GOVERNMENT OF INDIA
MINISTRY OF POWER

LOK SABHA
UNSTARRED QUESTION NO.4558
ANSWERED ON 27.03.2025

SUDDEN DIP IN SOLAR POWER PRODUCTION CAPACITY

4558. SHRI CHAVAN RAVINDRA VASANTRAO:
SHRI DHAIRYASHEEL SAMBHAJIRAO MANE:
SHRI SUDHEER GUPTA:

Will the Minister of POWER
be pleased to state:

(a) whether clouds over vast swathes has resulted in sudden dip in solar power production capacity in the country during the last few months raising worries about the stability of powergrids and if so, the details thereof;

(b) whether sudden dip due to low production and surge in power due to over production can damage the power grid and sometimes lead to spark and fires in the grid;

(c) if so, the details thereof and safety preventive measures taken by the Government in this regard;

(d) the steps taken/being taken by the Government to strike balance between renewable source of energy and other conventional source of energy so that the distribution of power may not be affected in the near future; and

(e) whether Grid India is working with several stakeholders to improve weather forecast required for renewable power generation and if so, the details thereof?

A N S W E R

THE MINISTER OF STATE IN THE MINISTRY OF POWER

(SHRI SHRIPAD NAIK)

(a) : There have been few instances of sudden dip in solar power generation in the country in recent months. The details of dip in Solar Power generation during past three months (December, 2024 to February, 2025) are given at Annexure.

(b) & (c) : Sudden dip in solar generation leads to demand-supply gap resulting in low frequency & localised high voltages in grid. Similarly, sudden ramp up in solar generation after clearance of cloud cover may lead to high frequency & localised low voltages in grid. The demand supply gap due to change in renewable generation have to be compensated by other generating resources for frequency control and reactive power support. In this regard, following preventive measures have been taken :

(i) Automatic Generation Control (AGC) maintains frequency stability by sending Secondary Reserve Ancillary Services (SRAS) Up or Down signals every 4 seconds to AGC-enabled thermal and hydro power plants.

(ii) During dip in RE generation, additional generation from thermal based power plants under Tertiary Reserve Ancillary Services (TRAS) is provided to maintain frequency in the band as defined in the Indian Electricity Grid Code (IEGC).

(iii) Mode of Pump Storage plants are also changed to support active power.

(iv) The generators with high ramp rate viz hydro/ gas are also brought on bar to maintain load generation balance.

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(v) Renewable Energy (RE) Plants are also instructed to revise schedule promptly.

(vi) Reactor switching is done so as to keep Voltages in RE plants within desired range for secure & reliable grid operation.

(vii) Mode of operation of RE Plants/Reactive Power compensation devices are also changed as per Reactive Power requirement of the grid.

(viii) Reactive Power support is also taken from on bar thermal, hydro and nuclear generators.

(d) : The Government of India has recognised the need for striking a balance between Renewable Source of Energy and Conventional source of energy to meet the growing power demand. As per National Electricity Plan (NEP) prepared by CEA, GoI has targeted 874 GW installed capacity by 2031-32. This includes capacity of 304 GW from conventional sources - Coal, Lignite, Gas, Nuclear and 570 GW from renewable sources - Solar, Wind, Biomass and Hydro. To achieve these targets, Government of India has initiated following capacity addition programme:

(i) Government of India has proposed in November 2023 for setting up of an additional minimum 80,000 MW coal based capacity by 2031-32. Against this target, coal based capacity of 9,350 MW has already been commissioned in 2023-24 & 2024-25. 32,300 MW Thermal Capacity is under construction and contracts for 23,440 MW thermal capacity have been awarded in FY 2024-25. Further, 35,180 MW of coal and lignite based candidate capacity has been identified which is at various stages of planning in the country.

(ii) 13,997.5 MW of Hydro Electric Projects are under construction. Further, 24,225.5 MW of Hydro Electric Projects are under various stage of planning and targeted to be completed by 2031-32.

(iii) 7,300 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.

(iv) 1,53,920 MW Renewable Capacity including 84,310 MW of Solar, 28,280 MW of Wind and 40,890 MW Hybrid power is under construction while 70,210 MW of Renewable Capacity including 46,670 MW of Solar, 600 MW of Wind and 22,940 MW Hybrid Power is at various stages of planning and targeted to be completed by 2029-30.

(v) In energy storage systems, 13,050 MW/78,300 MWh Pumped Storage Projects (PSPs) are under construction/concurred and 14,970 MW/54,803 MWh Battery Energy Storage System (BESS) are currently under various stages of construction/bidding.

Further, following measures have been taken to ensure reliability and stability of the National Grid: -

(i) 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.

(ii) 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.

(iii) Resource Adequacy Plan (RAP) has been prepared and both Long Term (LTRAP) & Short Term (STRAP) have been mandated. This would bring requirements of peaking and flexible resources to balance the demand and supply in all time blocks.

(iv) Encouraging setting up of RE projects with storage facilities for optimal utilisation of transmission facilities.

(v) Flexibilization of thermal generation is mandated to address the variability of RE generation.

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(vi) 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/RLDCs before granting connectivity/interconnection to the national grid. Robust compliances verification is done before interconnection of any new plant to the grid.

(vii) 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.

(viii) Establishment of 13 No. of Renewable Energy Management Centres (REMC) in RE rich States and Regions for dedicated monitoring, forecasting and scheduling of Solar and Wind plants.

(e) : Ministry of Power (MoP) and Ministry of Earth Sciences (MoES) have been interacting very closely and regularly to ensure sharing of accurate weather data with stakeholders for RE generation forecasting. As a result of close coordination between the two Ministries, India Meteorological Department (IMD), National Centre for Medium Range Weather Forecasting (NCMRWF) and Indian Space Research Organisation (ISRO) are sharing weather forecast data with various stakeholders which is being utilised for Renewable Energy (RE) and demand forecasting. Further, Weather data of all Inter State Transmission System (ISTS) connected RE Plants is being shared by Grid-India with NCMRWF four times a day through secure API (Application Programming Interface) for improving weather forecast.

Ministry of Power has modified the guidelines for tariff based competitive bidding process for procurement of power from grid connected Solar PV power projects on 12th Feb 2025. The amended bidding guidelines mandate the developers to install and maintain GPS enabled Automatic Weather Station (AWS) as per the technical specifications and standards specified by relevant central government agency. Availability of weather measurements from AWS placed at the RE complex will further enhance the quality of weather forecasting for all stakeholders.

In addition, IIT Bombay has been engaged for development of indigenous RE Forecasting Tool.

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ANNEXURE

ANNEXURE REFERRED IN REPLY TO PART (a) OF UNSTARRED QUESTION NO. 4558 ANSWERED IN THE LOK SABHA ON 27.03.2025

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The details of dip in Solar Power generation during past three months (December, 2024 to February, 2025):

Date	All India Solar generation (MU)	% Dip from previous day
26-Dec-24	227.33	-19.5
27-Dec-24	222.41	-2.16
11-Jan-25	301.1	-15.36
18-Feb-25	447.14	-4.16
19-Feb-25	406.41	-9.11
25-Feb-25	382.64	-18.96

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