

GOVERNMENT OF INDIA  
MINISTRY OF POWER

**RAJYA SABHA**  
**UNSTARRED QUESTION NO.2708**  
ANSWERED ON 16.03.2026

**INTEGRATION OF NON-FOSSIL FUEL POWER GENERATING  
INTO NATIONAL GRID**

2708 SHRI KARTIKEYA SHARMA:

Will the Minister of **POWER** be pleased to state:

- (a) the preparedness of Government to integrate the targeted 500 GW non-fossil fuel power capacity by 2030, particularly the rising share of solar and wind, into the national grid;
- (b) the details of grid-readiness and stability assessments conducted to manage intermittency, variability and peak-load balancing without risk of outages;
- (c) the measures taken to strengthen grid resilience, including transmission expansion, Green Energy Corridors, energy storage systems, smart-grid technologies, forecasting and real-time balancing mechanisms; and
- (d) whether additional flexible or baseload reserve capacity is being planned to ensure reliable 24×7 electricity supply, along with the timeline thereof?

**A N S W E R**

THE MINISTER OF STATE IN THE MINISTRY OF POWER

(SHRI SHRIPAD NAIK)

**(a), (b) & (c) :** Grid-readiness and stability for integrating large shares of renewable energy are continuously assessed through system studies, including load flow studies, dynamic stability studies, and contingency analysis. These studies evaluate the impact of renewable energy variability, intermittency and peak-load requirements on the grid.

The following measures are in place to ensure the smooth integration of RE into the national grid, maintain grid stability, manage intermittency, variability and peak-load balancing without risk of outages: -

- (i) Transmission system has been planned for integration of over 500 GW RE capacity by the year 2030. The transmission schemes associated with RE generation projects are being taken up for implementation in a phased manner commensurate with the RE Capacity addition.
- (ii) Development of intra-state transmission network is being planned to keep pace with RE capacity addition. Strong inter connection of ISTS RE schemes with the intra-state network to ensure better reliability in terms of anchoring voltage stability, angular stability, losses reduction etc. is being done.
- (iii) Central Financial Assistance (CFA) is being provided to the States for setting up Transmission infrastructure for RE integration within their State under the Green Energy Corridor Scheme. Intra State Green Energy Corridor (GEC) scheme is being implemented by the Ministry of New and Renewable Energy (MNRE) in 10 States. The intra state transmission system for evacuation of 24 GW RE under Green Energy Corridor Phase-I (GEC-I) is already commissioned. The

transmission system under GEC-II for evacuation of around 20 GW RE is under implementation.

- (iv) Setting up of Regional Energy Management Centers (REMCs) for better forecasting of renewable power and to assist grid operators to manage variability and intermittency of renewable power.
- (v) Innovative products like Solar-Wind Hybrid Projects, RE projects with energy storage systems and supply of RE power balanced with power from non-RE sources launched to reduce intermittency.
- (vi) Implementation of Green Term Ahead Market (GTAM) and Green Day Ahead Market (GDAM) for sale of renewable energy.
- (vii) Flexibility in generation and Scheduling of Thermal/Hydro Power Stations to address the variability of RE generation.
- (viii) CEA (Technical Standards for Connectivity to the Grid) Regulations lay down the minimum technical requirements for the RE generating plants to ensure the safe, secure and reliable operation of the grid. The compliances to the said regulations by RE plants are verified jointly by Central Transmission Utility (CTUIL) and Grid-India / Regional Load Despatch Centres (RLDCs) before granting connectivity/interconnection to the national grid. Robust compliances verification is done before interconnection of any new plant to the grid.
- (ix) Indian Electricity Grid Code mandates that RE plants participate in the primary and secondary frequency control in case of contingencies. Hybrid RE power plants, Energy Storage Systems such as BESS (Battery Energy Storage System) and PSP (Pump Storage Project) are being promoted for mitigating variability in RE generation and provide adequate frequency support to the grid. Considering the requirement of 'Energy Storage' to facilitate integration of renewable energy in the country, Ministry of Power (MOP) is providing Viability Gap funding (VGF) for installation of Battery Energy Storage System (BESS). Through this scheme, development of 43 GWh BESS is envisaged.
- (x) Static Synchronous Compensators (STATCOM) and Static VAR Compensator (SVC) are being deployed to dynamically adjust the reactive power flow in the grid for maintaining stable voltage levels. Further, Several Dynamic Compensation devices such as Static Var Compensators (SVCs) Static Compensators (STATCOMs) and Synchronous Condensers (SynCons) in ISTS system are under various stages of Planning and implementation.
- (xi) Automatic Generation Control (AGC) is being utilized to maintain frequency stability by sending Secondary Reserve Ancillary Services (SRAS) Up or Down signals every four (04) seconds to AGC-enabled power plants.
- (xii) Market-based Tertiary Reserve Ancillary Services (TRAS) for addressing real-time demand-supply imbalances.
- (xiii) The generators with high ramp rate (e.g. hydro or gas) are also scheduled optimally to maintain load generation balance.
- (xiv) Switching of Reactors is effected to maintain voltage in RE complex within the desired range for secure & reliable grid operation.
- (xv) Ministry of Heavy Industries (MHI), has a Production Linked Incentive (PLI) scheme, 'National Programme on Advanced Chemistry Cell (ACC) Battery Storage' for implementation of giga-scale ACC manufacturing facilities in India, with an aim to establish a competitive domestic manufacturing ecosystem for 50 GWh with a total budgetary outlay of ₹18,100 crore. Out of 50 GWh capacity, 10 GWh has been earmarked for grid scale stationary storage applications to MNRE.

(xvi) CEA has issued guidelines dated 07.07.2025 for installation of Automatic Weather Stations (AWS) for Solar and Wind Power Plants to measure critical meteorological parameters for accurate, real-time measurement of weather to enable optimization of RE generation. This would improve overall generation predictability, efficiency, enhance grid reliability and ensure regulatory compliance.

To strengthen the transmission infrastructure in line with the growing electricity demand, the Government of India notified the National Electricity Plan (Volume-II Transmission) in 2024. The plan outlines the transmission system requirements for the period 2023 to 2032, commensurate with projected generation capacity additions to meet the projected electricity demand.

**(d):** The peak electricity demand and electrical energy requirement are expected to reach 446 GW and 3215 BU respectively in 2034-35. To meet the projected electricity demand, adequate generation capacity has been planned in the country. In this regard, the Government of India has initiated the following capacity addition programme:

(A) The projected thermal (coal and lignite) capacity requirement by the year 2034–35 is estimated at approximately 3,07,000 MW as against the 2,11,855 MW installed capacity as on 31.03.2023. To meet this requirement, Ministry of Power has envisaged to set up an additional minimum 97,000 MW coal and lignite based thermal capacity.

To meet this requirement, several initiatives have already been undertaken. Thermal capacities of around 18,160 MW have already been commissioned since April 2023 till 31.01.2026. In addition, 38,745 MW of thermal capacity (including 4,845 MW of stressed thermal power projects) is currently under construction. The contracts of 22,920 MW have been awarded and are due for construction. Further, 24,020 MW of coal and lignite-based candidate capacity has been identified which is at various stages of planning in the country.

(B) 12,723.50 MW of Hydro Electric Projects are under construction. Further, 4,274 MW of Hydro Electric Projects are under various stage of planning and targeted to be completed by 2031-32.

(C) 6,600 MW of Nuclear Capacity is under construction and targeted to be completed by 2029-30. 7,000 MW of Nuclear Capacity is under various stages of planning and approval.

(D) 1,57,800 MW Renewable Capacity including 67,280 MW of Solar, 6,500 MW of Wind and 60,040 MW Hybrid power is under construction while 48,720 MW of Renewable Capacity including 35,440 MW of Solar and 11,480 MW Hybrid Power is at various stages of planning and targeted to be completed by 2029-30.

(E) In energy storage systems, 11,620 MW/69,720 MWh Pumped Storage Projects (PSPs) are under construction. Further, a total of 6,580 MW/39,480 MWh capacity of Pumped Storage Projects (PSPs) are concurred and yet to be taken up for construction. Currently, 9,653.94 MW/ 26,729.32 MWh Battery Energy Storage System (BESS) capacity are under construction and 19,797.65 MW/ 61,013.40 MWh BESS capacity are under tendering stage.

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