

April 30, 2015

The Secretary
Central Electricity Regulatory Commission (CERC)
3rd & 4th Floor, Chandralok Building,
36, Janpath,
New Delhi - 110001

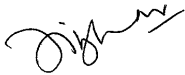
Subject: Comments on Proposed Framework on "Forecasting, Scheduling & Imbalance Handling for Renewable Energy (RE) Generating Stations based on wind and solar at Inter-State Level

Dear Madam,

The Honorable Commission has presented the Proposed Framework on "Forecasting, Scheduling & Imbalance Handling for Renewable Energy (RE) Generating Stations based on wind and solar at Inter-State Level, and consequent amendments in the regulations.

Our comments on the same are attached in this letter. Please consider these comments in finalizing these important changes to the draft regulation, and also provide us with an opportunity to present our findings and comments to the Commission in the public hearing for the same.

Kind Regards,



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Comments on Proposed Framework on “Forecasting, Scheduling & Imbalance Handling for Renewable Energy (RE) Generating Stations based on wind and solar at Inter-State Level and consequent amendments in regulations

1. CERC regulations need to be brought in force in tandem with state regulations

The proposed regulations apply to projects covered under RLDC’s mandate, i.e. those transacting power in the inter-state market. However, except for few solar projects, no other project is covered in the mandate at present. There is over 23,000 MW wind capacity in the country, but none of it is covered by the proposed regulations.

By not including the existing capacity in the forecasting and scheduling regime, there is a two-fold risk, which will defeat the purpose of the proposed regulations:

- a) The fundamental premise of the proposed regulation is that broadening the scope and aggregating a large number of wind and solar projects will bring about higher accuracy. The framework document state the following:

“In order to maximize the accuracy of forecasts, meteorological models must incorporate maximum possible data about as many wind / solar energy generators as possible in as high a resolution (spatial and temporal) as possible...”

As mentioned above, at present only a few projects are covered under the applicability of the proposed regulations. **These projects will have to meet the higher accuracy levels without getting the benefit of a larger aggregation.** This will impact their financial viability adversely.

- b) Risk of losing the work already done for the last two years under the current regulations.

At present, over 2,500 MW of wind farms are forecasting and scheduling their power. They are presently covered under the existing RRF mechanism (which requires forecasting and scheduling to be done, but has suspended the commercial settlement mechanism related to this as per CERC order of January 2014).

This 2,500 MW capacity has been forecasting its generation for the last two years. As a result, the forecasting models for these wind farms have improved significantly. All these wind farms are ‘embedded’ in the state grid, and sell power within the state.

However, the proposed regulations will not apply to such wind farms. This is a significant loophole. As a result of this loophole, wind farms are likely to stop forecasting activity. This will be a significant backward step as all the progress made over the last 2 years will be lost.

Suggestion: The draft regulations proposed by CERC should first be discussed with all SERCs in the Forum of Regulators. Once a consensus has been achieved with the states, only then should the regulations be promulgated.



This step will enable faster adoption of the CERC regulations by the states, thereby plugging the loophole, and preventing existing projects from stopping forecasting and scheduling activity.

At the same time, aggregation of forecasts at the state level, and at the regional level may enable projects to achieve a higher level of accuracy.

2. Opportunity for ‘Gaming’

The existing RRF mechanism incentivized ‘gaming’ – i.e., deliberately distorting the schedule to either avoid drastic loss or to gain additional revenue. In either case, the grid suffers, as it received inaccurate data.

The primary reason the existing RRF mechanism incentivized gaming was that the penalty for >150% was very punitive (loss of entire PPA revenue) – This skews behavior towards only ensuring that in no case generation exceeds >150%, rather than focus on providing accurate forecasts.

The recent high frequency scenario also enabled increase in revenue by under-injecting. Thus, the existing RRF mechanism enabled a positive RRF revenue and avoided the >150% scenario by deliberately over-scheduling generation.

The issue of ‘steep fall in revenue’ – the point where the generator loses his entire PPA rate in return for a very low rate is an issue that remains in the proposed regulations. Thus, the incentive for the generator to deliberately over-schedule generation to avoid a steep loss has remained intact.

In the existing mechanism, at >150%, the generator loses the entire PPA rate and is paid only Rs 1.65. In the current scheme, the generator also loses the entire PPA rate, and is given only an REC (valued at Rs 1.5, but with significantly delayed realization due to the demand-supply situation in the REC markets).

Suggestion: In the proposed regulation, in the >112% scenario, the generator should be given APPC price + REC (just like any other REC based project)

3. The proposed error band of +-12% is unrealistic at current capacity levels

As stated above, fundamental premise of the proposed regulation is that broadening the scope and aggregating a large number of wind and solar projects will bring about higher accuracy. However, at present very few solar projects and no wind projects are covered. Even when wind projects are set up, in the initial years only a small capacity will be covered under the inter-state market.

As a result of low capacity, the permissible range of +-12% appears unrealistic.



International experience suggests that deviation range expected in the proposed regulations are achievable only when capacity for which forecast is developed is large.

Experience in North America: An NREL study¹ of “Central Wind Power Forecasting Programs in North America” provides empirical evidence of the same:

Transmission Company	PJM	ERCOT	Midwest ISO
Area served	All or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia.	85% of load in Texas; 75% of Texas by geography.	All or most of North Dakota, South Dakota, Nebraska, Minnesota, Iowa, Wisconsin, Illinois, Indiana, Michigan and parts of Montana, Missouri, Kentucky, and Ohio.
Wind capacity	~2500 MW	8,916 MW	7,200 MW
Forecast performance	The monthly averaged Root Mean Squared Error (RMSE) for the May 2009 - July 2009 period ranged from 6.5% to 7.3% for intra-day; 8.3% to 10.3% for day-ahead.	Monthly averaged MAE for the 4:30 PM system-wide day-ahead forecast, for May 2009-August 2009, ranged from 8.28% to 10.73% of capacity for all hours.	For monthly RMSE for day-ahead (24 – 48) ranges from 5 to 10%.

Experience in Germany: Similarly, over 98% of the wind capacity is covered under online monitoring and forecasting. This has resulted in deviation (Root Mean Square Error RMSE in percent of the installed capacity) between the (day ahead) predicted and actual occurring power of about 6-7% of the installed capacity. The forecast error for the total German grid amounts to 5-6%².

¹ Study titled “Central Wind Power Forecasting Programs in North America by Regional Transmission Organizations and Electric Utilities”, K. Porter and J. Rogers, December 2009

² Study titled “Wind power prediction in Germany – Recent advances and future challenges”, Authors - Bernhard Lange, Kurt Rohrig, Bernhard Ernst, Florian Schlögl, Ümit Cali, Rene Jursa, Javad Moradi.

This study was conducted when the total installed wind capacity in Germany was about 18,000 MW



Further, the above study also emphasizes the fact that errors reduce over a period of time. The study says:

“the accuracy of the operational wind power forecast has improved from an approximately 10% RMSE at the first implementation in 2001 to an RMSE of about 6.5% in 2005.”

This is also borne out by the experience of data from the existing projects. The below are results of a project for a whole year, analyzed with the permissible deviation range. On a stand-alone basis, even during the high wind season, only 10% of the time-blocks fall within the permissible range of $\pm 12\%$.

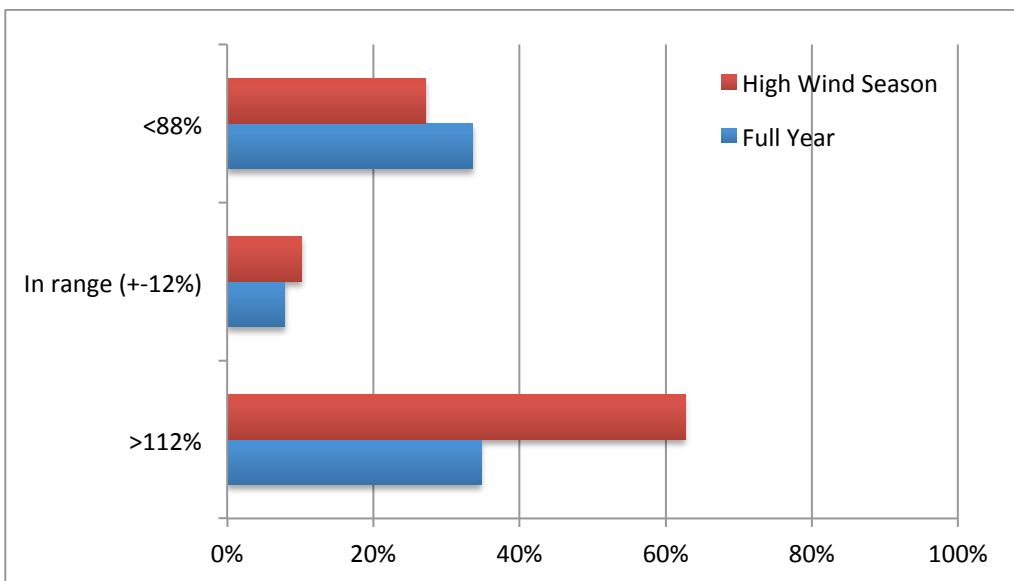


Figure: Accuracy (Time block wise) – Percentage of time blocks falling within the range

Suggestion: The permissible deviation range should be kept at a larger number, to be narrowed over time as (a) a larger number of projects come in the inter-state markets and (b) state projects are also aggregated to calculate deviations

Without such a larger aggregation, the projects covered under the proposed regulations will suffer significant financial burden making them unviable.

4. Tariff assumptions of Rs 5 and Rs 7 are arbitrary

Variation in actual tariff may encourage gaming – for example various solar projects sell power below Rs 6.5. Similarly, in many states the wind tariff exceeds Rs 5 already. At the same time, other models like inter-state OA, captive, etc also need to be factored in when calculating the penalties resulting from deviation.

Suggestion: An alternate approach could have a fixed penalty for all deviations below or above a limit. For example, all deviation below 30% or more than 150% of forecast could have a fixed penalty of Rs 0.40 (approximately 10% of contract rate). At the same time,



there should be no penalty for being within the permissible range. Thus, for a perfectly accurate forecast, the only cost the wind farm will incur is the cost of forecasting.

This approach has some benefits:

- Simple to understand and implement; not linked to UI
- Not very punitive to the wind farm, at the same time the penalty is substantive enough to encourage investment in high quality forecasting services
- Retains a financial disincentive against low-quality forecasts
- No opportunity for the wind-farm to make money from gaming the system

Over time the permissible range can be modified based on grid requirements and empirical analysis of generation and deviation data.

The amount collected from penalty levied can be distributed among host states in the proportion of UI incurred by them due to RE generation.

5. Proposed regulations will be a deterrent to new investment

The framework document for the draft regulations mentions that increasing the control area will enable greater accuracy by including a larger geographic area and different technologies (wind and solar).

However, at present there is miniscule capacity covered under the regulation. This capacity will have to incur significant burden as it will have to abide by the greater accuracy norms (+-12%, rather than +-30%). Capacity at the inter-state level is expected to grow slowly. In fact, the cost related to the higher burden due to small capacity covered may act as a deterrent to new investment at the inter-state level, thereby creating a vicious circle.

Suggestion: Only when intra-state and inter-state regulations are brought in simultaneously will projects benefit from greater accuracy due to increase in control area and number of projects.

6. Applicability of the proposed regulations

The proposed regulations have been made applicable to:

“wind and solar energy generators whose scheduling is done by the RLDCs”

We request the commission to define this term in the regulation so that the applicability of the proposed regulations is clarified.

- #### 7. Clarity on actual cost to be incurred by the project as a result of centralized forecasting and scheduling is necessary – NLDC procedures should also be presented in tandem with draft regulations for projects to comment on. Without such procedures being made available, projects are unable to make a clear decision about cost impact.



8. Captive and open access projects are not covered in the proposed regulation

The proposed regulations are silent on modalities for open access (OA) and captive projects (CPP). These need to be formulated as future growth, both at intra and inter-state level is likely to be in OA and CPP projects.

Further, in many cases projects selling power under OA may sell “brown” power while claiming RECs separately (as per the CERC REC regulations). Such a scenario is also not envisaged in the proposed regulations, as a part of the penalty is to be fulfilled through purchase of RECs.

9. Facility of 16 revisions provide limited relief

Forecast can be revised on the basis of two potential inputs – weather data or real-time inputs from the wind turbines. Of this, the weather data input is critical in building a revised forecast.

However, in most cases weather inputs are revised on a 6-hour basis (eg from IMD), i.e. 4 times in 24 hours. In such cases, 16 revisions in a 24 hour block are of very limited value to the project.

