



सोलर एनर्जी कॉर्पोरेशन ऑफ इंडिया लिमिटेड
(भारत सरकार का उपक्रम)
Solar Energy Corporation of India Ltd.
(A Government of India Enterprise)

स्वच्छ भारत - स्वच्छ ऊर्जा



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Shri S.C. Shrivastava

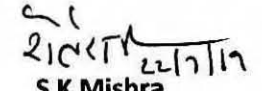
Chief (Engineering), CERC
Central Electricity Regulatory Commission
3rd and 4th Floor, Chanderlok Building
New Delhi

Sub: Energy Group to review "Indian Electricity Grid Code and other related issues"

Sir,

With reference to the comments/suggestions sought by the CERC on Indian Electricity Grid Code and other related issues, this is to express our gratitude for the opportunity given to SECI on the pertinent issue. As the nodal agency for the implementation of India's flagship National Solar Mission, SECI has a major role to play in the development of the renewable sector in the country. Our views and suggestions on the subject are enclosed herewith for your consideration. We are open for any further discussions on the same

Thanks and Regards,


S K Mishra
Director (PS)

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Suggestions for updating IEGC Regulations

Solar Energy Corporation of India Ltd" (SECI) is a CPSU set up under the administrative control of the Ministry of New and Renewable Energy (MNRE), for development, promotion and commercialization of solar energy technologies in the country. It is the only CPSU dedicated to the solar energy sector. As the nodal agency for the implementation of India's flagship National Solar Mission, SECI has a major role to play in the development of the renewable sector in the country. SECI undertakes tariff-based tendering for solar, wind and solar-wind hybrid power projects as well. SECI has awarded solar PV capacities of 11 GW, out of which projects of 4555 MW capacity have been commissioned cumulatively till 31.03.2019. In addition, solar tenders have been issued for 9700 MW capacity. Approx. 8900 MW Wind power capacities have also been awarded. SECI has signed PSAs of approx. 20 GW with the states of Punjab, Bihar, Haryana, Delhi, Odisha, Rajasthan, MP, Maharashtra, Gujarat, Tamil Nadu, Jharkhand, Chhattisgarh, Puducherry.

Within a very short span of time, the RE tariffs have already touched historic lows (approx Rs. 2.5-2.8 per unit). This portends an encouraging and yet a challenging way forward. Significant targets still remain to be fulfilled. Country-wide around 36 GW of Wind power and approx. 27.5 GW of solar capacity has been commissioned. Going forward, in addition to solar and Wind, Hybrid, hybrids with Storage systems and Off-shore wind capacities are also being developed as part of a strategy to attain capacity targets. In the overall scenario, approx. 70 GW of Solar and another 24 GW of Wind power remains to be integrated in to the grid by 2022. To realise these targets would require not just demand creation but also a conducive techno-commercial ecosystem. It is not enough to add wind and solar to a grid with physical and market structures designed for the characteristics of conventional power. In order to integrate wind and solar with minimal curtailment, interventions are necessary. The objective is to attain pathways for free flow of information as well as mechanisms for free flow of commodity (i.e. electricity). As the Govt's nodal agency for steering India's energy transition, SECI seeks support of a conducive Electricity Grid Code that is in coherence with the country's renewable energy targets. The comments and suggestions that ensue are intended to align the IEGC Regulations to a more inclusive, RE friendly document.

Optimal Operation of Grid:

The IEGC Regulations recognizes that the primary objective of the National / Regional Grids is to enhance operational reliability and economy of the entire electric power network. Undoubtedly, grid security and stability is a matter of concern for the grid operators. To address this, Solar PV generators may be mandated to provide grid support services as part of regulatory requirements. Solar PV inverters, for eg. are IGBT based power conversion systems that are capable of providing grid support functions like active power regulation, reactive power support and voltage ride through. With RE power being paid for active power only, this capability remains unutilised. Mandating its utilisation this could lead to some increase in the tariffs since RE generators are paid for active power only but address grid stability concerns to some extent and reduce investment on STATCOM and SVCs. From the system perspective, this would lead to the discovery of a more realistic valuation of renewable energy. On becoming a part of the Grid code, this would naturally flow into SECI's tenders going forward.

With the country's energy policy (India is a signatory to the Paris Agreement on Climate Change) firmly rooted in the promise of a sustainable future, Renewable energy is the way forward. Therefore, any scope for integration of more renewable power in the grid should be encouraged. As the RE capacity in the grid continues to grow, operating code should also look forward to run thermal units at their technical minimum or further less. States, based on their peculiar demand pattern may be obligated to procure hybrid power to begin with. To address peaking power requirements (in the evening and morning) it may be noted that SECI is already inviting tenders to set up hybrid (solar and wind) power plants that provisions for 3 hours of peaking power capacity. The success of this could lead the way to increased reliability on RE power.

Recommendations:

1. The Solar PV generators above 10 MW shall be obligated to utilise dynamic grid support capabilities of the inverter/PCU like active power regulation and reactive power control.
2. To encourage adoption of capabilities as above, Solar PV Generators should be incentivised for supporting the grid, the mechanism of which could be worked out by a technical work group.

Planning Code for Interstate Transmission

As solar rich states viz, Rajasthan, Gujarat tend to reach saturation for their internal consumption, projects are now being connected to the ISTS. This has allowed availability of cheap RE power to non-RE rich states. Power under SECI's ISTS connected projects is today flowing from states like Rajasthan and Gujarat to Punjab, Haryana, Odisha, Tamil Nadu. Since states like Gujarat, TN, Karnataka, AP, MP and Rajasthan which are solar/wind resource rich and suitable for commercial exploitation are already

saturated, further development of Wind power will only be possible if it can be transmitted over the ISTS. SECI is already witnessing shrinking in subscription to Wind tenders due to paucity of transmission infrastructure. It is therefore essential that transmission corridor planning is carried out in close co-ordination with the rollout plan for RE capacities. Some steps have been taken in this direction with a prospective plan for the upcoming solar and wind capacities being shared with the CTU.

The difficulty in land aggregation by states should not be allowed to become a hindrance to the achievement of the country's RE targets. With the announcement of Remote cold desert regions like Leh, Ladakh and Lahaul Spiti, HP as regions where renewable power can be explored, transmission planning for evacuation of power from these regions must be taken up immediately. It is well recognized that while RE projects have a much smaller commissioning schedule (approx. 18 months), Transmission assets take longer to come up. SECI's tendering experience over the past suggests that certainty of power assures lower tariffs. Lest this certainty is assured through timely planning, we may end up creating stranded assets. Existing process of ensuring LTA/connectivity before start of transmission system construction needs to be changed as they are designed for conventional generators where both have same gestation period. States need to consider transmission system in with forthcoming renewable tender and winning bidders shall apply for LTA/connectivity.

Recommendations:

1. As the nodal agency for all RE power in the country, SECI shall issue bids as per transmission infrastructure in the country.
2. To support addition of RE power in the energy mix, requirement of LTA for starting construction of transmission system in advance should be done away with.
3. To encourage states for faster off take of RE power, a single tariff based on the all India average tariff of the past year shall be prescribed.

Scheduling and Despatch Code:

As a principle, optimal scheduling and dispatch of available generation should be done with the objective of minimizing total production costs subject to physical, operational, and market constraints. It is noteworthy that Renewable Energy available today is a fixed cost energy that has no variable cost associated with it, unlike thermal power. While, thermal plants always incur fixed cost charges, losses incurred by RE plants due to curtailment or grid congestion leave no recourse for recovery of losses. It must be noted that forecasting based on weather parameters like availability of solar or wind source or cloud cover is done over a larger geographic expanse (say 100 sq. km) but weather phenomena could have a more local impact which is beyond the control of a generator.

As an alternative to imposition of the forecasting accuracy on every interconnection substation, forecasting and scheduling may be carried out over a bigger spatial area- *a more optimal node* since forecasting errors tend to average out as more number of generating stations are included. Karnataka and AP allow aggregation of forecasts at QCA level, which ensures that the penalty payable by generators is only to the extent SLDC is getting affected at state level. While a number of states levy penalties at the Pooling Substation (PSS) level resulting into RE generators having to bear DSM penalties at PSS level and State level as well which amounts to double penalty. A uniform strategy in all states is required with the proposed REMCs at the focal point as information repository and coordination agency for RE penetration. Moreover, this would help identify optimal locations for deployment of storage resources. Looking at larger geographic expanse shall promote efficiency through resource sharing- as it allows seeing the big picture (statistical combination) when it comes to dispatching electricity as efficiently as possible. Use of storage resources in combination with market-driven incentives in a competitive ecosystem would drive the performance of power plants- Reduce outages, achieve better demand supply balance.

Article 6.3 in the Scheduling and Dispatch code of the IEGC Regulations specifies that it applies to NLDC, RLDC/SLDCs, ISGS, Distribution Licensees, SEBs/Regional Entities, Regional Entities, Power Exchanges and Wind and Solar generating stations. With the Fourth Amendment to the IEGC in April, 2016, Clause 6.3A (Commercial Operation of Central generating Stations and inter-state generating stations) which lays down detailed procedure for Commissioning of Thermal and Hydro power stations was introduced. However, the detailed commissioning procedure for Solar and Wind Power generating stations on similar lines need to be defined considering the publication of the Central Electricity Authority (Technical Standards for Connectivity to the Grid) (Amendment) Regulations, 2019.

Recommendations:

1. Responsibility for Scheduling and forecasting should lie with the REMCs equipped with RE forecasting, scheduling & monitoring systems instead of each individual generator/QCA. Further, proposed REMCs shall be mandated with collection and processing of all plant data, including RE Plants, in real time from Plant SCADA systems. The REMCs shall work in close coordination with respective Load Dispatch Centres for RE generation and control for smooth grid operation. The Deviation Settlement Mechanism regulation should be pegged to the REMC schedule to implement a coherent strategy for managing RE penetration at state level.
2. The permissible deviation band should be rationalised based on the Forecasting Technology, capabilities and whether data available.
3. As per current regulatory mechanisms, forecast is applicable with a delay of 45- 60 to 90 mins. Since the variations due to cloud movements range from a few seconds to a few minutes,

capturing these variations in forecasts would necessarily require high temporal resolution. NWP models are available at a spatial resolution of 50KM. To achieve a higher spatial resolution, local or regional models are necessary which would be costly and inflict financial burden on RE generators. Instead RE generators can be mandated to maintain minimum smoothing storage reserves to ensure that output is maintained within a stipulated band of 15-30 minute moving average.

4. Limited Revisions Allowed - 16 Revisions for Wind and 9 revisions for Solar are allowed (One each in 1.5 Hours) as against unrestricted revisions allowed in case of conventional generators. To bring parity, RE generators shall be allowed unrestricted revisions.
5. Detailed Commissioning procedure for Wind and Solar Power generating stations may be appended to Clause 6.3A with due consideration to the notification of Central Electricity Authority (Technical Standards for Connectivity to the Grid) (Amendment) Regulations, 2019.

Energy Storage Resources

If the Emerging Trends in the nature of load demand patterns are to be taken as signs of Transition in the Indian Power Sector, there is an increasing demand for Flexible generation- to meet increasing intraday and seasonal demand variability. As storage systems are being increasingly seen as important element of power transmission system, the Grid Code may be amended to define storage resources as non-generating resources and allowed non-discriminatory access to the use of the transmission system like a generating company. This would open the market for grid side applications and storage-as-as-service merchant models.

Recommendations:

1. Standardized, non-discriminatory rules for grid interconnection will encourage emerging storage technologies that are deemed necessary to keep up with our targets of RE. A definition of a storage resource as below may be included in the IEGC:

Electrical Storage Resource:

A resource capable of receiving energy from a generating unit or grid, storing it for later injection of electric energy back to the grid that is both designed as well as configured to do so and is contractually permitted to do so.

Further, enabling provisions for the purpose of interconnecting a storage resource to the grid, on the generation and transmission side may also be added.

Recommendations: Summary

I. Definitions

1. The IEGC regulation defines a generating unit as “an electrical Generating unit coupled to a turbine within a Power Station together with all the Plant and Apparatus at that Power station which relates exclusively to the operation of that turbo-generator”.

With a view to make a more inclusive definition of Generating Unit, the definition may be amended as follows:

“an electrical Generating unit coupled to a turbine within a Power Station together with all the Plant and Apparatus at that Power station which relates exclusively to the operation of that turbo-generator

Or

A power conversion system/electrical inverter coupled with a photovoltaic array or energy storage system that converts direct current into alternating current together with plant and apparatus for synchronisation with electrical grid”

II. Optimal Operation of Grid:

1. The Solar PV generators above 10 MW shall be obligated to utilise dynamic grid support capabilities of the inverter/PCU like active power regulation and reactive power control.
2. To encourage adoption of capabilities as above, Solar PV Generators should be incentivised for supporting the grid, the mechanism of which could be worked out by a technical work group.

III. Planning Code for Interstate Transmission

1. As the nodal agency for all RE power in the country, SECI shall issue bids as per transmission infrastructure in the country.
2. To support addition of RE power in the energy mix, requirement of LTA for starting construction of transmission system in advance should be done away with.
3. To encourage states for faster off take of RE power, a single tariff based on the all India average tariff of the past year shall be prescribed.
4. Standardized, non-discriminatory rules for grid interconnection will encourage emerging storage technologies that are deemed necessary to keep up with our targets of RE. Accordingly, further to the inclusion of storage enabling provisions for the purpose of interconnecting a storage resource to the grid, on the generation and transmission side may be added.

IV. Scheduling and Despatch Code:

1. Responsibility for Scheduling and forecasting should lie with the REMCs equipped with RE forecasting, scheduling & monitoring systems instead of each individual generator/QCA. Further, proposed REMCs shall be mandated with collection and processing of all plant data, including RE Plants, in real time from Plant SCADA systems. The REMCs shall work in close coordination with respective Load Dispatch Centres for RE generation and control for smooth grid operation. The Deviation Settlement Mechanism regulation should be pegged to the REMC schedule to implement a coherent strategy for managing RE penetration at state level.
2. The permissible deviation band should be rationalised based on the Forecasting Technology, capabilities and whether data available.
3. As per current regulatory mechanisms, forecast is applicable with a delay of 45- 60 to 90 mins. Since the variations due to cloud movements range from a few seconds to a few minutes, capturing these variations in forecasts would necessarily require high temporal resolution. NWP models are available at a spatial resolution of 50KM. To achieve a higher spatial resolution, local or regional models are necessary which would be costly and inflict financial burden on RE generators. Instead RE generators can be mandated to maintain minimum smoothing storage reserves to ensure that output is maintained within a stipulated band of 15-30 minute moving average.
4. Limited Revisions Allowed - 16 Revisions for Wind and 9 revisions for Solar are allowed (One each in 1.5 Hours) as against unrestricted revisions allowed in case of conventional generators. To bring parity, RE generators shall be allowed unrestricted revisions.
5. Detailed Commissioning procedure for Wind and Solar Power generating stations may be appended to Clause 6.3A with due consideration to the notification of Central Electricity Authority (Technical Standards for Connectivity to the Grid) (Amendment) Regulations, 2019.