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Ministry of New & Renewable Energy
(Wind Energy Division)

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National Wind-Solar Hybrid Policy

Ministry of New & Renewable Energy issued draft National Wind-solar Hybrid Policy in June 2016. The Policy has been finalized after having detailed consultation with stakeholders.

2. The National Wind-solar Hybrid Policy is hereby released by the Ministry for information of all stakeholders and general public.

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NATIONAL WIND-SOLAR HYBRID POLICY

1. INTRODUCTION

1.1 India has set an ambitious target of reaching 175 GW of installed capacity from renewable energy sources by the year 2022, which includes 100 GW of solar and 60 GW of wind power capacity. Various policy initiatives have been taken to achieve this target. At the end of 2017-18 the total renewable power installed capacity in the country was almost 70 GW.

1.2 Solar and wind power being variable in nature pose certain challenges on grid security and stability. Studies revealed that in India solar and wind resources are complementary to each other and hybridization of these two technologies would help in minimizing the variability apart from optimally utilizing the infrastructure including land and transmission system.

1.3 Superimposition of wind and solar resource maps shows that there are large areas where both wind and solar have high to moderate potential.

1.4 The existing wind farms have scope of adding solar PV capacity and similarly there may be wind potential in the vicinity of existing solar PV plant.

1.5 Suitable policy interventions are therefore, required not only for new wind-solar hybrid plants but also for encouraging hybridization of existing wind and solar plants.

1.6 To smoothen the wind solar hybrid power further, appropriate capacity of battery storage may also be added to the project.

2. AIMS AND OBJECTIVE

2.1 The main objective of the Policy is to provide a framework for promotion of large grid connected wind-solar PV hybrid system for optimal and efficient utilization of transmission infrastructure and land, reducing the variability in renewable power generation and achieving better grid stability.

2.2 Policy also aims to encourage new technologies, methods and way-outs involving combined operation of wind and solar PV plants.

3. PERIOD OF ENFORCEMENT

This policy will remain in force unless withdrawn, modified or superseded by the Government. The Government will undertake a review of this Policy as and when required.

4. WIND-SOLAR HYBRID SYSTEMS

4.1 Under the category of wind-solar hybrid power plants, Wind Turbine Generators (WTGs) and Solar PV systems will be configured to operate at the same point of grid connection. There can be different approaches towards integrating wind and solar depending upon the size of each of the source integrated and the technology type.

4.2 In case of fixed speed wind turbines connected to grid using an induction generator, the integration can be on the HT side at the AC output bus. However, in case of variable speed wind turbines deploying inverters

for connecting the generator to the grid, the wind and the Solar PV system can be connected to the intermediate DC bus of the AC-DC-AC converter.

4.3 The second important aspect would be related to the sizing – which would depend on the resource characteristics. In order to achieve the benefits of hybrid plant in terms of optimal and efficient utilization of transmission infrastructure and better grid stability by reducing the variability in renewable power generation, in the locations where the wind power density is quite good, the size of the solar PVs capacity to be added as the solar-hybrid component could be relatively smaller. On the other hand, in case of the sites where the wind power density is relatively lower or moderate, the component of the solar PV capacity could be relatively on a higher side.

However, a wind-solar plant will be recognized as hybrid plant if the rated power capacity of one resource is at least 25% of the rated power capacity of other resource.

5. IMPLEMENTATION STRATEGY

5.1 The implementation of wind solar hybrid system will depend on different configurations and use of technology.

a. Wind-Solar Hybrid- AC integration:

In this configuration the AC output of the both the wind and solar systems is integrated either at LT side or at HT side. In the later case both system uses separate step-up transformer and HT output of both the system is connected to common AC Bus-bar. Suitable control equipment are deployed for controlling the power output of hybrid system.

b. Wind-Solar Hybrid- DC integration:

DC integration is possible in case of variable speed drive wind turbines using convertor-inverter. In this configuration the DC output of the both the wind and solar PV plant is connected to a common DC bus and a common invertors suitable for combined output AC capacity is used to convert this DC power in to AC power.

5.2 New Wind-Solar Hybrid Plants:

New wind-solar hybrid projects shall be encouraged with following provisions:-

- i. The hybrid power generated from the wind-solar hybrid project may be used for (a) captive purpose; (b) sale to third party through open access; (c) sale to the distribution company (ies) either at tariff determined by the respective SERC or at tariff discovered through transparent bidding process; and (d) sale to the distribution company (ies) at APPC under REC mechanism and avail RECs.
- ii. The power procured from the hybrid project may be used for fulfilment of solar RPO and non-solar RPO in the proportion of rated capacity of solar and wind power in the hybrid plant respectively.
- iii. For procurement of hybrid power through transparent bidding process different parameters may be used. Parameters that may be considered for bidding could be capacity delivered at grid interface point, effective CUF and unit price of electricity.
- iv. Government entities may invite bids for new hybrid plants keeping qualifying criteria such as those discussed in iii above, the tariff being the main criteria for selection.

5.3 Hybridisation of existing wind/solar PV plants:

Existing wind or solar power projects, willing to install solar PV plant or WTGs respectively to avail benefit of hybrid project, may be allowed to do so with following Conditions:

- i. No additional connectivity/transmission capacity charges shall be levied by the respective transmission entity for hybridisation at existing wind/solar PV plants if already granted transmission connectivity/ access is being used. Transmission charges may be applicable for the additional transmission capacity/ access granted as per prevailing regulation.
- ii. In case capacity margins are available at the receiving transmission sub-station of respective transmission entity, at which the existing wind/solar projects is connected, additional transmission capacity/access may be allowed subject to its technical feasibility. In such a case, any transmission augmentation required up to the receiving transmission sub-station will be the responsibility of project developer.
- iii. In case of AC integration assessment of solar and wind power injected from the hybrid project in to the grid will be worked out by apportioning the reading of main meter installed at the receiving station on the basis of readings of ABT meters installed on LT or HT side of the wind and solar PV plant as the case may be.
- iv. In case of DC integration assessment of solar and wind power injected from the hybrid project in to the grid will be worked out by apportioning the reading of main meter installed at the receiving station on the basis of readings of DC meters installed at the DC output of the wind and solar PV plant. Till such time the methodology

for DC metering of hybrid systems and standards & regulations are framed for DC meters, only AC integration will be permitted.

- v. The additional solar/wind power generated from the hybrid project may be used for (a) captive purpose; (b) sale to third party through open access; (c) sale to the distribution company (ies) either at tariff determined by the respective SERC or at tariff discovered through transparent bidding process; and (d) sale to the distribution company (ies) at APPC under REC mechanism and avail RECs. For bidding purpose, State or Central entities may bid for hybridization of existing projects connected to InSTS or ISTS as the case may be.
- vi. Government entities may invite bids for hybridisation of existing wind and solar plants with tariff being the main criteria for selection.
- vii. The additional solar/wind power procured from hybrid project shall be used for fulfilment of solar/non-solar RPO as the case may be.

5.4 Battery Storage:

Battery storage may be added to the hybrid project (i) to reduce the variability of output power from wind solar hybrid plant; (ii) providing higher energy output for a given capacity (bid/ sanctioned capacity) at delivery point, by installing additional capacity of wind and solar power in a wind solar hybrid plant; and (iii) ensuring availability of firm power for a particular period.

Bidding factors for wind solar hybrid plants with battery storage may include minimum firm power output throughout the day or for defined hours during the day, extent of variability allowed in output power, unit price of electricity, etc.

6. REGULATORY REQUIREMENTS

The Central Electricity Authority and CERC shall formulate necessary standards and regulations including metering methodology and standards, forecasting and scheduling regulations, REC mechanism, grant of connectivity and sharing of transmission lines, etc. for wind-solar hybrid systems.

7. STANDARD AND QUALITY

For wind turbines, solar modules and balance of systems, the technical guidelines issued by the Ministry from time to time for grid connected systems will be followed.

8. INCENTIVES

The Government will encourage development wind-solar hybrid systems through different schemes and programmes. All fiscal and financial incentives available to wind and solar power projects will also be made available to hybrid projects.

9. RESEARCH AND DEVELOPMENT

Government will support the technology development projects in the field of wind-solar hybrid systems. Besides, support will be provided for development of standards for hybrid systems.