujarat	220/66 kV	S/s			160
71	220/66 kV ICT augmentation at Suva(HGIS) 220 kV S/s	Gujarat	220/66 kV	S/s			160
72	220/66 kV ICT augmentation at Sartanpar(HGIS) 220 kV S/s	Gujarat	220/66 kV	S/s			160
73	220/66 kV ICT augmentation at Bhat 220 kV S/s	Gujarat	220/66 kV	S/s			60
74	220/66 kV ICT augmentation at Talangpur 220 kV S/s	Gujarat	220/66 kV	S/s			530

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
75	220/66 kV ICT augmentation at Mota 220 kV S/s	Gujarat	220/66 kV	S/s			60
76	220/66 kV ICT augmentation at Vav 220 kV S/s	Gujarat	220/66 kV	S/s			110
77	220/66 kV ICT augmentation at Vartej 220 kV S/s	Gujarat	220/66 kV	S/s			60
78	220/66 kV ICT augmentation at Ambhetha (Chikhali) 220 kV S/s	Gujarat	220/66 kV	S/s			110
79	220/66 kV ICT augmentation at Anjar 220 kV S/s	Gujarat	220/66 kV	S/s			120
80	220/66 kV ICT augmentation at Bhilad 220 kV S/s	Gujarat	220/66 kV	S/s			160
81	220/66 kV ICT augmentation at Agiyol 220 kV S/s	Gujarat	220/66 kV	S/s			100
82	220/66 kV ICT augmentation at Jamla 220 kV S/s	Gujarat	220/66 kV	S/s			160
83	220/66 kV ICT augmentation at Ukai Hydro (GSECL) 220 kV S/s	Gujarat	220/66 kV	S/s			210
84	Pachham (Fedra) 400 kV S/s	Gujarat	400/220/132 kV	S/s			1320
85	Shapar 400 kV S/s	Gujarat	400/220/66 kV	S/s			1980
86	Rajula (Sintex) 220 kV S/s	Gujarat	220/66 kV	S/s			320
87	Kalavad 220 kV S/s	Gujarat	220/66 kV	S/s			480
88	Talaja 220 kV S/s	Gujarat	220/66 kV	S/s			320
89	Sarigam 220 kV S/s	Gujarat	220/66 kV	S/s			320
90	Dhuvaran 220 kV S/s	Gujarat	220/66 kV	S/s			200
91	kV Dholera 220/33 S/s	Gujarat	220/66 kV	S/s			1000
92	Raghanesda 220 kV S/s	Gujarat	220/66 kV	S/s			750
93	Khambhalia 220 kV S/s	Gujarat	220/66 kV	S/s			320
(B)	**Transmission Lines**						
1	Essar - Amreli 400 kV S/c line	Gujarat	400 kV	Line	S/c	356	
2	Vadavi - Halvad 400 kV D/c line	Gujarat	400 kV	Line	D/c	290	
3	Mundra - Hadvad 400 kV S/c line	Gujarat	400 kV	Line	S/c	55	
4	Varsana - Halvad 400 kV D/c line	Gujarat	400 kV	Line	D/c	237	
5	Kasor - Amreli 400 kV D/c line	Gujarat	400 kV	Line	D/c	460	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
6	Wanakbori TPS - Soja 400 kV D/c line	Gujarat	400 kV	Line	D/c	212	
7	Soja - Zedra 400 kV D/c line	Gujarat	400 kV	Line	D/c	268	
8	Bhachunda - Varsana 400 kV D/c line	Gujarat	400 kV	Line	D/c	280	
9	Adani - Zerda 400 kV D/c line	Gujarat	400 kV	Line	D/c	640	
10	Shapar - Fedra 400 kV D/c line	Gujarat	400 kV	Line	D/c	200	
11	Hadala - Shapar 400 kV D/c line	Gujarat	400 kV	Line	D/c	130	
12	Bhogat - Kalavad 400 kV D/c line	Gujarat	400 kV	Line	D/c	270	
13	LILO of one ckt. of Wanakbori-Soja 400 kV D/c line at Prantij	Gujarat	400 kV	Line	D/c	80	
14	Kalavad - Keshod 400 kV D/c line	Gujarat	400 kV	Line	D/c	240	
15	Bhachunda - Shivlakha 400 kV D/c line	Gujarat	400 kV	Line	D/c	420	
16	Shapar - Chharodi (Sanand) 400 kV D/c line	Gujarat	400 kV	Line	D/c	180	
17	Veloda (Sankhari) - Prantij 400 kV D/c line	Gujarat	400 kV	Line	D/c	300	
18	LILO of Soja-Zerda 400 kV D/c line at Veloda s/s	Gujarat	400 kV	Line	D/c	60	
19	LILO Chorania-Asoj of 400 kV S/c line at Pachham(Fedra)	Gujarat	400 kV	Line	D/c	100	
20	Keshod - Shapar 400 kV D/c line	Gujarat	400 kV	Line	D/c	380	
21	Shivlakha - Veloda 400 kV D/c line	Gujarat	400 kV	Line	D/c	490	
22	LILO of Kosamba-Pachham 400 kV S/c line at Saykha	Gujarat	400 kV	Line	D/c	4	
23	LILO of Kosamba-Charal 400 kV S/c line at Saykha	Gujarat	400 kV	Line	D/c	4	
24	LILO of SSP - Asoj 400 kV S/c line at Achhalia	Gujarat	400 kV	Line	D/c	40	
25	LILO of SSP - Kasor 400 kV S/c line at Achhalia	Gujarat	400 kV	Line	D/c	40	
26	Achhalia - Kasor 400 kV S/c line	Gujarat	400 kV	Line	D/c	146	
27	Kosamba - Achhalia 400 kV D/c line	Gujarat	400 kV	Line	D/c	70	
28	Pipavav - Amreli 400 kV D/c line	Gujarat	400 kV	Line	D/c	160	
29	Gavasad - Salejda 220 kV D/c line	Gujarat	220 kV	Line	D/c	194	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
30	LILO of Vadavi-Chhatral 220 kV S/c line at Santej	Gujarat	220 kV	Line	D/c	102	
31	Vadodara - Jambuva 220 kV D/c line	Gujarat	220 kV	Line	D/c	68	
32	LILO of Jetpur-Sardargadh 220 kV D/c line Shapur	Gujarat	220 kV	Line	2xD/c	24	
33	LILO of Kawas-Navsari 220 kV D/c line at Khajod	Gujarat	220 kV	Line	2xD/c	40	
34	LILO of Ichhapore-Talangpore 220 kV S/c line at Khajod	Gujarat	220 kV	Line	D/c	8	
35	BECL - Botad 220 kV D/c line	Gujarat	220 kV	Line	D/c	190	
36	Halvad - Sadla 220 kV D/c line	Gujarat	220 kV	Line	D/c	74	
37	Chorania - Salejda 220 kV D/c line	Gujarat	220 kV	Line	D/c	134	
38	Bhatia - Kalavad 220 kV D/c line	Gujarat	220 kV	Line	D/c	238	
39	Kalavad - Kangasiyali 220 kV D/c line	Gujarat	220 kV	Line	D/c	112	
40	Chorania - Botad 220 kV D/c line	Gujarat	220 kV	Line	D/c	104	
41	LILO of Amreli-Dhasa 220 kV D/c line at Gariyadhar	Gujarat	220 kV	Line	D/c	160	
42	LILO of line-2 of Ukai(Tharmal)-Achhalia 220 kV T/c line at Virpore	Gujarat	220 kV	Line	D/c	60	
43	LILO of line-3 of Ukai(Tharmal)-Achhalia 220 kV T/c line at Virpore	Gujarat	220 kV	Line	D/c	60	
44	Virpore - Chikhli 220 kV D/c line	Gujarat	220 kV	Line	D/c	120	
45	LILO of GSEG-Kim 220 kV S/c line and Mora-Kim 220 kV S/c line at Velanja	Gujarat	220 kV	Line	2xD/c	10	
46	LILO of both circuits of Mota - Chikhli (Ambheta) 220 kV D/c line at Mahuva	Gujarat	220 kV	Line	2xD/c	40	
47	LILO of both circuits of Gandhinagar TPS - Soja/Ranasan 220 kV D/c line at Chiloda	Gujarat	220 kV	Line	2xD/c	60	
48	Bhogat - Moti Gop 220 kV D/c line	Gujarat	220 kV	Line	D/c	139	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
49	LILO of Lalpar - Sartanpar 220 kV S/c line at 220 kV Wankaner substation on M/c tower by dismentalling of existing 132 kV S/c Lalpar - Wankaner line	Gujarat	220 kV	Line	D/c	80	
50	LILO of one circuit of Kasor - Gavasad 220 kV D/c line at 220 kV Gotri substation	Gujarat	220 kV	Line	D/c	88	
51	LILO of both circuits of GSEG – Kosamba 220 kV line at 220 kV Kudiyana with pile foundation	Gujarat	220 kV	Line	2xD/c	140	
52	LILO Savarkundla - Visavadar of 220 kV S/c at Bagasara s/s	Gujarat	220 kV	Line	D/c	20	
53	LILO of Jetpur - Rajkot 220 kV S/c line at Metoda	Gujarat	220 kV	Line	D/c	8	
54	LILO of Chorania - Sarla 220 kV S/c line & Sarla - Gondal 220 kV S/c line (due to LILO of Chorania - Gondal 220 kV S/c line at Sarla S/s) at Shapar	Gujarat	220 kV	Line	D/c	240	
55	Bhogat - Bhatia 220 kV D/c line	Gujarat	220 kV	Line	D/c	26	
56	Bhogat - Ranavav 220 kV D/c line	Gujarat	220 kV	Line	D/c	138	
57	Pirana - Barejadi 220 kV D/c line	Gujarat	220 kV	Line	D/c	45	
58	Amreli - Babara 220 kV D/c line	Gujarat	220 kV	Line	D/c	53	
59	Babara - Shapar 220 kV D/c line	Gujarat	220 kV	Line	D/c	141	
60	Wanakbori TPS - Zalod 220 kV D/c line along with one circuit LILO at Savdasna Muvada	Gujarat	220 kV	Line	D/c	260	
61	LILO of both circuits of Otha - Sagapara 220 kV D/c line at Talaja	Gujarat	220 kV	Line	2xD/c	160	
62	Talaja - Maglana 220 kV D/c line	Gujarat	220 kV	Line	D/c	120	
63	Maglana - Pachchham 220 kV D/c line	Gujarat	220 kV	Line	D/c	200	
64	GPEC - Achhalia 220 kV D/c line	Gujarat	220 kV	Line	D/c	180	
65	Achhalia - Haldarwa 220 kV D/c line	Gujarat	220 kV	Line	D/c	180	
66	Suva - Achhalia 220 kV D/c line	Gujarat	220 kV	Line	D/c	140	
67	Prantij - Agiyol 220 kV D/c line	Gujarat	220 kV	Line	D/c	60	
68	Prantij - Dhansura 220 kV D/c line	Gujarat	220 kV	Line	D/c	70	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
69	Babara - Gondal-II 220 kV D/c line	Gujarat	220 kV	Line	D/c	160	
70	LILO of Keshod - Timbdi 220 kV S/c line at 220 kV Veraval	Gujarat	220 kV	Line	D/c	32	
71	Pipavav - Rajula 220 kV D/c line	Gujarat	220 kV	Line	D/c	12	
72	LILO of one circuit of Chandrapura - Godhara 220 kV D/c line at 220 kV Halol	Gujarat	220 kV	Line	D/c	10	
73	Vyankatpura – Halol 220 kVD/c line	Gujarat	220 kV	Line	D/c	50	
74	Amreli - Maglana 220 kV D/c line	Gujarat	220 kV	Line	D/c	200	
75	LILO of Vallabhipur - Vartej 220 kV S/c line at 220 kV Maglana substation	Gujarat	220 kV	Line	D/c	10	
76	LILO of both circuit of Visavadar - Timbdi 220 kV D/c line at 400 kV Keshod substation	Gujarat	220 kV	Line	2xD/c	24	
77	Keshod(400 kV) - Keshod 220 kV D/c line	Gujarat	220 kV	Line	D/c	50	
78	Dhama - Bechraji 220 kV D/c line	Gujarat	220 kV	Line	D/c	220	
79	Dhama - Chharodi 220 kV D/c line	Gujarat	220 kV	Line	D/c	200	
80	LILO of Bala - Dhanki 220 kV S/c line at 220 kV Sarla	Gujarat	220 kV	Line	D/c	80	
81	LILO of both ckt of Tappar - Shivlakha 220 kV D/c line at Shivlakha (400 kV)	Gujarat	220 kV	Line	2xD/c	100	
82	LILO of both ckt of Shapar - Babra 220 kV D/c line at Kamlapur (M/c)	Gujarat	220 kV	Line	2xD/c	60	
83	Kamlapur - Babara 220 kV D/c line	Gujarat	220 kV	Line	D/c	35	
84	LILO of Gondal – Padavala 220 kV S/c line at 220 kV Kamlapur	Gujarat	220 kV	Line	D/c	90	
85	LILO of Shapar – Sadla 220 kV S/c line at 220 kV Kamlapur	Gujarat	220 kV	Line	D/c	100	
86	Kamlapur - Bagodara 220 kV D/c line	Gujarat	220 kV	Line	D/c	220	
87	LILO of one ckt of Hadala - Sartanpar 220 kV D/c line at 220 kV Ghiyavad	Gujarat	220 kV	Line	D/c	20	
88	Bagodara - Mogar 220 kV D/c line	Gujarat	220 kV	Line	D/c	220	
89	Gomta - Kamlapur 220 kV D/c line	Gujarat	220 kV	Line	D/c	220	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
90	LILO of both ckts of Jambuva - Karamsad 220 kV D/c line at Dhuvaran CCPP (by using existing LILO portion and through Pachham - Kasor 220 kV D/c line)	Gujarat	220 kV	Line	2xD/c	80	
91	Vapi-II (ISTS) - Atul 220 kV D/c line	Gujarat	220 kV	Line	D/c	50	
92	LILO of Chikhli (Ambetha) – Vapi (GETCO) 220 kV S/c line at Vapi-II (ISTS substation) (AL-59 conductor)	Gujarat	220 kV	Line	D/c	40	
93	Keshod - Veraval 220 kV D/c line	Gujarat	220 kV	Line	D/c	90	
94	LILO of Bhatia - Kalavad 220 kV D/c line at Khambhalia-II	Gujarat	220 kV	Line	D/c	40	
95	Pipavav - Otha 220 kV D/c line	Gujarat	220 kV	Line	D/c	130	
96	LILO of one circuit of Tharad-Deodar 220 kV D/c line at 220 kV Mera	Gujarat	220 kV	Line	D/c	20	
97	Mera - Agathala 220 kV D/c line	Gujarat	220 kV	Line	D/c	70	
98	LILO of both circuit of Kansari-Deodar 220 kV D/c line at 220 kV Bhildi	Gujarat	220 kV	Line	2xD/c	40	
99	LILO of both circuits of Anjar – Welspun 220 kV S/c line and Shivlakha – Welspun 220 kV S/c line at Gandhidham B S/s	Gujarat	220 kV	Line	2xD/c	20	
100	LILO of both ckt of Bhimasar - Morbi 220 kV S/c line and Bhimasar - Sartanpar 220 kV S/c at Gandhidham B (Padana)	Gujarat	220 kV	Line	2xD/c	20	
101	Bhimsar - Gandhidham 220 kV D/c line	Gujarat	220 kV	Line	D/c	20	
102	Gandhidham - Sartanpar 220 kV D/c line	Gujarat	220 kV	Line	D/c	300	
103	LILO of both ckt of BECL - Botad 220 kV D/c line at Avaniya S/s	Gujarat	220 kV	Line	2xD/c	60	
104	LILO of Mitha - Soja 220 kV S/c line at 220 kV Mandali	Gujarat	220 kV	Line	D/c	30	
105	Chharodi - Mandali 220 kV D/c line	Gujarat	220 kV	Line	D/c	120	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
106	LILO of Wanakbori - Asoj 220 kV S/c line & Wanakbori - Vyankatpura 220 kV S/c line at 220 kV Sevalia substation with M/C tower or 2 X D/c Tower	Gujarat	220 kV	Line	2xD/c	80	
107	LILO of both circuit of Tharad-Dhanera 220 kV D/c at 220 kV Rah	Gujarat	220 kV	Line	2xD/c	40	
108	LILO of one circuit of Ranasan – Karamsad 220 kV D/c line at Kanbha substation	Gujarat	220 kV	Line	D/c	1	
109	Dehgam - Kanbha 220 kV D/c line	Gujarat	220 kV	Line	D/c	50	
110	LILO of both circuit of Kalavad - Kangashiyali 220 kV D/c line at Siddheshwar	Gujarat	220 kV	Line	2xD/c	22	
111	LILO of one circuit of Ukai (Th) – Achhalia 220 kV D/c line (which is not to be LILO at 220 kV Virpore) at 220 kV Balethi substation	Gujarat	220 kV	Line	D/c	30	
112	Kosamba - Balethi 220 kV D/c line	Gujarat	220 kV	Line	D/c	70	
113	LILO of Kosamba – Ichchhapore 220 kV S/c line at GSEG along with other miscellaneous work (High Ampacity Conductor)	Gujarat	220 kV	Line	D/c	16	
114	LILO of both circuit of Palanpur - Kheralu 220 kV D/c line at 220 kV Sisrana/Satlasana s/s (2x D/c or M/C tower)	Gujarat	220 kV	Line	2xD/c	48	
115	LILO of Jetpur – Visavadar 220 kV S/c line at 220 kV Bhesan substation	Gujarat	220 kV	Line	D/c	16	
116	Jetpur - Bhesan 220 kV S/c line	Gujarat	220 kV	Line	S/c	35	
117	Bhesan - Patkhilori 220 kV D/c line	Gujarat	220 kV	Line	D/c	70	
118	LILO of one circuit of Amreli – Babara 220 kV line at 220 kV Patkhilori	Gujarat	220 kV	Line	D/c	80	
119	Patkhilori - Gomta 220 kV D/c line	Gujarat	220 kV	Line	D/c	100	
120	LILO of both Ckt of Motigop - Kalawad 220 kV D/c line at 220 kV Babarzar substation	Gujarat	220 kV	Line	2xD/c	60	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
121	LILO of both circuits of Fedra - Dholera ‘AA’ 400 kV D/c line at Dholera Solar Park Pooling Substation. (Extension of 400 kV D/c Fedra - Dholera 'AA' line up to Dholera Solar Park Pooling Substation (400 kV M/C with AL-59 conductor)	Gujarat	220 kV	Line	2xD/c	60	
122	Raghanesda - Vav (Khimanvas) 220 kV D/c line	Gujarat	220 kV	Line	D/c	35	
123	LILO of Navsari-Nasik 220 kV D/c line at Limzer s/s	Gujarat	220 kV	Line	2xD/c	120	
124	LILO of both circuits of Gandhinagar TPS - Ranasan 220 kV D/c line at Bhat substation by using existing RoW of 66 kV Ranasan-Bhat OR Ranasan-PRL 132 kV line	Gujarat	220 kV	Line	2xD/c	128	
125	LILO of Sartanpar – Wankaner 220 kV S/c line at 220 kV Makansar substation	Gujarat	220 kV	Line	D/c	4	
126	LILO of Morbi - Hadala 220 kV S/c line at 220 kV Makansar substation	Gujarat	220 kV	Line	D/c	40	
127	LILO of Ukai (Th) - Achhalia 220 kV D/c line at 400 kV Achhalia	Gujarat	220 kV	Line	2xD/c	80	
128	Mansar - Dhama 220 kV D/c line	Gujarat	220 kV	Line	D/c	220	
129	LILO of both ckts of Bhimasar – Charadva 220 kV D/c line at Vankda (Nichimandal), (Shapar)	Gujarat	220 kV	Line	2xD/c	40	
130	Moti gop - Gondal-II 220 kV D/c line	Gujarat	220 kV	Line	D/c	220	
131	Ghiyavad – Shapar 220 kV D/c line	Gujarat	220 kV	Line	D/c	100	
132	LILO of both circuit of Ukai (Hy) - Achhalia 220 kV D/c line at 220 kV Umarpada (Chikda)	Gujarat	220 kV	Line	2xD/c	60	
133	LILO of one circuit of Ukai (Hydro) - Umarpada (Chikda) 220 kV D/c line at 220 kV Sarvala with AL-59 conductor (With OPGW)	Gujarat	220 kV	Line	D/c	70	
134	Sarvala - Umarpada (Chikda) 220 kV S/c line	Gujarat	220 kV	Line	S/c	140	
135	LILO of one circuit of Bhutiya - Agiyol 220 kV D/c line at 220 kV Kheradi	Gujarat	220 kV	Line	D/c	40	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
136	LILO of one circuit of Agiyol - Dhansura 220 kV D/c line at 220 kV Kheradi	Gujarat	220 kV	Line	D/c	56	
137	LILO of Haldarwa – Dahej 220 kV S/c line and Wagra-Dahej 220 kV S/c line at 400 kV Saykha (Both ckt on M/C Tower)	Gujarat	220 kV	Line	2xD/c	4	
138	Saykha - Suva 220 kV D/c line	Gujarat	220 kV	Line	D/c	20	
139	LILO of Ichhapore - Talangpore 220 kV S/c line at 220 kV Dumas	Gujarat	220 kV	Line	D/c	10	
140	LILO of GSEG - Talanpore 220 kV S/c line at 220 kV Dumas	Gujarat	220 kV	Line	D/c	10	
141	Pipavav - Bagasara 220 kV D/c line	Gujarat	220 kV	Line	D/c	150	
	Madhya Pradesh						
(A)	**New sub-stations / ICT augmentation**						
1	Mandsour 400 kV S/s	MP	400/220/132 kV	S/s			950
2	Ujjain 400 kV S/s	MP	400/220/132 kV	S/s			950
3	Kukshi 220 kV S/s (Upgradation)	MP	220/132 kV	S/s			160
4	Nalkheda 220 kV S/s (Upgradation)	MP	220/132 kV	S/s			320
5	Super Corridore(Indore) 220 kV S/s	MP	220/132 kV	S/s			160
6	Pichhore 220 kV S/s (Upgradation)	MP	220/132 kV	S/s			160
7	Budhni (Hoshngabad) 220 kV S/s	MP	220/132 kV	S/s			160
8	Guna 400 kV S/s	MP	400/220/132 kV	S/s			1000
9	Bhind 220 kV S/s	MP	220/132 kV	S/s			320
10	Begamganj 220 kV S/s	MP	220/132 kV	S/s			320
11	Bisonikalan 220 kV S/s	MP	220/132 kV	S/s			320
12	Ajaygarh 220 kV S/s	MP	220/132 kV	S/s			320
13	Mandideep 400 kV S/s	MP	400/220/132/33kV	S/s			1320
14	Khargone 220 kV S/s	MP	220/132/33kV	S/s			320
15	Bargawan 220 kV S/s	MP	220/132 kV	S/s			320

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
16	Shahpur 220/33kV S/s	MP	220/33kV	S/s			100
17	Manpur 220/33kV S/s	MP	220/33kV	S/s			100
18	Ratangarh 400/220 kV S/s (400 kV level establishment)	MP	400/220 kV	S/s			1000
19	1X500MVA,400/220 kV ICT (3rd) augmentation at at Mandsaur S/s	MP	400/220 kV	S/s			500
20	1x160MVA,220/132 kV ICT augmetation at Panagar 220 kV	MP	220/132 kV	S/s			160
21	1x160MVA,220/132 kV ICT augmetation at Ashoknagar 220 kV	MP	220/132 kV	S/s			160
22	1x160MVA,220/132 kV ICT augmetation at Mandideep 220 kV	MP	220/132 kV	S/s			160
23	1x160MVA,220/132 kV ICT augmetation at Mehgaon 220 kV	MP	220/132 kV	S/s			160
24	1x160MVA,220/132 kV ICT augmetation at Piparia 220 kV	MP	220/132 kV	S/s			160
25	1x160MVA,220/132 kV ICT augmetation at Vidisha 220 kV	MP	220/132 kV	S/s			160
26	1x160MVA,220/132 kV ICT augmetation at Katni 400 kV	MP	220/132 kV	S/s			160
27	1x160MVA,220/132 kV ICT augmetation at Ganjabasoda 220 kV S/s	MP	220/132 kV	S/s			160
28	1x160MVA,220/132 kV ICT augmetation at Mugaliachhap 220 kV S/s	MP	220/132 kV	S/s			160
29	1x160MVA,220/132 kV ICT augmetation at Chichli 220 kV S/s	MP	220/132 kV	S/s			160
30	2x(500-315) MVA,400/220 kV ICT augmetation at Bhopal 400 kV S/s	MP	400/220 kV	S/s			370
31	2x(500-315) MVA,400/220 kV ICT augmetation at Indore 400 kV S/s	MP	400/220 kV	S/s			370
32	(1x160-3x40) MVA,220/132 kV ICT augmetation at Bina 220 kV S/s	MP	220/132 kV	S/s			40
33	(1x160-3x40) MVA,220/132 kV ICT augmetation at Indore-SZ 220 kV S/s	MP	220/132 kV	S/s			40
34	(1x160-3x40) MVA,220/132 kV ICT augmetation at Itarsi 220 kV S/s	MP	220/132 kV	S/s			40
35	(1x160-3x40) MVA,220/132 kV ICT augmetation at Jabalpur 220 kV S/s	MP	220/132 kV	S/s			40
36	1x160MVA,220/132 kV ICT augmetation at Pithampur - II 220 kV S/s	MP	220/132 kV	S/s			160
37	1x160MVA,220/132 kV ICT augmetation at Sirmour 220 kV S/s	MP	220/132 kV	S/s			160
38	1x160MVA,220/132 kV ICT augmetation at Julwania 220 kV S/s	MP	220/132 kV	S/s			160
39	1x(200-160) MVA,220/132 kV ICT augmetation at Mehgaon 220 kV S/s	MP	220/132 kV	S/s			40

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
40	1x(200-160) MVA,220/132 kV ICT augmetation at Chegaon 400 kV	MP	220/132 kV	S/s			40
41	1x(200-160) MVA,220/132 kV ICT augmetation at Rewa 220 kV S/s	MP	220/132 kV	S/s			40
42	1x(200-160) MVA,220/132 kV ICT augmetation at Bhopal 220 kV S/s	MP	220/132 kV	S/s			40
43	1x(200-160) MVA,220/132 kV ICT augmetation at Damoh 220 kV S/s	MP	220/132 kV	S/s			40
44	1x(200-125) 200MVA,220/132 kV ICT augmetation at Nagda 220 kV S/s	MP	220/132 kV	S/s			75
45	Jatara 220/132/33 kV S/s	MP	220/132 kV	S/s			500
46	Upgradation 132 kV Seondha on 220 kV with 2x200MVA,220/132 kV ICT	MP	220/132 kV	S/s			400
(B)	**Transmission Lines**						
1	Ashta-Ujjain 400 kV D/c line	MP	400 kV	Line	D/c	89.74	
2	Nagda-Ujjain 400 kV D/c line	MP	400 kV	Line	D/c	53.2	
3	Indore PG-Ujjain 400 kV D/c line	MP	400 kV	Line	D/c	42.26	
4	Nagda-Mandsour 400 kV D/c line	MP	400 kV	Line	D/c	137.32	
5	LILO of Rajgarh 400 kV (PGCIL) -Khandwa 400 kV (PGCIL) 400 kV line at Chhegaon 400 kV	MP	400 kV	Line	D/c	320	
6	LILO of Both Circuit of Neemuch 220 kV - Daloda 220 kV D/c line at Mandsour 400 kV S/s	MP	220 kV	Line	D/c	168.3	
7	Daloda-Mandsour 220 kV D/c line	MP	220 kV	Line	D/c	36.5	
8	LILO of Both Circuit of Nagda 220 kV - Ujjain 220 kV line at Ujjain 400 kV S/s	MP	220 kV	Line	D/c	85	
9	LILO of Both Circuit of Badod 220 kV - Ujjain 220 kV line at Ujjain 400 kV S/s	MP	220 kV	Line	D/c	115	
10	Julwania-Kukshi 220 kV D/c line	MP	220 kV	Line	D/c	62.9	
11	Ujjain-Nalkheda 220 kV D/c line	MP	220 kV	Line	D/c	100	
12	Rajgarh(B)-Nalkheda 220 kV D/c line	MP	220 kV	Line	D/c	72	
13	Badod-Nalkheda 220 kV D/c line	MP	220 kV	Line	D/c	35	
14	220 kV Pithampur-Super Corridor D/c line	MP	220 kV	Line	D/c	50	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
15	LILO of Bina 400 kV (MP) - Gwalior 220 kV line at Pichore 220 kV S/s	MP	220 kV	Line	D/c	255	
16	Itarsi-Budhni 220 kV D/c line	MP	220 kV	Line	D/c	35	
17	LILO of Bina 220 kV - Ganbasoda 220 kV line at Bina 400 kV (MP) S/s	MP	220 kV	Line	D/c	75	
18	Chhatarpur-Tikamgarh 220 kV D/c (ACCC) line	MP	220 kV	Line	D/c	110	
19	Rewa-Rewa 220 kV D/c (ACCC) line	MP	220 kV	Line	D/c	30	
20	Rewa-Sidhi 220 kV D/c (ACCC) line	MP	220 kV	Line	D/c	60	
21	Indore-IndoreSZ 220 kV D/c (HTLS) line	MP	220 kV	Line	D/c	4	
22	Bhopal-Bhopal 220 kV D/c (HTLS) line	MP	220 kV	Line	D/c	12.1	
23	Guna-Bina 400 kV D/c line	MP	400 kV	Line	D/c	120	
24	Guna-Guna 220 kV D/c line	MP	220 kV	Line	D/c	15	
25	Guna-Shivpuri 220 kV D/c line	MP	220 kV	Line	D/c	100	
26	Morena-Bhind 220 kV D/c line	MP	220 kV	Line	D/c	65	
27	Sagar-Begamganj 220 kV D/c line	MP	220 kV	Line	D/c	70	
28	Chhatarpur-Ajaygarh 220 kV D/c line	MP	220 kV	Line	D/c	110	
29	Satna-Ajaygarh 220 kV D/c line	MP	220 kV	Line	D/c	82	
30	Satna PG-Ajaygarh 220 kV D/c line	MP	220 kV	Line	D/c	80	
31	Handiya-Bisonikalan 220 kV D/c line	MP	220 kV	Line	D/c	40	
32	Itarsi-Bisonikalan 220 kV D/c line	MP	220 kV	Line	D/c	55	
33	Satpura-Bisonikalan 220 kV D/c line	MP	220 kV	Line	D/c	127	
34	Mahalgaon-Gwalior 220 kV D/c line	MP	220 kV	Line	D/c	10.66	
35	Datiya-Gwalior 220 kV D/c line	MP	220 kV	Line	D/c	64	
36	Bhopal-Mandideep 400 kV D/c line	MP	400 kV	Line	D/c	40	
37	Itarsi-Mandideep 400 kV D/c line	MP	400 kV	Line	D/c	75	
38	Hoshngabad-Mandideep 220 kV D/c line	MP	220 kV	Line	D/c	60	
39	Adampur-Mandideep 220 kV D/c line	MP	220 kV	Line	D/c	40	
40	Mandideep-Mandideep 220 kV D/c line	MP	220 kV	Line	D/c	15	
41	Sidhi-Bargawan 220 kV D/c line	MP	220 kV	Line	D/c	85	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
42	Hindalco-Bargawan 220 kV D/c line	MP	220 kV	Line	D/c	10	
43	Nimrani-Khargone 220 kV D/c line	MP	220 kV	Line	D/c	45	
44	Chhegaon-Khargone 220 kV D/c line	MP	220 kV	Line	D/c	90	
45	Satna-Manpur 220 kV D/c line	MP	220 kV	Line	D/c	150	
46	Birsinghpur-Manpur 220 kV D/c line	MP	220 kV	Line	D/c	120	
47	Satpura-Shahpur 220 kV D/c line	MP	220 kV	Line	D/c	25	
48	Itarsi-Shahpur 220 kV D/c line	MP	220 kV	Line	D/c	57	
49	Bhopal-Bairagar 220 kV D/c line	MP	220 kV	Line	D/c	20	
50	Ashta-Bairagar 220 kV D/c line	MP	220 kV	Line	D/c	82	
	Tamil Nadu						
(A)	**New sub-stations / ICT augmentation**						
1	Ariyalur 765 kV S/s	Tamil Nadu	765/400 kV	S/s			3000
2	North Chennai Pooling Station (GIS) 765 kV S/s	Tamil Nadu	765/400 kV	S/s			4500
3	Coimbatore 765 kV S/s	Tamil Nadu	765/400 kV	S/s			3000
4	Virudhunagar 765 kV S/s	Tamil Nadu	765/400 kV	S/s			3000
5	Thervaigandigai 400 kV S/s	Tamil Nadu	400/230 kV	S/s			630
6	Pulianthope (GIS) 400 kV S/s	Tamil Nadu	400/230 kV	S/s			945
7	Vellalaviduthi (Pudukkottai) 400 kV S/s	Tamil Nadu	400/230 kV	S/s			1030
8	Guindy (GIS) 400 kV S/s	Tamil Nadu	400/230 kV	S/s			630
9	Korattur (GIS) 400 kV S/s	Tamil Nadu	400/230 kV	S/s			630
10	Edayarpalayam 400 kV S/s	Tamil Nadu	400/230-110 kV	S/s			1600
11	Tharamani (GIS) 400 kV S/s	Tamil Nadu	400/230-110/33 kV	S/s			1400
12	Ottapidaram 400 kV S/s	Tamil Nadu	400/230 - 110 kV	S/s			1400
13	Samugarengapuram 400 kV S/s	Tamil Nadu	400/230 - 110 kV	S/s			1400
14	Parali 400 kV S/s	Tamil Nadu	400/230 kV	S/s			1000
15	Koyambedu (GIS) 400 kV S/s	Tamil Nadu	400/230 kV	S/s			1000

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
16	Ulagam 400 kV S/s	Tamil Nadu	400/230-110 kV	S/s			1400
17	Cuddalore 400 kV S/s	Tamil Nadu	400/230-110 kV	S/s			1400
18	Mangalapuram 400 kV S/s	Tamil Nadu	400/230 kV	S/s			1000
19	Kalvadangam 400 kV S/s	Tamil Nadu	400/110 kV	S/s			600
20	Manalmedu 400 kV S/s	Tamil Nadu	400/230-110 kV	S/s			1600
21	Narimanam 230 kV S/s	Tamil Nadu	230/110 kV	S/s			200
22	Selvapuram (Puttuvikki) 230 kV S/s	Tamil Nadu	230/110 kV	S/s			200
23	Poolavady 230 kV S/s	Tamil Nadu	230/110 kV	S/s			200
24	Erode GIS 230 kV S/s	Tamil Nadu	230/110 kV	S/s			200
25	Thiruvanmiyur (GIS) 230 kV S/s	Tamil Nadu	230/110 kV	S/s			200
26	K.Pudur (GIS) 230 kV S/s	Tamil Nadu	230/33 kV	S/s			200
27	Ennore (GIS) 230 kV S/s	Tamil Nadu	230/110/33 kV	S/s			332
28	Ganesh Nagar (GIS) 230 kV S/s	Tamil Nadu	230/33 kV	S/s			200
29	Durainallur (Panjetty) (GIS) 230 kV S/s	Tamil Nadu	230/110 kV	S/s			300
30	Avadi 230 kV S/s	Tamil Nadu	230/110 kV	S/s			200
31	Karuppur (Jaggirammapalayam) 230 kV S/s	Tamil Nadu	230/110 kV	S/s			200
32	Maraimalai Nagar 230 kV S/s	Tamil Nadu	230/110 kV	S/s			200
33	Pallavaram (GIS) 230 kV S/s	Tamil Nadu	230/110 kV	S/s			300
34	Rajagopalapuram (GIS) 230 kV S/s	Tamil Nadu	230/33 kV	S/s			200
35	K.K.Nagar GIS 230 kV S/s	Tamil Nadu	230/110 kV	S/s			300
36	Vembakkam 230 kV S/s	Tamil Nadu	230/110 kV	S/s			300
37	Mambakkam 230 kV S/s	Tamil Nadu	230/110 kV	S/s			200
38	Nanguneri 230 kV S/s	Tamil Nadu	230/110 kV	S/s			200
39	Thuckalay (GIS) 230 kV S/s	Tamil Nadu	230/110 kV	S/s			320
40	Sathumadurai 230 kV S/s	Tamil Nadu	230/110 kV	S/s			320
41	Nallur (P.Velur) 230 kV S/s	Tamil Nadu	230/110 kV	S/s			200

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
42	Kalivelampatty (Velampalayam) 230 kV S/s	Tamil Nadu	230/110 kV	S/s			200
43	Muppandal 230 kV S/s	Tamil Nadu	230/110 kV	S/s			300
44	Saravanampatty (GIS) 230 kV S/s	Tamil Nadu	230/110 kV	S/s			300
45	Kongal Nagaram 230 kV S/s	Tamil Nadu	230/110 kV	S/s			200
46	Kondagai 230 kV S/s	Tamil Nadu	230/110 kV	S/s			200
47	Palani 230 kV S/s	Tamil Nadu	230/110 kV	S/s			200
48	Thindivanam 230 kV S/s	Tamil Nadu	230/110 kV	S/s			200
49	Kalugondapally 230 kV S/s	Tamil Nadu	230/110 kV	S/s			200
50	Nandhimangalam 230 kV S/s	Tamil Nadu	230/110 kV	S/s			200
51	K.Pudur 230 kV S/s	Tamil Nadu	230/110 kV	S/s			200
(B)	**Trasmission lines**						
1	Ariyalur - Thiruvalam (PGCIL), 765 kV D/c line	Tamil Nadu	765 KV	Line	D/c	347	
2	North Chennai Pooling station – Ariyalur, 765 kV D/c line	Tamil Nadu	765 KV	Line	D/c	548	
3	NCTPS - III switchyard - North Chennai Pooling Station, 765 kV D/c line	Tamil Nadu	765 KV	Line	D/c	13	
4	Virudhunagar – Coimbatore, 765 kV D/c line	Tamil Nadu	765 KV	Line	D/c	511	
5	Ariyalur - Coiambatore, 765 kV D/c line	Tamil Nadu	765 KV	Line	D/c	650	
6	Thervaikandikai – Korattur, 400 kV D/c line	Tamil Nadu	400 kV	Line	D/c	92	
7	OH and UG common point at Manjambakkam – Korattur, 400 kV UG Cable	Tamil Nadu	400 kV	Line	S/c	12	
8	Rasipalayam - Dharmapuri (Palavadi), 400 kV D/c line	Tamil Nadu	400 kV	Line	D/c	379	
9	LILO of Sunguvarchatram-Alamathy at Vellavedu (Guindy) upto Parivakkam	Tamil Nadu	400 kV	Line	D/c	28	
10	Parivakkam – Guindy, 400 kV UG Cable	Tamil Nadu	400 kV	Line	D/c	32.4	
11	Sholinganallur (Perumbakkam Jn) – Guindy, 400 kV UG Cable	Tamil Nadu	400 kV	Line	S/c	9	
12	Sholinganallur - Perumbakkam Jn towards Guindy, 400 kV S/c line	Tamil Nadu	400 kV	Line	S/c	14.7	
13	LILO of Thappagundu – Anaikadavu 400 kV S/c line at Udumalpet S/s	Tamil Nadu	400 kV	Line	D/c	40	
14	Manali – Pulianthoppe, 400 kV D/c line	Tamil Nadu	400 kV	Line	D/c	18.8	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
15	LILO of both, Karaikudi - Pugalur 400 kV D/c line at Vellalaviduthi	Tamil Nadu	400 kV	Line	2xD/c	166	
16	LILO of both, Pugalur - Kalivanthapattu 400 kV D/c line at Ariyalur S/s	Tamil Nadu	400 kV	Line	2xD/c	14.5	
17	LILO of one, NCTPS -II- Sunguvarchatram 400 kV D/c line at Koyambedu 400 kV S/s (UG cable)	Tamil Nadu	400 kV	Line	D/c	8	
18	Virudhunagar– Kayathar 400 kV D/c line	Tamil Nadu	400 kV	Line	D/c	140.4	
19	Ottapidaram - Udangudi Power Project and Ottapidaram - Kamudhi 400 kV D/c line	Tamil Nadu	400 kV	Line	D/c	279	
20	Coimbatore - Edayarpalayam 400 kV D/c line	Tamil Nadu	400 kV	Line	D/c	94	
21	LILO of both ckts of Rasipalayam - Palavady 400 kV D/c line at Coimbatore S/s	Tamil Nadu	400 kV	Line	2xD/c	120	
22	Samugarengapuram - Udangudi 400 kV D/c line	Tamil Nadu	400 kV	Line	D/c	80	
23	Kamuthi - common point near the proposed Virudhungar 400 kV D/c line and common point - Thappakundu 400 kV D/c line.	Tamil Nadu	400 kV	Line	D/c	312.4	
24	LILO of one of the NCTPS Stage-II -Sunguvarchatram 400 kV D/c line from tower location no.176 at Murkanchery upto cable termination point at Koyembedu	Tamil Nadu	400 kV	Line	D/c	60	
25	Ennore SEZ - North Chennai Pooling Station, 400 kV D/c line	Tamil Nadu	400 kV	Line	D/c	30.5	
26	Ennore SEZ - ETPS Expansion, 400 kV D/c line	Tamil Nadu	400 kV	Line	D/c	34.5	
27	ETPS Expansion - North Chennai Pooling Station, 400 kV D/c line	Tamil Nadu	400 kV	Line	D/c	5.4	
28	Inter connection from Common Point AP 23 of SEZ-ETPS exp to NCTPS Stage-II and LILO of the existing NCTPS -II to Sunguvarchatram 400 kV MC Line between loc.21 and Loc.22	Tamil Nadu	400 kV	Line	D/c	2.5	
29	Ottiyambakkam - Omega 230 kV S/c line on D/c towers	Tamil Nadu	230 kV	Line	S/c	35	
30	Ottiyambakkam - Omega 2nd Ckt (Free arm stringing)	Tamil Nadu	230 kV	Line	S/c	35	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
31	Sholinganallur -KITS 230kV D/c line	Tamil Nadu	230 kV	Line	D/c	24	
32	LILO of Guindy - R.A.Puram 230 kV line (UG cable) at Mambalam	Tamil Nadu	230 kV	Line	D/c	1	
33	CMRL Cental Jail – Mambalam, 230 kV UG Cable	Tamil Nadu	230 kV	Line	S/c	9	
34	Kilpauk - TNEB HQ, 230 kV S/c line	Tamil Nadu	230 kV	Line	S/c	10	
35	Basin Bridge - TNEB Head Quarters, 230 kV UG Cable	Tamil Nadu	230 kV	Line	S/c	7.2	
36	Basin Bridge - Pulianthope , 230 kV S/c line	Tamil Nadu	230 kV	Line	S/c	1.5	
37	LILO of Mylapore - Taramani 230 kV S/c line at Thiruvanmiyur GIS S/s via UG Cable	Tamil Nadu	230 kV	Line	D/c	2	
38	Alamathy 400 kV SS -Avadi Police quarters point Stringing of 230 kV D/c line in the free arm of the existing MC towers	Tamil Nadu	230 kV	Line	D/c	19	
39	Avadi police quarters -Annanur tower point laying of 230 kV D/c UG cable	Tamil Nadu	230 kV	Line	D/c	9	
40	Annanur tower point - Koladi point, Stringing of 230 kV D/c line in the free arm of the existing MC tower	Tamil Nadu	230 kV	Line	D/c	7.7	
41	LILO of Alamathy-Srperumbudur 230 kV S/c line at Avadi S/s via UG cable	Tamil Nadu	230 kV	Line	D/c	1	
42	LILO of Korattur- Kilpauk water works 230 kV S/c line at Ganesh Nagar S/s.	Tamil Nadu	230 kV	Line	D/c	3	
43	Palladam- Ingur, 230 kV S/c line	Tamil Nadu	230 kV	Line	S/c	62	
44	LILO of Ingur-Palladam, 230 kV S/c line at Kurukathi S/s	Tamil Nadu	230 kV	Line	D/c	62	
45	Ingur - Arasur (PGCIL), 230 kV S/c line	Tamil Nadu	230 kV	Line	S/c	54	
46	Strengthening of Singarapettai - Thiruvannamalai 230 kV S/c line (location 282 to 453)	Tamil Nadu	230 kV	Line	S/c	49.7	
47	Kinnimangalam - Samayanallur 230 kV S/c line	Tamil Nadu	230 kV	Line	S/c	20.4	
48	LILO of Paramathi - Alundur 230 kV S/c line at Valayapatty S/S.	Tamil Nadu	230 kV	Line	D/c	59.7	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
49	Shoolagiri - Uddanapally 230 kV D/c line	Tamil Nadu	230 kV	Line	D/c	2.3	
50	Dharmapuri (Palavadi) - proposed Udanapally 230 kV D/c line	Tamil Nadu	230 kV	Line	D/c	114	
51	Palavadi - Thiruppathur 230 kV S/c line	Tamil Nadu	230 kV	Line	S/c	76	
52	Villupuram - Ulundurpet 230 kV S/c line	Tamil Nadu	230 kV	Line	S/c	55	
53	LILO of Myvady -Kurukathi– Pugalur 230 kV S/c line at Rasipalayam.	Tamil Nadu	230 kV	Line	D/c	45	
54	LILO of Ingur-Kurukathi- Palladam 230 kV S/c line feeder at Rasipalayam	Tamil Nadu	230 kV	Line	D/c	27	
55	Vellalavidhuthi - Nemmeli Thippayakudy 230 kV S/c line	Tamil Nadu	230 kV	Line	S/c	23	
56	Vellalavidhuthi - existing Pudukottai 230 kV S/c line	Tamil Nadu	230 kV	Line	S/c	20	
57	Vellalaviduthi - Thuvakudy 230 kV S/c line.	Tamil Nadu	230 kV	Line	S/c	33	
58	Vellalaviduthi - Mondipatti 230 kV S/c line	Tamil Nadu	230 kV	Line	S/c	90	
59	N.T.gudi –Karaikudi 230 kV S/c line	Tamil Nadu	230 kV	Line	S/c	104	
60	Erection of 230 kV 4 circuits line on MC towers with Zebra conductor (i) 230 kV ETPS _ Tondiarpet 230 kV S/c line, ii) 230 kV ETPS _ Manali 230 kV S/c line, iii) 230 kV NCTPS I - Kilpauk, 230 kV S/c line iv) 230 kV NCTPS I –Tondiarpet 230 kV S/c line	Tamil Nadu	230 kV	Line	4xS/c	28	
61	LILO of existing PP Nallur – Thiruvarur, 230 kV S/c line at the proposed Narimanam S/s	Tamil Nadu	230 kV	Line	D/c	31	
62	LILO the existing PP Nallur – Thanjavur, 230 kV line at the proposed Narimanam 230 kV S/s	Tamil Nadu	230 kV	Line	D/c	30	
63	LILO the existing Alundur – Thanjavur 230 kV D/c line at the proposed Thuvakudy SS	Tamil Nadu	230 kV	Line	2xD/c	68	
64	LILO of MTPS – Salem, 230 kV S/c line at the proposed Karuppur S/s.	Tamil Nadu	230 kV	Line	D/c	25	
65	Conductor Strengthening in existing Pugalur- Paramathy feeder I & II	Tamil Nadu	230 kV	Line	S/c	24	
66	Sembatty – Myvady (from loc 1 to 9) and Myvady - Kadamparai 230 kV D/c line	Tamil Nadu	230 kV	Line	D/c	4.6	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
67	Sembatty - Myvady (Loc 9 to 262), 230 kV S/c line	Tamil Nadu	230 kV	Line	S/c	76	
68	Tiruchuli – Kamudhi, 230 kV D/c line	Tamil Nadu	230 kV	Line	S/c	32.5	
69	Strengthening of existing Kundah conductor by Zebra conductor in the existing Myvady - Othakkalmandapam feeder (1 to 29)	Tamil Nadu	230 kV	Line	D/c	17.5	
70	Strengthening of existing Kundah conductor by Zebra conductor from Loc 29 to Othakalmandapam (Myvady - Othakkalmandapam feeder) .	Tamil Nadu	230 kV	Line	S/c	46.8	
71	LILO of Othakalmandapam - Ponnapuram 230 kV S/c line at Edayarpalayam S/s	Tamil Nadu	230 kV	Line	D/c	20.5	
72	LILO of Ottiyambakkam - Omega Feeder II 230 S/c line at the proposed Mambakkam S/s.	Tamil Nadu	230 kV	Line	D/c	68	
73	LILO of S.P.Koil - Oragadam 230 S/c line at Maraimalai Nagar S/s	Tamil Nadu	230 kV	Line	D/c	16	
74	Strengthening of S.P.Koil - Oragadam line 230 kV S/c line from loc.4 to loc.63	Tamil Nadu	230 kV	Line	S/c	17.5	
75	LILO of existing Arni - Sriperumbudur 230 kV at Vembakkam 230 kV SS	Tamil Nadu	230 kV	Line	D/c	6	
76	LILO of existing MAPS - Arni 230kV S/c line at Vembakkam S/s	Tamil Nadu	230 kV	Line	D/c	24	
77	Erection of 230 kV 4 circuits line on MC towers from the proposed Saravanampatty 230/110 kV SS to a common point	Tamil Nadu	230 kV	Line	2xD/c	48	
78	Erection of 230 kV D/c line on D/c towers from common point to LILO location of existing 230 kV PUSHEP - Arasur feeder	Tamil Nadu	230 kV	Line	D/c	20	
79	Erection of 230 kV D/c line on D/c towers from common point up to the location 18 of the existing 230 kV Karamadai -Thudiyalur feeder	Tamil Nadu	230 kV	Line	D/c	58	
80	Stringing of 230 kV D/c line on the free arms of the existing multi-circuit towers of the existing 230 kV Karamadai - Thudiyalur feeder from location 18 upto Karamadai 400/230 kV SS	Tamil Nadu	230 kV	Line	D/c	8	
81	LILO of Abishekapatti - Udayathur 230 kV S/c line at proposed Nanguneri S/s	Tamil Nadu	230 kV	Line	D/c	41.7	
82	Samugarengapuram - Nanguneri 230 kV S/c line	Tamil Nadu	230 kV	Line	S/c	20.4	
83	LILO of Valuthur-Alagarkoil 230 kV S/c line at Uppur Super Critical Power Plant	Tamil Nadu	230 kV	Line	D/c	20.3	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
84	S.R.Pudur-Samugarenpuram 230 kV D/c line	Tamil Nadu	230 kV	Line	D/c	120	
85	Muppandal -Samugarenpuram 230 kV D/c line	Tamil Nadu	230 kV	Line	D/c	80	
86	Muthuramalingapuram - K.Pudur, 230 kV D/c line (OH line-64km, XLPE UG cable-5Kms)	Tamil Nadu	230 kV	Line	D/c	138	
	Karnataka						
(A)	**New sub-stations / ICT augmentation**						
1	Kumbalgod 220 kV S/s	Karnataka	220/66 kV	S/s			300
2	Channapatna 220 kV S/s	Karnataka	220/66 kV	S/s			100
3	Benkikere 220 kV S/s	Karnataka	220/66 kV	S/s			200
4	Koppal 220 kV S/s	Karnataka	220/110 kV	S/s			200
5	Ramasamudra 220 kV S/s	Karnataka	220/110 kV	S/s			200
6	Exora 220 kV S/s	Karnataka	220/66 kV	S/s			300
7	Nelamangala 220 kV S/s	Karnataka	220/66 kV	S/s			200
8	Sira 220 kV S/s	Karnataka	220/66 kV	S/s			200
9	Heggunje 220 kV S/s	Karnataka	220/110 kV	S/s			200
10	Ganagapura 220 kV S/s	Karnataka	220/110 kV	S/s			200
11	Sindagi 220 kV S/s	Karnataka	220/110 kV	S/s			200
12	HBR Layout 220 kV S/s	Karnataka	220/66 kV	S/s			300
13	Yalwar 400 kV S/s	Karnataka	400/220 kV	S/s			1000
14	Navalgund 220 kV S/s	Karnataka	220/110 kV	S/s			200
15	Banashankari 220 kV S/s	Karnataka	220/66 kV	S/s			300
16	Kadakola 400 kV S/s	Karnataka	400/220 kV	S/s			1000
17	Hanagal 220 kV S/s	Karnataka	220/66 kV	S/s			200
18	Mevundi 220 kV S/s	Karnataka	220/110 kV	S/s			200
19	Tekkalkote 220 kV S/s	Karnataka	220/110 kV	S/s			200
20	Nagamangala 220 kV S/s	Karnataka	220/66 kV	S/s			200
21	Adakanahalli 220 kV S/s	Karnataka	220/66 kV	S/s			200

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
22	Guttur 220 kV S/s	Karnataka	220/66 kV	S/s			200
23	Holalkere 220 kV S/s	Karnataka	220/66 kV	S/s			200
24	Chiduva limits 220 kV S/s	Karnataka	220/110 kV	S/s			200
25	Chadchan 220 kV S/s	Karnataka	220/110 kV	S/s			200
26	Muddebihal (Nagabenal Village) 220 kV S/s	Karnataka	220/110 kV	S/s			200
27	A-station 400 kV S/s	Karnataka	400/220 kV	S/s			1000
28	Keonics (Electronic City) 220 kV S/s	Karnataka	220/66 kV	S/s			300
29	Mathikere 220 kV S/s	Karnataka	220/66 kV	S/s			300
30	Nadamanchale 220 kV S/s	Karnataka	220/110 kV	S/s			200
31	Gangavathi (Sulekal) 220 kV S/s	Karnataka	220/110 kV	S/s			200
32	Shiggoan 220 kV S/s	Karnataka	220/110 kV	S/s			200
33	Srinivasapura 220 kV S/s	Karnataka	220/66 kV	S/s			200
34	Kushtagi 400 kV S/s	Karnataka	400/220 kV	S/s			1000
35	Deodurga 220 kV S/s	Karnataka	220/110 kV	S/s			100
36	Somasamudra 220 kV S/s	Karnataka	220/110 kV	S/s			200
37	Hungund 220 kV S/s	Karnataka	220/110 kV	S/s			200
38	Dudda 220 kV S/s	Karnataka	220/110/66 kV	S/s			300
39	Santhpur 220 kV S/s	Karnataka	220/110 kV	S/s			200
40	Nagarbhavi 220 kV S/s	Karnataka	220/66 kV	S/s			300
41	Yelburga 220 kV S/s	Karnataka	220/110 kV	S/s			200
42	Sirivara (Kodithimmanahalli) 220 kV S/s	Karnataka	220/66 kV	S/s			200
43	Divagi 220 kV S/s	Karnataka	220/110 kV	S/s			200
44	Dommasandra 400 kV S/s	Karnataka	400/220 kV	S/s			1000
45	Bharamasagara 220 kV S/s	Karnataka	220/66 kV	S/s			200
46	Arasapadavu 400 kV S/s	Karnataka	400/220 kV	S/s			1000
47	Peenya 400 kV S/s	Karnataka	400/220 kV	S/s			1000
48	P.D Kote 220 kV S/s	Karnataka	220/66 kV	S/s			200

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
(B)	**Trasmission lines**						
1	Hiriyur(PG) - LILO Point of 220 kV Hiriyur-Chitradurga 220 kV S/c line	Karnataka	220 kV	Line	S/c	20.9	
2	Hiriyur (PG)-Hiriyur 220 kV S/c line	Karnataka	220 kV	Line	S/c	15.1	
3	Kadakola –Vajamangala, 220 kV D/c line	Karnataka	220 kV	Line	D/c	19.6	
4	SRS Hubli –Haveri, 220 kV S/c line	Karnataka	220 kV	Line	S/c	68	
5	Replacement of Drake conductor by HPC of Bidnal –Harthi, 220 kV D/c line	Karnataka	220 kV	Line	D/c	46	
6	LILO of Bidnal –Mahalingpur, 220 kV S/c line at Sundatti S/S	Karnataka	220 kV	Line	S/c	121	
7	Replacement of Drake conductor by HPC of SRS Hubli- Bidanal, 220 kV D/c line	Karnataka	220 kV	Line	D/c	3.9	
8	Replacement of Drake conductor by HPC of Kolar -HVDC Kolar, 220 kV D/c line	Karnataka	220 kV	Line	D/c	6.7	
9	Replacement of AAAC conductor by HPC of Bidadi – Bidadi(PG), 220 kV D/c line	Karnataka	220 kV	Line	D/c	3.3	
10	Whitefield -Cessna(Exora), 220 kV S/c line	Karnataka	220 kV	Line	S/c	11.6	
11	Hoody- Whitefield, 220 kV S/c line	Karnataka	220 kV	Line	S/c	7.5	
12	Sindagi- Ganagapur, 220 kV D/c line	Karnataka	220 kV	Line	D/c	65	
13	LILO of Somanhalli –Dharamapuri 400 kV S/c line at Mylasandra	Karnataka	400 kV	Line	S/c	28.4	
14	Mylasandra –Dommasandra, 400 kV S/c line	Karnataka	400 kV	Line	S/c	15	
15	Kadavinkote- Kaniyar, 220 kV D/c line	Karnataka	220 kV	Line	D/c	30	
16	Chintamani- Mittemari, 220 kV D/c line	Karnataka	220 kV	Line	D/c	50.6	
17	Antharasanahalli –Nelamangala, 220 kV S/c line	Karnataka	220 kV	Line	S/c	42	
18	Replacement of Drake conductor by HPC of Nelamangala- Hoody, 220 kV D/c line	Karnataka	220 kV	Line	D/c	47	
19	Peenya –NRS 220 kV D/c line	Karnataka	220 kV	Line	D/c	5.9	
20	Stringing of 2nd circuit on Hiriyur (PG)- Madhugiri, 220 kV S/c line	Karnataka	220 kV	Line	S/c	75	
21	Hootaglli -T.K Halli, 220 kV D/c line (S/c to D/c)	Karnataka	220 kV	Line	D/c	71	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
22	Replacement of Twin Moose S/c to Quad Moose D/c of BTPS-Guttur, 400 kV line	Karnataka	400 kV	Line	D/c	140	
23	Lingapur- Guttur, 220 kV D/c line (S/c to D/c)	Karnataka	220 kV	Line	D/c	109	
	Andhra Pradesh						
(A)	**New sub-stations / ICT augmentation**						
1	Dharmavaram 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
2	Simhachalam 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
3	Sunappali 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
4	Pamuru 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
5	Adoni 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
6	Kancharapalem 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
7	Sarubujili 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
8	Tiruvuru 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
9	Goppili 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
10	Pedana 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
11	Bheemili 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
12	Koppaka 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			300
13	Koruprolu 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			400
14	Mutyal_Cheruvu 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
15	Pallan-SWS 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
16	Kakinada SEZ 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			320
17	Vijyanagram 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
18	Piduguralla 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
19	Rachaguneri 400 kV S/s	Andhra Pradesh	400/220 kV	S/s			1000
20	Thallaypalem 400 kV S/s	Andhra Pradesh	400/220 kV	S/s			1000
21	Guddigudem 400 kV S/s	Andhra Pradesh	400/220 kV	S/s			630
22	Anavilli 400 kV S/s	Andhra Pradesh	400/132 kV	S/s			630
23	Burugubanda 400 kV S/s	Andhra Pradesh	400/220 kV	S/s			1000
24	Achuthapuram 400 kV S/s	Andhra Pradesh	400/220 kV	S/s			1000
25	Kakinada SEZ 400 kV S/s	Andhra Pradesh	400/220 kV	S/s			1000
26	Chapalmadugu 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
27	Gudivada 400 kV S/s	Andhra Pradesh	400/220 kV	S/s			1000
28	Adoni 765 kV S/S	Andhra Pradesh	765/400 kV	S/s			3000
29	Dhone 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
30	Repalle 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
31	Gannavaram 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
32	Kanigiri 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
33	Kavali 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
34	Kadiri 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
35	Editha 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
36	Tanuku 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
37	Penugonda 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
38	Sarvepalli 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
39	Anandapuram 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
40	Common Point 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
41	Bobbili 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			480
42	Sambepalli 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			320
43	TB.Vara 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
44	Bethamcherala 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
45	Yemmiganur 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
46	Shree Cement 220 kV S/s	Andhra Pradesh	220/66 kV	S/s			60
47	Veldurthy RT 220 kV S/s	Andhra Pradesh	220/25 KV	S/s			63
48	Vepakayaladibba 220 kV S/s	Andhra Pradesh	220/33 KV	S/s			63
49	Gopavaram 220 kV S/s	Andhra Pradesh	220/33 KV	S/s			63
50	Narsapuram 220 kV S/s	Andhra Pradesh	220/132 KV	S/s			200

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
51	Koyalagudem 220 kV S/s	Andhra Pradesh	220/33 KV	S/s			63
52	Punganur 220 kV S/s	Andhra Pradesh	220/132 kV	S/s			200
53	Akiveedu 220 kV S/s	Andhra Pradesh	220/33 KV	S/s			130
54	Chinthuru 220 kV S/s	Andhra Pradesh	220/33 KV	S/s			100
55	Nansurala 220 kV S/s	Andhra Pradesh	220/33 KV	S/s			130
(B)	**Trasmission lines**						
1	Atchuthapuram 220 kV GIS S/s –Actchuthapuram 400 kV S/s 220 kV D/c UG cable	Andhra Pradesh	220 kV	Line	D/c	5	
2	LILO of Parawada- Anarak 220 kV S/c line at Atchuthapuram	Andhra Pradesh	220 kV	Line	D/c	20	
3	Koruprolu - Atchuthapurm 220 kV S/c line	Andhra Pradesh	220 kV	Line	S/c	60.2	
4	LILO of Gooty (PG) - Shapuram 220 kV S/c line at Dharmavram	Andhra Pradesh	220 kV	Line	D/c	20	
5	LILO of Ananthapur 220 kV S/s - Ramagiri 220 kV S/c line at Dharmavram	Andhra Pradesh	220 kV	Line	D/c	20	
6	LILO of KTS – Nunna 220 kV S/c line at Tiruvuru	Andhra Pradesh	220 KV	Line	D/c	20	
7	LILO of both circuits of Dairyfarm - Kalpaka 220 kV D/c line at Simhachalm	Andhra Pradesh	220 kV	Line	2xD/c	40	
8	Tekkali -Bavanapadu 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	15	
9	Pallantala- Guddigudem 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	60	
10	Pattiseema - Guddigudem 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	44	
11	Kakinada SEZ- Krishnavaran 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	80	
12	Cherivi –Rachaguneri 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	106	
13	Cherivi - Sullurpet 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	38	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
14	KVkota - Bhimadole 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	44	
15	LILO of both circuits of Maradam-Pendurthy at Vijayanagram and Bheemili	Andhra Pradesh	220 kV	Line	D/c	80	
16	Hindupur 220 kV S/s-Hindupur 400 kV S/s 220 kV S/c line	Andhra Pradesh	220 kV	Line	S/c	20	
17	Penukonda - Hindupur 400 kV S/s 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	35	
18	Pamanpurthanda -Hindupur 400 kV S/s 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	160	
19	Pamanpurthanda -Hindupur 400 kV S/s 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	160	
20	LILO of Koruprolu –Kakinada S/S, 220 kV line at Kakinada SEZ 400 kV	Andhra Pradesh	220 kV	Line	D/c	40	
21	Rampachodavaram -Lowersiler 220 kV S/c line	Andhra Pradesh	220 kV	Line	S/c	83	
22	Bavojipet - Lowersiler 220 kV S/c line	Andhra Pradesh	220 kV	Line	S/c	109	
23	Goppili - Tekkali 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	60	
24	Podili 400 kV S/s- Podili 220 kV S/s, 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	16.8	
25	Goppili -Sarubujili 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	130	
26	Kakinada SEZ- Gail_Kknd 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	20	
27	VTS- Lingapuram 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	72	
28	Lingapuram - Gorantla 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	38	
29	Gorantla - Rentachinthala 220 kV S/c line	Andhra Pradesh	220 kV	Line	S/c	77	
30	Gooty (PG)-Adoni 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	160	
31	Kalpaka 400 kV- Gazuwaka 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	40	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
32	LILO of Simhadri-Vemagiri 400 kV S/c line at Atchuthapuram	Andhra Pradesh	400 kV	Line	D/c	40	
33	LILO of Kalpaka-Khammam 400 kV S/c line at Atchuthapuram	Andhra Pradesh	400 kV	Line	D/c	40	
34	KV Kota – Konasema 400 kV S/c line	Andhra Pradesh	400 kV	Line	S/c	88	
35	KV Kota - Vemagiri 400 kV S/c line	Andhra Pradesh	400 kV	Line	S/c	98	
36	Gudivada –Burugubanda 400 kV S/c line	Andhra Pradesh	400 kV	Line	S/c	171	
37	Burugubanda -Sattenpali 400 kV D/c line	Andhra Pradesh	400 kV	Line	D/c	32	
38	LILO of both circuits of VTS IV-Sattenpali 400 kV D/c line at Thallaypalem	Andhra Pradesh	400 kV	Line	2xD/c	80	
39	Polavaram -Guddigudem 400 kV D/c line	Andhra Pradesh	400 kV	Line	D/c	120	
40	Hinduja – Kakinada SEZ 400 kV S/c line	Andhra Pradesh	400 kV	Line	S/c	105	
41	Kakinada SEZ -Guddigudem 400 kV D/c line	Andhra Pradesh	400 kV	Line	D/c	226	
42	Guddigudem - KV Kota 400 kV D/c line	Andhra Pradesh	400 kV	Line	D/c	100	
43	Kakinada SEZ -Atchuthapuram 400 kV S/c line	Andhra Pradesh	400 kV	Line	S/c	85.5	
44	Hinduja- Atchuthapuram 400 kV S/c line	Andhra Pradesh	400 kV	Line	S/c	23.8	
45	Adoni –Kurnool (PG) 765 kV D/c line	Andhra Pradesh	765 kV	Line	D/c	200	
46	Hyderabad-Adoni 765 kV D/c line	Andhra Pradesh	765 kV	Line	D/c	300	
47	Manubolu –Kothapalem 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	50	
48	Manubolu – Kavali 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	200	
49	Manubolu –Sarvepalli 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	50	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
50	Repalle- Parchur 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	134	
51	Repalle- Guntur 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	120	
52	Nunna –Gannavaram 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	50	
53	Podili – Kanigiri 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	120	
54	Vemagiri (400 kV)- Editha 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	80	
55	Nidadavolu –Tanuku 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	120	
56	Penugonda- Tanuku 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	52	
57	Dairy Farm- Anandapuram 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	30	
58	Gajuwaka -Common Point 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	40	
59	LILO of Chinakampall- Thimmapuram220 kV S/c line at Sambepalli	Andhra Pradesh	220 kV	Line	D/c	20	
60	LILO of Chakraypet – Jammalmadugu 220 kV S/c line at Animala	Andhra Pradesh	220 kV	Line	D/c	20	
61	TB.Vara –Vizayanagram 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	90	
62	Uppersileru- Kakinada SEZ 400 kV D/c line	Andhra Pradesh	400 kV	Line	D/c	210	
63	Kancharapalem-Simachalam 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	22	
64	Muthyalachereuvu-Pulivendula 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	108	
65	Koyalagudem-Guddigudem 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	30	
66	LILO of Upper Sileru –Pendurty 220 kV S/c line at Anarak	Andhra Pradesh	220 kV	Line	D/c	20	
67	Gudivada 400 kV S/s-Pedana 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	60	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
68	Machilipattanam- Pedana 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	24	
69	LILO of both circuit of Gudivada – Akiveedu 220 kV D/c line at Gopavaram	Andhra Pradesh	220 kV	Line	2xD/c	90.9	
70	LILO of Bhimadole-Nunna 220 kV S/c line at Nuzvid S/S	Andhra Pradesh	220 kV	Line	D/c	20	
71	LILO of K.V.Kota –Nuzvid 220 kV S/c line at Koppaka	Andhra Pradesh	220 kV	Line	D/c	20	
72	LILO of Bhimadole- Nuzvid 220 kV S/c line at Koppaka	Andhra Pradesh	220 kV	Line	D/c	20	
73	Narsapuram-Bhemavaram 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	60	
74	LILO of Somayajulapalli-Rangapuram 220 kVS/c line at Bethamcherela S/s	Andhra Pradesh	220 kV	Line	D/c	20	
75	LILO of Bavojipet-Bommur 220 kV S/c line at Vepakayaladibba S/s	Andhra Pradesh	220 kV	Line	D/c	20	
76	LILO of both circuits of Srisailam RB-Tallapali 220 kV D/c line at ChapalamaduguS/s	Andhra Pradesh	220 kV	Line	2xD/c	40	
77	LILO of both circuits Piduguralla-Talapalli 220 kV D/c line at Shreecement	Andhra Pradesh	220 kV	Line	2xD/c	12	
78	Shree Cement-Shree Cement Ltd 220 kV S/c line	Andhra Pradesh	220 kV	Line	S/c	5	
79	Settipalli-Veldurthy RT 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	13.24	
80	Settipalli-APCrabides 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	56	
81	Settipalli-Krisnagiri 220 kV S/c line	Andhra Pradesh	220 kV	Line	S/c	10.5	
82	Yemmiganur-Krisnagiri 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	90	
83	Nansurala-Krisnagiri 220 kV S/c line	Andhra Pradesh	220 kV	Line	S/c	25	
84	Ghani-Bilakalgudur 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	58.92	
85	LILO of 2nd Circuit of Tallapalli-Gorntla 220 kV line at Rentachintla S/s	Andhra Pradesh	220 kV	Line	D/c	20	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
86	LILO of Palamaneru-Madanapalli 220 kV S/c line at Punganur S/s	Andhra Pradesh	220 kV	Line	D/c	20	
87	BRANDIX –Achutapuram GIS 220 kV D/c line	Andhra Pradesh	220 kV	Line	D/c	6.76	
88	LILO of Konasema-Vemagirli 400 kV S/c line at Ainavali	Andhra Pradesh	220 kV	Line	D/c	40	
89	LILO of Simdhiri-Vemagirli 400 kV S/c line at Kakinada SEZ	Andhra Pradesh	220 kV	Line	D/c	40	
90	LILO of Kalpaka- Vemagirli 400 kV S/c line at Kakinada SEZ	Andhra Pradesh	220 kV	Line	D/c	40	
91	LILO of Kalpaka-Asupaka at 220 kV S/c line Atchuthapuram	Andhra Pradesh	220 kV	Line	D/c	40	
	Kerala						
(A)	**New sub-stations / ICT augmentation**						
1	Chithirapuram 220 kV S/s	Kerala	220/66kV	S/s			126
2	Kunnamangalam 220 kV S/s	Kerala	220/110 kV	S/s			200
3	Kunnamkulam 220 kV S/s	Kerala	220/110 kV	S/s			200
4	Thalassery 220 kV S/s	Kerala	220/110 kV	S/s			200
5	Ettumanoor 220 kV S/s	Kerala	220/110 kV	S/s			200
6	Vizhinjam 220 kV S/s	Kerala	220/110 kV	S/s			200
7	Kottayam 400 kV S/s	Kerala	400/220 kV	S/s			630
8	Pathanamthitta 220 kV S/s	Kerala	220/110 kV	S/s			100
9	Kakkad 220 kV S/s	Kerala	220/110 kV	S/s			100
10	Tirur 220 kV S/s	Kerala	220/110 kV	S/s			200
11	Sasthamkotta 220 kV S/s	Kerala	220/110 kV	S/s			200
12	Thuravur 220 kV S/s	Kerala	220/110 kV	S/s			200
13	Irinjalakuda 220 kV S/s	Kerala	220/110 kV	S/s			200
14	Palakkad 220 kV S/s	Kerala	220/110 kV	S/s			200
15	Edamon 400 kV S/s	Kerala	400/220 kV	S/s			1000
16	Nirmala City 220 kV S/s	Kerala	220/110 kV	S/s			100

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
17	Wayanad 220 kV S/s	Kerala	400/220 kV	S/s			630
18	Mannarkad 220 kV S/s	Kerala	220/110 kV	S/s			200
19	Kottathara 220 kV S/s	Kerala	220/33kV	S/s			120
20	Vidyanagar 220 kV S/s	Kerala	220/110 kV	S/s			200
(B)	**Trasmission lines**						
1	Kasargode - Kozhokode, 400 kV D/c line	Kerala	400 kV	Line	D/c	360	
2	Aluva –Pallivasal, 220 kV D/c line	Kerala	220 kV	Line	D/c	166	
3	Kanhirode- Mylatti, 220 kV D/c line	Kerala	220 kV	Line	D/c	177.5	
4	Mundayad –Thalasseri, 220 kV D/c line	Kerala	220 kV	Line	D/c	43.4	
5	Malayamma –Kunnamangalam, 220 kV D/c line	Kerala	220 kV	Line	D/c	15.2	
6	Kodungallur- Irinjalakuda, 220 kV D/c line	Kerala	220 kV	Line	D/c	24	
7	Wadakkanchery -Kunnamkulam, 220 kV D/c line	Kerala	220 kV	Line	D/c	44.6	
8	Kottayam - Ettumanoor, 220 kV D/c line	Kerala	220 kV	Line	D/c	13	
9	Kottayam -Thuravoor, 220 kV D/c line	Kerala	220 kV	Line	D/c	44.8	
10	LILO of one ckts of Pallom –Ambalamugal, 220 kV D/c line at Kottayam	Kerala	220 kV	Line	D/c	15.2	
11	Sabari Lines Package Pathanamthitta & Kakkad substations	Kerala	220 kV	Line	D/c	114	
12	Kunnamkulam –Vengallur, 220 kV D/c line	Kerala	220 kV	Line	D/c	68.4	
13	Kallada- Sastamkotta, 220 kV D/c line	Kerala	220 kV	Line	D/c	10	
14	Aluva- Irinjalakuda 220 kV D/c line	Kerala	220 kV	Line	D/c	60.8	
15	Aluva –Chalakudy 220 kV D/c line	Kerala	220 kV	Line	D/c	54	
16	Thalassery Kunnamagalam 220 kV D/c line	Kerala	220 kV	Line	D/c	180	
17	Irinjalakuda- Kunnamkulam 220 kV D/c line	Kerala	220 kV	Line	D/c	86	
18	Mannarkad- Palakkad 220 kV D/c line	Kerala	220 kV	Line	D/c	80	
19	LILO of one circuits of Elappully –Madakathara at Palakkad	Kerala	220 kV	Line	D/c	15	
20	Kuyilimala -Nirmala City 220 kV D/c line	Kerala	220 kV	Line	D/c	40	
21	Wayanad – Kasargode, 400 kV D/c line	Kerala	400 kV	Line	D/c	248	
22	Vettathur –Kottathara, 220 kV D/c line	Kerala	220 kV	Line	D/c	116	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
23	Kattakkada –Vizhinjam, 220 kV D/c line	Kerala	220 kV	Line	D/c	20	
24	Mylatty –Vidyanagar, 220 kV D/c line	Kerala	220 kV	Line	D/c	10	
	Telangana						
(A)	**New sub-stations / ICT augmentation**						
1	Uddandapur 400 kV S/s	Telangana	400/11 kV	S/s			1010
2	Laxmidevipally SS	Telangana	220/11 kV	S/s			370
3	Kokapet GIS 400 kV S/s	Telangana	400/220/132/33 kV	S/s			2170
4	Narlapur S/S (Augmentation) 400 kV S/s	Telangana	400/11 kV	S/s			800
5	Yedula S/S(Augmentation) 400 kV S/s	Telangana	400/11 kV	S/s			800
6	Vattem S/S(Augmentation) 400 kV S/s	Telangana	400/11 kV	S/s			800
7	Velgatoor 400 kV S/s	Telangana	400/11 kV	S/s			800
8	Namapur 400 kV S/s.	Telangana	400/11 kV	S/s			640
9	Kachapur Switching Station 400 kV S/s	Telangana	400 kV	S/s			0
10	Veljipur 400 kV S/s	Telangana	400 /11 kV	S/s			640
11	Yellaipally 400 kV S/s	Telangana	400/11 kV	S/s			960
12	New Tukkapur 400 kV S/s	Telangana	400/11 KV	S/s			480
13	Annaram 400 kV S/s	Telangana	400/220 kV	S/s			1500
14	Sarangapur 220 kV S/s	Telangana	220/11 KV	S/s			120
15	Manichippa 220 kV S/s	Telangana	220/11 KV	S/s			80
16	Metrajpally 220 kV S/s.	Telangana	220/11 KV	S/s			63
17	Devannapet 220 kV S/s	Telangana	220/11 kV	S/s			120
18	YacharamThanda 220 kV S/s.	Telangana	220/11 KV	S/s			120
(B)	**Trasmission lines**						
1	Telangana STPP - Narsapur 400 kV D/c line	Telangana	400 kV	Line	D/c	171	
2	Telangana STPP - Ramadugu 400 kV D/c line	Telangana	400 kV	Line	D/c	53	
3	LILO of both ckts of Mamidipally-Dindi 400 kV Line at Maheshwaram S/s	Telangana	400 kV	Line	2xD/c	4.5	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
4	Kethireddypally- Rayadurg GIS 400 kV D/c line (line 38.71 km and cable 3.048 km)	Telangana	400 kV	Line	D/c	41.7	
5	Julurupadu -Kamalapuram LI SS, 400 kV D/c line	Telangana	400 kV	Line	D/c	39.6	
6	YTPP Switchyard- Choutuppal, 400 kV D/c line	Telangana	400 kV	Line	D/c	92	
7	YTPP Switchyard-Damaracherla, 400 kV D/c line	Telangana	400 kV	Line	D/c	6.1	
8	YTPP Switchyard- Jangaon, 400 kV D/c line	Telangana	400 kV	Line	D/c	150	
9	YTPP Switchyard- Dindi, 400 kV D/c line	Telangana	400 kV	Line	D/c	103	
10	LILO of both circuits of Khammam-Mamidipally 400 kV D/c line at Choutuppal S/S	Telangana	400 kV	Line	2xD/c	17.1	
11	Yedula LI S/S - Narlapur LI SS, 400 kV D/c line	Telangana	400 kV	Line	D/c	30	
12	Yedula LI SS – Veltoor, 400 kV D/c line	Telangana	400 kV	Line	D/c	53	
13	Yedula LI SS – Dindi, 400 kV D/c line	Telangana	400 kV	Line	D/c	61	
14	Yedula LI SS - Vattem LI SS, 400 kV D/c line	Telangana	400 kV	Line	D/c	35	
15	Vattem LI SS- Uddandapur LI SS, 400 kV D/c line	Telangana	400 kV	Line	D/c	50	
16	Maheshwaram - Uddandapur LI SS, 400 kV D/c line	Telangana	400 kV	Line	D/c	65	
17	LILO of one circuit of Maheshwaram-Shankarpally 400 kV D/c line at Kokapet GIS	Telangana	400 kV	Line	D/c	25	
18	LILO of Gachibowli – Shivarampally 220 kV S/c line at Rayadurg GIS	Telangana	220 kV	Line	D/c	5.1	
19	LILO of Gachibowli – Shapurnagar 220 kV S/c line at Rayadurg GIS	Telangana	220 kV	Line	D/c	4.5	
20	LILO of Gachibowli – Miyapur 220 kV S/c line at Rayadurg GIS	Telangana	220 kV	Line	D/c	6.6	
21	LILO Gachibowli – Erragadda 220 kV S/c line at Rayadurg GIS	Telangana	220 kV	Line	D/c	3.3	
22	LILO of one circuit of 220 kV KTPS V-Lower Sileru –II, 220 kV D/c line at B.G.Kothur LI SS	Telangana	220 kV	Line	D/c	16.7	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
23	LILO of one circuit of KTPS-Manuguru 220 kV D/c line at B.G.Kothur LI SS	Telangana	220 kV	Line	D/c	0.5	
24	LILO of KTS-Lower Sileru-I 220 kV S/c line -220/11 kV V.K.Ramavaram LI SS	Telangana	220 kV	Line	D/c	1.4	
25	LILO of KTS – Lower Sileru-I 220 kV S/c line at Asupaka SS	Telangana	220 kV	Line	D/c	0.5	
26	Kamalapuram LI SS- V.K.Ramavaram LI SS 220 kV D/c line	Telangana	220 kV	Line	D/c	14.1	
27	Kethireddypalli SS-Laxmidevipalli LI SS 220 kV D/c line	Telangana	220 kV	Line	D/c	46	
28	SCCL Jaipur- Annaram SS 400 kV D/c line	Telangana	400 kV	Line	D/c	20	
29	LILO of both ckts of Jaipur – Gajwel 400 kV D/c line at Kachapur	Telangana	400 kV	Line	2xD/c	10	
30	LILO of both ckts of Narsapur SS - NTPC400 kV D/c line at Kachapur	Telangana	400 kV	Line	2xD/c	10	
31	Vadkapur Switching Station- Ramadugu 400 kV D/c line	Telangana	400 kV	Line	D/c	18	
32	Vadkapur Switching Station-Pegadapally LI SS 400 kV D/c line	Telangana	400 kV	Line	D/c	32	
33	Velgatoor Switchyard - Pegadapally 400 kV D/c line	Telangana	400 kV	Line	D/c	29	
34	Vadkapur Switching Station- Velgatoor 400 kV D/c line	Telangana	400 kV	Line	D/c	35	
35	Tippapur SS-Veljipur Switchyard 400 kV D/c line	Telangana	400 kV	Line	D/c	5	
36	Chandlapur SS- Chinnagundevelli 400 kV D/c line	Telangana	400 kV	Line	D/c	5	
37	Nizamabad SS - Chandlapur 400 kV D/c line	Telangana	400 kV	Line	D/c	120	
38	Tukkapur S/S- Tukkapur 1 Switchyard 400 kV D/c line	Telangana	400 kV	Line	D/c	0.5	
39	Jangaon –Devannapeta 220 kV D/c line	Telangana	220 kV	Line	D/c	55	
40	Dichpally- Yacharamthanda 220 kV D/c line	Telangana	220 kV	Line	D/c	26.5	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
41	Dichpally- Sarangapur 220 kV D/c line	Telangana	220 kV	Line	D/c	34.5	
42	Dichpally- Manchippa LIS 220 kV D/c line	Telangana	220 kV	Line	D/c	23	
43	LILO of Manchippa – Dichpally 220 kV line at Mentrajpally	Telangana	220 kV	Line	D/c	4	
44	LILO of Mahaboobabad-Warangal 220 kV at Ammavaripet	Telangana	220 kV	Line	D/c	62	
45	Gajwel-Siddipet 220 kV D/c line	Telangana	220 kV	Line	D/c	80	
46	Narsapur-Borampet 220 kV D/c line	Telangana	220 kV	Line	D/c	86	
47	Dindi-Kondamallepalli 220 kV D/c line	Telangana	220 kV	Line	D/c	70	
48	Dichpally-Banswada 220 kV D/c line	Telangana	220 kV	Line	D/c	120	
49	LILO of Pulukurthy-Bhimghanapur 220 kV line at KTPP S/s	Telangana	220 kV	Line	D/c	50	
50	LILO of Salivagu – Bheemghanpur 220 kV D/c line at KTPP S/s	Telangana	220 kV	Line	D/c	50	
51	KTPP-Manthani 220 kV D/c line	Telangana	220 kV	Line	D/c	98	
52	Nirmal-Indravelli 220 kV D/c line	Telangana	220 kV	Line	D/c	220	
53	Damaracharla-Miryalaguda 220 kV D/c line	Telangana	220 kV	Line	D/c	100	
54	Damaracharla-Huzurnagar 220 kV D/c line	Telangana	220 kV	Line	D/c	90	
55	LILO of both ckts of Malkaram - Narketpally 220 kV D/c line at Choutuppal S/s	Telangana	220 kV	Line	2xD/c	60	
56	Janagaon –Husnabad 220 kV D/c line	Telangana	220 kV	Line	D/c	120	
	Bihar						
(A)	**New sub-stations / ICT augmentation**						
1	Jakkanpur (New), Kuda Nawada,BGCIL 400/220/132/33 kV S/s	Bihar	400/220/132/33 kV	S/s			1000
2	Naubatpur (New),BGCIL 400 kV S/s	Bihar	400/220/132/33 kV	S/s			1000
3	Bhusaula(New), BGCIL 220/33 kV S/s	Bihar	220/33 kV	S/s			200
4	Chhapra, Saran 400/220/132 kV S/s	Bihar	400/220/132 kV	S/s			1000

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
(B)	**Transmission Line**						
1	LILO of 400 kV Barh-Motihari (DMTCL) D/c line at Chhapra (New)	Bihar	400 kV	Line	2xD/c	20	
2	LILO of Barh - Patna 400 kV D/c (Quad) line at Bakhtiyarpur (New)	Bihar	400 kV	Line	2xD/c	20	
3	Muzaffarpur (PG) – Goraul GSS 220 kV D/c line	Bihar	220 kV	Line	D/c	40	
4	Goraul – Tajpur GSS 220 kV D/c line	Bihar	220 kV	Line	D/c	90	
5	Kishanganj (New)–Thakurganj GSS 220 kV D/c line	Bihar	220 kV	Line	D/c	104	
6	Samastipur (New) – Tajpur GSS 220 kV D/c line	Bihar	220 kV	Line	D/c	60	
7	Amnour – Digha (New) GIS(River crossing) 220 kV D/c line	Bihar	220 kV	Line	D/c	96	
8	Biharshariff (BSPTCL) – Ashthawan GSS- 220 kV D/c line	Bihar	220 kV	Line	D/c	40	
9	Sheikhpur Sarai(BGCL) GIS – Ashthawan GSS- 220 kV D/c line	Bihar	220 kV	Line	D/c	40	
10	Sitamarhi(New) – Motipur 220 kV D/c (Twin moose) line	Bihar	220 kV	Line	D/c	108	
11	Sitamarhi(New) – Raxaul (New) 220 kV D/c (Twin Moose) line	Bihar	220 kV	Line	D/c	240	
12	LILO of Gaya (PG) – Sonenagar 220 kV D/c line at both Bodhgaya (BSPTCL) and Chandauti (New)	Bihar	220 kV	Line	2xD/c	62	
13	GSS Raxaul (new) - GSS Gopalganj 220 kV D/c (twin ACSR Moose conductor) line	Bihar	220 kV	Line	D/c	160	
14	Saharsa New- Begusarai 220 kV D/c (ACSR Zebra Conductor) line	Bihar	220 kV	Line	D/c	200	
15	Saharsa New- Khagaria New 220 kV D/c (ACSR Zebra Conductor) line	Bihar	220 kV	Line	D/c	160	
16	Bakhtiyarpur (New) - Sheikhpur Sarai(BGCL) 220 kV D/c line	Bihar	220 kV	Line	D/c	102	
17	Bakhtiyarpur (New) - Fatuha (BSPTCL) 220 kV D/c line	Bihar	220 kV	Line	D/c	56	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
18	Bakhtiyarpur(new) - Hathidah (new) 220 kV D/c Line	Bihar	220 kV	Line	D/c	104	
19	LILO of Sasaram(Pusauli PG) – Sahupuri 220 kV D/c at Karmnasa (New)	Bihar	220 kV	Line	D/c	12	
20	Karmnasa (New) – Pusauli (BSPTCL) 220 kV D/c (Twin Moose) line	Bihar	220 kV	Line	D/c	80	
21	LILO of Purnea (PG) – Begusarai 220 kV D/c at Korha (New)	Bihar	220 kV	Line	D/c	28	
22	Muzaffarpur (PG) – Amnour Chhapra (New) 220 kV D/c line	Bihar	220 kV	Line	D/c	130	
23	Chhapra (New) - Amnour 220 kV D/c (Twin Moose DCDS) line	Bihar	220 kV	Line	D/c	40	
24	Chhapra (New) - Gopalganj 220 kV D/c (Zebra DCDS) line	Bihar	220 kV	Line	D/c	180	
	West Bengal						
(A)	**New sub-stations / ICT augmentation**						
1	Jangalpur 220 kV S/s	West Bengal	220/132 kV	S/s			320
2	New Town AA-IIC 220 kV S/s	West Bengal	220/132 kV	S/s			320
3	New Town AA-IIC 220 kV S/s	West Bengal	220/33 kV	S/s			200
4	C.K.Road 220 kV S/s	West Bengal	220/132 kV	S/s			320
5	Deganga 220 kV S/s	West Bengal	220/132 kV	S/s			320
6	DPL AB Zone 220 kV S/s	West Bengal	220/132 kV	S/s			320
7	Falakata 220 kV S/s	West Bengal	220/132 kV	S/s			320
8	Food Park 220 kV S/s	West Bengal	220/132 kV	S/s			320

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
9	Jagadishpur 220 kV S/s	West Bengal	220/132 kV	S/s			320
10	Khanakul 220 kV S/s	West Bengal	220/33 kV	S/s			100
11	Kotasur 220 kV S/s	West Bengal	220/132 kV	S/s			320
12	Mahachanda 220 kV S/s	West Bengal	220/132 kV	S/s			320
13	Mongalpur 220 kV S/s	West Bengal	220/33 kV	S/s			200
14	Satgachia 400 kV (Upg) S/s	West Bengal	400/220 kV	S/s			1000
15	N. Lakshmikantapur 400 kV S/s	West Bengal	400/132 kV	S/s			630
16	New PPSP 400 kV S/s	West Bengal	400/132 kV	S/s			200
17	Raghunathpur 220 kV S/s	West Bengal	220/132 kV	S/s			320
18	Gokarna 400 kV (Aug) S/s	West Bengal	400/220 kV	S/s			315
19	Durgapur 400 kV (Aug) S/s	West Bengal	400/220 kV	S/s			315
(B)	**Transmission Line**						
1	Gokarna-Satgachia 400 kV D/c line	West Bengal	400 kV	Line	D/c	194	
2	Satgachia-N. Chanditala 400 kV D/c line	West Bengal	400 kV	Line	D/c	156	
3	Haldia Energy Ltd.-N. Laxmikantapur 400 kV D/c line	West Bengal	400 kV	Line	D/c	100	
4	N. Laxmikantapur-Subhasgram (PG) 400 kV D/c line	West Bengal	400 kV	Line	D/c	80	
5	Kharagpur-Midnapur (PG) 400 kV D/c line	West Bengal	400 kV	Line	D/c	230	
6	Midnapur (PG)-N. Chanditala 400 kV D/c line	West Bengal	400 kV	Line	D/c	194	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
7	Sagardighi TPS-Jeerat 400 kV S/c line	West Bengal	400 kV	Line	S/c	199	
8	Jeerat-Subhasgram (PG) 400 kV S/c line	West Bengal	400 kV	Line	S/c	64	
9	Rajarhat (PG)-New Town AA-IIC 220 kV D/c line	West Bengal	220 kV	Line	D/c	44	
10	STPS-Raghunathpur 220 kV D/c line	West Bengal	220 kV	Line	D/c	100	
11	Jeerat-Krishnagar 220 kV D/c line	West Bengal	220 kV	Line	D/c	130	
12	N. Chanditala-Jagadishpur 220 kV D/c line	West Bengal	220 kV	Line	D/c	40	
13	KTPP-Food Park 220 kV D/c line	West Bengal	220 kV	Line	D/c	104	
14	Food Park-Jangalpur 220 kV D/c line	West Bengal	220 kV	Line	D/c	14	
15	Jangalpur-Howrah 220 kV D/c line	West Bengal	220 kV	Line	D/c	22	
16	Jeerat-Deganga 220 kV D/c line	West Bengal	220 kV	Line	D/c	52	
17	Rajarhat (PG)-Barasat 220 kV D/c line	West Bengal	220 kV	Line	D/c	44	
18	STPS-Asansol 220 kV S/c line	West Bengal	220 kV	Line	S/c	68	
19	Asansol-JK Nagar (IPCL) 220 kV S/c line	West Bengal	220 kV	Line	S/c	80	
20	JK Nagar (IPCL)-Durgapur 220 kV S/c line	West Bengal	220 kV	Line	S/c	41	
21	Asansol-Mongalpur 220 kV S/c line	West Bengal	220 kV	Line	S/c	65	
22	Mongalpur-Durgapur 220 kV S/c line	West Bengal	220 kV	Line	S/c	27	
23	Satgachia-Rishra 220 kV D/c line	West Bengal	220 kV	Line	D/c	176	
24	Durgapur-DPL AB Zone 220 kV D/c line	West Bengal	220 kV	Line	D/c	21	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
25	DPL AB Zone-DPL 220 kV D/c line	West Bengal	220 kV	Line	D/c	3	
26	Alipurduar (PG)-Falakata 220 kV D/c line	West Bengal	220 kV	Line	D/c	68	
27	Falakata-Birpara (PG) 220 kV D/c line	West Bengal	220 kV	Line	D/c	62	
28	Subhasgram (PG)-KLC 220 kV S/c line	West Bengal	220 kV	Line	S/c	20	
29	KLC-New Town AA-III 220 kV S/c line	West Bengal	220 kV	Line	S/c	8	
30	Arambag-Khanakul 220 kV S/c line	West Bengal	220 kV	Line	S/c	31	
31	Khanakul-Domjur 220 kV S/c line	West Bengal	220 kV	Line	S/c	47	
32	BkTPP-Mahachanda 220 kV D/c line	West Bengal	220 kV	Line	D/c	183	
33	Mahachanda-Satgachia 220 kV D/c line	West Bengal	220 kV	Line	D/c	93	
34	Sadaipur-Kotasur 220 kV D/c line	West Bengal	220 kV	Line	D/c	87	
35	Kotasur-Gokarna 220 kV D/c line	West Bengal	220 kV	Line	D/c	85	
36	Arambag-CK Road 220 kV D/c line	West Bengal	220 kV	Line	D/c	110	
37	Purulia (DVC)-Budwan 220 kV D/c line	West Bengal	220 kV	Line	D/c	204	
38	CK Road-Midnapur 220 kV D/c line	West Bengal	220 kV	Line	D/c	134	
	Jharkhand						
(A)	**New sub-stations / ICT augmentation**						
1	MTPS (DVC) 400 kV S/s	Jharkhand	400/220 kV	S/s			630
2	Latehar 400 kV S/s	Jharkhand	400/220 kV	S/s			630
3	Patratu 400 kV S/s	Jharkhand	400/220 kV	S/s			630
4	Chatra 220 kV S/s	Jharkhand	220/132 kV	S/s			300

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
5	Ratu (Burmu) 220 kV S/s	Jharkhand	220/132 kV	S/s			300
6	Jainamore, Bokaro 220 kV S/s	Jharkhand	220/132 kV	S/s			300
7	Lohardagga 220 kV S/s	Jharkhand	220/132 kV	S/s			300
8	Ranchi Smart City (GIS) 220 kV S/s	Jharkhand	220/33 kV	S/s			195
9	Latehar 220 kV S/s	Jharkhand	220/132 kV	S/s			300
(B)	**Transmission Line**						
1	Gola (DVC)-Ranchi 220 kV D/c line	Jharkhand	220 kV	Line	D/c	116	
2	Latehar-Patratu (400 kV GSS) 400 kV D/c line	Jharkhand	400 kV	Line	D/c	220.3	
3	Essar (Latehar)-Latehar 400 kV D/c line	Jharkhand	400 kV	Line	D/c	80.88	
4	New Ranchi Bero (PGCIL)-Patratu (400 kV GSS) 400 kV D/c line	Jharkhand	400 kV	Line	D/c	101.92	
5	Chatra-Latehar 220 kV D/c line	Jharkhand	220 kV	Line	D/c	208	
6	Chatra-Pakribarwadih 220 kV D/c line	Jharkhand	220 kV	Line	D/c	117	
7	Patratu (400 kV GSS)-Ratu (Burmu) 220 kV D/c line	Jharkhand	220 kV	Line	D/c	61	
8	LILO of TTPS-Govindpur 220 kV D/c line at Jainamore	Jharkhand	220 kV	Line	2xD/c	70	
9	Chaibasa-Gua 220 kV D/c line	Jharkhand	220 kV	Line	D/c	168.34	
10	TTPS-Govindpur 220 kV D/c line	Jharkhand	220 kV	Line	D/c	181.44	
	Odisha						
(A)	**New sub-stations / ICT augmentation**						
1	Installation of 3rd ICT with 400 kV and 220 kV bay extension at New Duburi	Odisha	400/220 kV	S/s			315
2	Meramundali-B (GIS) 400 kV S/s	Odisha	400/220 kV	S/s			1000
3	Bhadrak 400 kV S/s	Odisha	400/220 kV	S/s			1000
4	Paradeep 400 kV S/s	Odisha	400/220 kV	S/s			1000
5	Khuntuni 400 kV S/s	Odisha	400/220 kV	S/s			1000
6	Narendrapur 400 kV S/s	Odisha	400/220 kV	S/s			1000

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
7	2x 160 MVA Auto Transformer at Joda (new) 220 kV S/s	Odisha	220/132 kV	S/s			320
8	2x 1500 MVA ICT at Paradeep(new) 765 kV S/s	Odisha	765/400 kV	S/s			3000
9	2x1500 ICT at Kolabira 765 kV S/s	Odisha	765/400 kV	S/s			3000
(B)	**Transmission Line**						
1	Paradeep substation-Pratapsasan substation 220 kV D/c line	Odisha	220 kV	Line	D/c	162	
2	New Duburi-Meramundali-B 400 kV D/c line	Odisha	400 kV	Line	D/c	340	
3	Kesinga-Baliguda 220 kV D/c line	Odisha	220 kV	Line	D/c	160	
4	LILO of Budhipadar- Tarkera 220 kV S/c line at Bamra.	Odisha	220 kV	Line	S/c	2	
5	LILO of Bhanjanagar-Meramundali 220 kV S/c line at Daspalla	Odisha	220 kV	Line	D/c	0.5	
6	LILO Rengali-Tarkera 220 kV S/c line at Deogarh	Odisha	220 kV	Line	S/c	0.5	
7	LILO of Duburi-Balasore ckt-I 220 kV S/c line atBalimunda (Dhamara)	Odisha	220 kV	Line	S/c	48	
8	LILO of one circuit of Mendhasal - Bidanasi 220 kV D/c line at Godisahi	Odisha	220 kV	Line	S/c	7.54	
9	Katapalli substation-Kiakata 220 kV D/c line	Odisha	220 kV	Line	D/c	170	
10	LILO of one ckt. of Budhipadar-Tarkera 220 kV D/c line at Kumarmunda	Odisha	220 kV	Line	S/c	4.25	
11	LILO of Budhipadar-Basundhara 220 kV S/c line at Lephripara	Odisha	220 kV	Line	S/c	5	
12	LILO of TTPS to Joda 220 kV S/c line at Telkoi	Odisha	220 kV	Line	S/c	10.25	
13	LILO of one ckt of Theruvali-Narendrapur 220 kV D/c line at Aska	Odisha	220 kV	Line	D/c	40	
14	LILO of one circuit of Cuttack - Pratapsasan 220 kV D/c line at Balianta	Odisha	220 kV	Line	S/c	10	
15	LILO of one circuit of Mendhasal - Chandaka 220 kV D/c line at Kantabada.	Odisha	220 kV	Line	S/c	2	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
16	LILO of one circuit of Joda-TTPS 220 kV D/c line at Keonjhar.	Odisha	220 kV	Line	S/c	2	
17	LILO of one ckt. of Duburi (New) -Paradeep 220 kV D/c line at Balichandrapur (Palei)	Odisha	220 kV	Line	S/c	5	
18	LILO of Pandiabil-Kuchei 400 kV D/c line at Bhadrak	Odisha	400 kV	Line	D/c	60	
19	LILO of Duburi -Balasore 220 kV D/c line at Bhadrak.	Odisha	220 kV	Line	D/c	0	
20	Duburi -Paradeep 400 kV D/c line	Odisha	400 kV	Line	D/c	224	
21	LILO of Pratapsasan -Paradeep 220 kV D/c line at Paradeep 400/220 kV substation.	Odisha	220 kV	Line	D/c	0	
22	LILO of Meramundali-B - Duburi 220 kV D/c line -at Dhenkanal (New) GIS.	Odisha	220 kV	Line	D/c	4	
23	LILO of one ckt. of Meramundali -Duburi 400 kV D/c line at Khuntuni.	Odisha	400 kV	Line	D/c	40	
24	LILO of one ckt. of Meramundali - Mendhasal 400 kV D/c line at Khuntuni.	Odisha	400 kV	Line	D/c	50	
25	Khuntuni -Dhenkanal 220 kV D/c line	Odisha	220 kV	Line	D/c	30	
26	Khuntuni -Bidanasi 220 kV D/c line	Odisha	220 kV	Line	D/c	64	
27	LILO of Narendrapur - Jeypur 400 kV D/c line at Theruvali.	Odisha	400 kV	Line	2xD/c	30	
28	Pandiabil -Narendrapur 400 kV D/c line	Odisha	400 kV	Line	D/c	264	
29	LILO of Therubali - Narendrapur 220 kV D/c line at Narendrapur.	Odisha	220 kV	Line	D/c	8	
30	LILO of TTPS- Joda 220 kV D/c line at Tikarapada	Odisha	220 kV	Line	D/c	30	
31	LILO of Tikarapada- Joda 220 kV D/c line at Joda (new)	Odisha	220 kV	Line	D/c	35	
32	LILO of Keonjhar -Joda 220 kV D/c line at Joda (new)	Odisha	220 kV	Line	D/c	32	
33	Tikarapada to Keonjar(PG) 220 kV D/c line	Odisha	220 kV	Line	D/c	45	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
34	LILO of Talcher- Rourkela 400 kV D/c line at Joda (new)	Odisha	400 kV	Line	D/c	62	
35	Anugul-Paradeep 765 kV D/c line	Odisha	765 kV	Line	D/c	200	
36	LILO of jarsuguda- anugul 765 kV D/c line at Kolabira	Odisha	765 kV	Line	D/c	60	
37	Kolabira-Bhusan 400 kV D/c line	Odisha	400 kV	Line	D/c	25	
38	Kolabira-Shyam steel 400 kV D/c line	Odisha	400 kV	Line	D/c	29	
39	Kolabira –Lapanga 400 kV D/c line	Odisha	400 kV	Line	D/c	60	
40	Kolabira –Bolangir 400 kV D/c line	Odisha	400 kV	Line	D/c	112	
41	NLC-Kolabira 765 kV D/c line	Odisha	765 kV	Line	D/c	50	
42	TTPS -Meramundali (B) 400 kV D/c line	Odisha	400 kV	Line	D/c	56	
43	TTPS - Anugul (PG) 400 kV D/c line	Odisha	400 kV	Line	D/c	54	
	Arunanchal Pradesh						
(A)	**New sub-stations / ICT augmentation**						
1	Seppa 132/33 kV S/s, 7x5 MVA (single phase-one spare)	Arunachal Pradesh	132/33 kV	S/s			30
2	Sagali 132/33 kV S/s, 7x5 MVA (single phase-one spare)	Arunachal Pradesh	132/33 kV	S/s			30
3	Naharlagun 132/33 kV, 2x31.5 MVA S/s	Arunachal Pradesh	132/33 kV	S/s			63
4	Gerukamukh 132/33 kV, 7x5 MVA (single phase-one spare) S/s	Arunachal Pradesh	132/33 kV	S/s			30
5	Likabali 132/33 kV, 7x5 MVA (single phase-one spare) S/s	Arunachal Pradesh	132/33 kV	S/s			30
6	Niglok 132/33 kV, 2x31.5 MVA S/s	Arunachal Pradesh	132/33 kV	S/s			63
7	Pasighat 132/33 kV, 7x5 MVA (single phase-one spare) S/s	Arunachal Pradesh	132/33 kV	S/s			30
8	Khonsa 132/33 kV, 7x5 MVA (single phase-one spare) S/s	Arunachal Pradesh	132/33 kV	S/s			30

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
9	Changlang 132/33 kV, 7x5 MVA (single phase-one spare) S/s	Arunachal Pradesh	132/33 kV	S/s			30
10	Jairampur 132/33 kV, 7x5 MVA (single phase-one spare) S/s	Arunachal Pradesh	132/33 kV	S/s			30
11	Miao 132/33 kV, 7x5 MVA (single phase-one spare) S/s	Arunachal Pradesh	132/33 kV	S/s			30
12	Halaipani 132/33 kV, 4x5 MVA (single phase-one spare) S/s	Arunachal Pradesh	132/33 kV	S/s			15
13	Banderdewa 132/33 kV, 2x25 MVA (single phase-one spare) S/s	Arunachal Pradesh	132/33 kV	S/s			50
14	Palin 132/33 kV substation (7x5 MVA single Phase)	Arunachal Pradesh	132/33 kV	S/s			30
15	Koloriang 132/33 kV Substation (7x5 MVA single Phase)	Arunachal Pradesh	132/33 kV	S/s			30
16	Basar 132/33 kV Substation (7x5 MVA single Phase)	Arunachal Pradesh	132/33 kV	S/s			30
17	Yingkiong 132/33 kV Substation (7x5 MVA single Phase)	Arunachal Pradesh	132/33 kV	S/s			30
18	Dambuk 132/33 kV Substation (4x5 MVA single Phase)	Arunachal Pradesh	132/33 kV	S/s			15
19	Seijosa 132/33 kV Substation (4x5 MVA single Phase)	Arunachal Pradesh	132/33 kV	S/s			15
20	Bameng 132/33 kV Substation (4x5 MVA single Phase)	Arunachal Pradesh	132/33 kV	S/s			15
21	4x8 MVA, 132/33 kV ICT augmentation at Ziro 132/33 kV Substation	Arunachal Pradesh	132/33 kV	S/s			24
22	2x12.5 MVA, 132/33 kV ICT augmentation at Daporijo 132/33 kV Substation	Arunachal Pradesh	132/33 kV	S/s			25
23	Kambang 132/33 kV Substation (4x5 MVA single Phase)	Arunachal Pradesh	132/33 kV	S/s			15
(B)	**Transmission Lines**						
1	Pasighat New (Napit)-Pasighat Old 132 kV D/c line	Arunachal Pradesh	132 kV	Line	D/c	4	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
2	Chimpu (Itanagar)-Holongi 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	11	
3	LILO of Daporijo-Along 132 kV D/c line at Basar	Arunachal Pradesh	132 kV	Line	D/c	120	
4	Deomali – Khonsa 132 kV S/c line	Arunachal Pradesh	132 kV	Line	S/c	22	
5	Khonsa – Changlong 132 kV S/c line	Arunachal Pradesh	132 kV	Line	S/c	28	
6	Changlang – Jairampur 132 kV S/c line	Arunachal Pradesh	132 kV	Line	S/c	36	
7	Jairampur - Miao 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c	24	
8	Ziro - Palin 132 kV S/c line	Arunachal Pradesh	132 kV	Line	S/c	25	
9	Khupi - Seppa 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	40	
10	Sagali-Naharlagun 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	25	
11	Naharlagun-Gerukamukh 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	72	
12	Gerukamukh – Likabali 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	45	
13	Likabali – Niglok 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	50	
14	Niglok-Pasighat 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	24	
15	Miao - Namsai (PG) 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	40	
16	Teju-Halaipani 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	45	
17	Naharlagun-Banderdewa132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	12	
18	Palin-Koloriang 132 kV S/c line	Arunachal Pradesh	132 kV	Line	S/c on D/c	35	
19	Roing - Anini 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	76	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
20	Along - Yingkiong 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	55	
21	Along – Kambang 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	120	
22	Kambang – Mechuka 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	100	
23	Yingkiong – Tuting 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	40	
24	Ziro (PG) - Ziro (New) 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	5	
25	Tawang – Lumla 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	35	
26	Daporijo – Nacho 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	45	
27	Khonsa – Longding 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	50	
28	Roing (PG) – Dambuk 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	35	
29	Pasighat Old – Mariyang 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	80	
30	Rilo – Seijosa 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	200	
31	Seppa – Bameng 132 kV S/c line on D/c tower	Arunachal Pradesh	132 kV	Line	S/c on D/c	45	
	Assam						
(A)	**New sub-stations / ICT augmentation**						
1	AIIMS 132/33 kV, 1x50 MVA S/s	Assam	132/33 kV	S/s			50
2	Nathkuchi 132/33 kV, 2x50 MVA S/s	Assam	132/33 kV	S/s			100
3	Hatsingimari 132/33 kV, 2x16 MVA S/s	Assam	132/33 kV	S/s			32
4	Karimganj 132/33 kV, 2x25 MVA S/s	Assam	132/33 kV	S/s			50
5	Barpeta 132/33 kV, 2x25 MVA S/s	Assam	132/33 kV	S/s			50
6	Tezpur 132/33 kV, 2x50 MVA S/s	Assam	132/33 kV	S/s			100

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
7	Silapathar 132/33 kV, 2x31.5 MVA S/s	Assam	132/33 kV	S/s			63
8	Chapakhowa 132/33 kV, 2x31.5 MVA S/s	Assam	132/33 kV	S/s			63
9	Sarupathar 132/33 kV, 2x31.5 MVA S/s	Assam	132/33 kV	S/s			63
10	Teok 132/33 kV, 2x31.5 MVA S/s	Assam	132/33 kV	S/s			63
11	Tangla 132/33 kV, 2x31.5 MVA S/s	Assam	132/33 kV	S/s			63
12	Hazo 132/33 kV, 2x31.5 MVA S/s	Assam	132/33 kV	S/s			63
13	Paltanbazar GIS 132/33 kV, 2x50 MVA S/s	Assam	132/33 kV	S/s			100
14	GMC GIS 132/33 kV, 2x50 MVA S/s	Assam	132/33 kV	S/s			100
15	Amingaon GIS 220/132 kV, 2x160 MVA S/s	Assam	220/132 kV	S/s			320
16	Behaiting 220/132 kV, 2x100 MVA S/s	Assam	220/132 kV	S/s			200
17	Khumtai 220/132 kV, 2x160 MVA & 132/33 kV, 2x50 MVA S/s	Assam	220/132/33 kV	S/s			420
18	Bihpuria 220/33 kV, 2x100 MVA S/s	Assam	220/33 kV	S/s			200
19	Jakhlabandha GIS 220/33 kV, 2x100 MVA S/s	Assam	220/33 kV	S/s			200
20	Chaygaon GIS 220/33 kV, 2x100 MVA S/s	Assam	220/33 kV	S/s			200
21	Burhigaon GIS 132/33 kV, 2x50 MVA S/s	Assam	132/33 kV	S/s			100
22	Nagaon-2 GIS 220/33 kV, 2x100 MVA S/s	Assam	220/33 kV	S/s			200
23	Lumding GIS 132/33 kV, 2x50 MVA S/s	Assam	132/33 kV	S/s			100
24	Rowta(new) 220/132 kV, 2x160 MVA S/s	Assam	220/132 kV	S/s			320
25	Rangia 400/220 kV, 2x500 MVA S/s	Assam	400/220 kV	S/s			1000
26	Sonapur 400/220 kV, 2x500 MVA S/s	Assam	400/220 kV	S/s			1000
27	Agomoni GIS 220/132 kV, 2x160 MVA S/s	Assam	220/132 kV	S/s			320
28	Agomoni GIS 132/33 kV, 2x50 MVA S/s	Assam	132/33 kV	S/s			100
29	Shankardevnagar GIS 220/132 kV, 2x160 MVA S/s	Assam	220/132 kV	S/s			320
30	Boragaon GIS 220/33 kV, 2x100 MVA S/s	Assam	220/33 kV	S/s			200
31	Panjabari GIS 220/33 kV, 2x100 MVA S/s	Assam	220/33 kV	S/s			200
32	Zoo Road GIS 132/33 kV, 2x50 MVA S/s	Assam	132/33 kV	S/s			100
33	Serfanguri 132/33 kV, 2x50 MVA S/s	Assam	132/33 kV	S/s			100

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
34	Dhing 132/33 kV, 2x50 MVA S/s	Assam	132/33 kV	S/s			100
35	Ghungur GIS 132/33 kV, 2x50 MVA S/s	Assam	132/33 kV	S/s			100
36	Titabor GIS 132/33 kV, 2x50 MVA S/s	Assam	132/33 kV	S/s			100
37	Kumarikata 132/33 kV, 2x50 MVA S/s	Assam	132/33 kV	S/s			100
38	Chabua 132/33 kV, 2x50 MVA S/s	Assam	132/33 kV	S/s			100
39	Morigaon 132/33 kV, 2x50 MVA S/s	Assam	132/33 kV	S/s			100
40	Amayapur 132/33 kV, 2x50 MVA S/s	Assam	132/33 kV	S/s			100
41	Dhupdhara 132/33 kV, 2x50 MVA S/s	Assam	132/33 kV	S/s			100
(B)	**Transmission Lines**						
1	LILO of Kahilipara-Kamalpur 132 kV D/c line at AIIMS (Amingaon)	Assam	132 kV	Line	D/c	1	
2	LILO of Rangia-Barnagar 132 kV D/c line at Nathkuchi	Assam	132 kV	Line	D/c	1.4	
3	Agia-Hatsingimari 132 kV S/c line	Assam	132 kV	Line	S/c	108.18	
4	Salakati(BTPS)-APM 132 kV S/c line	Assam	132 kV	Line	S/c	42.48	
5	Hailakandi-Karimganj 132 kV S/c line	Assam	132 kV	Line	S/c	27	
6	Lilo of Dhaligaon- Nalbari 132 kV D/c Line at Barpeta	Assam	132 kV	Line	D/c	47.6	
7	Sonabil-Biswanath Chariali 220 kV S/c line	Assam	220 kV	Line	S/c	42.76	
8	Sonapur-Baghjhap 132 kV D/c line	Assam	132 kV	Line	D/c	54	
9	Tinsukia-Behaiting 220 kV D/c line	Assam	220 kV	Line	D/c	99.38	
10	Dhemaji-Silapathar 132 kV S/c line	Assam	132 kV	Line	S/c	35.88	
11	Rupai-Chapakhowa 132 kV S/c line	Assam	132 kV	Line	S/c	44	
12	Rangia-Amingaon 220 kV D/c line	Assam	220 kV	Line	D/c	66	
13	LILO of Rangia-Rowta 132 kV S/c line at Tangla	Assam	132 kV	Line	S/c	10.87	
14	LILO of Kamalpur-Sishugram 132 kV S/c line at Amingaon	Assam	132 kV	Line	S/c	9.34	
15	LILO of Kamalpur-Kamakhya 132 kV S/c line at Amingaon	Assam	132 kV	Line	S/c	9.34	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
16	LILO of Golaghat- Bokajan 132 kV S/c line at Sarupathar	Assam	132 kV	Line	S/c	0.27	
17	Sonabil-Tezpur 132 kV D/c line	Assam	132 kV	Line	D/c	31.98	
18	LILO of Jorhat- Nazira 132 kV S/c line at Teok	Assam	132 kV	Line	S/c	0.944	
19	Kamakhya-PaltanBazar 132 kV S/c line	Assam	132 kV	Line	S/c	4.5	
20	Kahilpara-GMC 132 kV D/c line	Assam	132 kV	Line	D/c	12.8	
21	Amingaon-Hazo 132 kV D/c line	Assam	132 kV	Line	D/c	17.2	
22	LILO of 01st circuit of Samaguri-Mariani 220 kV D/c Line at Khumtai	Assam	220 kV	Line	S/c	6	
23	LILO of 02nd circuit of Samaguri-Mariani 220 kV D/c Line at Khumtai	Assam	220 kV	Line	S/c	5	
24	LILO of Jorhat(W)-Bokakhat 132 kV S/c line at Khumtai	Assam	132 kV	Line	S/c	5	
25	Khumtai-Sarupathar 132 kV S/c line	Assam	132 kV	Line	S/c	60	
26	Sonabil-Bihpuria 220 kV D/c line	Assam	220 kV	Line	D/c	156	
27	LILO of one circuit of Samaguri-Mariani 220 kV D/c line at Jakhalabandha	Assam	220 kV	Line	S/c	10	
28	LILO of Azara-Boko 220 kV D/c line at Chaygaon	Assam	220 kV	Line	D/c	6	
29	LILO of Sipajhar-Rowta 132 kV S/c line at Burhigaon	Assam	132 kV	Line	S/c	15	
30	LILO of one ckt of Samaguri-Jwaharnagar 220 kV D/c line at Nagaon-2	Assam	220 kV	Line	S/c	1	
31	LILO of Sharkardevnagar - Diphu 132 kV S/c line at Lumding	Assam	132 kV	Line	S/c	10	
32	Rangia-Rowta 220 kV D/c line	Assam	220 kV	Line	D/c	160	
33	LILO of one ckt of Balipara-Bongaigaon 400 kV D/c line at Rangia	Assam	400 kV	Line	S/c	21	
34	LILO of one ckt of Rangia-Amingaon 220 kV D/c line at Rangia	Assam	220 kV	Line	D/c	20	
35	LILO of one ckt of Silchar-Byrnihat 400 kV D/c line at Sonapur	Assam	400 kV	Line	S/c	25	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
36	LILO of both ckt of Alipurduar-Bongaigaon 220 kV D/c line at Agomoni	Assam	220 kV	Line	D/c	6	
37	LILO of Gossaigaon-Gauripur 132 kV D/c line at Agomoni	Assam	132 kV	Line	D/c	20	
38	Shankardevnagar-Misa 220 kV D/c line	Assam	220 kV	Line	D/c	50	
39	Shankardevnagar-LKHEP 220 kV D/c line	Assam	220 kV	Line	D/c	100	
40	Boragaon-Kukurmara 220 kV D/c line	Assam	220 kV	Line	D/c	42	
41	LILO of Sonapur-Sarusajai 220 kV D/c line at Panjabari	Assam	220 kV	Line	S/c	3	
42	Zoo Road-GMC 220 kV S/c line	Assam	220 kV	Line	S/c	8	
43	Serfanguri-Kokrajhar 132 kV D/c line	Assam	132 kV	Line	D/c	36	
44	Dhing-Nagaon 132 kV S/c line	Assam	132 kV	Line	S/c	35	
45	Ghungur-Srikona 132 kV S/c line	Assam	132 kV	Line	S/c	10	
46	Titabor-Mariani 132 kV D/c line	Assam	132 kV	Line	D/c	40	
47	Kumarikata-Nalbari 132 kV S/c line	Assam	132 kV	Line	S/c	40	
48	LILO of Tinsukia-Dibrugarh 132 kV S/c line Chabua	Assam	132 kV	Line	S/c	8	
49	Bagjhap-Morigaon 132 kV D/c line	Assam	132 kV	Line	D/c	40	
50	Amayapur-Hajo 132 kV D/c line	Assam	132 kV	Line	D/c	50	
51	Dhupdhara-Boko 132 kV D/c line	Assam	132 kV	Line	D/c	50	
	Meghalaya						
(A)	**New sub-stations / ICT augmentation**						
1	Mawphlang 220/132 kV S/s	Meghalaya	220/132 kV	S/s			320
2	New Shillong 220/132 kV S/s	Meghalaya	220/132 kV	S/s			320
3	New Shillong 132/33 kV S/s	Meghalaya	132/33 kV	S/s			100
4	Mynkre 132/33 kV S/s	Meghalaya	132/33 kV	S/s			100
5	Phulbari 132/33 kV S/s	Meghalaya	132/33 kV	S/s			100
6	ICT Augmentation at Mawlai – 132/33 kV S/s	Meghalaya	132/33 kV	S/s			150

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
7	Nongpoh 132/33 kV S/s	Meghalaya	132/33 kV	S/s			50
8	Baghmara 132/33 kV S/s	Meghalaya	132/33 kV	S/s			50
9	IIM 132/33 kV S/s	Meghalaya	132/33 kV	S/s			40
10	Ampati 132/33 kV S/s	Meghalaya	132/33 kV	S/s			25
11	Rongkhon 132/33 kV S/s	Meghalaya	132/33 kV	S/s			20
12	Praharinagar 132/33 kV S/s	Meghalaya	132/33 kV	S/s			25
13	Killing 132/33 kV S/s	Meghalaya	132/33 kV	S/s			40
14	Ichamati 220/132 kV S/s	Meghalaya	220/132 kV	S/s			320
15	Ichamati 132/33 kV S/s	Meghalaya	132/33 kV	S/s			100
16	Sohra 220/132 kV S/s	Meghalaya	220/132 kV	S/s			320
17	ICT – Augmentation at Sohra 132/33 kV S/s	Meghalaya	132/33 kV	S/s			100
18	ICT Augmentation at NEHU – 132/33 kV S/s	Meghalaya	132/33 kV	S/s			100
19	ICT Augmentation at Khliehriat – 132/33 kV S/s	Meghalaya	132/33 kV	S/s			100
20	ICT Augmentation at Nangalbibra – 132/33 kV S/s	Meghalaya	132/33 kV	S/s			100
(B)	**Transmission Lines**						
1	Killing-Mawngap 220 kV D/c line	Meghalaya	220 kV	Line	D/c	172.52	
2	Mawngap-New Shillong 220 kV D/c line	Meghalaya	220 kV	Line	D/c	85.8	
3	LILO of Myntdu-Leshka P/S - Khliehriat S/S 132 kV D/c line at Mynkre	Meghalaya	132 kV	Line	D/c	51.664	
4	Ampati-Phulbari 132 kV D/c line	Meghalaya	132 kV	Line	D/c	99.376	
5	Mawngap-Sohra 220 kV D/c line	Meghalaya	220 kV	Line	D/c	360	
6	Sohra-Ichamati 220 kV D/c line	Meghalaya	220 kV	Line	D/c	120	
7	LILO of Rongkhon-Ampati 132 kV D/c line at Praharinagar	Meghalaya	132 kV	Line	D/c	20	
8	Nangalbibra (PGCIL)-Sohra 220 kV D/c line	Meghalaya	220 kV	Line	D/c	320	
9	Nangalbibra-Nangalbibra (PGCIL) 132 kV D/c line	Meghalaya	132 kV	Line	D/c	20	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
10	LILO of Umiam Stage-III P/S - Umtru P/S 132 kV D/c line at Nongpoh	Meghalaya	132 kV	Line	M/C	10	
11	LILO of Umtru P/S - Kahelipara 132 kV D/c line at Killing	Meghalaya	132 kV	Line	D/c	20	
12	New Shillong-IIM 132 kV S/c line	Meghalaya	132 kV	Line	S/c	10	
13	Rongkhon-Ganol SHEP 132 kV S/c line	Meghalaya	132 kV	Line	S/c	10	
14	Nangalbibra-Baghmara 132 kV D/c line	Meghalaya	132 kV	Line	D/c	120	
	Nagaland						
(A)	**New sub-stations / ICT augmentation**						
1	Tsitronge 220/132/33 kV S/s	Nagaland	220/132/33 kV	S/s			300
2	Zhadima/New Kohima 220/132/33 kV S/s	Nagaland	220/132/33 kV	S/s			100
3	Doyang(NH-61), Wokha 132/33 kV S/s	Nagaland	132/33 kV	S/s			10
4	Nagarjan 66/33 kV S/s	Nagaland	66/33 kV	S/s			50
5	Cheiphobozou 132/33 kV S/s	Nagaland	132/33 kV	S/s			12.5
6	Longnak 132/33 kV S/s	Nagaland	132/33 kV	S/s			50
7	Longleng 132/33 kV S/s	Nagaland	132/33 kV	S/s			20
8	New Secretariat Complex Kohima 132/33 kV S/s	Nagaland	132/33 kV	S/s			50
9	Pfutsero 132/33 kV S/s	Nagaland	132/33 kV	S/s			50
10	Zunheboto 132/33 kV S/s	Nagaland	132/33 kV	S/s			50
11	Tuensang 132/33 kV S/s	Nagaland	132/33 kV	S/s			20
(B)	**Transmission Lines**						
1	Dimapur-Zhadima/New Kohima 220 kV D/c line	Nagaland	220 kV	Line	D/c	138	
2	Zhadima/New Kohima-Mokokchung(PG) 220 kV D/c line	Nagaland	220 kV	Line	D/c	184	
3	Tuensang-Longleng 132 kV D/c line	Nagaland	132 kV	Line	D/c	72	
4	Zhadima/New Kohima-New Secretariat 132 kV D/c line	Nagaland	132 kV	Line	D/c	56	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
5	LILO of Kohima-Wokha 132 kV D/c line at Zhadima/New Kohima	Nagaland	132 kV	Line	D/c	30	
6	LILO of Kohima-Meluri 132 kV D/c line at Pfutsero	Nagaland	132 kV	Line	D/c	32	
7	LILO of Mokokchung-Mariani 132 kV D/c line at Longnak	Nagaland	132 kV	Line	D/c	1	
8	Wokha-Mokocbung 132 kV D/c line via Zunheboto	Nagaland	132 kV	Line	D/c	194	
	Manipur						
(A)	**New sub-stations / ICT augmentation**						
1	Khoupum 132/33 kV S/s	Manipur	132/33 kV	S/s			25
2	Kamjong 132/33 kV S/s	Manipur	132/33 kV	S/s			25
3	Maram 132/33 kV S/s	Manipur	132/33 kV	S/s			25
4	Chandel (Augmentation) 132/33 kV S/s	Manipur	132/33 kV	S/s			40
5	Moreh (Augmentation) 132/33 kV S/s	Manipur	132/33 kV	S/s			40
(B)	**Transmission Lines**						
1	Tamenglong-Karong 132 kV S/c line	Manipur	132 kV	Line	S/c	70	
2	Rengpang-Khoupum 132 kV S/c line	Manipur	132 kV	Line	S/c	10	
3	Hundung-Kamjong 132 kV S/c line	Manipur	132 kV	Line	S/c	55	
4	Karong –Maram 132 kV S/c line	Manipur	132 kV	Line	S/c	4	
5	2nd circuit stringing of Heikakpokpi (Kakching)-Chandel 132 kV D/c line	Manipur	132 kV	Line	S/c	16	
6	2nd circuit stringing of Kakching-Moreh 132 kV D/c line	Manipur	132 kV	Line	S/c	45	
7	2nd circuit stringing of Yaingangpokpi –Hundung 132 kV D/c line	Manipur	132 kV	Line	S/c	27	
8	2nd circuit stringing of Thoubal -Moreh 132 kV D/c line	Manipur	132 kV	Line	S/c	70	
9	2nd circuit stringing of Ningthoukhong –Yurembam 132 kV D/c line	Manipur	132 kV	Line	S/c	32.25	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
10	2nd circuit stringing of Rengpang –Tamenglong 132 kV D/c line	Manipur	132 kV	Line	S/c	21.405	
	Tripura						
(A)	**New sub-stations / ICT augmentation**						
1	Belonia (New) 132/33 kV S/s	Tripura	132/33 kV	S/s			100
2	Bagafa (New) 132/33 kV S/s	Tripura	132/33 kV	S/s			100
3	Sabroom (New) 132/33 kV S/s	Tripura	132/33 kV	S/s			63
4	Satchand (New) 132/33 kV S/s	Tripura	132/33 kV	S/s			63
5	Rabindra Nagar (New) 132/33 kV S/s	Tripura	132/33 kV	S/s			100
6	Gokul Nagar (New) 132/33 kV S/s	Tripura	132/33 kV	S/s			100
7	Mohonpur (New) 132/33 kV S/s	Tripura	132/33 kV	S/s			63
8	Manu (New) 132/33 kV S/s	Tripura	132/33 kV	S/s			100
9	Amarpur (New) 132/33 kV S/s	Tripura	132/33 kV	S/s			63
10	ICT Augmentation at Udaipur 132/33 kV s/s	Tripura	132/33 kV	S/s			100
11	ICT Augmentation at Jirania 132/33 kV S/S	Tripura	132/33 kV	S/s			63
12	Extn. of 132/33 kV Kailasahar S/S	Tripura	132/33 kV	S/s			100
13	ICT Augmentation at Ambassa 132/33kV S/S	Tripura	132/33 kV	S/s			31.5
14	ICT Augmentation at Dhalabil (Khowai) 132/33 kV S/S	Tripura	132/33 kV	S/s			63
15	Bishramganj (New) 132/33 kV S/S	Tripura	132/33 kV	S/s			20
(B)	**Transmission Lines**						
1	Bagafa-Belonia 132 kV D/c line	Tripura	132 kV	Line	D/c	25.49	
2	Udaipur-Bagafa 132 kV D/c line	Tripura	132 kV	Line	D/c	63.886	
3	Bagafa-Satchand 132 kV S/c line	Tripura	132 kV	Line	S/c	29.543	
4	Inter-connection of Sabroom-Satchand 132 kV S/c line at Satchand end-Satchand	Tripura	132 kV	Line	S/c	2.528	
5	Rabindranagar-Rokhia 132 kV D/c line	Tripura	132 kV	Line	D/c	44.062	
6	Rabindranagar-Belonia 132 kV D/c line	Tripura	132 kV	Line	D/c	127.218	

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
7	Belonia-Sabroom 132 kV D/c line	Tripura	132 kV	Line	D/c	77.24	
8	LILO of Surjyamaninagar-Rokhia 132 kV D/c line at Gokulnagar	Tripura	132 kV	Line	D/c	4.98	
9	Inter-connection of Sabroom-Satchand 132 kV S/c line at Sabroom end-Sabroom	Tripura	132 kV	Line	S/c	1.153	
10	Kailasahar-Dharamnagar 132 kV D/c line	Tripura	132 kV	Line	D/c	43.48	
11	LILO of Agartala (79 Tilla)-Dhalabil 132 kV D/c line at Mohanpur	Tripura	132 kV	Line	D/c	2.48	
12	Udaipur-Amarpur 132 kV D/c line	Tripura	132 kV	Line	D/c	30.4	
13	LILO of Ambassa-P.K.Bari 132 kV D/c line at Manu	Tripura	132 kV	Line	D/c	1.258	
14	Inter-connection of Manu (old)-Manu (new) 132 kV S/c line for charging 132 kV Manu-Chamuna S/c line	Tripura	132 kV	Line	S/c	7.48	
15	Surjamaninagar-Monarchak 132 kV D/c line	Tripura	132 kV	Line	D/c	86.242	
16	Surjamaninagar-Rokhia 132 kV D/c line	Tripura	132 kV	Line	D/c	42.808	
17	Gamaitilla-Dhalabill 132 kV S/c line	Tripura	132 kV	Line	S/c	30.4	
	Mizoram						
(A)	**New sub-stations / ICT augmentation**						
1	Bawktlang S/s, Kolashib 132/33 kV, 2x20 MVA S/s	Mizoram	132/33 kV	S/s			40
2	Luangmual 132/33 kV, 1x12.5 & 2x20 MVA S/s	Mizoram	132/33 kV	S/s			52.5
3	Saitual 132/33 kV, 2x12.5 MVA S/s	Mizoram	132/33 kV	S/s			25
4	Khawmzawl 132/33 kV, 2x12.5 MVA S/s	Mizoram	132/33 kV	S/s			25
5	Champai 132/33 kV, 2x12.5 MVA S/s	Mizoram	132/33 kV	S/s			25
6	E.Lungdar 132/33 kV, 1x6.3 & 1x12.5 MVA S/s	Mizoram	132/33 kV	S/s			18.8
7	Bukpui 132/33 kV, 1x6.3 & 2x12.5 MVA S/s	Mizoram	132/33 kV	S/s			31.3
8	Lawngtlai 132/33 kV, 2x12.5 MVA S/s	Mizoram	132/33 kV	S/s			25
(B)	**Transmission Lines**						

Sl. No.	Scheme /details	State	Voltage (kV)	Type of Work	No. of circuits	ckm	MVA
1	Saiha to Lawngtlai 132 kV S/c line on D/c tower	Mizoram	132 kV	Line	S/c on D/c	43.65	
2	Hnathial to Bukpui 132 kV D/c line	Mizoram	132 kV	Line	D/c	110	
3	S. Bungtlang to Lawngtlai 132 kV S/c line on D/c tower	Mizoram	132 kV	Line	S/c on D/c	60	
4	Marpara to Thenhlum 132 kV S/c line	Mizoram	132 kV	Line	S/c	26	
5	Khawzawl to Champai 132 kV S/c line on D/c tower	Mizoram	132 kV	Line	S/c on D/c	20	
6	Lungsen - Chawngte (charged at 33kV) 132 kV S/c line	Mizoram	132 kV	Line	S/c	62	
7	Chawngte - S. Bungtlang(charged at 33kV) 132 kV S/c line	Mizoram	132 kV	Line	S/c	55	
8	Tuirial-Kolasib 132 kV S/c (operated at 33 kV) - (existing) 132 kV S/c line	Mizoram	132 kV	Line	S/c	95	
9	W. Phaileng – Marpara 132 kV S/c line on D/c tower	Mizoram	132 kV	Line	S/c on D/c	85	

Annex – 7.2

Details of Dynamic Compensation devices (Existing, under construction and planned)

Sl. No.	Location	Dynamic Compensation (STATCOM)	Dynamic Compensation (SVC)	Mechanically Switched Compensation (MVAR)		Status
				Reactor	Capacitor	
	Northern Region					
1	Nalagarh	± 200 MVAR		2x125	2x125	Commissioned
2	New Lucknow	± 300 MVAR		2x125	1x125	Commissioned
3	New Wanpoh		(+)300 / (-)200 MVAR			Commissioned
4	Kankroli		(+)400 / (-)300 MVAR			Commissioned
5	Ludhiana		(+)600 / (-)400 MVAR			Commissioned
6	Fatehgarh-II	± 2x300 MVAR		2x125	4x125	Commissioned
7	Bhadla-II	± 2x300 MVAR		2x125	4x125	Commissioned
8	Bikaner-II	± 300 MVAR		1x125	2x125	Commissioned
9	Fatehgarh-III	± 2x300 MVAR		2x125	4x125	Planned
10	Ramgarh	± 2x300 MVAR		2x125	4x125	Planned
	Western Region					
11	Solapur	± 300 MVAR		2x125	1x125	Commissioned
12	Gwalior	± 200 MVAR		2x125	1x125	Commissioned
13	Satna	± 300 MVAR		2x125	1x125	Commissioned
14	Aurangabad (PG)	± 300 MVAR		2x125	1x125	Commissioned
15	Boisar-II	± 300 MVAR		1x125	3x125	Under Implementation
16	Navsari New	± 300 MVAR		1x125	3x125	Under Implementation
17	Khavda PS-I Bus Section-I	± 300 MVAR		2x125	1x125	Under Implementation
18	Khavda PS-I Bus Section-II	± 300 MVAR		2x125	1x125	Under Implementation
19	Khavda PS-III Bus Section-I	± 300 MVAR		2x125	1x125	Under Implementation
20	Khavda PS-III Bus Section-II	± 300 MVAR		2x125	1x125	Under Implementation
21	Boisar-II Bus Section-I	± 200 MVAR		1x125	2x125	Under Implementation
22	Boisar-II Bus Section-II	± 200 MVAR		1x125	2x125	Under Implementation
23	Jamnagar	± 400 MVAR		2x125	3x125	Under Implementation
	Southern Region					
24	Hyderabad (PG)	± 200 MVAR		2x125	1x125	Commissioned
25	Udumalpet	± 200 MVAR		2x125	1x125	Commissioned
26	Trichy	± 200 MVAR		2x125	1x125	Commissioned
27	NP Kunta	± 100 MVAR		-	-	Commissioned
	Eastern Region					
28	Rourkela	± 300 MVAR		2x125	-	Commissioned
29	Kishanganj	± 200 MVAR		2x125	-	Commissioned
30	Ranchi (New)	± 300 MVAR		2x125	-	Commissioned
31	Jeypore	± 200 MVAR		2x125	2x125	Commissioned

Annex – 7.4

Inter-regional Transmission Links and Capacity (MW)			
	Inter Regional transmission Capacity as on 31.03.2022 (MW)	**Addition likely during the period 2022-27 (MW)**	**Inter Regional Transmission Capacity likely by the end of 2026-27 (31.03.2027) (MW)**
EAST-NORTH			
Dehri-Sahupuri 220 kV S/c line	130		130
Muzaffarpur-Gorakhpur 400 kV D/c line (with Series Cap+TCSC)	2000		2000
Patna – Balia 400 kV D/c (Quad) line	1600		1600
Biharshariff – Balia 400 kV D/c (Quad) line	1600		1600
Barh – Patna - Balia 400 kV D/c (Quad) line	1600		1600
Gaya - Balia 765 kV S/c line	2100		2100
Sasaram – Allahabad/Varanasi 400 kV D/c line (Sasaram HVDC back to back has been bypassed)	1000		1000
Sasaram - Fatehpur 765 kV S/c line	2100		2100
Barh-II-Gorakhpur 400 kV D/c (Quad) line	1600		1600
Gaya-Varanasi 765 kV 2xS/c line	4200		4200
Biharsharif-Varanasi 400 kV D/c (Quad) line	1600		1600
LILO of Biswanath Chariali - Agra +/- 800 kV, 3000 MW HVDC Bi-pole at new pooling station in Alipurduar and addition of second 3000 MW module	3000		3000
Sub-total	**22530**	**0**	**22530**
EAST-WEST			
Raigarh-Budhipadar 220 kV S/c line	130		130
Budhipadar-Korba 220 kV 2xS/c line	260		260
Rourkela-Raipur 400 kV D/c line with series comp.+TCSC	1400		1400
Ranchi –Sipat 400 kV D/c line with series comp.	1200		1200
Rourkela-Raipur 400 kV D/c (2nd) line with series comp.	1400		1400
Ranchi - Dharamjayagarh - WR Pooiling Station 765 kV S/c line	2100		2100
Ranchi - Dharamjaygarh 765 kV 2nd S/c line	2100		2100
Jharsuguda-Dharamjaygarh 765 kV D/c line	4200		4200
Jharsuguda-Dharamjaygarh 765 kV 2nd D/c line	4200		4200
Jharsuguda - Raipur Pool 765 kV D/c line	4200		4200
Jeypore-Jagdalpur 400 kV D/c line		1600	1600
Sub-total	**21190**	**1600**	**22790**
WEST- NORTH			
Bhanpura-Ranpur 220 kV S/c line	130		130
Bhanpura-Modak 220 kV S/c line	130		130
Auriya (UP)-Malanpur 220 kV S/c line	130		130
Auriya (UP) – Bhind 220 kV S/c line	130		130
Vindhyachal HVDC back-to-back	500		500
Gwalior-Agra 765 kV 2 x S/c line	4200		4200
Zerda-Kankroli 400 kV D/c line	1000		1000
Gwalior-Jaipur 765 kV 2xS/c lines	4200		4200
Adani (Mundra) - Mahendranagar +/- 500 kV, HVDC Bi-pole	2500		2500
RAPP-Sujalpur 400 kV D/c line	1000		1000

Inter-regional Transmission Links and Capacity (MW)			
	Inter Regional transmission Capacity as on 31.03.2022 (MW)	**Addition likely during the period 2022-27 (MW)**	**Inter Regional Transmission Capacity likely by the end of 2026-27 (31.03.2027) (MW)**
Champa Pool- Kurukshetra +/- 800 kV, HVDC Bi-pole	6000		6000
Jabalpur - Orai 765 kV D/c line	4200		4200
LILO of Satna - Gwalior 765 kV S/c line at Orai	4200		4200
Banaskantha-Chittorgarh 765 kV D/c line	4200		4200
Vindhyachal-Varanasi 765 kV D/c line	4200		4200
Neemuch PS – Chhittorgarh 400 kV D/c line		1600	1600
Beawar – Mandasaur 765 kV D/c line		4200	4200
Rishabhdeo – Mandasaur 765 kV D/c line		4200	4200
Kota – Kurawar 765 kV D/c line		4200	4200
Rishabhdeo- Ahmedabad 765 kV D/c line		4200	4200
Rishabhdeo- Prantij (GETCO) 400 kV D/c line		1600	1600
Sub-total	**36720**	**20000**	**56720**
EAST- SOUTH			
Balimela-Upper Sileru 220 kV S/c line	130		130
Gazuwaka HVDC back-to-back	1000		1000
Talcher-Kolar HVDC bipole	2000		2000
Upgradation of Talcher-Kolar HVDC Bipole	500		500
Angul – Srikakulum 765 kV D/c line	4200		4200
Sub-total	**7830**		**7830**
WEST- SOUTH			
Chandrapur HVDC back-to-back	1000		1000
Kolhaphur (Talandage)-Chikkodi 220 kV S/c line	130		130
Ponda-Ambewadi 220 kV S/c line	130		130
Xeldem-Ambewadi 220 kV S/c line	130		130
Kolhaphur(Mudshingi)-Chikkodi 220 kV S/c line	130		130
Raichur - Sholapur 765 kV S/c line (PG)	2100		2100
Raichur - Sholapur 765 kV S/c line (Pvt. Sector)	2100		2100
Narendra - Kolhapur 765 kV D/c (ch at 400 kV) line	2200		2200
Wardha - Nizamabad 765 kV D/c line	4200		4200
Warora Pool - Warangal (New) 765 kV D/c line		4200	4200
Raigarh-Pugulur +/- 800 kV, HVDC Bi-pole	6000		6000
LILO of Narendra-Narendra (New) 400 kV (quad) line at Xeldam (Goa)		1600	1600
Narendra - Pune765 kV D/c line		4200	4200
Sub-total	**18120**	**10000**	**28120**
EAST- NORTH EAST			
Birpara-Salakati 220 kV D/c line	260		260
Siliguri - Bongaigaon 400 kV D/c line	1000		1000
Siliguri - Bongaigaon 400 kV D/c (Quad) line	1600		1600
Sub-total	**2860**		**2860**
NORTH EAST-NORTH			
Biswanath Chariali - Agra +/- 800 kV, HVDC Bi-pole	3000		3000
Sub-total	**3000**		**3000**
TOTAL	**112,250**	**31,600**	**143,850**

Note: (i) The transmission capacity between two regions as mentioned above is the aggregate of capacity of individual transmission lines between the two regions. The ability of a single transmission line to transfer *power, when operated as part of the interconnected network is a function of the physical relationship of that line to the other elements of the transmission network and the prevalent load –generation scenario. Hence, the actual power transfer capacity between two regions may be less than the aggregated capacity of the individual transmission lines.*

(ii) It is to mention that the inter-regional transmission capacity in one direction may not be same as the inter-regional capacity in other direction. For instance, the maximum capacity of HVDC Raigarh-Pugalur is 6000 MW in WR-SR direction whereas the capacity in reverse direction (i.e. SR-WR) is limited to only 3000 MW. Similarly, the Champa – Kurukshetra HVDC link cannot be operated in reverse direction.

Annex 10.1

Details of the transmission schemes for integration of RE along with broad scope of works

(A) Northern Region

A. Rajasthan

Sl. No.	Transmission scheme	Broad Transmission System
	Transmission schemes under implementation	
1.	Transmission Scheme for evacuation of power from Solar Energy Zones (SEZs) in Rajasthan (8.1 GW) under Phase-II-Part A	Establishment of 400/220 kV, 4x500 MVA Fatehgarh-III PS (*erstwhile Ramgarh*)
		Fatehgarh-III PS – Fatehgarh-II PS 400 kV D/c line
		Fatehgarh-III PS – Jaisalmer-II (RVPN) 400 kV D/c line (Twin HTLS)
2.	Transmission Scheme for evacuation of power from Solar Energy Zones (SEZs) in Rajasthan (8.1 GW) under Phase-II-Part B	Fatehgarh-II PS – Bhadla-II PS 765 kV D/c line (2nd)
		1x240 MVAr Switchable line reactor for each circuit at each end of Fatehgarh-II – Bhadla-II 765 kV D/c line (2nd)
3.	Transmission Scheme for evacuation of power from Solar Energy Zones (SEZs) in Rajasthan (8.1 GW) under Phase-II-Part C	Establishment of 765/400 kV, 2x1500 MVA Sikar – II
		Bhadla-II PS – Sikar-II 765 kV D/c line
		1x330 MVAr switchable line reactor for each circuit at Sikar-II end of Bhadla-II PS – Sikar-II 765 kV D/c line
		1x240MVAr switchable line reactor for each circuit at Bhadla-II end of Bhadla-II PS – Sikar-II 765 kV D/c line
		Sikar-II – Neemrana 400 kV D/c line
4.	Transmission Scheme for evacuation of power from Solar Energy Zones (SEZs) in Rajasthan (8.1 GW) under Phase-II-Part D	Sikar-II – Aligarh 765 kV D/c line along with 1x330 MVAr switchable line reactor for each circuit at each end of Sikar-II – Aligarh 765 kV D/c line
5.	Transmission Scheme for evacuation of power from Solar Energy Zones (SEZs) in Rajasthan (8.1 GW) under Phase-II-Part E	Bhadla-II PS – Sikar-II 765 kV D/c line (2nd)
		1x330 MVAr switchable line reactor for each circuit at Sikar-II end of Bhadla-II PS – Sikar-II 765 kV D/c line
		1x240 MVAr switchable line reactor for each circuit at Bhadla-II end of Bhadla-II PS – Sikar-II 765 kV D/c line
6.	Transmission Scheme for evacuation of power from Solar Energy Zones (SEZs) in Rajasthan (8.1 GW) under Phase-II-Part G	1x330 MVAr switchable line reactor for each circuit at Sikar-II end of Bhadla-II PS – Sikar-II 765 kV D/c line
		1x240 MVAr switchable line reactor for each circuit at Bhadla-II end of Bhadla-II PS – Sikar-II 765 kV D/c line
		LILO of 765 kV Meerut-Bhiwani S/c line at Narela
7.	Transmission Scheme for evacuation of power from Solar Energy Zones (SEZs) in Rajasthan (8.1 GW) under Phase-II-Part G1	Removal of LILO of Bawana – Mandola 400 kV D/c (Quad) line at Maharani Bagh /Gopalpur S/s. Extension of above LILO section from Maharani Bagh / Gopalpur upto Narela S/s so as to form Maharanibagh – Narela 400 kV D/c (Quad) and Maharanibagh - Gopalpur - Narela 400 kV D/c (Quad) lines
8.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase III Part A1	Establishment of 2x500 MVA, 400/220 kV pooling station at Fatehgarh-IV
		Fatehgarh-IV - Fatehgarh-III 400 kV D/c line
9.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase-III Part A2	Augmentation by 3x500 MVA, 400/220 kV ICT's at Fatehgarh-IV
10.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase III Part A3	Fatehgarh-III- Bhadla-III 400 kV D/c line along with 50 MVAr Switchable line reactor for each circuit at both ends of Fatehgarh-III- Bhadla-III 400 kV D/c line
11.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase III	Establishment of 2x1500 MVA, 765/400 kV & 3x500 MVA, 400/220 kV pooling station at Bhadla-III

Sl. No.	Transmission scheme	Broad Transmission System
	Part B1	Bhadla-III – Sikar-II 765 kV D/c line along with 330 MVAr Switchable line reactor for each circuit at each end of Bhadla-III – Sikar-II 765 kV D/c line
		Fatehgarh-III S/s: STATCOM : ±2x300 MVAr, 4x125 MVAr MSC, 2x125 MVAr MSR
12.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase-III Part B2	Augmentation by 7x500 MVA, 400/220 kV ICT's at Bhadla-III
13.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase III Part C1	Establishment of 2x1500 MVA, 765/400 kV & 2x500 MVA, 400/220 kV pooling station at Ramgarh
		Ramgarh – Bhadla-III, 765 kV D/c line along with 240 MVAr switchable line reactor for each circuit at Ramgarh end of Ramgarh – Bhadla-III, 765 kV D/c line
		± 2x300 MVAr, STATCOM at Ramgarh with 4x125 MVAr MSC, 2x125 MVAr MSR
14.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase-III Part E1	Establishment of 3x1500 MVA 765/400 kV & 3x500 MVA 400/220 kV pooling station at Fatehgarh-III (new section)
15.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase-III Part E2	Augmentation by 3x1500 MVA, 765/400 kV & 2x500 MVA, 400/220 kV ICT's at Fatehgarh-III (new section)
16.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase-III Part E3	Fatehgarh-III S/s: STATCOM : ±2x300 MVAr, 4x125 MVAr MSC, 2x125 MVAr MSR
17.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase III Part F	Establishment of 2x1500 MVA, 765/400 kV Sub-station at suitable location near Beawar
		LILO of both circuit of Ajmer-Chittorgarh 765 kV D/c line at Beawar
		LILO of 400 kV Kota – Merta line at Beawar
		Fatehgarh-III – Beawar 765 kV D/c line along with 330 MVAr Switchable line reactor for each circuit at each end of Fatehgarh-III–Beawar 765 kV D/c line
18.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase III Part G	Fatehgarh-III – Beawar 765 kV D/c (2nd) line along with 330 MVAr Switchable line reactor for each circuit at each end of Fatehgarh-III–Beawar 765 kV D/c line
19.	Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part J	Augmentation by 1x500 MVA, 400/220 kV ICT (10th ICT) at Fatehgarh-II PS
		Augmentation by 1x1500 MVA, 765/400 kV ICT (5th) at Bhadla-II PS
		Augmentation by 1x1500 MVA, 765/400 kV ICT (3rd) at Bikaner (PG)
		Augmentation by 1x1500 MVA, 765/400 kV ICT (3rd) at Jhatikara Substation (Bamnoli/Dwarka section)
20.	Augmentation by 1x1500MVA, 765/400 kV ICT at Kanpur (GIS) substation	Augmentation by 1x1500 MVA, 765/400 kV ICT at Kanpur (GIS) substation
21.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase III Part H	Establishment of 2x1500 MVA, 765/400 kV substation at suitable location near Dausa
		LILO of both circuits of Jaipur (Phagi)-Gwalior 765 kV D/c line at Dausa along with 240 MVAr Switchable line reactor for each circuit at Dausa end of Dausa – Gwalior 765 kV D/c line
		LILO of both circuits of Agra – Jaipur (South) 400 kV D/c line at Dausa along with 50 MVAr Switchable line reactor for each circuit at Dausa end of Dausa – Agra 400 kV D/c line
		Beawar – Dausa 765 kV D/c line along with 240 MVAr

Sl. No.	Transmission scheme	Broad Transmission System
		Switchable line reactor for each circuit at each end
	Transmission schemes under Bidding	
22.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase III Part D	Sikar-II – Khetri 765 kV D/c line
		Sikar-II – Narela 765 kV D/c line along with 240 MVAr Switchable line reactor for each circuit at each end of Sikar-II – Narela 765 kV D/c line
		Jhatikara – Dwarka 400 kV D/c line
23.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase III - Part I	Establishment of 6000 MW, ± 800 kV Bhadla (HVDC) [LCC] terminal station (4x1500 MW) at a suitable location near Bhadla-III substation
		Establishment of 6000 MW, ±800 kV Fatehpur (HVDC) [LCC] terminal station (4x1500 MW) at suitable location near Fatehpur (UP)
		Bhadla-III – Bhadla (HVDC) 400 kV 2xD/c line
		±800 kV HVDC line between Bhadla (HVDC) & Fatehpur (HVDC)
		Establishment of 5x1500 MVA, 765/400 kV ICTs at Fatehpur (HVDC)
		LILO of both ckts of 765 kV Varanasi – Kanpur (GIS) D/c line at Fatehpur
24.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-1: Bikaner Complex)-Part-A *[Bikaner-II (7 GW solar & 3 GW BESS), Bikaner-III (7 GW solar & 3 GW BESS)]*	Establishment of 6x1500 MVA (along with one spare unit of 500 MVA), 765/400 kV &5x500 MVA 400/220 kV Bikaner-III Pooling Station along with 2x330 MVAr (765kV) Bus Reactor (along with one spare unit of 110 MVAr) & 2x125 MVAr (420 kV) Bus Reactor at a suitable location near Bikaner
		LILO of both ckts of 400kV Bikaner (PG)-Bikaner-II D/c line (Quad) at Bikaner-III PS (20km)
		Bikaner-II PS – Bikaner-III PS 400 kV D/c line (Quad) (30 km)
		Bikaner-III - Neemrana-II 765 kV D/c line along with 330 MVAr switchable line reactor for each circuit at each end (350 km)
25.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-1: Bikaner Complex)-Part-B *[Bikaner-II (7 GW solar & 3 GW BESS), Bikaner-III (7 GW solar & 3 GW BESS)]*	Establishment of 765/400 kV, 4x1500 MVA (along with one spare unit of 500 MVA) Neemrana-II S/s along with 2x330 MVAr (765 kV) Bus Reactor (along with one spare unit of 110 MVAr) & 2x125 MVAr (420kV) Bus Reactor at a suitable location near Neemrana
		Neemrana-II -Kotputli 400 kV D/c line (Quad) (70 km)
		LILO of both ckts of 400 kV Gurgaon (PG) - Sohna Road (GPTL) D/c line (Quad) at Neemrana-II S/s (85 km)
26.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-1: Bikaner Complex)-Part-C *[Bikaner-II (7 GW solar & 3 GW BESS), Bikaner-III (7 GW solar & 3 GW BESS)]*	Bikaner-III - Neemrana-II 765 kV D/c line (2nd) along with 330 MVAr switchable line reactor for each circuit at each end (350 km)
27.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-1: Bikaner Complex)-Part-D *[Bikaner-II (7 GW solar & 3 GW BESS), Bikaner-III (7 GW solar & 3 GW BESS)]*	Neemrana-II- Bareilly (PG) 765 kV D/c line along with 330 MVAr switchable line reactor for each circuit at each end (350 km)
28.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-2: 5.5 GW)	Establishment of 4x1500 MVA, 765/400 kV & 5x500 MVA, 400/220 kV Fatehgarh-IV (Section-2) Pooling

Sl. No.	Transmission scheme	Broad Transmission System
	(Jaisalmer/Barmer Complex): Part A *(Part of Fatehgarh-IV (6 GW Wind, 6 GW Solar & 4 GW BESS), Distt. Jaisalmer)*	Station along with 2x240 MVAR (765 kV) Bus Reactor & 2x125 MVAR (420 kV) Bus Reactor
		Fatehgarh-IV (Section-2) PS – Bhinmal (PG) 400 kV D/c line (Twin HTLS) along with 50 MVAR switchable line reactor on each ckt at each end (200 km)
		LILO of both ckts of 765 kV FatehgarhIII- Beawar D/c line (2nd) at Fatehgarh-IV (Section-2) PS along with 330 MVAR switchable line reactor at Fatehgarh-IV PS end of each ckt of 765 kV Fatehgarh-IV- Beawar D/c line (formed after LILO) (15 km)
29.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-2: 5.5 GW) (Jaisalmer/Barmer Complex): Part B *(Part of Sirohi (3 GW Solar & 1 GW BESS))*	Establishment of 2x1500 MVA, 765/400 kV Substation at suitable location near Sirohi along with 2x240 MVAR (765 kV) & 2x125 MVAR (420 kV) Bus Reactor
		Fatehgarh-IV (Section-2) PS – Sirohi PS 765 kV D/c line along with 240 MVAR switchable line reactor for each circuit at each end (240 km)
		Sirohi PS-Chittorgarh (PG) 400 kV D/c line (Quad) along with 80 MVAR switchable line reactor for each circuit at Sirohi PS end (160 km)
30.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-2: 5.5 GW) (Jaisalmer/Barmer Complex): Part C *(Part of Fatehgarh-IV (6 GW Wind, 6 GW Solar & 4 GW BESS), Distt. Jaisalmer)*	Establishment of 3x1500 MVA, 765/400 kV & 5x500 MVA, 400/220 kV Mandsaur Pooling Station along with 2x330 MVAR (765 kV) Bus Reactors & 2x125 MVAR, 420 kV Bus Reactor
		Mandsaur PS – Indore(PG) 765 kV D/c Line (200 km) along with 1x330 MVAR switchable line reactor (SLR) on each ckt at Mandsaur end of Mandsaur PS – Indore(PG) 765 kV D/c Line
31.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-2: 5.5 GW) (Jaisalmer/Barmer Complex): Part D *(Part of Fatehgarh-IV (6 GW Wind, 6 GW Solar & 4 GW BESS), Distt. Jaisalmer)*	Beawar- Mandsaur PS 765 kV D/c line along with 240 MVAR switchable line reactor for each circuit at each end (260 km)
32.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-2: 5.5 GW) (Jaisalmer/Barmer Complex): Part E *(Part of Sirohi (3 GW Solar & 1 GW BESS))*	Establishment of 765 kV Substation at suitable location near Rishabdeo (Distt. Udaipur) along with 2x240 MVAR (765 kV) Bus Reactor
		Sirohi PS- Rishabdeo 765 kV D/c line along with 330 MVAR switchable line reactor for each circuit at Sirohi end (170 km)
		Rishabdeo - Mandsaur PS 765 kV D/c line along with 240 MVAR switchable line reactor for each circuit at Rishabdeo end (160 km)
		LILO of one circuit of 765 kV Chittorgarh- Banaskanta D/c line at Rishabdeo S/s (20 km)
33.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-2: 5.5 GW) (Jaisalmer/Barmer Complex): Part F *(Barmer-I (3 GW Wind, 4 GW Solar & 1.5 GW BESS)*	Establishment of 3x1500 MVA, 765/400 kV & 2x500 MVA, 400/220 kV Barmer-I Pooling Station along with 2x240 MVAR (765 kV) Bus Reactor & 2x125 MVAR (420 kV) Bus Reacto
		Fatehgarh-III (Section-2) PS – Barmer-I PS 400 kV D/c line (Quad) (50 km)
		Barmer-I PS– Sirohi PS 765 kV D/c line along with 240 MVAR switchable line reactor for each circuit at each end (200 km)
34.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-2: 5.5 GW) (Jaisalmer/Barmer Complex): Part H1	Establishment of 765/400 kV (2x1500 MVA), 400/22 kV (2x500 MVA) & 220/132 kV (3x200 MVA) Kurawar S/s with 2x330 MVAR 765 kV bus reactor and

Sl. No.	Transmission scheme	Broad Transmission System
	(Part of Fatehgarh-IV (6 GW Wind, 6 GW Solar & 4 GW BESS), Distt. Jaisalmer)	1x125 MVAR, 420 kV bus reactor
		Mandsaur – Kurawar 765 kV D/c line (235 km) along with 240 MVAR switchable line reactors on each ckt at both ends of Mandsaur – Kurawar 765 kV D/c line
		LILO of Indore – Bhopal 765 kV S/c line at Kurawar (LILO length- 15 km)
		Kurawar – Ashtha 400 kV D/c (Quad ACSR/AAAC/AL59 moose equivalent) line (65 km)
		LILO of one circuit of Indore – Itarsi 400 kV D/ c line at Astha (30 km)
		Shujalpur – Kurawar 400 kV D/c (Quad ACSR/ AAAC/AL59 moose equivalent) line (40 km)
	Planned transmission schemes	
35.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase-III Part C2	Augmentation by 1x1500 MVA, 765/400 kV ICT's at Ramgarh
36.	**Jalore (3 GW Solar & 1 GW BESS), Sirohi (3 GW Solar & 1 GW BESS), Sanchore (3 GW Solar & 1 GW BESS) and Pali (3 GW Solar & 1 GW BESS)** • Establishment of 4x1500 MVA, 765/400 kV, 3x500 MVA, 400/220 kV Pooling Station along with 2x330 MVAr (765 kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor near Sirohi (1 GW injection at 220 kV level and 1 GW injection at 400 kV level) *(This is the total system planed for evacuation of RE from Sirohi. The scheme is partially under implementation)* • Establishment of 3x500 MVA, 400/220 kV Pooling Station near Jalore along with 2x125 MVAr (420kV) Bus Reactor (1 GW injection at 220 kV level and 1 GW injection at 400 kV level) • Establishment of 3x500 MVA, 400/220 kV Pooling Station along with 2x125 MVAr (420 kV) Bus Reactor near Sanchore (1 GW injection at 220 kV level and 1 GW injection at 400 kV level) • Establishment of 3x500 MVA, 400/220 kV Pali Pooling Station along with 2x125 MVAr (420kV) Bus Reactor (1 GW injection at 220 kV level and 1 GW injection at 400 kV level) • Pali – Sirohi 400 kV D/c line (Quad Moose equivalent) (~130 km) • Sanchore – Sirohi 400 kV D/c Line (Quad Moose equivalent) (~130 km) • Jalore- Sirohi 400 kV D/c line (Quad Moose equivalent) (~80 km) • Establishment of 3x1500 MVA, 765/400 kV Pooling Station along with 2x330 MVAr (765 kV) Bus Reactor & 2x125 MVAr (420 kV) Bus Reactor near Rishabhdeo. *(under implementation)* • LILO of one circuit of 765 kV Chittorgarh-Banaskanta D/c line at Rishabdeo S/s (20 km*) (under implementation)* • Sirohi PS-Chittorgarh (PG) 400 kV D/c line along with 80 MVAr switchable line reactor for each circuit at Sirohi PS end (Quad) (~160 km) *(under implementation)* • Sirohi PS- Rishabdeo 765 kV 2xD/c line along with 330 MVAr switchable line reactor for each circuit at Sirohi end (~170 km) *(under implementation)* • Rishabdeo- Mandsaur 765 kV D/c line along with 330 MVAr switchable line reactor for each circuit at Rishabdeo end. *(under implementation)* • Rishabhdeo – Ahmedabad 765 kV D/c line along with 240 MVAr switchable line reactor for each circuit at each end (~200 km) • Rishabhdeo – Prantij (GETCO) 400 kV D/c line (Quad Moose equivalent) (~150 km) with 50MVAr switchable line reactor for each circuit at each end • LILO of Soja – Wanakbori 400 kV 2nd line at Prantij(GETCO) S/s	

Sl. No.	Transmission scheme	Broad Transmission System
37.	**Ajmer (2 GW Solar) & Nagaur (2 GW Solar)** • Establishment of 4x1500 MVA, 765/400 kV & 3x500 MVA, 400/220 kV Ajmer (New) Pooling Station along with 2x330 MVAr (765 kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor (1 GW injection at 220 kV level and 1 GW injection at 400 kV level) • Establishment of 3x500 MVA, 400/220 kV Nagaur Pooling Station along with 2x125 MVAr (420kV) Bus Reactor (1 GW injection at 220 kV level and 1 GW injection at 400 kV level) • Ajmer (New) – Beawar 400 kV D/c line (Quad Moose equivalent) (~50 km) • Nagaur – Ajmer (New) 400 kV D/c line (Quad Moose equivalent) (~120 km) • Establishment of 765/400 kV, 2x1500 MVA Kota (New) Pooling Station along with 2x330 MVAr (765 kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor • 765 kV Ajmer (New) - Kota (New) D/c line (~200 km) along with 240 MVAr switchable line reactor for each circuit at each end • Kota (New) – Kota (PG) 400 kV D/c line (Quad Moose equivalent) (~50 km) • Kota (New) - Kurawar 765 kV D/c line (~250 km) along with 240 MVAr switchable line reactor for each circuit at each end	
38.	**Ramgarh (4 GW Wind, 6 GW Solar & 3 GW BESS), Distt. Jaisalmer** • Augmentation by 4x1500MVA, 765/400 kV ICTs at Ramgarh PS • Augmentation by 400/220 kV, 6x500 MVA ICTs at Ramgarh PS (2.5 GW injection at 220 kV level and 2.5 GW injection at 400 kV level)* • Establishment of 2x1500 MVA, 765/400 kV S/s along with 2x330 MVAr (765 kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor near Hanumangarh in Rajasthan • Establishment of 3x1500 MVA, 765/400 kV S/s along with 2x330 MVAr (765 kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor near Sangrur in Punjab • Ramgarh PS- Bhadla-III PS 765 kV D/c line (2nd) along with 240 MVAr switchable line reactor for each circuit at each end (~200 km) • Bhadla-III PS – Hamumangarh 765 kV D/c line along with 330 MVAr switchable line reactor for each circuit at each end (~300 km) • Hamumangarh - Sangrur 765 kV D/c line along with 240 MVAr switchable line reactor for each circuit at each end (~200 km) • Hanumangarh – Fatehabad 400 kV D/c line along with 80 MVAr switchable line reactor for each circuit at Hanumangarh end (Quad Moose equivalent) (~130 km) • LILO of both circuits of Patiala- Patran 400 kV D/c line at Sangrur S/s(~40 km) • LILO of Kurukshetra – Jallandhar/Dhanansu 400 kV line at Sangrur S/s (~40 km) *Already planned capacity at Ramgarh PS: 3x1500 MVA, 765/400 kV, 2x500 MVA, 400/220 kV with 1 GW injection at 220 kV level and about 1.9 GW injection at 400 kV level) along with 2x240 MVAr (765 kV) Bus Reactor & 2x125 MVAr (420 kV) Bus Reactor	
39.	**Fatehgarh-IV (6 GW Wind, 6 GW Solar & 4 GW BESS), Distt. Jaisalmer** • Establishment of 5x1500 MVA, 765/400 kV & 6x500 MVA, 400/220 kV Fatehgarh- IV (Section-2) Pooling Station along with 2x330 MVAr (765 kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor (2.5 GW injection at 220 kV level and 2.5 GW injection at 400 kV level) *(This is the total system planed for evacuation of RE from Fatehgarh IV. The scheme is partially under implementation)* • LILO of both ckts of 2nd D/c 765 kV Fatehgarh-III-Beawar 2xD/c line at Fatehgarh-IV (Section-2) PS along with 330 MVAr switchable line reactors at Fatehgarh-IV PS end of each ckt of 765 kV Fatehgarh –IV- Beawar D/c line • Fatehgarh-IV (Section-2) PS – Sirohi PS 765 kV D/c line along with 240 MVAr switchable line reactor for each circuit at each end (~240 km) *(under implementation)* • Bhinmal-Fatehgarh-IV (Section-2) PS 400 kV D/c line (Quad Moose equivalent) (200 km)	

Sl. No.	Transmission scheme	Broad Transmission System
	• Augmentation by 1x1500 MVA, 765/400 kV ICT at Fatehgarh-II PS (7th) • Augmentation by 1x1500 MVA, 765/400 kV ICT at Fatehgarh-III PS (7th) • Establishment of 3x1500 MVA, 765/400 kV & 5x500 MVA, 400/220 kV Mandsaur Pooling Station along with 2x330 MVAR (765 kV) Bus Reactors & 2x125 MVAR, 420 kV Bus Reactor *(under implementation)* • Mandsaur PS – Indore (PG) 765 kV D/c line (200 km) along with 1x330 MVAr switchable line reactor (SLR) on each ckt at Mandsaur end *(under implementation)* • Beawar- Mandsaur PS 765 kV D/c line along with 240 MVAr switchable line reactor on each circuit at each end (~260 km) *(under implementation)* • Establishment of 765/400 kV (2x1500 MVA) 400/220 kV (2x500 MVA) and 220/132 kV (3x200 MVA) Kurawar S/s (with 1x500 MVA spare single phase transformer unit) with 2x330 MVAr, 765 kV bus reactor and 1x125 MVAr, 420 kV bus reactor (with 1x110 MVAr and 1x80 MVAr, 765 kV spare single phase reactor unit for line/bus reactor) *(under implementation)* • Mandsaur – Kurawar 765 kV D/c line (~235 km) with 240 MVAr switchable line reactors at both ends *(under implementation)* • LILO of Indore – Bhopal 765 kV S/c line at Kurawar (LILO route length ~15 km) *(under implementation)* • Kurawar – Ashtha 400 kV D/c (Quad ACSR/AAAC/AL59 moose equivalent) line (~65 km) *(under implementation)* • LILO of one circuit of Indore – Itarsi 400 kV D/c line at Astha (LILO route length ~ 30 km) *(under implementation)* • Shujalpur – Kurawar 400 kV D/c (Quad ACSR/AAAC/AL59 moose equivalent) line (~40 km) *(under implementation)* • Establishment of 2x1500 MVA, 765/400 kV Santrampur S/s along with 2x330 MVAr (765 kV) Bus Reactor & 2x125 MVAr (420 kV) Bus Reactor • Rishabdeo - Santrampur 765 kV D/c line along with 240 MVAr switchable line reactors for each circuit at each end (~120 km) • Santrampur -Dhule(BDTCL) 765 kV D/c line along with 330 MVAr switchable line reactor for each circuit at each end (~300 km) • Establishment of 3x1500 MVA, 765/400 kV & 4x500 MVA, 400/220 kV Boisar-II S/s along with 2x330 MVAr (765 kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor • Dhule(BDTCL)- Boisar-II 765 kV D/c line along with 330 MVAr switchable line reactor for each circuit at each end (~300 km) • Boisar-II – Velgaon(MSETCL) 400 kV D/c (Quad Moose equivalent) line (~50km.) (Additional 400 kV as well as 220 kV outlets shall be planned in coordination with MSETCL) • LILO of Navsari(New) – Padghe 765 kV D/c line at Boisar-II (~20 km) • Santrampur – Asoj 400 kV D/c line along with 80 MVAr switchable line reactor for each circuit at Santrampur end (~150 km)* **Issue of high fault level at Asoj to be resolved in coordination with GETCO*	
40.	**Bhadla-IV (2 GW Wind, 3 GW Solar & 2 GW BESS), Distt. Jodhpur** • Establishment of 3x500 MVA, 400/220 kV Bhadla-IV Pooling Station along with 2x125 MVAr (420kV) Bus Reactor (1 GW injection at 220 kV level and 1 GW injection at 400 kV level) • Bhadla-IV – Bhadla-III 400 kV D/c line (Quad Moose Equivalent) (~30 km) • Augmentation by 1x1500MVA, 765/400 kV ICT (3rd) at Bhadla-III PS	
41.	**Barmer-II (6 GW Solar, 2 GW BESS)** • Establishment of 5x500 MVA, 400/220 kV Barmer-II Pooling Station along with 2x125 MVAr (420 kV) Bus Reactor (2 GW injection at 220 kV level and 2 GW injection at 400 kV level) • Fatehgarh-IV (Section-2) PS – Barmer-II 400 kV D/c line (Quad Moose equivalent) (~30 km) • Barmer-I - Barmer-II 400 kV D/c Line (Quad Moose equivalent) (~30 km) • Barmer-II -Barmer-II (HVDC) 400 kV 2xD/c line (Quad Moose equivalent) (~20 km)	
42.	**Common HVDC system for Fatehgarh-IV, Barmer-I and Barmer-II**	

Sl. No.	Transmission scheme	Broad Transmission System
	• 6000 MW, ±800 kV HVDC terminal station at a suitable location near Barmer-II [Barmer-II (HVDC)] # • 6000MW, ±800 kV HVDC terminal station at a suitable location near Jabalpur# • Establishment of 5x1500MVA, 765/400 kV ICT at pooling station at suitable location near Jabalpur along with 2x330MVAr (765 kV) bus reactor# • ±800 kV HVDC line between Barmer-II (HVDC)and Jabalpur PS# (~1100 km) • Jabalpur(HVDC)-Jabalpur Pool 765 kV 2xD/c line(~50 km) • Jabalpur Pool – Jabalpur (PG) 400 kV (2nd) D/c line (~20 km)^ *# The HVDC system to be developed initially for 6000 MW with a provision for upgradation to 8000 MW based on the future requirements. The type of HVDC (VSC or LCC), requirement of reactive power support etc. would be decided at the time of implementation based on the system requirement.* ^Suitable scheme to control fault level at Jabalpur Pool/ Jabalpur (PG) S/s to be planned for fault level control. ***Note: For the planned transmission schemes in Northern Region, dynamic compensation requirement like STATCOMs, Synchronous Condensers etc. would be identified separately based on the detailed reactive power planning studies and the Short Circuit Ratios (SCRs) at different locations. Requirement of Synchronous condensers based on inertia considerations will also be assessed based on detailed studies***	

B. Ladakh

Sl. No.	Transmission Scheme	Broad Transmission System
	Transmission scheme under Implementation	
1.	Transmission system for evacuation of RE power from renewable energy parks in Leh (5 GW Leh - Kaithal transmission corridor)	Pooling point in Pang (Leh): ±350 kV, 2 Nos. of 2500 MW HVDC terminal
		Pooling point in Kaithal (Haryana): ±350 kV, 2 Nos. of 2500 MW HVDC terminal
		HVDC Line (OHL and UG Cable): 480 km of ±350kV HVDC line between Pang & Kaithal PS
		(i) Kaithal - Bahadurgarh (PG) 400 kV D/C line (ii) Kaithal - Modipuram (Meerut) (UPPTCL) 765 kV D/C line along with 1x240 MVAr switchable line reactor on each circuit at Kaithal end (iii) 3 Nos. of 765/400/33 kV, 1500 MVA ICTs along with associated bays at Kaithal (iv) Augmentation by 765/400 kV, 1500 MVA ICT at Bhiwani S/s (v) 2 Nos. of 400/220/33 kV 315 MVA ICTs along with associated bays at Pang
		220 kV Pang – Leh (Phyang) (PG) S/c line
		BESS of suitable size (1 GWh: 250 MW x 4 hr)*

C. Himachal Pradesh (Kaza Solar Park)

Sl. No.	Transmission Scheme	Broad Transmission System
1.	Transmission system for evacuation of power from Kaza Solar Power Project (880 MW)	Establishment of 3x315 MVA, 400/132 kV Kaza PS (GIS)
		Kaza-Wangtoo (HPPTCL) 400 kV D/c line

		Wangtoo (HPPTCL) - Panchkula (PG) 400 kV D/c line

(B) Western Region

A. Gujarat

Sl. No.	Transmission scheme	Broad Transmission System
	Transmission schemes under Implementation	
1.	Transmission scheme for evacuation of 3 GW RE injection at Khavda Pooling Station 1 (KPS 1) under Phase I	Establishment of 3x1500 MVA, 765/400 kV and 2x500 MVA, 400/220 kV Khavda Pooling Station 1 (GIS), KPS1
		Khavda PS1 (GIS) – Bhuj PS 765 kV D/c line.
2.	Establishment of Khavda Pooling Station-2 (KPS2) in Khavda RE Park	Establishment of 4 x1500 MVA, 765/400 kV, KPS-2
3.	Establishment of Khavda Pooling Station-3 (KPS3) in Khavda RE Park	Establishment of 3 x1500 MVA, 765/400 kV, KPS-3
		KPS3- KPS2 765 kV D/c line
4.	Transmission scheme for injection beyond 3 GW RE power at Khavda PS1 (KPS1)	Augmentation of KPS1 by 4x1500 MVA ICTs
		KPS1-KPS2 765 kV D/C line
5.	Transmission scheme for evacuation of 4.5 GW RE injection at Khavda P.S. under Phase-II – Part A	KPS2 (GIS) – Lakadia 765 kV D/C line with 330 MVAr switchable line reactors at KPS2 end
6.	Transmission scheme for evacuation of 4.5 GW RE injection at Khavda P.S. under Phase-II – Part B	Lakadia PS – Ahmedabad 765 kV D/c line with 240 MVAR switchable line reactors on both ends
7.	Transmission scheme for evacuation of 4.5 GW RE injection at Khavda P.S. under Phase-II – Part C	Ahmedabad – South Gujarat/Navsari (New) 765 kV D/c line with 240 MVAr switchable line reactor at both ends
8.	Transmission Network Expansion in Gujarat associated with integration of RE projects from Khavda Potential RE zone	Banaskantha – Ahmedabad 765 kV D/c line with 330 MVAr, 765 kV Switchable line reactor on each ckt at Ahmedabad S/s end.
9.	Transmission scheme for evacuation of 4.5 GW RE injection at Khavda P.S. under Phase-II – Part D	LILO of Pirana (PG) – Pirana (T) 400 kV D/c line at Ahmedabad S/s with twin HTLS conductor along with reconductoring of Pirana (PG) – Pirana(T) line with twin HTLS conductor
10.	Augmentation of transformation capacity at Khavda PS (2500 MW)	Augmentation by 765/400 kV, 2x1500 MVA ICT's at KPS1or KPS2 or KPS3 (depending upon connectivity applied by RE generator)
	Transmission schemes under Bidding	
11.	Transmission system for evacuation of additional 7 GW RE power from Khavda RE park under Phase-III Part A	Establishment of 765 kV switching station at Halvad
		KPS2- Halvad 765 kV D/c line along with 240 MVAr Switchable line reactor for each circuit at each end
		LILO of both circuits of Lakadia – Ahmedabad 765 kV D/c line at Halvad
12.	Transmission system for evacuation of additional 7 GW RE power from Khavda RE park under Phase-III Part B	Establishment of 765 kV switching station near Vataman
		Halvad – Vataman 765 kV D/c line along with 330 MVAr Switchable line reactor for each circuit at Vataman end
		LILO of both circuits of Lakadia – Vadodara 765 kV D/c line at Vataman 765 kV switching station
		240 MVAr 765 kV switchable line reactor on each ckt at Vataman end of Lakadia – Vataman 765 kV D/c line with NGR bypassing arrangement

Sl. No.	Transmission scheme	Broad Transmission System
		Vataman switching station – Navsari (New) 765 kV D/c line along with 330 MVAr Switchable line reactor for each circuit at Navsari end
13.	Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-IV (7 GW): Part A	Creation of 765kV bus section-II at KPS3 (GIS) along with 765kV Bus Sectionaliser & 1x330MVAr, 765kV Bus Reactors on Bus Section-II (Bus section – II shall be created at 765 kV & 400 kV level both with 3x1500 MVA, 765/400 kV ICTs at Bus Section-II)
		Creation of 400 kV bus section-II at KPS3 (GIS) along with 400 kV Bus Sectionaliser & 1x125 MVAr, 400 kV Bus Reactors on Bus Section-II
		KPS3 (GIS) – Lakadia 765 kV D/c line along with 330 MVAR switchable line reactors at KPS3 end of KPS3 (GIS) – Lakadia 765 kV D/c line (with NGR bypass arrangement)
		±300MVAr STATCOM with 1x125 MVAr MSC, 2x125 MVAr MSR at KPS3 400 kV Bus section-2
		KPS1 – Bhuj 765 kV 2nd D/c line
14.	Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-IV (7 GW): Part B	Establishment of 2x1500 MVA, 765/400 kV & 2x500 MVA, 400/220 kV GIS S/s at a suitable location South of Olpad (between Olpad and Ichhapore) with 2x330 MVAR, 765 kV & 1x125 MVAR, 420 kV bus reactors
		Vadodara – South Olpad 765 kV D/c line with 240 MVAR switchable line reactors at Vadodara(GIS) end of Vadodara(GIS) – Navsari(New)(GIS) 765 kV D/c line (with NGR bypass arrangement)
		LILO of Gandhar – Hazira 400 kV D/c line at South Olpad (GIS) using twin HTLS conductor with minimum capacity of 1700 MVA per ckt at nominal voltage
		Ahmedabad – South Olpad (GIS) 765 kV D/c line along with 240 MVAR switchable line reactors on each ckt at Ahmedabad & South Olpad (GIS) end of Ahmedabad – South Olpad (GIS) 765 kV D/c line (with NGR bypass arrangement)
15.	Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-IV (7 GW): Part C	Establishment of 765/400/220 kV Boisar-II (GIS) S/s (4x1500, 765/400 kV & 2x500MVA, 400/220 kV) with 2x330MVAr 765 kV and 2x125MVAr 420kV bus reactors
		South Olpad (GIS) – Boisar-II (GIS) 765 kV D/c line along with 240 MVAR switchable line reactors on each ckt at South Olpad (GIS) & Boisar-II (GIS) end of South Olpad (GIS) – Boisar-II (GIS) 765 kV D/c line (with NGR bypass arrangement)
		LILO of Navsari (New) – Padghe(PG) 765 kV D/c line at Boisar-II
		Boisar-II – Velgaon(MH) 400 kV D/c line
		LILO of Babhaleswar – Padghe(M) 400 kV D/c line at Bosar-II along with 80 MVAR switchable line reactors at Bosar-II end of Boisar-II – Babhaleswar 400 kV D/c line (with NGR bypass arrangement)
		±200 MVAR STATCOM with 2x125 MVAR MSC, 1x125 MVAR MSR at 400 kV bus section-I of Boisar-II and ±200 MVAR STATCOM with 2x125 MVAR MSC, 1x125 MVAR MSR at 400 kV bus section-II of Boisar-II

Sl. No.	Transmission scheme	Broad Transmission System
		± 300 MVAR STATCOM with 3x125 MVAR MSC, 1x125 MVAR MSR at 400 kV level of Navsari (New)(PG) S/s with 1 No. of 400 kV bay (GIS)
16.	Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-IV (7 GW): Part D	Establishment of 765/400/220 kV Pune-III (GIS) S/s (2x1500, 765/400 kV & 3x500 MVA, 400/220 kV) with 2x330MVAr 765 kV and 2x125 MVAr 420kV bus reactors
		Boisar-II – Pune-III 765 kV D/c line along with 330 MVAR switchable line reactors at Pune-III end of Boisar-II – Pune-III 765 kV D/c line (with NGR bypass arrangement)
		LILO of Narendra(New) – Pune(GIS) 765 kV D/c line at Pune-III along with 330 MVAR switchable line reactors at Pune-III end of Narendra(New) – Pune-III(GIS) 765 kV D/c line (with NGR bypass arrangement)
		Inter tripping scheme on 330 MVAr SW LR at Pune(GIS) end of Pune(GIS) – Pune-III(GIS) 765 kV D/c line
		LILO of Hinjewadi- Koyna 400 kV line at Pune-III(GIS) S/s along with 80MVAr, 420 kV switchable Line Reactors on each ckt at Pune-III(GIS) end of Pune-III(GIS) – Koyna 400 kV line
17.	Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-IV (7 GW): Part E2	Augmentation of transformation capacity at KPS2 (GIS) by 2x1500 MVA, 765/400 kV ICT on Bus section-I (5th& 6th) & 2x1500 MVA, 765/400 kV ICT on Bus section-II (7th & 8th) & 2 Nos. 400 kV bays at Bus Section-I for RE interconnection and 3 Nos. 400 kV bays at Bus Section-II for RE interconnection
18.	Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8 GW): Part A	Establishment of 6000 MW, ± 800 kV KPS2 (HVDC) [LCC] terminal station (4x1500 MW) along with associated interconnections with 400 kV HVAC Switchyard
		Establishment of 6000 MW, ± 800 kV Nagpur (HVDC) [LCC] terminal station (4x1500 MW) along with associated interconnections with 400 kV HVAC Switchyard
		±800 kV HVDC Bipole line (Hexa lapwing) between KPS2 (HVDC) and Nagpur (HVDC) (1200 km) (with Dedicated Metallic Return) (capable to evacuate 6000 MW with overload as specified)
		Establishment of 6x1500 MVA, 765/400 kV ICTs at Nagpur S/s along with 2x330 MVAR (765 kV) & 2x125 MVAR, 420 kV bus reactors along with associated interconnections with HVDC Switchyard. The 400 kV bus shall be established in 2 sections through 1 set of 400 kV bus sectionaliser so that 3x1500 MVA ICTs are placed in each section. The bus sectionaliser shall be normally closed and may be opened based on Grid requirement
		LILO of Wardha – Raipur 765 kV one D/c line (out of 2xD/c lines) at Nagpur along with 240 MVAR switchable line reactor at Nagpur end on each ckt of Nagpur – Raipur 765 kV D/c line
19.	Transmission System for Evacuation of Power from potential renewable energy zone in Khavda	Establishment of 2500 MW, ± 500 kV KPS3 (HVDC) [VSC] terminal station (2x1250 MW) at a suitable

Sl. No.	Transmission scheme	Broad Transmission System
	area of Gujarat under Phase-V (8 GW): Part C	location near KPS3 substation with associated interconnections with 400 kV HVAC Switchyard
		Establishment of 2500 MW, ± 500 kV South Olpad (HVDC) [VSC] terminal station (2x1250 MW) along with associated interconnections with 400 kV HVAC Switchyard of South Olpad S/s
		Establishment of KPS3 (HVDC) S/s along with 2x125 MVAR, 420 kV bus reactors along with associated interconnections with HVDC Switchyard. The 400 kV bus shall be established in 2 sections through 1 set of 400 kV bus sectionaliser to be kept normally OPEN (400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal.)
		KPS3 - KPS3 (HVDC) 400 kV 2xD/c (Quad ACSR/AAAC/AL59 moose equivalent) line along with the line bays at both substations
		±500 kV HVDC Bipole line between KPS3 (HVDC) and South Olpad (HVDC) (with Dedicated Metallic Return) (capable to evacuate 2500 MW)
	Planned transmission schemes	
20.	Augmentation of transformation capacity at Lakadia PS for providing connectivity to RE projects (2000 MW)	Establishment of 4x500 MVA, 400/220 kV ICTs at Lakadia PS (GIS)
21.	Augmentation of transformation capacity at KPS1(GIS), KPS2(GIS) , KPS3(GIS) 7 Padghe (PG) (GIS)	Augmentation of transformation capacity at KPS1(GIS) by 1x1500 MVA, 765/400 kV ICT (8th)
		Augmentation of transformation capacity at KPS2(GIS) by 4x1500 MVA, 765/400 kV ICT (5th, 6th, 7th & 8th) on Bus section-II
		Augmentation of transformation capacity at KPS3(GIS) by 1x1500 MVA, 765/400 kV ICT (7th) on Bus section-I
		Augmentation of transformation capacity at Padghe(PG) (GIS) by 1x1500 MVA, 765/400 kV ICT (4th)
22.	Transmission system for evacuation of power from Dholera UMSP	Establishment of 4x1500 MVA, 765/400 kV Dholera Pooling Station
		Dholera PS – Vataman switching station 765 kV D/C line
	Transmission schemes planned for 5 GW Off shore Wind	
23.	<u>**For 3.7 GW (B3 Pocket: 1 GW, B4 Pocket: 1.11 GW & B5 Pocket: 1.59 GW)**</u> • Establishment of 9x500 MVA, 400/220 kV Mahuva Onshore Pooling Station (Mahuva PS) (with space provision for upgradation to 765 kV level so as to cater to future Offshore Wind Projects adjacent to B3, B4, B5 pockets in future) • Off Shore Sub-Station (OSS) B3 – Mahuva Onshore PS 220 kV 2xS/c Submarine cable (~45 km) • Off Shore Sub-Station (OSS) B4 – Mahuva Onshore PS 220 kV 3xS/c cables (~44 km) • Off Shore Sub-Station (OSS) B5 – Mahuva Onshore PS 220 kV 4xS/c cables (~45 km) • Mahuva Onshore PS – Vataman* 400 kV T/c line (Out of 2xD/c line, one D/c strung as S/c) (190 km) (Quad Moose) with 63MVAr & 50MVAr, 420 kV switchable line reactors on each ckt at Mahuva & Vataman ends respectively • Installation of 4x1500MVA, 765/400 kV ICTs at Vataman* along with 2x125 MVAr (420kV) Bus Reactor • Suitable Static Compensation / Dynamic Compensation with Mechanical Switched Reactor (MSR)	

Sl. No.	Transmission scheme	Broad Transmission System
	Note: *Vataman S/s has been planned through LILO of Lakadia-Vadodara 765 kV D/c line at Vataman with Khavda Ph-III (7 GW) and Dholera (Ph-I: 2GW)	
24.	**<u>For 1.24 GW (B6 Pocket)</u>** • Establishment of 4x500 MVA, 400/220 kV Ubhrat Onshore Pooling Station (Ubhrat PS) (with space provision for upgradation to 765 kV level so as to cater to future Offshore Wind Projects adjacent to B6 pocket) • Off Shore Sub-Station (OSS) B6 – Ubhrat Onshore PS 220 kV 3xS/c cables (~55 km) • Ubhrat Onshore PS – Vapi 400 kV D/c line (100km) (Quad Moose) with 50MVAr, 420 kV switchable line reactors on each ckt at Ubhrat Onshore PS end • Suitable Static Compensation / Dynamic Compensation with MSR ***<u>Note</u>:*** *1. The no. of 220 kV Submarine Cables has been considered assuming capacity of one three phase cable as 500 MW. However, the requirement of cables (single phase or three phase and its voltage class) would be further firmed up while detailing the scheme.* 2. *Exact Reactive compensation to be worked out based on data being received from submarine cable manufactures pertaining to MVAr generation from the cables*	

B. Maharashtra

Sl. No.	Transmission scheme	Broad Transmission System
	Transmission Schemes under Implementation	
1.	Transmission system for evacuation of power from RE projects in Osmanabad area (1 GW) in Maharashtra	Establishment of 2x500 MVA, 400/220 kV Kallam PS LILO of both circuits of Parli(PG) – Pune(GIS) 400 kV D/c line at Kallam PS 50 MVAr switchable line reactor with 400 ohms NGR at Kallam PS end of Kallam – Pune (GIS) 400 kV D/c line
2.	1 GW at Kallam	• Augmentation of Kallam Pooling Station by 2x500 MVA, 400/220 kV ICT • 1x125 MVAr bus reactor (2nd) at Kallam PS
3.	Kallam/Parli: (1 GW Solar, 1 GW Wind, 0.3 GW BESS)	<u>0.3 GW at Parli:</u> Direct interconnection at 220 kV level of 400/220 kV Parli (PG) S/s <u>0.7 GW at Parli (New):</u> Direct interconnection at 400 kV level of 765/400 kV Parli (New) S/s
4.	Solapur (2 GW Solar)	Direct interconnection at 400 kV Solapur (PG) S/s.
	Transmission Schemes under Bidding	
5.	Transmission system for evacuation of power from RE projects in Solapur (1500 MW) SEZ in Maharashtra	Establishment of 400/220 kV, 4x500 MVA at Solapur PS Solapur PS - Solapur (PG) 400 kV D/c line (twin HTLS) (with minimum capacity of 2100 MVA/ckt at nominal voltage)
6.	Transmission scheme for evacuation of power from Dhule 2 GW REZ *(Dhule- 1 GW Solar, 1 GW Wind, 0.3 GW BESS)*	Establishment of 4x500 MVA, 400/220 kV Pooling Station near Dhule Dhule PS – Dhule (BDTCL) 400 kV D/c line-60 km

Sl. No.	Transmission scheme	Broad Transmission System
7.	Western Region Network Expansion scheme in Kallam area of Maharashtra	LILO of both circuits of Parli (M) – Karjat(M)/Lonikand-II (M) 400 kV D/c line (twin moose) at Kallam PS-15 km
		63 MVAR, 420 kV switchable line reactor (with NGR bypassing arrangement) on each ckt at Kallam PS end of Karjat – Kallam 400 kV D/c line.
	Planned Transmission Schemes	
8.	Transmission system for evacuation of power from RE projects in Wardha (2500 MW) SEZ in Maharashtra	Establishment of 400/220 kV, 5x500 MVA Wardha SEZ PP
		LILO of Wardha - Warora Pool 400 kV D/c (Quad) line at Wardha SEZ PP

C. Madhya Pradesh

Sl. No.	Transmission scheme	Broad Transmission System
	Transmission Schemes under Implementation	
1.	Transmission system for evacuation of power from RE projects in Rajgarh (2500 MW) SEZ in Madhya Pradesh - Phase-I: 1500	Establishment of 400/220 kV, 3x500 MVA Pachora SEZ PP
		Pachora SEZ PP -Bhopal (Sterlite) 400 kV D/c line (Quad/HTLS) along with 80MVAr switchable line reactors on each circuit at Pachora end
2.	Transmission system for evacuation of power from Neemuch SEZ (1000 MW)	Establishment of 2x500 MVA, 400/220 kV Neemuch
		Neemuch PS – Chhittorgarh (PG) S/s 400 kV D/C line
		Neemuch PS- Mandsaur S/s 400 kV D/c line
		Anantapur PS-Kurnool-III PS 400 kV D/c line
		Anantapur PS-Cuddapah 400 kV D/c Line
	Transmission Schemes under Bidding	
3.	Transmission system for evacuation of power from Chhatarpur SEZ (1500 MW)	Establishment of 3x500 MVA, 400/220 kV Pooling Station at Chhatarpur
		LILO of Satna - Bina 400 kV (1^{st}) D/c line at Chhatarpur PS
4.	Transmission system for evacuation of power from RE projects in Rajgarh (2500 MW) SEZ in Madhya Pradesh - Phase-II: 1000 MW	400/220 kV, 2x500 MVA ICT augmentation at Pachora PS
		Pachora SEZ PP – Shujalpur 400 kV D/c line (Quad/HTLS) (with minimum capacity of 2100 MVA/ckt at nominal voltage)
5.	Neemuch (Mandsaur): 2 GW Wind	Integrated at 765 kV Mandsaur S/s (already covered in transmission schemes of Northern Region)
	Planned Transmission schemes	
6.	**Sagar: 1.5 GW Solar** • Establishment of 4x500 MVA, 400/220 kV Sagar PS along with 2x125 MVAr (420 kV) Bus Reactor • Sagar – Damoh (PG) 400 kV D/c (quad moose) line (~80km	
7.	**Morena: 3.9 GW Solar** • Establishment of 9x500 MVA, 400/220 kV Pooling Station along with 2x125 MVAr (420 kV) Bus Reactor near Morena • Morena PS – Morena (TBCB) 400 kV D/c (quad) line (~50 km) • Morena PS – South Gwalior (near Datia)* 400 kV D/c (quad moose) line (~100 km) with 50 MVAr switchable line reactors on each ckt at Morena PS end **A new 765/400/220 kV S/s is being planned south of Gwalior so as to cater to increase in demand in the area. The same is proposed to be utilized for evacuation of power from Morena (3.9 GW) Solar Park*	

Sl. No.	Transmission scheme	Broad Transmission System
8.	**Khandwa: 0.6 GW Solar** • To be integrated at existing Khandwa (PG) 400/220 kV S/s (Madhya Pradesh is planning to connect the RE capacity to intra-state system)	
	Note: For the planned transmission schemes in Western Region, dynamic compensation requirement like STATCOMs, Synchronous Condensers etc. would be identified separately based on the detailed reactive power planning studies and the Short Circuit Ratios (SCRs) at different locations. Requirement of Synchronous condensers based on inertia considerations will also be assessed based on detailed studies.	

(C) Southern Region

A. Andhra Pradesh

<table>
<tr><th>Sl. No.</th><th>Transmission scheme</th><th>Broad Transmission System</th></tr>
<tr><td></td><td colspan="2">Transmission Schemes under Implementation</td></tr>
<tr><td rowspan="3">1.</td><td rowspan="3">Transmission scheme for Solar Energy Zone in Anantapur (Anantapur) (2500 MW) and Kurnool (1000 MW), Andhra Pradesh</td><td>Establishment of 400/220 kV, 7x500 MVA pooling station at suitable border location between Anantapur & Kurnool Distt</td></tr>
<tr><td>Anantapur PS-Kurnool-III PS 400 kV D/c line</td></tr>
<tr><td>Anantapur PS-Cuddapah 400 kV D/c Line</td></tr>
<tr><td rowspan="3">2.</td><td rowspan="3">Transmission Scheme for evacuation of power from RE sources in Kurnool Wind Energy Zone (3000 MW)/Solar Energy Zone (AP) (1500MW) - Part-A & B</td><td>Establishment of 765/400/220 kV 3x1500 MVA, 9x500 MVA Pooling station at suitable location in Kurnool Distt (Kurnool-III)</td></tr>
<tr><td>Kurnool –III PS – Kurnool (New) 765 kV D/c line</td></tr>
<tr><td>Kurnool –III PS – Maheshwaram (PG) 765 kV D/c Line</td></tr>
<tr><td></td><td colspan="2">Other planned Transmission system for 51 GW REZ (18 GW Wind & 33 GW Solar)</td></tr>
<tr><td>3.</td><td colspan="2">Transmission System for integration of Kurnool REZ-I (7.5 GW Solar, 4 GW Wind, 3 GW BESS)
Establishment of 5x1500 MVA, 765/400 & 7x500 MVA, 400/220 kV Kurnool-IV Pooling Station near Kurnool, Andhra Pradesh along with 2x330 MVAr (765 kV) & 2x125 MVAr (400 kV) bus reactors at Kurnool-IV PS (3 GW injection at 220 kV level and 3 GW injection at 400 kV level)
Kurnool-IV – Kurnool-III PS 765 kV D/c line (~100 km)
Kurnool-IV – Bidar PS 765 kV D/c line with 240 MVAr SLR at both ends (~280 km)</td></tr>
<tr><td>4.</td><td colspan="2">Transmission System for integration of Kurnool REZ-II (7.5 GW Solar, 4 GW Wind, 3 GW BESS)
Establishment of 5x1500 MVA, 765/400 kV & 7x500 MVA, 400/220 kV Kurnool-V Pooling Station near Kurnool, Andhra Pradesh along with 2x330 MVAr (765 kV) & 2x125 MVAr (400 kV) bus reactors at Kurnool-V PS (3 GW injection at 220 kV level and 3 GW injection at 400 kV level)
Kurnool-V – Chilakaluripeta 765 kV D/c line with 330 MVAr SLR at Kurnool-V PS end (~210 km)
Kurnool-V – Kurnool-IV 765 kV D/c line (~100 km)
Chilakaluripeta – Podili 400 kV (quad) D/c line (~100 km)
Augmentation by 2x1500 MVA, 765/400 kV ICTs at Chilakaluripeta 765/400 kV substation
Augmentation by 2x1500 MVA, 765/400 kV ICTs at Maheshwaram 765/400 kV substation</td></tr>
<tr><td>5.</td><td colspan="2">Transmission System for integration of Anantapur REZ (8 GW Solar, 8 GW Wind, 4 GW BESS)
Establishment of 6x1500 MVA, 765/400 kV & 9x500 MVA, 400/220 kV Anantapur-II Pooling Station near Kurnool, Andhra Pradesh along with 2x330 MVAr (765 kV) & 2x125 MVAr (400 kV) bus reactors at Anantapur-II PS (4 GW injection at 220 kV level and 4 GW injection at 400 kV level)
Anantapur-II – Cuddapah 765 kV D/c line with 240 MVAr SLR at Anantapur-II PS (~250 km)
Anantapur-II – Kurnool-V PS 765 kV D/c line (~100 km)</td></tr>
<tr><td>6.</td><td colspan="2">Transmission System for integration of Anantapur REZ (2 GW Solar, 2 GW Wind, 1 GW BESS integrated with already planned Anantpur pooling station under 66.5 GW)
Augmentation by 3x500 MVA, 400/220 kV ICTs at Anantapur PS (Additional 1 GW injection at 220 kV level and 1 GW injection at 400 kV level)</td></tr>
<tr><td>7.</td><td colspan="2">Transmission System for integration of Kadapa REZ (8 GW Solar, 3 GW BESS)
Establishment of 4x1500 MVA, 765/400 kV & 6x500 MVA, 400/220 kV Pooling Station near Kadapa (Kadapa II PS), Andhra Pradesh along with 2x330 MVAr (765 kV) & 2x125 MVAr (400 kV) bus reactors at Kadapa-II PS (2.5 GW injection at 220 kV level and 2.5 GW injection at 400 kV level)</td></tr>
</table>

Sl. No.	Transmission scheme	Broad Transmission System
	• LILO of both circuits of Anantapur-II – Cuddapah 765 kV D/c line at Kadapa-II PS (~10 km) • Kadapa-II PS – Thiruvalam 765 kV D/c line with 240 MVAr SLR at both ends (~250 km)	

B. Karnataka

Sl. No.	Transmission scheme	Broad Transmission System
	Transmission schemes under Implementation	
1.	Transmission scheme for evacuation of 1000 MW from Gadag SEZ Phase-I	Establishment of 400/220 kV, 2x500 MVA Gadag Pooling Station
		Gadag PS- Narendra (New) 400 kV D/C line
2.	Evacuation of power from RE sources in Koppal Wind Energy Zone (Karnataka) (2500MW)	Establishment of 400/220 kV, 5x500 MVA Koppal Pooling Station
		Koppal PS-Narendra (New) 400 kV D/c line
		2x125 MVAr 420 kV Bus Reactors at Koppal PS
3.	Transmission scheme for evacuation of 1500 MW from Gadag SEZ under Phase- II	400/220 kV, 3x500 MVA ICT Augmentation at Gadag Pooling Station
		Gadag PS - Koppal PS 400 kV D/c line
	Transmission schemes under Bidding	
4.	Transmission Scheme for Solar Energy Zone in Bidar (2500 MW), Karnataka	Establishment of 3x1500 MVA, 765/400 kV & 5x500 MVA 400/220 kV station at suitable location near Bidar
		Bidar PS – Maheshwaram (PG) 765 kV D/C line
5.	**Transmission System for integration of Koppal REZ (2 GW Wind, 2 GW Solar, 1 GW BESS)** • Establishment of 6x1500 MVA, 765/400 kV & 4x500 MVA, 400/220 kV Koppal-II Pooling Station near Koppal, Karnataka along with 2x330 MVAr (765 kV) & 2x125MVAr (400 kV) bus reactors at Koppal-II PS (1 GW injection at 220 kV level and 1 GW injection at 400 kV level) • Koppal-II PS – Narendra (New) 765 kV D/c line with 330 MVAr SLR at Koppal-II PS end (~150 km) • Koppal-II PS – Raichur 765 kV D/c line with 330 MVAr SLR at Koppal-II PS end (~190 km)	
6.	**Transmission System for integration of Gadag REZ (2 GW Wind, 2 GW Solar, 1 GW Storage)** • Establishment of 3x500 MVA, 400/220 kV Gadag-II Pooling Station near Gadag, Karnataka along with 2x125 MVAr 420 kV bus reactors at Gadag-II PS (1 GW injection at 220 kV level and 1 GW injection at 400 kV level) • Gadag-II PS – Koppal-II PS 400 kV (Quad Moose equivalent) D/c line (~65km)	
7.	**Transmission System for integration of Tumkur REZ (1.5 GW Solar)** • Establishment of 4x500 MVA, 400/220 kV Tumkur-II Pooling Station near Tumkur, Karnataka along with 2x125 MVAr 400 kV bus reactors at Tumkur-II PS • Tumkur-II PS – Tumkur(Pavagada) 400 kV (Quad Moose equivalent) D/c line (~100 km)	
	Planned Transmission schemes	
8.	**Transmission System for integration of Devanagere/Chitragurga REZ (2 GW Wind, 2 GW Solar, 1 GW BESS)** • Establishment of 3x500 MVA, 400/220 kV Devanagere / Chitragurga Pooling Station near Devanagere/ Chitragurga, Karnataka along with 2x125 MVAr 420 kV bus reactors at Devanagere / Chitragurga PS (1 GW injection at 220 kV level and 1 GW injection at 400 kV level) • Devanagere / Chitragurga PS – Koppal-II PS 400 kV (Quad Moose equivalent) D/c line (~100 km)	
9.	**Transmission System for integration of Bijapur REZ (2 GW Wind)**	

Sl. No.	Transmission scheme	Broad Transmission System
	• Establishment of 3x500 MVA, 400/220 kV Bijapur Pooling Station near Bijapur (Vijayapura), Karnataka along with 2x125 MVAr, 400 kV bus reactors at Bijapur PS (1 GW injection at 220 kV level and 1 GW injection at 400 kV level) • Bijapur PS – Koppal-II PS 400 kV (Quad Moose equivalent) D/c line (~100 km)	
10.	**Transmission System for integration of Bellary REZ (1.5 GW Solar)** • Establishment of 4x500 MVA, 400/220 kV Bellary Pooling Station near Bellary, Karnataka along with 2x125 MVAr 400 kV bus reactors at Bellary PS • Bellary PS – Koppal-II PS 400 kV (Quad Moose equivalent) D/c line (~100 km)	

C. Tamil Nadu

Sl. No.	Transmission Scheme	Broad Transmission System
	Transmission schemes under Implementation	
1.	Transmission Scheme for Evacuation of power from RE sources in Karur/Tirrupur Wind Energy Zone (Tamil Nadu) (1000 MW)- Phase I	Establishment of 2x500 MVA, 400/230 kV Karur PS LILO of both circuits of Pugalur – Pugalur (HVDC) 400 kV D/c line at Karur PS
2.	Augmentation of 500 MVA ICT at Tuticorin (RTM)	Augmentation by 1x500 MVA, 400/230 kV ICT at Tuticorin
	Schemes whose Phase- I is under implementation and Phase-II is to be notified based on progress of Phase-I	
3.	Transmission Scheme for Evacuation of power from RE sources in Karur/ Tiruppur Wind Energy Zone (Tamil Nadu) (1500 MW) under Phase-II	Augmentation by 3x500 MVA, 400/230 kV ICTs at Karur PS
	Planned Transmission schemes: Transmission System for 5 GW Offshore wind farm (Sub Zone B1 to B4 & G1 to G3) in Tamil Nadu	

Zone-wise details of 5 GW Offshore wind farm in Tamil Nadu

Sub Zone ID	OSS ID	Capacity (MW)
B1	OSS B1	912
B2	OSS B2	828
B3	OSS B3	705
B4	OSS B4	809
G1	OSS G1	655
G2	OSS G2	555
G3	OSS G3	878

Sl. No.	Transmission Scheme	Broad Transmission System
4.	**A. Onshore pooling station and Transmission System from Onshore Pooling Station** • Establishment of 12x500 MVA, 400/230 kV Onshore Pooling Station near Avaraikulam, Tirunelveli District in Tamil Nadu • Avaraikulam Onshore PS – Pugalur (HVDC) 400 kV D/c line (Quad Moose equivalent) with 125 MVAr switchable reactors at both ends (300 km) • Avaraikulam Onshore PS – Tuticorin PS 400 kV D/c line (Quad Moose equivalent) (100 km) • Suitable Static Compensation / Dynamic Compensation with MSR	
5.	**B. Transmission System for integration of Offshore Wind Farms with Onshore PS** • OSS B1 – Avaraikulam Onshore PS 230 kV 2xS/c Submarine cable (30 km) • OSS B2 – Avaraikulam Onshore PS 230 kV 2xS/c Submarine cable (35 km) • OSS B3 – Avaraikulam Onshore PS 230 kV 2xS/c Submarine cable (41 km) • OSS B4 – Avaraikulam Onshore PS 230 kV 2xS/c Submarine cable (43 km)	

Sl. No.	Transmission Scheme	Broad Transmission System
	• OSS G1 – Avaraikulam Onshore PS 230 kV 2xS/c Submarine cable (40 km) • OSS G2 – Avaraikulam Onshore PS 230 kV S/c Submarine cable (35 km) • OSS G3 – Avaraikulam Onshore PS 230 kV 2xS/c Submarine cable (36 km)	
	Note: 1. The number of 230 kV submarine Cables has been considered assuming capacity of one three phase cable as 500 MW. However, the requirement of cables (single phase or three phase and its voltage class) would be further firmed up while detailing the scheme. Reactive compensation to be worked out based on data being received from submarine cable manufactures pertaining to MVAr generation from the cables. *For the planned transmission schemes in Southern Region, dynamic compensation requirement like STATCOMs, Synchronous Condensers etc. would be identified separately based on the detailed reactive power planning studies and the Short Circuit Ratios (SCRs) at different locations. Requirement of Synchronous condensers based on inertia considerations will also be assessed based on detailed studies.*	

D. Telangana

Sl. No.	Transmission scheme with Broad Scope of Works
	Transmission System planned for 13 GW REZ (3 GW Wind & 10 GW Solar) in Telangana
1.	**Transmission System for integration of Nizamabad REZ (1 GW Wind, 2.5 GW Solar, 1 GW BESS)** • Establishment of 6x1500 MVA, 765/400 kV & 3x500 MVA, 400/220 kV Pooling Station near Nizamabad (Nizamabad-II) along with 2x330 MVAr (765 kV) & 2x125 MVAr (400 kV) bus reactors at Nizamabad-II PS (1 GW injection at 220 kV level and 1 GW injection at 400 kV level) • Augmentation by 1x1500 MVA, 765/400 kV ICT at Nizamabad (PG) S/s • Nizamabad-II PS – Nizamabad(PG) 765 kV 2x D/c line (~30 km) • Nizamabad-II PS – Warangal (New) 765 kV D/c line with 330 MVAr SLR at Nizamabad-II PS (~180 km)
2.	**Transmission System for integration of Medak REZ (1 GW Wind, 2.5 GW Solar, 1 GW BESS)** • Establishment of 3x500 MVA, 400/220 kV Pooling Station near Medak (Medak PS) along with 2x125 MVAr bus reactors at Medak PS (1 GW injection at 220 kV level and 1 GW injection at 400 kV level) • Medak PS – Nizamabad-II 400 kV (Quad Moose equivalent) D/c line (~60 km)
3.	**Transmission System for integration of Rangareddy REZ (1 GW Wind, 2.5 GW Solar, 1 GW BESS)** • Establishment of 3x500 MVA, 400/220 kV Rangareddy Pooling Station near Rangareddy along with 2x125 MVAr bus reactors at Rangareddy PS (1 GW injection at 220 kV level and 1 GW injection at 400 kV level) • Rangareddy PS – Nizamabad-II 400 kV (Quad Moose equivalent) D/c line with 80 MVAr SLR at Rangareddy PS (~155 km)
4.	**Transmission System for integration of Karimnagar REZ (2.5 GW Solar)** • Establishment of 4x500 MVA, 400/220 kV Pooling Station near Karimnagar (Karimnagar PS) along with 2x125 MVAr bus reactors at Karimnagar PS (1.5 GW injection at 220 kV level and 1 GW injection at 400 kV level) • Karimnagar PS – Nizamabad-II 400 kV (Quad) D/c line (~100 km)

(D) North Eastern Region

Transmission System for evacuation of power from 1000 MW Solar Park at Karbi Anglong, Bokajan, Assam is given below:

- Establishment of 400 kV switching station at Bokajan in Assam.
- LILO of both circuits of Misa (PG) – New Mariani (PG) 400 kV D/c line at Bokajan (LILO route length ~ 20 km)
- 420 kV, 80 MVAr bus reactor: 2 Nos.

Annex 10.2

Intra-state Transmission System under Green Energy Corridor Phase-II scheme

(A) Himachal Pradesh

Package no.	Package name and details
1	Construction of 220/66 kV, 80/100 MVA substation at Mindhal in Chenab basin in Distt. Lahaul & Spiti.
2	Construction of 132/33 kV, 31.5 MVA GIS substation upstream of Malana-11 HEP in Distt. Kullu along with LILO of one circuit of 132 kV Barsaini — Charor D/c transmission line
3	Construction of 132 kV D/c transmission line from Chanju-1 HEP to220/132 kV substation at Mazra in Distt. Chamba.
4	Construction of 400/220 kV, 2x315 MVA GIS Pooling Station at Mazra along with LILO of 400 kV Chamera - I to Chamera - II S/c line in Distt. Chamba.

(B) Karnataka

Package no.	Package name and details
1.	2x100 MVA, 220/110/11 kV sub-station at Savalagi in Bagalkot district.
	220 kV D/c LILO Line from 220 kV Kudgi-Vajramatti D/c line toSavalgi substation - 16.3 km
	LILO of Todalbagi-Mamadapura 110 kV S/C line at 220/110 kV Savalagi sub-station - 2.414 km
	LILO of 110 kV Mamadapura - Babaleshwara SC line at Savalagi sub-station - 15.889 km
2.	220/66/11 kV sub-station at P.D.Kote in Chitradurga District with 2x100 MVA, 220/66 kV power transformer and lx12.5MVA, 66/11 kV power transformer
	LILO of 220 kV Hiriyur (PGCIL) to Gowribidanur D/c line at 220/66 kV P.D. Kote - 34.338 km
	LILO of 66 kV Hiriyur - Kalamaranahalli -P.R.Pura line at 220/66 kV P.D. Kote - 12.332 km
	LILO of 66 kV P.D. Kote - Hariyabbe DC line at 220/66kV P.D.Kote - 5.099 km
3.	2x100 MVA, 220/110/11 kV sub-station at Ron in Gadag district
	2 nos. of 220 kV Terminal Bays at 400 kV Gadag (Doni) S/s
	220 kV D/c line from 400kV Doni S/s to 220/110 kV Ron S/s - 43.577 km
	LILO of 110 kV Gadag-Naragal-Ron D/c line at 220/110 kV Ron S/s - 7.515 km
	LILO of 110 kV Ron-Gajendragad D/c line at 220/110 kV Ron S/s - 0.991 km
4.	2x100 MVA, 220/l10 kV sub-station at Santhpur in Bidar district
	220 kV Halabarga-Santhpur D/c Line - 28.276 km
	2 nos. of 220 kV Terminal Bays at 220 kV Halabarga S/s
	LILO of existing Halabarga - Santhpur 110 kV S/c line at proposed 220 /110 kV Santhpur sub-station - 1.357 km
	LILO of existing Santhpur-Dongargaon 110 kV S/c line at proposed 220/110 kV Santhpur sub-station - 3.361 km
	LILO of existing Santhpur-Janwad 110 kV D/c line at proposed 220/110 kV Santhpur sub - station - 2.750 km
5.	2x100 MVA, 220/66 kV, 1x12.5 MVA, 66/11 kV sub-station at Hangalin, Chitradurga district
	220 kV Hiremallanahole (Jagalur)-Hangal D/c Line - 36.304 km
	2 nos of 220 kV Terminal Bays at 400/220 kV Hiremallanahole (Jagalur) S/s
	LILO of existing Hangal - Gudikote 66 kV S/c line at proposed 220/66kV Hangal substation with Drake conductor - 4.070 km
	LILO of existing Hangal - Nagasamudra (Ramapura) 66 kV D/C line at

Package no.	Package name and details
	proposed 220/66 kV Hangal sub-station with Coyote conductor - 5.895 km
	66 kV Konasagara - Hangal S/C Line with Coyote conductor - 11.536 km
	1 No. of 66 kV Terminal Bay at 66/11 kV Konasagara S/s
6.	2x100 MVA, 220/110 kV sub-station at Yelburga in Koppal district
	LILO of 220 kV Doni-Ron D/c Lines at proposed 220/110/11 kV sub-station at Yelburga - 18.524 km
	220 kV Kushtagi-Yelburga D/c lines for a distance of 28.333 km
	2 nos. of 220 kV Terminal Bays at 220/110 kV Kushtagi S/s
	110 kV Yelburga (old)-Yelburga D/C lines for a distance of 3.54 km
	110 kV Bevor-Yelburga D/c lines for a distance of 22.54 km
	2 nos. of 110 kV Terminal Bays at existing 110/33 kV Yelburga (old) S/s
	2 nos. of 110 kV Terminal Bays at existing 110/33 kV Bevor S/s
7.	LILO of 2nd circuit of 220 kV Mahalingapura-Kudachi D/c line at 220 kV Athani S/s -25.6 km
	2 nos. of 220 kV Terminal Bays at 220 kV Athani S/s
8.	Conversion of 220 kV Bidnal –Soundatti -Mahalingapura S/C line to 220 kV Bidnal - Mahalingapur D/C line - 125.25 km
	1 no. of 220 kV Terminal Bay each at 220 kV Bidnal S/s and 220 kV Mahalingapur S/s
9.	Strengthening of existing 220 kV DC line having Drake conductor from 220 kV Gadag sub-station to 220 kV Lingapura s/s by Drake equivalent HTLS conductor for a distance of about 89.763 km
10.	Conversion of 220 kV Lingapura –Ittagi –Neelagunda -Guttur S/c line by 220 kV D/c line twin Drake conductor — 123.14 km
	Construction of one number of 220 kV Terminal Bay at Lingapura S/s
	Construction of two numbers of 220 kV Terminal Bays at Ittigi S/s
	Construction of one number of 220 kV Terminal Bay at 400/220 kV Guttur S/s
	Construction of two numbers of 220 kV Terminal Bays at 220/66 kV Neelagunda S/s

(C) Kerala

Package no.	Package name and details
1	220 kV D/c line from Vettathur tap to Mannarkad - 28 km
	220 kV D/c line from Mannarkad to Kottathara - 30 km
2	2x100 MVA, 220/110 kV substation at Mannarkad
3	2x100 MVA, 220/33 kV substation at Kottathara
4	110 kV D/c line from Anakkaramedu to Nedumkandam substation - 9 km
	20 km, 220/110 kV MCMV line from Kuyilimala to Nirmala City and 5 km 110 kV D/c line from Nirmala City to Kattappana along ROW of existing 66 kV S/c line.
5	100 MVA, 220/110 kV substation at Nirmala City (near Katta pana) with 4 nos. of 220 kV feeder bays and 6 no. of 110 kV feeders.
	2 nos. of 110 kV bays at Nedumkandam substation
	Upgradation of Vazhathope substation - Construction of 2 nos. 110 kV feeder bays
	2 x 60 MVA, 33/110 kV substation at Anakkaramedu (near Ramakkalmedu)

(D) Rajasthan

Package no.	Package name and details
1	Construction of 2x500 MVA, 400/220 kV GSS at Hanumangarh along with 400 kV, lx125 MVAR Bus Reactor, 1x25 MVAR, 220 kV Bus reactor & lx50 MVAR , 400 kV Line Reactor and Bay work at 220 kV GSS Rawatsar & Udhyog Vihar, 132 kV GSS Sriganganagar.
2	LILO of one circuit of 400 kV STPS - Bikaner line (Twin Moose) at proposed 400/220 kV GSS Hanumangarh- 85 km
3	LOT-I (i) LILO of 220 kV S/c Hanumangarh (220 kV GSS) - Udyog vihar (220 kV GSS) line at proposed 400 kV GSS at proposed 400/220 kV GSS Hanumangarh (with OPGW)- 6 km (ii) LILO of 220kV S/C Suratgarh (220 kV GSS) -Padampur (220 kV GSS) line at proposed 400 kV GSS Hanumangarh [with OPGW]-55 km
	LOT-II (i) 220 kV S/c proposed 400kV GSS Hanumangarh- Rawatsar (220 kV GSS) line [with OPGW]-80 km (ii) 132 kV S/c Udhyog Vihar (220kV GSS)- Sriganganagar (132 kV GSS) line [with OPGW]-18 km
4	Construction of 220/132 kV, 1x160 MVA and 132/33 kV, 1x40/50 MVA GSS at Sheo with 25MVAR, 245 kV Bus Reactor & bay work at 132kV GSS Undoo.
5	(i) LILO of 220 kV S/c Akal-Giral line at proposed 220kV GSS Sheo- 8 km (ii) LILO of 220kV S/c Akal-Barmer line at proposed 220kV GSS Sheo- 8 km (iii) LILO of 132kV S/c Jhijhaniyali- Sheo (132 kV GSS) line at proposed 220 kV GSS Sheo-5 km (iv) LILO of 132 kV S/c Undoo- Sheo (132 kV GSS) line at proposed 220 kV GSS Sheo- 5 km (v) l32 kV D/c 220 kV GSS Sheo (porposed)-132 kV GSS Undoo line-48 km
6	Phase -1 - Construction of 220/132 kV, 1x160 MVA and 132/33 kV, 1x40/50 MVA GSS at Kolayat and Bay work at 400 kV Bhadla & 132 kV GSS Kolayat
7	(i) 220 kV D/c Kolayat- Bhadla line (Utilisation of already constructed 33 km Bhadla-Bhikainpur line)-60 km (ii) 132 kV D/c Kolayat (220 kV)- Kolayat (l32 kV) line- 42 km (iii) Strengthening work of 220 kV D/c Bhadla-Bhikampur line - 33 km
8	LOT-I:- Construction of 400 kV D/c Jodhpur (765 kV GSS)- Jaisalmer-II Twin HTLS Line (Part-A)- 100 km (with conductor) from Jodhpur.
	LOT-II:-Construction of 400 kV D/c Jodhpur (765 kV GSS)- Jaisaliner-II Twin HTLS Line.(Part-B)- 100 km (with conductor) from Jaisalmer-II.
9	Phase-II - LOT-I:- Installation of 245 kV, 25 MVAR Bus Reactor along with associated bays and 2x220 kV feeder bay at 220 kV GSS Kolayat. Installation of new 160 MVA transformer at 220 kV GSS Panchu. 2x220 kV Feeder bay at 220 kV GSS Panchu. LOT-II :- 220 kV D/c Kolayat- Panchu line- 67 km

(E) Tamil Nadu

Package no.	Package name and details
1	1400 MVA, 400/230/110 kV Samugarengapuram substation
2	400 kV D/c quad line on DC Towers from Udangudi switchyard to 400 kV Samugarengapuram Substation — 40 km
3	230 kV D/c line from S.R Pudur Substation to Samugarengapuram substation- 60 km
	230 kV D/c line from Muppandal Substation to Samugarengapuram substation- 60 km

Package no.	Package name and details
	110 kV SC line on D/c tower from Kottaikarungulam substation to Samugarengapuram substation- 5 km
	110 kV S/c line on D/c tower from Kudangulam substation to Samugarengapuram substation- 17 km
	110 kV S/c line on D/c tower from Thandayarkulam substation to Samugarengapuram substation- 20 km
	110 kV S/c line on D/c tower from Vadakankulam substation to Samugarengapuram substation- 28 km
	110 kV S/c line on D/c tower from Navaladi substation to Samugarengapuram substation- 25 km
	110 kV line from existing Samugarengapuram substation to 400 kV Samugarengapuram substation
4	230/110 kV, 200 MVA Digital substation at Poolavady
5	230 kV D/c line from 400/230 kV Anaikadavu substation to Poolavady substation -15km
	LILO of 230 kV D/c line Palladam — Tirupur at Poolavady substation - 35 km
	Conversion of existing 110 kV S/c line on S/c towers in the 110 kV Poolavady spur — line of 110 kV Udumalpet - Gudimangalam feeder into 110 kV D/c line on D/c towers -6.15 km
	Conversion of existing 110 kV S/c line on S/c towers from 110 kV Poolavady substation to 110 KV Kethanur substation into 110 kV D/c line on D/c towers for a distance of 26 km The second circuit will be connected from Poolavady to 110 kV Sultanpet substation
	110 kV D/c line from proposed 230 kV Poolavady substation to existing 110 kV Poolavady substation - 1 km
6	230/110 kV Muppandal Substation
7	230 kV D/c line from 230/110 kV Muppandal substation to new Muppandal Substation- 40 Km
	110 kV S/c line on D/c tower from 230/110 kV Muppandal Substation to 110 /11 kV Muppandal substation - 1 km
	110 kV S/c line on D/c tower to 110/11 kV Aralvaimozhi substation to Muppandal substation -4 km
	110 kV S/c line on D/c tower 110/11 kV Kannanallur substation to Muppandal substation -5 km
	l10 kV S/c line on D/c tower 110/33/11 kV Pazhavoor Muppandal substation- 8km
8	300 MVA, 230/110 kV substation at Kongalnagaram
9	LILO of 110 kV O.K. Mandapam- Myvadi D/c line at Kongalnagaram substation-2 km
	LILO of 230 kV O.K.Mandapam- Ponnapuram D/c line at- Kongalnagaram substation-9 km
	LILO of 110 kV O.K.Mandapam-Udumalpet-I D/c line at Kongalnagaram substation-2 km
	LILO of 110 kV O.K.Mandapam- Udumalpet-II D/c line at Kongalnagaram substation-2 km
	LILO of 110 kV Udumalpet -Kongalnagaram D/c line at Kongalnagaram substation-2km
	110 kV D/c line from 230 kV Kongalanagarain substation to 110 kV Kongalnagaram substation - 5km
	Stringing of new 110 kV S/c line in the free arm of the existing D/c towers from 110 kV Kongalnagaram Substation to 230 kV Kongalanagaram substation – 5 km
	400 kV Quad D/c Lines for making LILO of both circuits of Karaikudi- Pugalur 400 kV D/c Quad Line at Pudukottai - 210 km

(F) Gujarat

Package no.	Package name and details
1.	220/66 kV Bhachunda GIS substation (Dis. Kutch) Scope of works: i. 220/66 KV, 2 x 160 MVA Transformers ii. 6 Nos. of 220 kV & 6 Nos. of 66 kV feeder bays
2.	400 kV D/C Bhogat – Kalavad line (Twin AL-59)

3.	400 kV Hadala – Shapar line (Twin AL-59)
4.	LILO of both circuits of 220 kV D/C Jamanvada – Varsana line at 220 kV Bhachunda (AL-59) M/C line
5.	LILO of one circuit of 220 kV D/C Akrimota – Nakhatrana line at Bhachunda
6.	220 kV D/C Bhatia - Bhogat line (AL-59)
7.	220 kV D/C Chorania – Salejada line (AL-59)
8.	220 kV D/C Radhanpur – Sankhari line (AL-59)
9.	LILO of one Circuit of 220 kV D/C Hadala - Sartanpar at 220 kV at Wankaner (AL-59)
10.	220 kV D/C Bhogat – Moti Gop line (AL-59)
11.	LILO of both circuits of 220 kV D/C Tebhda – Nyara line at Moti Gop substation (M/C line : AL-59)
12.	400 kV D/C Bhachunda – Varsana line (Twin AL-59)
13.	220/66 kV Moti Gop substation (Dist. Jamnagar) Scope of works: i. 220/66 kV, 3 x 160 MVA Transformers ii. 8 Nos. of 220 kV & 6 Nos. of 66 kV feeder bays
14.	220/66 kV Kalavad GIS substation (Dis. Jamnagar) Scope of works: i. 220/66 kV 3x160 MVA Transformers ii. 10 Nos. of 220 kV & 10 Nos. of 66 kV feeder bays
15.	Up-gradation of 132 kV Wankaner substation to 220 kV level (Dist. Rajkot) - Hybrid / GIS technology Scope of works: i. 220/66 kV, 3 x 160 MVA Transformers ii. 220/132 kV, 2 x 150 MVA Transformers iii. 4 Nos. of 220 kV & 6 Nos. of 66 kV feeder bays
16.	400/220 kV Bhachunda GIS substation (Dist. Kutch) (220/66 kV scheme is already approved) Scope of works: i. 400/220 kV, 3 x 500 MVA Transformers ii. 400 kV, 1 x 125 MVAR Reactor iii. 4 Nos. of 400 kV feeder bays iv. 125 MVAR Reactor bay
17.	LILO on 220 kV S/C Lalpar - Sartanpar line at 220 kV Wankaner (AL-59)
18.	LILO of one circuit of 220 kV D/C Gandhinagar TPS – Chhatral line at Vadavi (AL-59)
19.	400/220/66 kV Bhogat GIS substation (Dist. Jamnagar) Scope of works: i. 400/220 kV, 3 x 500 MVA Transformers ii. 220/66 kV, 2 x 160 MVA Transformers iii. 2 Nos. of 400 kV feeder bays iv. 125 MVAR Reactor bay v. 6 Nos. of 220 kV & 6 Nos. of 66 kV feeder bays
20.	220/132/66 kV Babara substation (Dist. Amreli) Scope of works: i. 220/66 kV, 3 x 160 MVA Transformers ii. 220/132 kV 2 x 150 MVA Transformers iii. 6 Nos. 220 kV, 4 Nos. of 132 kV & 6 Nos. 66 kV feeder bays.
21.	400 kV D/C Shapar – Pachham (Fedra) line (Twin AL-59)
22.	220 kV D/C Shapar-Babara line (AL-59)
23.	1 No. of 220 kV Reactor bay each at 220 kV Moti Paneli, Bhatia, Nakhatrana, Bhachau & Deodar substations

24.	220 kV, 1x50 / 1 x 25 MVAR Bus Reactors each at 220 kV Moti Paneli, Bhatia, Nakhatrana, Bhachau & Deodar substations
25.	400/220/66 kV *Shapar GIS substation (Dist. Surendranagar)* Scope of works: i. 400/220 kV, 3 x 500 MVA Transformers with bays ii. 220/66 kV, 3 x 160 MVA Transformers with bays iii. 400 kV, 1 x 125 MVAR Reactor iv. 10 Nos. of 400 kV feeder bays v. 10 Nos. of 220 kV line bays vi. 12 nos. of 66 kV Bays
26.	220 kV D/C Amreli - Babara line (AL-59)
27.	Transformer Package for Moti gop, Wankaner & Kalawad i. Lot-I: 6 nos. of 220/66 kV, 160 MVA Transformer (220 kV Moti gop & Kalawad S/s) ii. Lot-II: 2 nos. of 220/132 kV, 150 MVA transformers & 3 nos. 220/132 kV, 160 MVA transformers (Wankaner S/s)
28.	LILO of both circuits of 132 kV D/C Sitac WF - Jasdan line at Babara (M/C line)
29.	Transformer package Lot-I : Supply, Erection, Testing & Commissioning of 4 nos. of 400 kV, 500 MVA transformers and 2 nos of 125 MVAr reactors for 400 kV Bhachunda & 400 kV Bhogat S/s i.e. • 400/220 kV, 2x500 MVA transformers at 400 kV Bhachunda GIS • 400/220 kV, 2x500MVA transformers at Bhogat GIS, • 400 kV, 1x125 MVAr Reactor at Bhachunda GIS • 400 kV, 1x125 MVAr Reactor at Bhogat GIS
30.	Transformer package Lot-II : Supply, Erection, Testing & Commissioning of 5 nos. of 220/66 kV, 160 MVA transformers and 2 nos of 220/132 kV, 150 MVA transformers for 220 kV Babara & 400 kV Bhogat S/s i.e. • 220/66 kV, 3x160 MVA transformers at 220 kV Babara S/stn • 220/66 kV, 2x160 MVA transformers at 400 kV Bhogat S/stn • 220/132 kV, 2x150 MVA at 220 kV Babara S/stn
31.	Transformer package Lot-I Supply, Erection, Testing & Commissioning of 1 no. of 400 kV 500 MVA transformer for 400 kV Bhachunda S/s
32.	Transformer package Lot-II Supply, Erection, Testing & Commissioning of 4 nos. of 400/220 kV 500 MVA transformer for 400 kV Bhogat S/s & 400 kV Shapar S/s
33.	Reactor package Lot-I of E-132171 Supply, Erection, Testing & Commissioning of 1 no. of 125 MVAr Reactor for 400 kV Shapar S/s
34.	Transformer package Lot-II of E-132170 Supply, Erection, Testing & Commissioning of 3 nos. of 220/66kV160 MVA transformer for 400 kV Shapar S/s
35.	220 kV D/C Bhogat - Ranavav line (AL-59)

Annex 10.3

Transmission system of Hydroelectric projects likely by 2030

Sl. No.	Name of Hydro Project	Capacity (MW)	Broad transmission system
	Andhra Pradesh		
1.	Polavaram (APGENCO/ Irrigation Dept.)	960	Transmission System under Intra State
2.	Pinnapuram PSP (Greenko AP01 IREP Private Limited)	1200	Greenko AP01 IREP Pvt. Ltd. – Kurnool (New) 400 kV (quad) D/c line.
	Arunachal Pradesh		
3.	Subansiri Lower (NHPC)	2000	Lower Subansiri - Biswanath Chariali 400 kV 2 x D/c line
	Assam		
4.	Lower Kopli (APGCL)	120	Transmission System under Intra State
	Himachal Pradesh		
5.	Parbati St. II (NHPC)	800	Parbati-II - Parbati Pooling Station 400 kV D/c line
6.	Luhri Stage -I (SJVN)	210	**Common System:** 1. Establishment of 7x105 MVA, 400/220 kV Nange GIS Pooling Station. 2. Nange (GIS) Pooling Station – Koldam 400 kV D/c line. 3. Bypassing one ckt of Koldam – Ropar/ Ludhiana 400 kV D/c line at Koldam and connecting it with one of the circuit of Nange- Koldam 400 kV D/c line, thus forming Nange- Ropar/ Ludhiana 400 kV S/c line. **Under the scope of generation developer:** Luhri Stage-I – Nange Pooling Station 220 kV D/c line.
7.	Luhri Stage-II (SJVN)	172	**Common System:** 1. Establishment of 7x105 MVA, 400/220 kV Nange GIS Pooling Station. 2. Nange (GIS) Pooling Station – Koldam 400 kV D/c line. 3. Bypassing one ckt of Koldam – Ropar/ Ludhiana 400 kV D/c line at Koldam and connecting it with one of the circuit of Nange- Koldam 400 kV D/c line, thus forming Nange- Ropar/ Ludhiana 400 kV S/c line. **Under the scope of generation developer:** Luhri Stage-II – Nange Pooling Station 220 kV D/c line.
8.	Sunni Dam HEP (SJVN)	382	**Common System:** 1. Establishment of 7x105 MVA, 400/220 kV Nange GIS Pooling Station. 2. Nange (GIS) Pooling Station – Koldam 400 kV D/c line. 3. Bypassing one ckt of Koldam – Ropar/ Ludhiana 400 kV D/c line at Koldam and connecting it with one of the circuit of Nange- Koldam 400 kV D/c line, thus forming Nange- Ropar/ Ludhiana 400 kV S/c line. **Under the scope of generation developer:** Sunni Dam – Nange Pooling Station 220 kV D/c line.

Sl. No.	Name of Hydro Project	Capacity (MW)	Broad transmission system
9.	Tidong-I (Statkraft IPL)	150	1. Establishment of 2x315 MVA (7x105 MVA 1-ph units) 220/400 kV GIS Pooling Station at Jhangi. 2. 400 kV Jhangi PS – Wangtoo (Quad) D/c line. 3. 1x125 MVAR, 420 kV Bus reactor at Jhangi PS (1-ph units along with one spare unit) **Under the scope of generation developer:** Tidong HEP -Jhangi PS 220 kV D/c line
10.	Shongtong Karcham (HPPCL)	450	1. LILO of one circuit of Jhangi PS - Wangtoo (HPPTCL) 400 kV D/c (Quad) line at generation switchyard of Shongtong HEP. 2. Wangtoo (HPPTCL) - Panchkula (PG) 400 kV D/c (Twin HTLS) Line along with 80 MVAr switchable line reactor at Panchkula end at each circuit.
11.	Dugar HEP (NHPC)	500	*Interim Arrangement*: Kishtwar to Dugar Section of Kishtwar PS – Tindi PS 400 kV D/c to be taken up for implementation and to be terminated at Dugar HEP switchyard. *Final Arrangement*: After completion of the section from Dugar to Tindi, one circuit of Dugar-Kishtwar D/c line would be connected directly to one circuit of Dugar to Tindi 400 kV D/c line thus forming Kistwar- Dugar-Tindi 400 kV S/c line and Kishtwar- Tindi 400 kV S/c line **Common system:** 1. 400 kV Pooling/Switching Station (GIS) at Tindi and Barangal. 2. 1x125 MVAR 420 kV bus reactor each at Tindi and Barangal. 3. LILO of Chamera-I – Chamera –II 400 kV line at Barangal PS.
12.	Reoli Dugli HEP (SJVN)	458	LILO of one circuit of Kishtwar/Dugar- Tindi 400 kV D/C line at Reoli Dugli HEP **Common system:** 1. 400 kV Pooling/Switching Station (GIS) at Tindi and Barangal. 2. 1x125 MVAR 420 kV bus reactor each at Tindi and Barangal. 3. LILO of Chamera-I – Chamera –II 400 kV line at Barangal PS.
13.	Jangi Thopan Powari HEP (SJVN)	804	LILO of Kaza/ Jhangi 400 kV PS – Wangtoo (HPPTCL) 400 kV D/c line at Jangi Thopan HEP.
14.	Dhaulasidh (SJVN)	66	Transmission system under Intra State
15.	Uhl-III (BVPCL)	100	Transmission System under Intra State
16.	Kutehr (JSW Energy Ltd)	240	Transmission System under Intra State
	Jammu & Kashmir		

Sl. No.	Name of Hydro Project	Capacity (MW)	Broad transmission system
17.	Pakal Dul (CVPPL)	1000	**Common System:** 1. Establishment of 2x200 MVA, 400/132 kV Kishtwar Pooling Station by LILO of one circuit of Kishenpur – Dulhasti 400 kV D/c (Quad) line 2. Stringing of 2nd circuit of Kishenpur – Dulhasti 400 kV D/c (Quad) line from Kishtwar to Kishenpur. **Under the scope of generation developer:** Implementation of Kiru –Kwar –Pakal Dul - Kishtwar 400 kV D/C Triple HTLS line
18.	Kiru (CVPPL)	624	**Common System:** 1. Establishment of 2x200 MVA, 400/132 kV Kishtwar Pooling station by LILO of one circuit of Kishenpur – Dulhasti 400 kV D/c (Quad) line 2. Stringing of 2nd circuit of Kishenpur – Dulhasti 400 kV D/c (Quad) line from Kishtwar to Kishenpur. **Under the scope of generation developer:** Implementation of Kiru –Kwar – Pakal Dul - Kishtwar 400 kV D/C Triple HTLS line
19.	Kwar (CVPPPL)	540	**Common System:** 1. Establishment of 2x200 MVA, 400/132 kV Kishtwar Pooling station by LILO of one circuit of Kishenpur – Dulhasti 400 kV D/c (Quad) line 2. Stringing of 2nd circuit of Kishenpur – Dulhasti 400 kV D/c (Quad) line from Kishtwar to Kishenpur. **Under the scope of generation developer:** Implementation of Kiru –Kwar – Pakal Dul - Kishtwar 400 kV D/C Triple HTLS line.
20.	Ratle (RHEPPL / NHPC)	850	**Common System:** 1. Establishment of 2x200 MVA, 400/132 kV Kishtwar Pooling station by LILO of one circuit of Kishenpur – Dulhasti 400 kV D/c (Quad) line 2. Stringing of 2nd circuit of Kishenpur – Dulhasti 400 kV D/c (Quad) line from Kishtwar to Kishenpur. 3. Kishtwar – Kishenpur 400 kV (2nd) D/c line **Under the scope of generation developer:** Ratle HEP - Kishtwar PS 400 kV D/c line
21.	Parnai (JKSPDC)	37.50	Transmission System under Intra State
	Kerala		
22.	Pallivasal (KSEB)	60	Transmission System under Intra State
23.	Thottiyar (KSEB)	40	Transmission System under Intra State
	Punjab		
24.	Shahpurkandi (PSPCL/ Irrigation Deptt., Punjab)	206	Transmission System under Intra State
	Sikkim		
25.	Teesta St. VI (NHPC)	500	Teesta VI - Rangpo 220 kV (Twin Moose) D/c line
26.	Rangit-IV (NHPC)	120	Rangit IV - New Melli 220 kV D/c line

Sl. No.	Name of Hydro Project	Capacity (MW)	Broad transmission system
	Tamil Nadu		
27.	Kundah PSP (TANGEDCO)	500	Transmission System under Intra State
	Uttarakhand		
28.	Vishnugad Pipalkoti (THDC)	444	1. Establishment of 400 kV Pipalkoti switching station. 2. Pipalkoti HEP– 400 kV Pipalkoti switching station 400 kV D/c (Twin Moose) line. 3. Pipalkoti 400 kV S/s- Srinagar 400 kV D/c (Quad Moose) line 4. Srinagar- Kashipur 400 kV D/c (Quad) line
29.	Tapovan Vishnugad (NTPC)	520	1. Establishment of 400 kV Pipalkoti switching station. 2. Tapovan Vishnugad HEP – Pipalkoti 400 kV S/s 400 kV D/c line. 3. Pipalkoti 400 kV S/s - Srinagar 400 kV D/c (Quad Moose) line. 4. Srinagar- Kashipur 400 kV D/c (Quad) line
30.	Tehri PSP (THDC)	1000	Tehri PSP - Tehri Pooling Station 400 kV D/c line
31.	Naitwar Mori (SJVNL)	60	Transmission System under Intra State
	West Bengal		
32.	Rammam-III (NTPC)	120	Transmission System under Intra State
	Madhya Pradesh		
33.	Gandhi Sagar PSP (Greenko Energies Private Limited, GEPL)	1440	GEPL – Neemuch PS 400 kV D/c line.
	Total	**16673.50**	

Annex-11.1

List of ISTS transmission schemes commissioned (through TBCB route) till October, 2023

a) Schemes already commissioned by Transmission Service Providers: (47 Nos.)

Sl. No.	Transmission Scheme	Date of Award	Date of Commissioning	Parent Company
1.	Transmission system associated with IPPs of Nagapattinam / Cuddalore Area- Package A	March 2012	January 2019	PGCIL
2.	Transmission system for Strengthening in SR for Import of Power from ER.	August 2013	September 2016	PGCIL
3.	ATS of Unchahar TPS	March 2014	December 2016	PGCIL
4.	NR System strengthening Scheme-NRSS-XXXI(Part-A)	May 2014	July 2017	PGCIL
5.	Transmission System associated with Gadarwara STPS (2x800 MW) of NTPC (Part-A)	April 2015	July 2018	PGCIL
6.	Transmission System associated with Gadarwara STPS (2x800 MW) of NTPC (Part-B)	April 2015	June 2018	PGCIL
7.	Transmission System Strengthening associated with Vindhyachal – V	February 2015	December 2018	PGCIL
8.	Strengthening of Transmission system beyond Vemagiri	December 2015	January 2020	PGCIL
9.	Transmission system associated with LTA applications from Rajasthan SEZ Part-A	October 2019	May 2021	PGCIL
10.	New WR-NR 765 kV Inter- Regional Corridor	March 2018	July 2021	PGCIL
11.	Transmission system associated with LTA applications from Rajasthan SEZ Part-B	October 2019	August 2021	PGCIL
12.	Transmission system associated with LTA applications from Rajasthan SEZ Part-C	August 2019	October 2021	PGCIL
13.	System Strengthening Scheme in Eastern Region ERSS XXI	January 2018	October 2021	PGCIL
14.	765 kV System Strengthening Scheme in Eastern Region ERSSXVIII	March 2017	August 2022	PGCIL
15.	Transmission System for providing connectivity to RE Projects at Bhuj-II (2000 MW) in Gujarat	October 2019	November 2022	PGCIL
16.	Transmission system strengthening scheme for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under “Phase-II Part-F	March 2021	July 2023	PGCIL
17.	System strengthening for WR	March 2011	January 2015	Sterlite Power TL
18.	System strengthening common for WR and NR	March 2011	September 2015	Sterlite Power TL
19.	Scheme for enabling import of NER/ER surplus by NR	March 2010	November 2014	Sterlite Power TL

Sl. No.	Transmission Scheme	Date of Award	Date of Commissioning	Parent Company
20.	Part ATS for RAPP U-7&8 in Rajasthan	March 2014	November 2016	Sterlite Power TL
21.	Eastern Region System Strengthening Scheme-VII	December 2013	January 2017	Sterlite Power TL
22.	Northern Regional System Strengthening Scheme, NRSS-XXIX	August 2014	August 2018	Sterlite Power TL
23.	Connectivity lines for Maheshwaram 765/400 kV S/S	August 2015	December 2017	Sterlite Power TL
24.	Common Transmission system for phase-II generation projects in Orissa and immediate evacuation system for OPGC project (Orissa)	April 2016	December 2018	Sterlite Power TL
25.	Creation of new 400 kV GIS substations in Gurgaon area and Palwal as a part of ISTS	July 2016	March 2020	Sterlite Power TL
26.	NER System Strengthening Scheme II	March 2017	March 2021	Sterlite Power TL
27.	Connectivity system for Khargone TPP (2x660MW)	August 2016	December 2021	Sterlite Power TL
28.	WRSS – 21 Part – B – Transmission System Strengthening for Relieving Over Loadings Observed in Gujarat Intra-State System Due to RE injections in Bhuj PS	November 2019	January 2023	Sterlite Power TL
29.	Eastern Region System Strengthening Scheme-VI	December 2013	August 2017	Essel Infra
30.	Northern Region System Strengthening Scheme, NRSS-XXXI (Part-B)	May 2014	April 2017	Essel Infra
31.	Western Region System Strengthening – II under Project – B (Maharashtra)	November 2007	January 2014	Adani TL
32.	Western Region System Strengthening – II under Project – C (Gujarat)	November 2007	December 2015	Adani TL
33.	Additional system strengthening for Sipat STPS	November 2015	March 2019	Adani TL
34.	Additional system strengthening for Chhattisgarh (B)	November 2015	March 2019	Adani TL
35.	System strengthening for IPPs in Chhattisgarh and other generation projects in Western Region	November 2015	August 2019	Adani TL
36.	Transmission System for Ultra Mega Solar Park in Fatehgarh, Distt. Jaisalmer Rajasthan	March 2018	July 2021	Adani TL
37.	Transmission System Associated with LTA applications from Rajasthan SEZ Part-D	September 2019	September 2021	Adani TL
38.	Transmission System for Western Region Strengthening Scheme – 21 (WRSS – 21) Part – A – Transmission System Strengthening for Relieving Over Loadings Observed in Gujarat Intra-State System Due to Re-injections in Bhuj PS	October 2019	October 2022	Adani TL
39.	Transmission System for Transmission System Associated with RE Generations at Bhuj-II, Dwarka & Lakadia	November 2019	October 2022	Adani TL
40.	Transmission System for Jam Khambaliya Pooling Station and Interconnection of Jam Khambaliya Pooling Station for Providing Connectivity to RE Projects (1500 MW) in Dwarka (Gujarat) and Installation of 400/220 kV ICT along with Associated Bays at CGPL Switchyard	November 2019	November 2022	Adani TL
41.	Additional inter- Regional AC link for import into Southern Region i.e Warora - Warangal and Chilakaluripeta Hyderabad- Kurnool 765	July 2016	October 2023	Adani TL

Sl. No.	Transmission Scheme	Date of Award	Date of Commissioning	Parent Company
	kV link			
42.	Transmission Scheme for Evacuation of power from RE sources in Karur/Tirrupur Wind Energy Zone (Tamil Nadu) (1000 MW)- Phase I	January 2022	October 2023	Adani TL
43.	Transmission System required for evacuation of power from Kudgi TPS (3x800 MW in Phase-I) of NTPC Ltd.	August 2013	September 2016	L&T
44.	Transmission System for Patran 400kV S/S	November 2013	June 2016	Techno Electric
45.	Transmission System Associated with Krishnapattnam UMPP- Synchronous interconnection between SR and WR (Part-B)	July 2011	June 2014	RSTCL
46.	Transmission system strengthening in Indian system for transfer of power from new HEP's in Bhutan	January 2016	March 2019	Kalpataru
47.	North Eastern Region Strengthening Scheme (NERSS-VI)	March 2017	October 2022	Kalpataru

Annex-11.2

Transmission Schemes under implementation by Transmission Service Providers: (41 Nos.)

Sl. No.	Transmission Scheme	TSP
1.	Transmission scheme for evacuation of 3 GW RE injection at Khavda Pooling Station 1 (KPS 1) under Phase I	Adani TL
2.	Immediate evacuation for North Karanpura (3x660MW) generation project of NTPC alongwith creation of 400/220 kV sub-station at Dhanbad – Proposal of JUSNL (ERSS-XIX)	Adani TL
3.	Transmission scheme for evacuation of 4.5 GW RE injection at Khavda P.S. under Phase-II – Part A	Adani TL
4.	ISTS Network Expansion scheme in Western Region & Southern Region for export of surplus power during high RE scenario in Southern Region	Adani TL
5.	Transmission system for evacuation of power from RE projects in Rajgarh (1500 MW) SEZ in Madhya Pradesh: Phase-I	G R Infra Projects Limited
6.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase- III Part A1	Apraava Energy Private Limited
7.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase- III Part A3	Apraava Energy Private Limited
8.	Transmission system for evacuation of power from RE projects in Osmanabad area (1 GW) in Maharashtra	IndiGrid
9.	400 kV Khandukhal (Srinagar) - Rampura (Kashipur) D/c line	Megha Engineering & Infrastructures Limited
10.	Transmission scheme for injection beyond 3 GW RE power at Khavda PS1 (KPS1)	Megha Engineering & Infrastructures Limited
11.	Transmission system for evacuation of power from Neemuch SEZ (1000 MW)	PGCIL
12.	System Strengthening Scheme for Eastern and North Eastern Regions: A. Eastern Region Strengthening Scheme-XXV (ERSS-XXV) B. North Eastern Region Strengthening Scheme-XV (NERSS-XV)	PGCIL
13.	Transmission system strengthening for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase II –Part B	PGCIL
14.	Transmission system strengthening scheme for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under phase-II- Part C	PGCIL
15.	Transmission system strengthening scheme for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase-II- Part D	PGCIL
16.	Transmission system strengthening scheme for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase II –Part A	PGCIL
17.	Transmission system strengthening scheme for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase-II- Part G	PGCIL
18.	Transmission Network Expansion in Gujarat associated with integration of RE projects from Khavda potential RE zone	PGCIL
19.	Establishment of Khavda Pooling Station-2 (KPS2) in Khavda RE Park	PGCIL
20.	Establishment of Khavda Pooling Station-3 (KPS3) in Khavda RE Park	PGCIL
21.	Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase- III Part B1	PGCIL
22.	Transmission scheme for evacuation of 4.5 GW RE injection at Khavda P.S. under Phase-II – Part C	PGCIL
23.	Transmission scheme for evacuation of 4.5 GW RE injection at Khavda P.S. under Phase-II – Part B	PGCIL

Sl. No.	Transmission Scheme	TSP
24.	Transmission scheme for Solar Energy Zone in Ananthpuram (Ananthapur) (2500 MW) and Kurnool (1000 MW), Andhra Pradesh	PGCIL
25.	Transmission system strengthening scheme for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase-II- Part E	PGCIL
26.	Western Region Expansion Scheme XXVII	PGCIL
27.	Western Region Expansion Scheme XXVIII & XXIX	PGCIL
28.	Inter-regional ER-WR Interconnection	PGCIL
29.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase- III: Part C1	PGCIL
30.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase- III: Part H	PGCIL
31.	Evacuation of Power from RE Sources in Koppal Wind Energy Zone (Karnataka) (2500 MW)	ReNew Transmission Ventures Ltd
32.	Transmission Scheme for Solar Energy Zone in Gadag (1000 MW), Karnataka-Phase-I	ReNew Transmission Ventures Ltd
33.	Transmission Scheme for Solar Energy Zone in Gadag (1500 MW), Karnataka: Phase-II	ReNew Transmission Ventures Ltd
34.	System Strengthening Scheme in Northern Region (NRSS-XXXVI)" along with LILO of Sikar-Neemrana 400 kV D/C line at Babai (RRVPNL)	Resurgent Power Ventures Pvt. Ltd
35.	Transmission system for evacuation power from Pakal Dul HEP in Chenab Valley HEPs - Connectivity System	Sterlite Power TL
36.	Establishment of new 220/132 kV substation at Nangalbibra	Sterlite Power TL
37.	Transmission System for 400 kV Udupi (UPCL) – Kasargode D/C Line	Sterlite Power TL
38.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase- III: Part F	Sterlite Power TL
39.	Western Region Strengthening Scheme-XIX (WRSS-XIX) and North Eastern Region Strengthening Scheme-IX (NERSS-IX)	Sterlite Power TL
40.	Additional 400 kV Feed to Goa and Additional System for Power Evacuation from Generation Projects pooled at Raigarh (Tamnar) Pool	Sterlite Power TL
41.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase- III: Part G	Sterlite Power TL

Annex-11.3

Transmission Schemes under bidding process by Bid Process Coordinators: (41 Nos.)

Sl. No.	Transmission Schemes
1.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase- III: Part D
2.	Creation of 400/220 kV, 2x315 MVA S/S at Siot, Jammu & Kashmir
3.	Transmission system for evacuation of power from Chhatarpur SEZ (1500 MW)
4.	Transmission Scheme for Solar Energy Zone in Bidar (2500 MW), Karnataka
5.	Transmission system for evacuation of power from Luhri Stage-I HEP
6.	North Eastern Region Expansion Scheme-XVI (NERES-XVI)
7.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part1) (Bikaner Complex)- Part-A
8.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part1) (Bikaner Complex)- Part B
9.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part1) (Bikaner Complex)- Part-C
10.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part1) (Bikaner Complex)- Part-D
11.	Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase-III: Part I
12.	Transmission Scheme for integration of Renewable Energy Zone (Phase-II) in Koppal-II (Phase-A & B) and Gadag-II (Phase- A) in Karnataka
13.	Transmission System for evacuation of additional 7 GW RE Power from Khavda RE Park under Phase-III: Part A
14.	Transmission System for evacuation of additional 7 GW RE Power from Khavda RE Park under Phase-III: Part B
15.	Transmission scheme for evacuation of power from Dhule 2 GW REZ
16.	Western Region Expansion Scheme XXXIII (WRES-XXXIII): Part B
17.	Western Region Expansion Scheme XXXIII (WRES-XXXIII): Part C
18.	Transmission system for evacuation of power from Shongtong Karcham HEP (450 MW) and Tidong HEP (150 MW)
19.	Transmission System for Evacuation of Power from RE Projects in Rajgarh 1000 MW SEZ in Madhya Pradesh Phase-II
20.	Transmission system for evacuation of power from RE projects in Solapur (1500 MW) SEZ in Maharashtra
21.	Provision of Dynamic Reactive Compensation at KPS1 and KPS3
22.	Eastern Region Expansion Scheme-XXXIV (ERES-XXXIV)
23.	Western Region Network Expansion scheme in Kallam area of Maharashtra
24.	Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-IV (7 GW): Part A
25.	Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-IV (7 GW): Part B
26.	Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-IV (7 GW): Part C
27.	Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-IV (7 GW): Part D
28.	Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-IV (7 GW): Part E2

Sl. No.	Transmission Schemes
29.	Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8 GW): Part A
30.	Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8 GW): Part C
31.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-2 :5.5 GW)(Jaisalmer/Barmer Complex): Part A
32.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-2 :5.5 GW)(Jaisalmer/Barmer Complex): Part B
33.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-2 :5.5 GW)(Jaisalmer/Barmer Complex): Part C
34.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-2 :5.5 GW)(Jaisalmer/Barmer Complex): Part D
35.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-2 :5.5 GW)(Jaisalmer/Barmer Complex): Part E
36.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-2 :5.5 GW)(Jaisalmer/Barmer Complex): Part F
37.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-2 :5.5 GW)(Jaisalmer/Barmer Complex): Part H1
38.	ISTS Network Expansion scheme “Transmission Scheme for integration of Renewable Energy Zone in Tumkur area of Karnataka”
39.	Transmission system strengthening for interconnections of Bhadla-III & Bikaner III complex
40.	Network Expansion scheme in Gujarat for drawl of about 3.6 GW load under Phase-I in Jamnagar area
41.	North Eastern Region Generation Scheme-I (NERGS-I)

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