Comments and Suggestions on Draft National Electricity Plan Volume II (Transmission)

Prayas (Energy Group), 26th March, 2024

Context

As per the 20th Electric Power Survey (EPS) report, the peak demand during 2026-27 is projected to be 277 GW while the installed generation capacity is likely to be 609 GW on an all-India basis as per National Electricity Plan Vol I (Generation). The expansion of the transmission system has been planned to cater to this growth to make a reliable power system. The adequacy of existing, under construction and requirement of additional transmission system has been assessed in this draft report based on the power system studies with respect to the intra-state, inter-state transmission system as well as cross border power transfer with neighbouring countries. 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 also been considered in the study.

Based on the studies, about 1,23,577 ckm of transmission lines and 7,10,940 MVA of transformation capacity (at 220 kV and above voltage levels) need to be added during the period 2022-27 with substantial growth to be 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. The aggregate inter-regional transmission capacity by the end of 2021-22 was 1,12,250 MW and projected to be 1,43,850 MW by 2026-27.

The draft plan '*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.* Further, 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'.*

CEA published the Draft National Electricity Plan (Volume-II: Transmission) on 24th January 2024 and invited public comments by 26th March 2024. Our suggestions and comments in this regard are detailed below.

1. Need for publishing draft and final Transmission plan well before the start of the plan period.

As planning of the transmission system is a complex exercise and the gestation period of the transmission system is higher than that of generation (esp. renewables), the transmission plan should ideally be notified analogous (in terms of time frames, details etc.) to the generation plan. Section 7 of the Tariff Policy 2016 also mandates 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, but the current plan for 2022-27 is going to be notified almost after 2 to 2.5 years from the start date of the plan

period. **It would be ideal to notify the five-year plan of generation as well as transmission one year to six months in advance of the start date of the plan period for the coming cycles.**

2. Need for more load-generation balance scenarios

The draft transmission plan notifies that *the load-generation balance has been worked out for nine scenarios (three scenarios each for February, June & August based on solar peak, evening peak and night off peak) in 2026-27 time frame* without providing detailed methodological justification regarding the selected months. **It is suggested that additional scenarios may be run by considering the seasonal variation of demand, high demand/low demand months, impact of Energy Storage, Time of Day tariffs, Green hydrogen and EV charging as well.** Some of these aspects are noted below.

a. Variation in maximum demand met at national level

The maximum demand met at national level and regional level usually don't coincide on the same day. Leaving aside regional variation in maximum demand, even the maximum demand met at national level is not limited to months of February, June & August. The data compiled from POSOCO monthly reports for the last five years in the table below shows that the maximum demand is fluctuating across different months (January, April, May, June, July, August, September, and December).

Date	Max Demand met (MW)
30 May'19	1,82,610
30 Dec'20	1,82,888
30 Jan'21	1,89,644
30 Jun'21	1,91,514
07 Jul'21	2,00,570
29 Apr'22	2,07,111
10 Jun'22	2,11,856
18 Apr'23	2,15,882
23 May'23	2,21,347
09 Jun'23	2,23,235
31 Aug'23	2,36,598
01 Sep'23	2,39,978

Source: Compilation from various monthly reports published by POSOCO

b. Effect of Energy Storage (peak load shaving) and ToD tariffs (peak load shifting)

The deployment of Energy Storage and Time of day (ToD) tariffs at state level will have a direct impact on the load generation balance scenario and hence impact transmission planning. The energy storage would be charged during the off-peak hours and would be supplying the load during the peak hours thus resulting in peak shaving to some extent, and increasing the demand during the off-peak hours.

By implementing Time of day tariffs, the peak demand profile will change (in a few years), thus reducing the demand during the peak hours and increasing the transmission capacity requirement during off peak hours. So, it would be better to explicitly consider and model the impact of implementation of ToD while preparing the plan. It may also be noted that ToD is different for different utilities. So, to make the system reliable, such uncertainties may be included while framing the transmission plan.

c. Effect of Green Hydrogen/Ammonia deployment

The scale and rapid pace of green hydrogen deployment can become a great challenge on transmission planning if not thought of well in advance. As per the draft, the only mention of Hydrogen is, '*Green Hydrogen production facilities co-located with RE Zones may also reduce the requirement of transmission system from the RE Zones.'* While this may be an ideal situation, we certainly know from the several State Green Hydrogen policies that such production facilities will come up in several states and not just in RE Zones. Thus States/regions which were thought of / planned for being net exporters of power could become importers and vice versa depending on the location of the G H2/Ammonia facilities. The economic trade-off between transportation cost of hydrogen and transmission charge of electricity among other factors will contribute to the decision framework on locations for production of green hydrogen/ammonia.

d. Effect of EV charging

EV charging, especially in pockets where EV penetration is very high can become a challenge for transmission planning as well. The Government aims to install a total of 46,397 public charging stations (PCS) for electric vehicles (EV) in nine major cities by the end of the decade[1]. As per Ministry of Power any individual entity is free to set up a public charging station after meeting the technical, performance and safety standards and DISCOMs are mandated to ensure connections. It is also proposed that there shall be at least one charging station set up at every 25 km on both sides of the highway and at least one fast charging point at every 100 km[2]. Many vehicles may be charging in the peak periods in the evening as well, hence increasing the peak demand. It is important to consider such scenarios for efficient planning.

3. Review impact of ISTS RE waiver and minimum connectivity threshold (50 MW) on ISTS Transmission addition or planning

The waiver on ISTS charges is incentivising RE generators as well as the RE procurers to shift towards ISTS connectivity, thus intensifying the capacity requirement of ISTS transmission system. Thus, there is a need for an analysis to be carried out to study the impact of ISTS waiver on ISTS connectivity requirements and whether connectivity for some projects at the InSTS network would have been more optimal from a planning and operational point of view.

[1] BEE and Ministry of Power
[2] Ministry of Power - Guidelines for charging infrastructure for electrical Vehicles dated 14th January, 2022

POSOCO reported that by November 2023, around 21 GW of RE has been exempted for ISTS waiver, though 103 GW LTA demand/injection is considered for determining ISTS transmission charges.

The ISTS waiver has several sunset clauses and ISTS network planning should consider likely drop in scale and number of projects applying for ISTS connectivity as a scenario once the waiver timeline runs its course.

4. Incorporate reconductoring of transmission lines in Plan

To meet the changing demand and generation scenario, the transmission system needs to be expanded and strengthened. The strengthening requires building of new transmission lines and substations or augmentation of existing transmission/ transformation capacity by suitable means. As per CEA's own draft paper on "*Reconductoring of Transmission Lines*"[3] planning should consider the possibility of using high-capacity, high performance conductors in the new systems to preserve the right of way (RoW) and increase transmission capacity of a line. **It is suggested that such planning of reconductoring if any, with identified capacity and time frame may also be incorporated with this plan.**

5. Pilot for introducing new Technologies

Chapter 4 of the draft notes several new technology options for Sub-Stations, Lines, Communication Equipment in Transmission System, Surveying and Cyber-security. However, beyond noting these options and their benefits, there is a need for a clear action plan in terms of trying out and testing these in Indian conditions. An expert group or a committee may be constituted under CEA to assess the techno-economic benefits of these new options. Further pilot projects (by different entities) on many of these technologies should be tried out to assess the practical results and to analyse their performance and impact on grid stability and reliability. Based on learnings from their implementation and performance, the future consideration for wider adoption can be decided.

6. Planning for bi-directional transmission links

Note (ii) of section 5.10.1 states that the *inter-regional transmission capacity in one direction may not be the same as the inter-regional capacity in another 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.* However, considering dispatch priority and variability of different RE sources and the changing regional supply demand scenario, **the transmission links could be planned for bi-directional flow of power considering surplus/deficit scenarios of different regions over a period of time. Such planning may result in savings in the investments in terms of Right of Way, cost of transmission towers and cost of conductors etc.** The current plan is silent on providing information regarding the quantum of

[3] CEA - Draft paper on reconducturing of Transmission Lines in ISTS dated 17th July, 2023

existing capacity designed for bidirectional flow, capacity that can be easily converted to bidirectional flow and how much actual capacity is required with bidirectional flow characteristics. It is suggested that there should be a detailed analysis in terms of requirement, availability and cost implications for better understanding the need and scope of bi-directional transmission links.

7. Detailing of transmission elements expected to be added in next 5 years

The draft proposes 1,23,577 ckm of transmission lines and 7,10,940 MVA of transformation capacity (at 220 kV and above voltage levels) need to be added during the period 2022-27. Table 7.2 gives a breakup of this capacity by voltage but the data provided is far too aggregated and even sparse details on the various transmission elements such as number of towers, transformers etc. are not provided. Chapter 7 - Transmission System Requirement during 2022-27, which is the heart of the entire exercise is a mere 4.5 pages long and should provide many more granular details of the results of the studies. Without such details, one is unable to critically examine and reflect on the expected total transmission investments of which the only thing that is noted is, '*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.'* Likely costs of different transmission elements should be detailed in the plan.

8. Specify categorization (for load, generation evacuation, system strengthening etc.) of transmission projects

It would be useful if all the transmission projects are classified/tagged as

1. Power Evacuation from Generator/ Energy zone: To connect the newly commissioned generator(s) or REZ/SEZ to national grid.
2. Transmission network for load drawl: To expand the existing transmission network to cater the increasing demand in an area (already connected to national grid)
3. System strengthening or augmentation: To improve/ enhance power flow and/ or grid reliability at state/ regional/ national level

   This kind of categorisation will provide a better understanding about the purpose/ requirement and location of the transmission infrastructure.

9. Improved Data Reporting

There should be detailed reporting on several aspects noted below to understand project progress and benefits of various interventions.

a. Interim/progress/status report of achievement

Due to delay in notifying the plan, *it is suggested that an interim report for the years 2022-24 may be notified* and included in the plan. This will give a clear indication about what has been

achieved in the past two years and what needs to be achieved in the remaining three years. Further, it is suggested that the reporting may be done separately for capacity addition during the previous plan, thereby not including any previous/backlog addition in the current plan.

b. Progress check on project wise basis

It is important that the progress in the transmission sector is not reported only in terms of capacity (MVA) added or line length (ckm) added. There is a need to report the transmission progress in terms of the number of projects envisaged to be completed and number of projects actually completed after a period of 5 years. In addition to this, in case some projects are not completed, the progress of such projects (in terms of %) should be reported. Similar reporting should be done for future transmission projects. CEA already publishes a monthly report on the status of construction of substations and lines (220 kV and above) for all Transcos. However, the reporting on projects planned in one 5-year plan should be reported separately.

c. Reporting of projects given some sort of relaxation

Clause 6.3.5 of the draft states that 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. Here, it is suggested that the transmission projects that were given relaxation during the covid-19 pandemic or due to ROW issues or land issues, may be identified separately by reporting their current status as well as CoD, if commissioned already.

d. Utilisation of transmission elements

At present, CEA reports progress of construction of transmission network, however, the operational data other than failure is not being reported by CEA. But there is an increasing demand to report the utilisation of existing transmission elements (line and transformer loading) to understand whether strengthening of transmission network is being targeted effectively and whether investments made are resulting in desired outputs.

Hence, it is suggested that CEA captures the operational data for each transmission project in the country and reports them in public domain. In this regard, it will be good if the reporting can be further categorised (apart from the categorisation suggested above) at different time of day: solar generation hours, peak demand hours, off-peak hours and rest of day. This disaggregated data will not only help to utilise the existing assets, but will also help to improve the transmission planning.

e. Power factor /Grid Reliability improvement devices

According to the draft plan, to improve the grid reliability and provide reactive power compensation various equipment like line reactors, bus reactors, SVCs, STATCOMs etc. have been commissioned, few are under implementation and planned for future. Details are given below in the tables.

Summary of Bus Reactors planned during the period 2022-27

Region	MVAr Compensation		Cost (Rs.Cr)	
	765 kV	400 kV	765 kV	400 kV
NR	14589	9464	3073	2446
WR	10560	5125	2159	1285
SR	5010	4625	1066	1160
ER	600	625	135	157
NER	0	410	0	119
Total	**30819**	**20249**	**6433**	**5167**

Summary of Line Reactors planned during the period 2022-27

Region	MVAr Compensation		Cost (Rs.Cr)	
	765 kV	400 kV	765 kV	400 kV
NR	31740	1936	7295	838
WR	16110	1524	3558	624
SR	4625	820	2042	238
ER	660	189	135	80
NER	0	286	0	109
Total	**53135**	**4755**	**13030**	**1889**

Also, the draft plan reported that *'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'.*

However, as far as we know, there has been no detailed reporting about the effectiveness of these devices till now. **It is suggested that an assessment of impact of such devices on grid operation and management shall be reported on an annual basis.**

f. Data reporting at various portals

CEA is reporting the data related to transmission projects (focussed on their progress of construction) on its website - NPP and Tarang website. Clause 3.2.3. (viii) of the draft highlights that *"PM Gati Shakti - National Master Plan (PMGS-NMP) provides digital platform for integrating planning and coordinated implementation of projects. For planning of any new transmission lines or substations, the portal of PMGS-NMP to be used to identify preliminary feasibility of the same."* Also, there is another portal named "National Single Window System (NSWS)", which guides in identifying and applying for approvals according to the business requirements.

The information on these platforms is extremely valuable for coordination and timely completion of the projects. Considering the importance of these portals, we request the CEA to keep updating these websites regularly and add further data related to transmission (some of which is suggested in this submission). It is also suggested to report quarterly/ annually the

data on how many new projects have applied through NSWS or which projects are being reviewed or their issues being resolved through PMGS-NMP[4].

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[4] Tarang website, does not mention the date the website was updated last time, thus, making it difficult to use any data provided on the website as final/ latest with full confidence.