Rajasthan Electricity Regulatory Commission

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PUBLIC NOTICE

In exercise of powers conferred under Section 86(1)(e) read with Section 181 of the Electricity Act, 2003, and all other provisions enabling it in this behalf, the Rajasthan Electricity Regulatory Commission having framed the Draft Regulations, "RERC (Forecasting, Scheduling, Deviation Settlement and Related Matters of Solar and Wind Generation Sources) Regulations, 2016", invites suggestions/comments from the interested persons before finalizing it.

Persons desirous of offering suggestions or comments in the matter may do so in five copies, so as to reach this office by **08.03.2016** with copies of supporting details. The suggestions/comments may also be sent to the Commission through email at rercjpr@yahoo.co.in. The draft regulations are available with the Receiving Officer of the Commission and can be obtained on payment of Rs. 50/-. The draft documents are also available on the Commission's website www.rerc.rajasthan.gov.in**.**

(G.K. Sharma)
Secretary

(Not to be published)

(G.K. Sharma)
Secretary

राजस्थान विद्युत विनियामक आयोग

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सार्वजनिक सूचना

विद्युत अधिनियम, 2003 की धारा 86(1)(ई) सहपठित धारा 181 एवं अन्य सभी प्रावधान जो इस संदर्भ में इसे सामर्थ्य प्रदान करते है, के अंतर्गत राजस्थान विद्युत विनियामक आयोग द्वारा बनाए गए रा.वि. वि.आ. (सौर एवं पवन ऊर्जा उत्पादन स्त्रोतो के पूर्वानुमान, अनुसूचन, विचलन व्यवस्थापन तथा सम्बद्ध मामले) विनियम, 2016, प्रारूप विनियमों को अंतिम रूप देने से पूर्व आयोग द्वारा सभी संबंधितों से सुझाव/टिप्पणियां आमंत्रित की जाती है।

यदि कोई महानुभाव उक्त प्रारूप विनियमों के प्रावधानों पर सुझाव एवं टिप्पणी देना चाहे तो वे अपने सुझाव/ टिप्पणियां आयोग को **पांच प्रतियों** में दिनांक **08.03.2016** तक सहायक दस्तावेजों की कॉपी सहित भेज सकते है। सुझाव एवं टिप्पणियां आयोग के ई–मेल rercjpr@yahoo.co.in पर भी प्रेषित किये जा सकते हैं। प्रारूप विनियमों की प्रति आयोग के प्राप्तकर्ता अधिकारी के पास अवलोकनार्थ उपलब्ध है जो कि पचास रूपये मात्र के भुगतान पर प्राप्त की जा सकती हैं। प्रारूप दस्तावेज आयोग की बेबसाइट www.rerc.rajasthan.gov.in पर भी उपलब्ध है।

(जी.के. शर्मा)
सचिव

(Not to be published)

(जी.के. शर्मा)
सचिव

RAJASTHAN ELECTRICITY REGULATORY COMMISSION

DRAFT NOTIFICATION

JAIPUR, …. FEBRUARY, 2016

No. RERC/Secy./Regulation - …….

In exercise of the powers conferred under Section 86(1)(e) read with Section 181 of the Electricity Act, 2003 and all powers enabling it in this behalf, the Rajasthan Electricity Regulatory Commission makes the following Regulations to facilitate large-scale grid integration of solar and wind generating stations while maintaining grid stability and security as envisaged under the IEGC/REGC, through forecasting & scheduling and providing commercial mechanism for Deviation Settlement of these generators.

1. **Short title and commencement**

(1) These regulations may be called the Rajasthan Electricity Regulatory Commission (Forecasting, Scheduling, Deviation Settlement and Related Matters of Solar and Wind Generation Sources) Regulations, 2016.

(2) These regulations shall come into force from the date of their publication in the official Gazette.

2. **Definitions and Interpretation**

(1) In these regulations, unless the context otherwise requires,-

(a) **'Absolute Error'** means the absolute value of the error in the actual generation of wind or solar generators with reference to the scheduled generation and the 'Available Capacity' (AvC), as calculated using the following formula for each 15 minute time block:
Error (%) = 100 X [Actual Generation– Scheduled Generation] / (AvC) ;

(b) **'Act'** means the Electricity Act, 2003 (36 of 2003);

(c) **'Actual drawal'** in a time-block means electricity in MW or MWh ex-bus drawn by a buyer, as the case may be, measured by the interface meters;

(d) **'Actual injection/generation'** in a time-block means electricity in MW or MWh ex-bus generated or supplied by the seller, as the case may be, measured by the Interface meters;

(e) **'Available Capacity or AvC'** for wind or solar generators means the cumulative capacity rating of the wind turbines or solar inverters that are capable of generating power in a given time-block;

(f) **'Beneficiary'** means a person purchasing electricity generated from a generating station;

(g) **'Buyer'** means a person, including beneficiary, purchasing electricity through a transaction scheduled in accordance with the regulations applicable for short-term, medium-term and long-term open access;

(h) '**CERC**' means the Central Electricity Regulatory Commission referred to in sub-section (1) of section 76 of the Act;

(i) '**Deviation**' in a time-block for a seller means its total actual injection minus its total scheduled generation and for a buyer means its total actual drawal minus its total scheduled drawal;

(j) '**Gaming**' in relation to these regulations, shall mean an intentional mis-declaration of available capacity or schedule by any seller in order to make an undue commercial gain through Charge for Deviations;

(k) '**REGC/State Grid Code**' means the Grid Code specified by Rajasthan Electricity Regulatory Commission under clause (h) of sub-section (1) of Section 86 of the Act;

(l) '**IEGC**' means the Grid Code specified by Central Commission under clause (h) of sub-section (1) of Section 79 of the Act;

(m) '**Interface Meters**' means interface meters as defined by the Central Electricity Authority under the Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006, as amended from time to time;

(n) '**Pool Account**' means state account for receipts and payments on account of deviation by buyers or sellers including wind and solar generators;

(o) '**Pooling Station**' means the sub-station where pooling of generation of individual wind generators or solar generators is done for interfacing with the grid/transmission or distribution system:

Provided that where there is no separate pooling station for a wind / solar generator and the generating station is connected through common feeder and terminated at a sub-station of distribution company/STU/CTU, the sub-station of distribution company/STU/CTU shall be considered as the pooling station for such wind/solar generator, as the case may be;

(p) **'Qualified Coordinating Agency or QCA'** means the agency coordinating on behalf of Wind/Solar Generators connected to a pooling station. QCA may be one of the generators or any other mutually agreed agency;

(q) '**Scheduled Generation'** at any time or for a time block or any period means schedule of generation in MW or MWh ex-bus ;

(r) '**Scheduled drawal'** at any time or for a time block or any period time block means schedule of despatch in MW or MWh ex-bus;

(s) **'Seller'** means a person, including a generating station, supplying electricity through a transaction scheduled in accordance with the regulations applicable for short-term , medium-term and long-term open access;

(t) **'State Commission'** means Rajasthan Electricity Regulatory Commission established under sub-section 1 of Section 82 of the Act;

(u) **'State Entity'** means an entity which is in the SLDC control area and whose metering and energy accounting is done at the State level;

(v) **'State Load Despatch Centre or SLDC'** means Load Despatch Centre of the State, established under sub-section (1) of Section 31 of the Act, responsible for coordinating scheduling of the State entities in accordance with the provisions of the REGC Code;

(w) '**Time-block'** means a time block of 15 minutes, for which specified electrical parameters and quantities are recorded by special energy meter, with first time block starting at 00.00 hrs;

(2) Save as aforesaid and unless repugnant to the context or the subject matter otherwise requires, words and expressions used in these Regulations and not defined, but defined in the Act, or the State Grid

Code or any other Regulations of this Commission, shall have the meaning assigned to them respectively in the Act or the REGC or any other Regulation.

PART-1

GENERAL:

3. **Applicability of the Regulations**:

(1) For wind power generators supplying power to the Discoms, or to the third party consumers through Open Access (OA) or for captive consumption through OA within or outside the State:

(a) Wind power generators having individual or combined capacity of 5 MW and above whether connected to the State Grid independently or through pooling stations;

(b) Wind power generators of any capacity connected to the State Grid through pooling station with total capacity of 5 MW and above.

(2) For solar power generators supplying power to the Discoms, or to the third party consumers through Open Access (OA) or for captive consumption through OA within or outside the State:

(a) Solar power generators having Individual or combined capacity of 5 MW and above whether connected to the State Grid independently or through pooling stations and/or solar parks;

(b) Solar power generators of any capacity connected to the State Grid through pooling station and /or solar park with total capacity of 5 MW and above.

PART – 2

FORECASTING AND SCHEDULING:

4. These Regulations provide methodology for day-ahead scheduling of wind and solar energy generators which are connected to the State grid and the methodology of handling deviations of such wind and solar energy generators. Appropriate meters shall be provided for energy accounting. Telemetry/communication system & Data Acquisition System shall also be provided for transfer of information to the SLDC.

5. The Qualified Coordinating Agency (QCA) as defined at regulation 2(1)(p) may be a Principal Generator and shall be nominated based on consensus and mutually agreed terms and conditions amongst the wind

and solar generators. The wind and solar generators shall also inform SLDC to this effect**.** The functions of the QCA shall be as follows:

- Provide schedules with periodic revisions as per this regulation on behalf of all the Wind/Solar Generators connected to the pooling station.
- Responsible for metering, data collection and its transmission, communication, coordination with DISCOMS, SLDC and other agencies.
- Undertake commercial settlement of all charges on behalf of the generators, including payments to the State UI pool accounts through the concerned SLDC.
- Undertake de-pooling of payments received on behalf of the generators from the State UI Pool account and settling them with the individual generators.
- Undertake commercial settlement of any other charges on behalf of the generators as may be mandated from time to time:

Provided QCA shall not be a compulsory requirement for the process. Some large solar or wind plants in future may aggregate their generation at one or more pooling stations themselves. Such large generators as QCA may choose to interact directly with the SLDC, if they so desire.

6. Forecasting shall be done by wind and solar generators connected to the State Grid or by QCAs on their behalf. The SLDC is also mandated to undertake forecasting of wind and solar power that is expected to be injected into the State grid, by engaging forecasting agency (ies) if required. The forecast by the SLDC shall be with the objective of ensuring secure grid operation by planning for the requisite balancing resources. The forecast by the QCA or wind and solar generator, as the case may be, shall be generator centric. The QCA or wind and solar generators will have the option of accepting the SLDC's forecast for preparing its schedule or provide the SLDC with a schedule based on their own forecast. The QCA shall coordinate the aggregation of schedules of all generators connected to a pooling station and communicate it to the SLDC.

   Provided the existing wind and solar generators or QCA on their behalf shall establish the Forecasting facilities within three months from the date of coming into effect of these Regulations. However, all the new wind and solar generators or QCA on their behalf shall establish forecasting arrangements before commissioning of the plant and connecting to the State Grid.

7. The QCA or the wind and solar generator shall submit a day-ahead and week-ahead schedule for each pooling station or each generating station, as the case may be. Day-ahead schedule shall contain wind or solar energy generation schedule at intervals of 15 minutes (time-block) for the next day, starting from 00:00 hours of the day, and prepared for all 96 time-blocks. Week-ahead schedule shall contain the same information for the next seven days.

8. The schedule of wind and solar generators connected to the State grid (excluding collective transactions) may be revised by giving advance notice to the SLDC. Such revisions shall be effective from 4th time block, the first being the time-block in which notice was given. There may be one revision for each time slot of one and half hours starting from 00:00 hours of a particular day subject to a maximum of 16 revisions during the day.

9. Any commercial impact on account of deviation from schedule based on the forecast shall be borne by the wind and solar generator, either directly or transacted via the representing QCA**.**

Part-3

METERING, TELEMETRY AND DATA COMMUNICATION:

10. Wind and Solar generators covered under these Regulations shall be governed under interface metering requiring installation of Special Energy Meters (SEM) with a provision for recording and storing all the load survey and billing parameters for every 15-minute time block. Monthly meter readings shall be forwarded to the SLDC in addition to data acquisition through SCADA for energy accounting.

11. Data telemetry shall be adopted at the turbine/inverter level. Wind and Solar generators, represented via Qualified Coordinating Agencies (QCAs), shall mandatorily provide to the SLDC, in a format as prescribed by SLDC, the technical specifications at the beginning and whenever there is any change. The data relating to power system output & parameters and weather related data as applicable shall also be mandatorily provided by such generators or QCA to the SLDC in real time:

Provided that the full data telemetry and communication facilities shall be provided by the wind and solar generator or QCA whose scheduling is done by SLDC. However, a preparatory window shall be provided by SLDC for the wind and solar principal generator or QCA to ensure installation of data management and telemetry equipment and for

SLDC to prepare their systems and teams for receipt of regular Data and schedules.

12. The plan for data telemetry, Communication requirement, formats of forecast submission and other details in this regard shall be provided in the Detailed Procedure to be prepared by SLDC and would be submitted to the Commission for approval within two months of the date of publication of these Regulations in the Official Gazette.

PART – 4

COMMERCIAL AND DEVIATION SETTLEMENT:

13. The DSM specified under these Regulations henceforth shall be applicable to all wind and solar generators covered under Regulation and connected to the State Grid.

14. The wind or solar generators connected to the State grid and selling power within the State shall be paid by the buyer as per actual energy supplied irrespective of quantum of energy scheduled by it.

15. The wind and solar generator or the QCA, as the case may be, shall have the option of accepting the SLDC's forecast for preparing its schedule or provide the SLDC with a schedule based on its own forecast, and such schedule shall be used as reference for deviation settlement.

16. The QCA shall undertake all commercial settlement on behalf of the generator(s) connected to the respective pooling station(s).

17. In the event of actual generation of a generating station or a pooling station, as the case may be, being less or more than the scheduled generation, the deviation charges for shortfall or excess generation shall be payable by the wind and solar generator or the QCA, as the case may be, to the State DSM Pool, as given in Table – I below:

Table – I: Deviation Charges in case of under or over-injection for sale of power within the State

S. No.	Absolute Error in the 15-minute time block	Deviation charges payable to the State DSM pool
1.	<=15%	None
2.	>15% but <=25%	At Rs. 0.50 per unit for the shortfall or excess of energy for absolute error beyond 15% and upto 25%

S. No.	Absolute Error in the 15-minute time block	Deviation charges payable to the State DSM pool
3.	>25% but <=35%	At Rs. 0.50 per unit for the shortfall or excess energy beyond 15% and upto 25% + Rs. 1.0 per unit for balance energy beyond 25% and upto 35%
4.	>35%	At Rs. 0.50 per unit for the shortfall or excess energy beyond 15% and upto 25% + Rs. 1.0 per unit for shortfall or excess energy beyond 25% and upto 35% + Rs. 1.50 per unit for balance energy beyond 35%.

18. The QCA shall also de-pool the energy deviations as well as deviation charges to each generator in proportion to actual generation units for each time-block for each generator.

19. The State Load Despatch Centre shall maintain separate records and account of time-block wise schedules, actual generation and deviations for all generators, including wind and solar generators.

20. Once the accounting procedures as above are put in place, all RE generators shall be treated together as a virtual pool within the State Pool. Deviations for and within this virtual pool shall be settled first at the rates and methodology stipulated above for wind and solar generators.

21. Annual accounts as mentioned above shall be prepared by the SLDC. The amount available in the DSM pool on the last day of the Financial Year shall be transferred to a separate Fund maintained and operated by SLDC in the manner as approved by the Commission based on the proposals to be submitted by SLDC or as directed on Suo-Motu basis by the Commission.

22. The charges payable for deviation from schedule by the wind and solar generators which are supplying power outside the State, i.e., regional entities, shall be accounted for and settled in accordance with the provisions of the CERC (Deviation Settlement Mechanism and Related Matters) Regulations, 2014 as amended from time to time.

PART – 5

MISCELLANEOUS:

23. **Power to Relax**

The Commission may by general or special order, for reasons to be recorded in writing, and after giving an opportunity of hearing to the

parties likely to be affected by grant of relaxation, may relax any of the provisions of these regulations on its own motion or on an application made before it by an interested person.

24. **Power to issue directions**

If any difficulty arises in giving effect to these regulations, the Commission may on its own motion or on an application filed by any affected party, issue such directions as may be considered necessary in furtherance of the objective and purpose of these Regulations.

Secretary

RAJASTHAN ELECTRICITY REGULATORY COMMISSION, JAIPUR

Explanatory Memorandum for the Draft Rajasthan Electricity Regulatory Commission (Forecasting, Scheduling, Deviation Settlement and Related Matters of Solar and Wind Generation Sources) Regulations, 2016.

EXPLANANTORY MEMORANDUM

1 Background:

1.1 The current installed capacity of the State Power Sector is 17281.10 MW (December'15) including the share from CGS and Renewable Energy (RE) power projects.

1.2 The present installed capacity (including OA and CPP) of wind and solar power projects in the State is 3866.545 MW and 1264.35 MW respectively, which account for 22.37% wind and 7.32% solar of the current installed capacity of the State.

1.3 MNRE has identified the estimated potential of 18.770 GW(@100m) of wind power and 142.31 GW in respect of solar power. Therefore, so far 20.60% and 0.90% of the wind and solar power potential has been harnessed in the State.

1.4 The GoI has planned for 100 GW of solar and 60 GW of wind power by 2022. The existing RE Capacity (wind and solar) come under the control of the States. In alignment with the above GoI plans and potential available, it is apparent that there will be large additions of Renewable Energy (RE) (wind and solar) capacities and these are likely to be connected to the CTU grid in future. This will become essential as this State is rich in solar and wind resources, whereas, the RPOs shall ensure that the whole country takes advantage of Renewable Energy in the State while marching towards the National goal of Universal Electrification.

1.5 RE sources like wind and solar are variable, uncertain and intermittent in nature. Due to these features, RE power poses a challenge for the system operator to maintain Load-Generation balance in the power system at any given point of time. Thus, any increase or decrease in variable RE generation would make it increasingly difficult to integrate it to the power system, in particular for system operation. The system operator has to ensure reliability and security of the power system. In order to achieve this, the schedule of generation of RE is to be kept as

near to actual generation as possible by Forecasting and Scheduling their Generation. Therefore, there is a need to Forecast and Schedule the Variable RE generation.

1.6 To overcome the difficulties in managing variable RE power, CERC has notified the Framework on Forecasting, Scheduling and Imbalance Handling for Variable RE Sources (Wind and Solar) on 7.08.2015 by making Amendments to the Indian Electricity Grid Code (IEGC) and the DSM Regulations:

- Central Electricity Regulatory Commission (Indian Electricity Grid Code) (Third Amendment) Regulations, 2015.
- Central Electricity Regulatory Commission (Deviation Settlement Mechanism and related matters) (Second Amendment) Regulations, 2015.

1.7 With CERC Framework already in place, a Framework at the State level is also considered desirable in order to accommodate the RE Capacity in the State. The implementation of this Framework at the State level would bring in synergy and optimization in harnessing the wind and solar power generation. Commission, therefore, proposes to make the Rajasthan Electricity Regulatory Commission (Forecasting, Scheduling, Deviation Settlement and Related Matters of Solar and Wind Generation Sources) Regulations, 2016.

2 Applicability of the Regulations:

2.1 These Regulations shall be applicable to the wind and solar power projects in the State, supplying power to the Discoms, or to the third party consumers through OA or for captive consumption through OA within or outside the State.

2.2 It is noticed that most of wind power projects supplying power through above transactions are connected to the pooling station arrangement and combined generation capacity is normally more than 5 MW. For the capacity less than this, it is very difficult to have visibility and monitoring at the level of SLDC. It is proposed that the Framework shall be applicable to the following types/capacities of wind power projects irrespective of the nature of transactions of power within or outside the State:

(a) Wind power generators having individual or combined capacity of 5 MW and above whether connected to the State Grid independently or through pooling stations and/or solar parks;

(b) Wind power generators of any capacity connected to the State Grid through pooling station with total capacity of 5 MW and above.

2.3 Solar power projects are being installed in the State in different modes such as rooftop installations, stand alone installations and by way of solar parks. It is very difficult to have visibility of geographically dispersed installations such as in case of roof top and small solar installations directly connected to the transmission/distribution system through Net Metering scheme and isolated locations of capacity below 5 MW. Such installations shall not be covered under these Regulations. It is proposed that the Framework shall be applicable to the following types/capacities of solar power projects irrespective of the nature of transactions of power within or outside the State:

(a) Solar power generators having Individual or combined capacity of 5 MW and above whether connected to the State Grid independently or through pooling stations and/or solar parks;

(b) Solar power generators of any capacity connected to the State Grid through pooling station and /or solar park with total capacity of 5 MW and above.

2.4 It is proposed that the above Framework shall be applicable to all wind and solar power plants commissioned before and after coming into effect of the proposed Regulations.

3 Forecasting and Scheduling:

3.1 Qualified Coordinating Agency (QCA):

3.1.1 Forecasting for scheduling of wind and solar power means the prediction of generation from them over a particular interval. Forecasting and Scheduling of these generators is critical for a system operator to anticipate balancing requirements and procure requisite reserves to maintain Load-Generation balance and Grid reliability. Forecasting and Scheduling gives visibility how much RE is expected to be injected into the Grid. At the same time, due to intermittent nature

of these sources, special provisions must be made so that the generators are not unduly penalised.

3.1.2 The fragmented nature of the industry which is evident from the large number of owners of wind turbines poses a challenge of direct interaction of these generators with the respective SLDCs. This process can become unwieldy due to the sheer number of turbine owners. Secondly, benefits of aggregation on forecasting accuracy are well documented. Keeping in view the above reasons, the Commission proposes to formalize a new aggregator entity, termed as Qualified Coordinating Agency or the QCA. This aggregator or the QCA shall coordinate all forecasting, scheduling and commercial settlement processes for all wind or solar generators connected to a pooling station. The QCA may aggregate one or more pooling stations, and several QCAs may come together to aggregate even at the State level for leveraging maximum benefit of aggregation. The QCAs shall interact with the SLDC (or RLDC, if required) on behalf of the generators. This shall significantly cut down the complexity both for small generators as well as the SLDC, which shall have to interact with a few number of agencies instead of thousands of generators. The QCA may be a Principal Generator, as recognized in the Central Electricity Regulatory Commission (Grant of Connectivity, Long-term Access and Medium-term Open Access in inter-State Transmission and Related Matters) (Third Amendment) Regulations, 2013, or a third party. The proposed functions of the QCA are as follows:

- Provide schedules with periodic revisions as per this regulation on behalf of all the Wind/Solar Generators connected to the pooling station.
- Responsible for metering, data collection and its transmission, communication, coordination with DISCOMS, SLDC and other agencies.
- Undertake commercial settlement of all charges on behalf of the generators, including payments to the State UI pool accounts through the concerned SLDC.
- Undertake de-pooling of payments received on behalf of the generators from the State UI Pool account and settling them with the individual generators.
- Undertake commercial settlement of any other charges on behalf of the generators as may be mandated from time to time.

The wind and solar generators shall nominate QCA based on consensus and mutually agreed terms and conditions amongst them and inform SLDC to this effect**.** It is proposed that this is not a compulsory requirement for the process. Some large solar or wind plants in future may aggregate their generation at one or more pooling stations themselves. Such large generators as QCA may choose to interact directly with the SLDC, if they so desire.

3.2 Forecasting:

3.2.1 Solar plants are now mandated to undertake forecasting. Notwithstanding the lack of indigenous experience, solar forecasting methodologies are quickly maturing worldwide and have higher accuracy levels than wind forecasting. With the present aim for ambitious solar power targets, this is the opportune moment to ensure that these plants connect to the grid in a sustainable and streamlined manner.

3.2.2 Forecasting shall be done by wind and solar generators connected to the State Grid, or by QCAs on their behalf. The SLDC shall also undertake forecasting of wind and solar power that is expected to be injected into the State Grid by engaging forecasting agency(ies) if required. The forecast by the concerned SLDC shall be with the objective of ensuring secure grid operation by planning for the requisite balancing resources. The forecast by the QCA or wind and solar generator, as the case may be, shall be generator centric.

3.2.3 It is proposed that the existing wind and solar generators or QCA on their behalf shall establish the Forecasting facilities within three months from the date of coming into effect of these Regulations. However, all the new wind and solar generators or QCA on their behalf shall establish Forecasting facilities before commissioning of the plant and connecting to the State Grid.

3.2.4 The QCA or wind and solar generators shall have the option of accepting the SLDC's forecast for preparing its schedule or provide the SLDC with a schedule based on their own forecast. The QCA shall

coordinate the aggregation of schedules of all generators connected to a pooling station (or a cluster of pooling stations) and communicate it to the SLDC. Such schedule shall be used as reference for deviation settlement.

3.3 Scheduling:

3.3.1 In order to have better visibility for SLDC, it is proposed that wind and solar generator or QCA shall submit a day-ahead and a week-ahead schedule for each generating station or each pooling station, as the case may be. In case the QCA is coordinating for several pooling stations, it shall submit an aggregate schedule as well. Day-ahead schedule shall contain wind or solar energy generation forecast at intervals of 15 minutes (time-block) for the next day, starting from 00:00 hours of the day, and prepared for all 96 time-blocks. Week-ahead schedule shall contain the same information for the following seven days.

3.3.2 The schedule of wind and solar generators can be revised by giving advance notice to the SLDC. Such revisions shall be effective from the 4th time block, the first being the time-block in which notice was given. There may be one revision for each time slot of one and half hours starting from 00:00 hours of a particular day subject to a maximum of 16 revisions during the day.

4 Metering, Telemetry and Data Communication:

4.1 Metering:

4.1.1 Wind and solar generators covered under these Regulations shall be governed under interface metering requiring installation of Special Energy Meters (SEM) with a provision for recording and storing all the load survey and billing parameters for every 15-minute time block. Monthly meter readings shall be forwarded to the SLDC in addition to data acquisition through SCADA for energy accounting.

4.1.2 In case of wind and solar generators under the QCA arrangement and pooling stations, the data communication shall be done at the level of QCA/pooling station as applicable.

4.2 Telemetry & Data Communication:

4.2.1 Data telemetry shall be adopted at the turbine/inverter level. Wind and Solar generators, represented via Qualified Coordinating Agencies (QCAs), shall mandatorily provide to the SLDC, in a format as prescribed by SLDC, the technical specifications at the beginning and whenever there is any change. The data relating to power system output & parameters and weather related data as applicable shall also be mandatorily provided by such generators or QCA to the SLDC in real time.

4.2.2 The full data telemetry and communication facilities shall be provided by the wind and solar generator or QCA whose scheduling is done by SLDC. However, a preparatory window shall be provided by SLDC for the wind and solar principal generator or QCA to ensure installation of data management and telemetry equipment and for SLDC to prepare their systems and teams for receipt of regular data and schedules.

4.2.3 The plan for data telemetry, Communication requirement, formats of forecast submission and other details in this regard shall be provided in the Detailed Procedure to be prepared by SLDC and shall be submitted to the Commission for approval within two months of the date of publication of these Regulations in the Official Gazette.

5 Error Quantity:

5.1 The accuracy of forecasting algorithm can be measured by computing the delta between scheduled and actual generation. 'Absolute Error' means the absolute value of the error in the actual generation of wind or solar generators with reference to the scheduled generation and the 'Available Capacity' (AvC), as calculated using the following formula for each 15-minute time block:

Error (%) = 100 X [Actual Generation– Scheduled Generation] / (AvC) ;

Where Available Capacity or AvC for wind or solar generators means the cumulative capacity rating of the wind turbines or solar inverters that are capable of generating power in a given time-block.

Absolute value of Error shall then be computed:
Abs Error = Absolute value [Error]

For every time block, Abs Error may be determined and deviation settlement done accordingly.

5.2 Any attempt at mis-declaration, that is, declaration of the capacity when it is actually not available due to reasons of maintenance or shutdown etc., would be treated as gaming and would be liable to action under appropriate provisions of the Act or the Regulations.

5.3 Mean Absolute Error or MAE shall be determined by averaging the absolute error over a day or week or year, etc. MAE shall give an indication of forecasting accuracy over a longer period of time. Accordingly, suitable provision defining 'Absolute Error' has been proposed in the draft Regulations.

5.4 CERC, in the Statement of Reasons (SOR) accompanying the Framework on Forecasting, Scheduling and Imbalance Handling for Variable Renewable Energy Sources (Wind and Solar), has noted that the definition of error, calculated w.r.t. schedule, does not adequately address instances such as low/no generation cases such as during low wind season where close to zero schedules would result in high numerical errors but with no real impact on grid. Additionally, incentives to generators for better forecasting must be aligned with the objective of grid management, which is to minimize actual MW deviations from schedule. As commercial impact on generators is directly proportional to the error percentage, forecasting models shall be designed to minimize MW deviations only if the denominator is a constant (and not a variable such as 'schedule'). This shall ensure that the error quantity corresponds to the physical MW impact on the grid, and the error definition holds valid in all seasons. Therefore, in the formula for computation of Error(%), the error has been normalized with constant, i.e., Available Capacity (AvC) instead of scheduled generation.

6 Commercial and Deviation Settlement

6.1 While forecasting accuracy increases over time with improved models and more reliable data, 100% accuracy is not possible to achieve given the uncertain nature of solar and wind sources. However, to incentivize investment in better forecasting methodologies and reliable data, deviation charges shall be levied outside a tolerance band. Within this tolerance band, there will be no revenue impact on the generator.

However, outside this band, a graded deviation charge can be applied. This will provide incentive to forecast as accurately as possible utilizing the schedule revisions, and communicate them accordingly to SLDC.

6.2 **Tolerance limits and Deviation Bands:**

6.2.1 A tolerance band equivalent to 15% of the available capacity, AvC, is proposed which is based on simulations got conducted by CERC. Commission considers tolerance band of <=15% for all wind and solar power plants as a reasonable limit to start with. This mechanism on one hand would be simple to implement and at the same time would also ensure minimal financial impact on existing PPAs.

6.2.2 In case of over and under injection, wind and solar generators covered under these Regulations shall pay to DSM pool account at the rates indicated in the table given below:

Table-1: Deviation charges in case of under or over injection, for sale of power within the State

S. No.	Absolute Error in the 15-minute time block	Deviation charges payable to the State DSM pool
1.	<=15%	None
2.	>15% but <=25%	At Rs. 0.50 per unit for the shortfall or excess of energy for absolute error beyond 15% and upto 25%
3.	>25% but <=35%	At Rs. 0.50 per unit for the shortfall or excess energy beyond 15% and upto 25% + Rs. 1.0 per unit for balance energy beyond 25% and upto 35%
4.	>35%	At Rs. 0.50 per unit for the shortfall or excess energy beyond 15% and upto 25% + Rs. 1.0 per unit for shortfall or excess energy beyond 25% and upto 35% + Rs. 1.50 per unit for balance energy beyond 35%.

The illustration for a 15-minute time block is shown in **Annexure-I**.

6.3 SLDC shall maintain the State DSM pool account. It is proposed that amount available in the DSM pool on the last day of the Financial Year shall be transferred to a separate Fund maintained and operated by SLDC in the manner as approved by the Commission based on the

proposals to be submitted by SLDC or as directed on Suo-Motu basis by the Commission.

6.4 The charges payable for deviation from schedule by the wind and solar generators which are supplying power outside the State, i.e., which are regional entities, shall be accounted for and settled in accordance with the provisions of the CERC(Deviation Settlement Mechanism and Related Matters) Regulations,2014 as amended from time to time.

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Annexure-I

Illustration of computation of Deviation charges for wind and solar generators for a 15-minute time block

Particulars	Case-1	Case-2	Case-3	Case-4
Available Capacity (AvC) (MW)	100	100	100	100
Schedule (MW)	90	100	95	100
Actual (MW)	80	120	65	140
Deviation (MW)	-10	20	-30	40
Absolute Error (%)	10%	20%	30%	40%
DSM Charges payable (Rs.)	Nil	[(20-15)*0.25*10^3*0.5] =Rs 625	[(10*0.25*10^3*0.5)+ (5*0.25*10^3*1.0)] =Rs 1250+1250 =Rs 2500	[(10*0.25*10^3*0.5)+ (10*0.25*10^3*1.0)+ (5*0.25*10^3*1.5)] = Rs 1250+ 2500+ 1875 =Rs 5625