

9. SUB-COMMITTEE 9- HUMAN RESOURCE REQUIREMENT

CONSTITUTION:

- Member(E&C), as Chairman
- Chief Engineer(HRD),CEA as Member Secretary

MEMBERS:

- Representatives of MNRE,PGCIL,NTPC,NHPC, POSOCO , two State GENCOs
- Representative from NPTI, PSTI
- Representative from National Skill Development Corporation

TERMS OF REFERENCE OF SUB-COMMITTEE:

- Assess the human resource requirement in power sector for the period 2022-27 and 2027-32.
- Human Resource Development Plans including training need assessment and infrastructure required.

10. SUB-COMMITTEE-10: REQUIREMENT OF FLEXIBLE RESOURCES FOR GRID STABILITY

CONSTITUTION:

- Member (Planning), CEA as Chairman
- Chief Engineer (PSP&A -II) as Member Secretary of the Sub-committee.

MEMBERS:

- Representative from MNRE, NITI AAYOG, CTU, POWERGRID, NHPC, NTPC,NPCIL, POSOCO,PFC
- CEA- Chief Engineer (IRP), Chief Engineer (TETD), Chief Engineer (PSP&A I), Chief Engineer (R&D), Chief Engineer(HETD), Chief Engineer(HP&I), Chief Engineer (TPRM)

TERMS OF REFERENCE OF SUB-COMMITTEE:

- To assess the requirement of flexible resources for grid stability.
- To identify various flexible resources available for grid operation including energy storage options for better operational characteristics, better utilization of Renewable energy, etc.
- Development of future roadmap for integration of energy storage system for better Operational characteristics, better utilization of Renewable energy, etc.
- To formulate roadmap for maximum utilization of renewable energy by flexible operation of conventional generating units keeping in consideration Grid stability, Security, reliability and cost constraints.

MAJOR HIGHLIGHTS

The National Electricity Plan includes a review of the period 2017-22, detailed capacity addition requirement during the years 2022-27 and Perspective Plan projections for the years 2027-32. Major Highlights are as follows.

- i) The scheduled capacity addition from conventional sources during the period of 2017-22 was 51,561.15 MW as per National Electricity Plan, 2018. The capacity addition achieved from conventional sources is 30,667.91 MW for the year 2021-22.
- ii) India has achieved a cumulative installed renewable energy capacity (including large hydro) of 156607.9 MW as on 31.03.2022.
- iii) Capacity consisting of Coal (18320 MW), Hydro (4801.5 MW) and Nuclear (3300 MW) envisaged during the period 2017-22 is slipped where COVID-19 being the major reason resulting in delay.
- iv) The projected electrical energy requirement and peak electricity demand on all-India basis is estimated as 1874 BU and 272 GW for year 2026-27 and 2538 BU and 363 GW for year 2031-32 respectively.
- v) Projections of energy savings for utility and non-utility is estimated to be 213 TWh for the year 2026-27 and 404 TWh for year 2031-32.
- vi) The projections of reduction of energy demand through implementation of various programmes of Demand side management is 398.49 BU for year 2026-27 and 590.53 BU for year 2031-32.
- vii) The Installed Capacity of the country as on 31.03.2022 was 398986 MW(excluding 510 MW of Diesel) comprising of 235599 MW thermal, 6,780 MW Nuclear and 156607MW renewables This is considered as a base installed capacity for the study period 2022-32.
- viii) Under construction plants comprising of 25,950 MW of Thermal Power Plants, 10,903 MW of Hydro Power plants, 1580 MW of Pumped storage plants and 7,000 MW of Nuclear Power plants has been considered for the studies during period of 2022-27. Additionally, a likely capacity of 8700 MW of Nuclear Power plants which are at under various stages of construction (or in advance stages of development) likely to benefit during period 2027-32.
- ix) The retirement for period 2022-27 has been considered as 4629 MW.
- x) The capacity addition required during 2022-27 to meet the peak demand and energy requirement for the year 2026-27 is 2,28541 MW comprising of 40,632 MW of Conventional capacity addition (Coal-25580MW, Gas-370 MW and Nuclear-7000MW) and 187,909 MW of Renewable based Capacity Addition (Large Hydro-10951 MW, Solar-132,080, Wind-40500 MW, Biomass-2318 MW, PSP-2700 MW) excluding 5,856 MW of likely Hydro based Imports.
- xi) The capacity addition required during 2027-32 to meet the peak demand and energy requirement for the year 2031-32 is 2,43,042 MW comprising of 18,134 MW of Conventional capacity addition (Coal-9,434 MW, Nuclear-8700 MW) and 224,908 MW of Renewable based Capacity Addition (Large Hydro-10,888 MW, Solar-147,400, Wind-53,100(Onshore- 43,100 and Offshore 10,000 MW, Biomass-1,500 MW, PSP-12,020 MW) excluding 5,856 MW of likely Hydro based Imports

- xii) All India installed capacity is likely to be 6,22,899 MW at the end of year 2026-27 and 8,65,941 MW at the end of year 2031-32.
- xiii) It is seen that apart from under construction coal based capacity of 25GW, the additional coal based capacity required till 2031-32 may vary from 17 GW to around 28 GW. It is also seen that the BESS (5-hour) requirement in 2031-32 is varying from 51 GW to 84GW.
- xiv) The Projection of Total capacity addition are in line with the target of the country to achieve a non-fossil based installed capacity of 500 GW by the year 2029-30.
- xv) A PSP based storage capacity of 6.81 GW is required to meet the projected peak electricity demand and energy requirement in 2026-27. A PSP based capacity of 18.82 GW and 5-hour BESS capacity of 51.56 GW is likely to be required to meet the peak electricity demand and energy requirement in 2031-32.
- xvi) A generation of 1968 BU comprising of coal based -1158.8 BU, Gas based-35 BU, Nuclear based- 82 BU, Large Hydro based- 189 BU (including generation from Hydro imports), PV based-326 BU, Wind based- 170 BU and SHP based-8 BU, is projected during the year 2026-27 based on the generation planning studies to meet the projected hourly demand.
- xvii) The average PLF of the total Installed coal capacity of 239.3 GW was found to be about 55% in 2026-27. The average PLF of the total Installed coal capacity of 248.9 GW was found to be about 62 % in 2031-32.
- xviii) The domestic coal requirement in the year 2026-27 have been estimated as 831.5 Million Tonnes and in 2031-32 as 1018.2 MT and Imports by plants designed on imported coal to be 40 Million tonnes.
- xix) The total fund requirement for the period 2022-2027 is estimated to be Rs. 14,30,718 Crores, which also includes the likely expenditure during 2022-27 for advance action for the projects expected to get commissioned during 2027-2032.
- xx) The total fund requirement for the period 2027-2032 has been estimated to be Rs. 17,15,608 Crores. This fund requirement does not include advance action for the projects which may get commissioned after 31.03.2032
- xxi) Based on the estimation of fund requirement for the period 2022-27 and considering sector-wise equity contribution mentioned in para 11.3.1, it is estimated that developers will be required to infuse equity amount totalling to Rs. 3,57,679 Crores. Further, they will have to arrange for total debt of Rs. 10,73,039 Crores.
- xxii) Similarly, the equity and debt requirement (excluding fund requirement for advance action for projects during the period beyond 31.03.2032) for the period 2027-2032 have been estimated as Rs. 4,28,902 Crores and Rs. 12,86,706 Crores respectively.
- xxiii) The average CO₂ emission rate from coal based stations in the country has been on declining trend indicating improvement in efficiency of power generation from coal based power plants.
- xxiv) During 2020-21, the country has achieved Fly Ash Utilization of 107.77 Million tonnes with percentage utilization of 60.97%.
- xxv) The total CO₂ emissions projected will increase from 910 Million tonnes in 2020-21 to 1030 Million tonnes in the year 2026-27 and 1180 Million tonnes in 2031-32.
- xxvi) The average emission factor is expected to reduce to 0.524 kg CO₂/kWh in the year 2026-27 and to 0.441 kg CO₂/kWh by the end of 2031-32.



DRAFT