

**BEFORE THE CENTRAL ELECTRICITY REGULATORY COMMISSION**

New Delhi

FILING No.....

CASE No.....

IN THE MATTER OF :

Proposed Framework on Forecasting, Scheduling & Imbalance Handling for Renewable Energy (RE) Generating Stations based on wind and solar at Inter-State Level and amendments to relevant CERC regulations.

AND,

IN THE MATTER OF:

Shanti Prasad,  
41-A, RSEB Officers' colony, D-Block, Vaishali Nagar,  
Jaipur -302021.

Commenter

Hon'ble Chairman and Members,

The Central Commission ,vide public notice No. 1/14/2015-Reg. Aff. (FSDS)/CERC dated: 31st March, 2015,has invited comments / suggestions by 30.4.15 on aforesaid proposed framework and consequential amendments to (i) CERC (Indian Electricity Grid Code) Regulations, (ii) CERC (Deviation Settlement Mechanism and related matters) Regulations and (iii) CERC (Terms and Conditions for recognition and issuance of Renewable Energy Certificate for Renewable Energy Generation) Regulations. I am submitting my views / suggestions for the considerations of the Commission. I wish to state that I am not representing any person and giving my views on the subject for reference of the commission. I will not be participating in the proceeding.

**2. Forecasting by Renewable Energy Management Centres (REMCs) instead of by wind & solar power generators:** The scheduling of wind and solar generation is with the sole purpose of grid management. It will be worth considering whether forecasting and scheduling by wind and solar generators or by Renewable Energy Management Centres ('REMC'), as suggested by CEA in their document "Large Scale Grid Integration of Renewable Energy Sources - Way Forward (Nov. 2013)" will be more appropriate. On account of the following, forecast of capacity in operation by Wind/solar power generators and forecasting of generation at 15 minute's interval by REMCs will be more appropriate:-

(i) In case of conventional thermal and hydro generation, power generator has full knowledge and control on availability of inputs (i.e. fuel or stored hydro energy) and availability of plant and machinery. As such, he is in a position to give more precise generation schedule. Further, in case his

generation schedule is curtailed, system operator can direct to generate to the schedule, and in case of failure to achieve, penalty in cash and/or limiting his scheduling to generation so achieved will be imposed (in other words, his generation scheduling can be put to test). This is not the case with wind and solar generation. Power input in this case is wholly dependent on nature and not under generator's control. On this account his generation schedule can not be put to test. Further, knowing the available generation capacity, any person with meteorological data and software can forecast generation. Thus wind / solar generator does not have control over wind / solar generation and they should not be given incentive or penalised for the aspect not under their control.

(ii) Prediction / forecasting of generation is dependent on data and software and thus are not under control of generating company. Forecasting can have as much inaccuracy as such prediction made by any other person. Further, wind / solar generation is by large number of investors. While for thermal plant there may be single generator for 250 MW (and higher capacity), for solar / wind even for 250 MW capacity there may be more than dozen investors/ generators. With the present installed capacity, number of generators may be sizable. Summation of their 15 minutes' schedule and their 16 revisions in a day, keeping record of their final schedule, preparing accounts for money due from / to DSM pool will be herculean task.

Ultimately, scheduling may have to be specified to be on pooling station / solar park basis, that is, by third party and if, so it can be by REMCs also.

(iii) In case on conventional power station, at nominal frequency, under generation, a generator is subject to payment to DSM pool (and over generation is subject to receipt from DSM pool) and user is respectively subject to receipt from DSM pool (and payment to DSM pool). Thus receipts from and payment to DSM pool is normally balanced. This will not be the case with proposed framework for wind and solar generator, in the proposed framework, upto a range of -ve to +ve deviation (as indicated below as (-) 24% to 13.7%), generator will get incentive and only for deviation beyond this deviation there will be payment to DSM pool. At every instant, there will be no balancing of receipt to and payment from DSM pool. It will not be correct to conceive that prediction error of some generators, leading to payment from DSM pool will balance out by prediction errors of other generators leading to payment to DSM pool.

(iv) The prediction of wind and solar generation can not be treated on equal footing. While wind generation/ MW of available capacity is wholly dependent on nature, in case of solar PV generation, except for few cloudy / rainy / dust storm days, can be predicted accurately based on solar ray inclination considering Sun and Earth position on the day of the year, equation of time, longitude and latitude of the site. Prediction error will be much less for solar PV and with same framework of incentive / penalty, in all likelihood, solar generator will get incentive and there will be risk of

DSM pool drained out, which may ultimately put burden on distribution licenses ( and hence on consumers).

(v) A wind / solar generator may not bother to improve forecasting , once he is in the band giving incentive as incentive to him is directly proportional to deviation. Compared to this, forecast by REMCs, established by System operator, and utilities, and wind and solar generators will be improved from year to year, as system operator will be affected for grid management and utilities will be affected financially. This improvement may be brought out by adoption of multiple softwares and selecting that giving better results. REMC can strive for installations of anemometers and meteorological equipment like doppler's radar etc.

(vi) Wide range of deviation for incentive may prompt unscrupulous generators to resort to gaming. For putting check on gaming, independent forecasting by third party say REMC may be required.

3. In view of above, it would be appropriate that RE (wind / solar) power generators give day ahead availability of operating capacity and Renewable Energy Management Centres ('REMC'), established by System operator ('SLDC') ,utilities ('Discoms') and REGenCos, may be assigned the task of forecasting of RE generation based on capacity so declared by RE generators on day ahead basis and its revisions during the day. . REMCs may be funded by levy of REMC charge (of say 2-3 p/kwh) on wind / solar generation from existing as well as future power plants. This will not require any amendments to the tariff regulations. It will be free from apprehension of gaming, wind power generator will get as per generation and will not get undue benefit by way of incentives and wrong declaration. REMC may be well equipped with multiple agencies and software to forecast wind power generation. It will strive for more and more accuracy in forecasting. Forecasting error of one region may some what even out by by errors of forecast for other region. There is no likelihood of wrong declaration of capacity by wind / solar power generators as his capacity can be verified physically as well as by peak power injection. However in order that wrong declaration may not be out of carelessness, mis-declaration of availability by wind generator may be subject to penalty of say Rs.10000/- per day per MW of mis-declaration.

4. **Amendments also necessary for tariff regulations:-** The proposed framework (vide its para 3.2 and 4.0 of explanatory note) is based on the concept that the wind and solar generators at the inter-state level ,whose scheduling is done by the RLDCs, would be scheduled like any other generator and **would be paid as per scheduled generation and not actual generation** and that **for the purpose of fulfilment of RPO by the buying utility / distribution company , the 'scheduled energy' would be considered as the quantum of renewable energy procured by the concerned utility.** It is submitted that this concept is based on that for conventional thermal and hydro power plants. The tariff for conventional thermal / hydro power plants and RE power plants are determined by the CERC as per

prevalent tariff regulations on annual basis for existing as well as new power plants. As per regulations (vide reg. 30(5), 31(4) and 32(4) of CERC (Terms and Conditions of Tariff) Regulations, 2014.), such tariff is applicable on **energy scheduled** with deviations subject to provisions of the CERC (deviation settlement) regulations and in turn UI charges. In contrast, as per reg. 10(1) CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2012, the levelised generic tariffs for wind and solar power plants is determined by CERC for the energy supplied to distribution licensee and this levelised tariff is the same for entire tariff period (of 13 years for wind and 25 years for solar Power plants) from commercial operations date of the power plant. The said tariff regulations do not provide for applying levelised tariff on scheduled energy only and subjecting deficit / surplus as per CERC deviation settlement regulations. Thus levelised tariff can not be applied to energy scheduled without specific changes in tariff regulations. Such changes in regulations can not be applied on existing power plants whose tariff has already been determined and have attained finality. Any changes will violate the provisions of then prevalent tariff regulations on which it was determined and will attract estoppel. The generic RE tariff determined by state regulatory commissions has similar provisions. Thus any change will apply only on new power projects and existing large capacity of wind and solar power plants will be out of the provisions of proposed framework. Thus intent of subjecting scheduling of wind and solar power plants subject to incentive / penalties with an intent to have high accuracy ( and minimum deviation) in scheduling so as to enable grid management will not be achieved. **It is therefore necessary that relevant tariff regulations are amended to enforce the proposed amendments on new projects and to devise another mechanism for existing wind and solar power plants or otherwise to have latter framework followed for both new and existing projects.**

5. **Applicability on solar and wind power plant within state:** it is rightly stated at para 1.0 of explanatory note that presently almost all of the RE capacity is grid connected at the sub-transmission level within the States. These wind and solar generators are not at the inter-state level and their scheduling is not done by the RLDCs, as such the aforesaid framework will not apply presently to any solar and wind power plant. However, from para 7(b) of explanatory note, it appears that this framework will be extended to wind and solar power plants within the state

“7.(b) The SERCs would need to be informed about the proposed mechanism in detail so that the scheduled energy quantum is accepted as energy procured towards RPO compliance of the buying utility in the concerned State. The entire scheme could be taken up in the meeting of the Forum of Regulators (FOR) to sensitize the SERCs.”

6. The extension of proposed framework on RE power plants within the state will not only require amendments to relevant tariff regulations (with deviation

settlement mechanism) , relevant State Grid Code,etc but will also require enabling provisions in the CERC (Terms and Conditions for recognition and issuance of Renewable Energy Certificate for Renewable Energy Generation) Regulations so that mechanism of payment to / from DSM pool and issue / transfer of RECs is made applicable on them also. In absence of such amendments, deviations at the inter-state level will continue to be settled for regional entities and deviation settlement among RE power plants and distribution licensees within the state will have to be effected by SLDC/State Transmission Utility. As SLDCs /STUs are not well equipped so desired incentives / dis-incentives will pass slowly and purpose will get defeated. **The enabling provisions ,as stated above, it is suggested may be following addition below Reg 1B of CERC (Terms and Conditions for recognition and issuance of Renewable Energy Certificate for Renewable Energy Generation) Regulations:-**

“Provided that commission may notify the applicability of provisions of sub clause 1B on Wind and solar energy generators , , which are connected to State Grid and whose generation is scheduled by State LDCs and who are governed by regulations of appropriate Commission, adopting, mutatis mutandis, the following provisions of CERC regulations on scheduling and settlement of the deviation from schedule. In that case, issuance of RECs by central nodal agency shall be based on the quantum of positive deviation / over injection from schedule as per the deviation accounts prepared by the concerned SLDC and certified by the concerned Regional Power Committee (RPC).

(a) Regulations 2.4.5 , 6.2 , 6.5(23)(i) to (iv) of regulation and regulation 4 (i) and(ii) and 5 of CERC (Indian Electricity Grid Code) Regulations,

(b) Sub clause (iv),(v),(vi) and (vii) of Regulations 5(1) of CERC (Deviation Settlement Mechanism and related matters) Regulations”

**7. Proposed framework of deviation settlement mechanism:** Proposed framework specify the following for the deviations from schedule:-

(1) Payment to /from deviation settlement mechanism (‘DSM’) pool

(a) deviation within +/- 12% of the schedule:

(i) negative deviation (from 0% to -12%): Generating company to pay @ Rs.3/- per kwh to DSM pool.

(ii) positive deviation (from 0% to +12%): Generating company to get @ Rs.4/- kwh from DSM pool.

(b) deviation beyond +/-12% of the schedule:

(i) negative deviation (from -12% and below) : generating company to pay to DSM pool @ Rs.3/- per kwh up to -12% deviation and @ Rs.4/- per kwh for the balance.

[Note:-For this deviation explanatory memo states payment @ Rs. 4/kWh for the shortfall energy to the DSM Pool. The proposed amendment to sub-clause (vi) to clause (1) of

Regulation 5 of CERC (DSM and related matters) regulations states that ‘If the actual generation is below 88% of the schedule, the wind and solar energy generator would pay to the Regional DSM Pool, **for the shortfall energy below 88%** at such fixed rate as may be determined by the Commission’. Both are not specific to the rate applicable for shortfall up to -12% of deviation. Appropriate provision is indicated above]

(ii) positive deviation (from +12% and above): No payment from DSM pool.

(2) Purchase, issuance etc of RECs.:

- (a) Negative deviation: Generating company to procure RECs corresponding to deviation and transfer them to distribution licensees
- (b) Positive deviation: Generating Company will be issued RECs corresponding to deviation.

8. The proposed mechanism vis-à-vis payment for actual energy injection, is as under for wind power plant :-

Sr. no.	particulars	Deviation from schedule			
		<-12%	0 to (-)12%	0 to +12%	>+12%
0	Notations:				
	A = actual generation in kwh				
	D = Deviation from schedule with sign Thus schedule will be A-D				
	T = Tariff for supply of RE Power, Rs/kwh				
	S = sale rate for supply of REC , Rs/kwh				
1	Payment for scheduled generation, Rs./kwh	$T * (A - D)$	$T * (A - D)$	$T * (A - D)$	$T * (A - D)$
2	Payment (+)/ recovery (-) for deviation from DSM, Rs/kwh	$- 3.00 * 0.12 * (A - D) + 4.00 * (D - 0.12 * (A - D)) = 0.12 * A + 3.88 * D$	$+3.00 * D$	$+4.00 * D$	$+4.00 * 0.12 * (A - D) = +0.48 * (A - D)$
3	REC equivalence, Rs/kwh (for purchase (-ve) and issuance (+))	$+S * D$	$S * D$	$S * D$	$S * D$

4	Equivalent payment in Rs/kwh (formula)	$T*A + 0.12*A + D*(-T + 3.88 + S)$	$T*A + D*(-T + 3.00 + S)$	$T*A + D*(-T + 4.0 + S)$	$T*A + 0.48A + D*(-T - 0.48 + S)$
5	Equivalent payment as Adjustment over and above tariff payment for energy injected ( $T*A$ )	$0.12*A + D*(-T + 3.88 + S)$	$D*(-T + 3.00 + S)$	$D*(-T + 4.0 + S)$	$0.48A + D*(-T - 0.48 + S)$
5A	-do- for wind power plant with $T=5.00$ , $S=1.5$	$0.12*A + 0.38*D$ D is -ve	$-0.50*D$ D is -ve	$+0.50*D$ D is +ve	$0.48*A - 3.98*D$ D is +ve
5B	-do- for solar PV power plant with $T= 7.00$ and $S= 3.5$	$0.12*A + 0.38*D$ D is -ve	$-0.50*D$ D is -ve	$+0.50*D$ D is +ve	$0.48*A - 3.98*D$ D is +ve

9. Thus within +/- 12% deviation , wind /solar generator will get incentive which will depend on Tariff and REC sale rate. For their values considered at para of explanatory note it will be @Rs0.50 per kwh for the deviation from schedule(vide sr.no. 5A and 5B). While for deviation below-12% and above + 12%, incentive will reduce and for their values considered at para 3.4 of explanatory note, there will disincentive for deviation below -24% and above +13.7%. With such wide range of incentive , scrupulous generators can resort to gaming. Further up to +/- 12% deviation, more the deviation , more will be the incentive. **This is not desirable, incentives should be more for less deviation and vice versa. Further, there is asymmetry in incentive / dis-incentive for deviation beyond +/- 12%. It is suggested that incentives, may be based on (12% - absolute value of deviation) and to avoid gaming, there should be provision in regulation that based on forecasting by REMCs or otherwise, if SLDC /RLDC observes that wind / solar generating company is resorting to gaming, SLDC /RLDC besides any other action under the provisions of the Electricity Act, shall have right to revise scheduling of wind / solar generation or disallow payment from DSM pool and / or issuance of RECs.**

10. Further, quantum of incentive for forecasting within +/- 12% is dependent on tariff and sale rate of RECs. Requirement of RECs will be worked out for all wind or solar power plant almost simultaneously and consequently market demand will rise and sale rate of RECs may not remain at floor price (of Rs.1,50 per kwh for wind and Rs.3.50 per kwh for solar). Any increase will skew the scheme of incentives / disincentives towards +ve deviation. For example, a rise of REC(wind)

sale rate to Rs.2.00 per kwh, will wipe out incentive for –ve deviation and will increase it for +ve deviation. Further tariff for Wind power plants have shown annual increase. Any increase in tariff by say 0.50 per kwh will skew the scheme of incentives / disincentive in other direction. **The dependence of incentives / disincentives on tariff and REC sale rate will not send correct signals required for grid operations. Further wind velocity is nature dependent phenomenon and consequently the wind power generation is not within the control of wind generation company. Saddling the Wind power generator with additional workload and financial liability or providing incentive may not be appropriate as gain / loss to wind power generator is not on account of his efficiency or inefficiency. Any incentive to wind power generator will be the burden on distribution licensees and ultimately the consumers. This is not the desirable feature. From these considerations, establishing of REMCs and forecasting of wind / solar generation by them will be more appropriate.**

11. Besides above, proposed framework is complex involving preparation of energy accounts based on 15 minute's interval and accordingly application for issuing RECs, Issue of RECs, purchase and transfer of RECs. **Another simplified framework can be based on payment to Wind and solar RE generating companies ('REGenCo') at levelised tariff based on energy injected and providing incentive / disincentives for deviations from schedule.** Like conventional thermal and storage type hydro power plants , wind / solar generation can not be predicted with certainty and there is bound to be some error which will reduce with the availability of more and more meteorological data and improved softwares. Even with adequate meteorological data and best software, there will be some inaccuracy in predication. I presume that based on international experience , such minimum error is 12% for wind generation. If so, it will not be appropriate to subject wind generating company for liability of payment to DSM pool and purchase of REC for under-injection upto this error and payment from DSM pool and issue of REC for over injection upto this error. **This minimum conceivable range of +/- 12% ( or any other lower range considered appropriate) should not be subject to payment to /from DSM pool And purchase / issue of RECs. Another higher range, which may be considered achievable at present ( and to be reviewed periodically by CERC) say +/- 18% be considered towards payment to /from DSM pool and purchase / issue of RECs.** This can be applied to existing as well as new projects who are to give schedule as provided at reg. 6.5(23)(i) and(ii) and clause 5 and 7 of annexure –I of CERC (Indian Electricity Grid Code) Regulations, 2010 by the following formula:-  
$$R = K * A - r * [Da - S]$$

Where:-

**R=Amount in Rs./kwh ,payable from DSM pool to REGenCo (+ve) / to DSM pool by REGenCo(-ve).**

**K=0 for absolute deviation from 0 to S% and 1.0 for other values.**

**Da = absolute value of deviation in %.**



**S = specified deviation ( absolute value) up to which no payment will be due [Da-S] to be considered only when it is +ve, otherwise it will be zero.**

**This rate is to be applied on absolute value of deviation in kwh.**

12. The incentive / disincentive, by above formula, will be the same for the same deviation whether +ve or -ve. This mechanism will be independent of tariff and REC sale rate. Rate will be high for better accuracy of deviation. Values of A, r and S can be altered to suit incentive / disincentive scheme. These can be different for Wind and solar power plants. For example, for A=0.60, r=0.10 and S=12, rate will be Rs.  $(K*0.60 - 0.10 * [Da-12])$  and accordingly up to -12% to +12% deviation (Da=12), no incentive will be admissible. For deviation of -12% to -18% and +12% to +18%, Da from 12 to 18, incentive will be applicable with Rs.0.60 paisa at Da=12, Rs.0.30 for Da=15 and Rs.0 at Da=18 and beyond this range there will be disincentive. A, r and S can be altered by the Commission to suit changed scenario.

**Other observations on framework as proposed:**

13. Time schedule has not been specified for computation of amount due to /from DSM pool and its compliance thereafter. Further agency for such computation has not been specified. The scheduling as per CERC (IEGC) regulations will be on 15 minute's time block basis (vide reg. 6.5(23)). However, the requirement of payments to /from DSM pool and of purchase / transfer and issue of RECs will have to be based on longer period of computation and to be based on date of meter readings and terms of payment to REGenCo as per PPA. In considerations to these, requirement of computation of payment to /from can be on monthly basis with compliance in next 7 days. RPO fulfilment is on annual basis, as such computation of issue of RECs, their procurement and transfer can be for more longer period. It may be on annual but it may not allow sufficient time to REGenCo to procure RECs. It may be appropriate to have determination on quarterly or half yearly basis with compliance in next 3 months. As per reg 2.4.5 of IEGC, RPC Secretariat is to prepare, inter alia, the weekly unscheduled interchange account, renewable regulatory charge account based on data provided by SLDC/RLDC of the State/Region. As per reg 7 of CERC – REC reg. applications for issuance of RECs will be received on fortnightly and RECs issued within 15 days thereafter and presently trading of RECs are done through electronic auctioning on monthly basis. **Accordingly, it is suggested that following provisions may be added below regulation 1B of CERC (deviation settlement) Regulation.**

**“ Provided that monthly accounts shall be prepared by RPC or State LDC, as the case may be, for the requirement of payment due to / from DSM pool and transfer / issue of RECs as per this regulation.**

**Provided that amount due to /from DSM pool shall be settled within 7 days of issue of monthly account.**

**Provided that statement of requirement of issue of RECS by Nodal Agency and procuring and transferring of RECs shall be**

**prepared on quarterly basis and compliance of issue and transfer or procurement of RECs will be effected in next 90 days.**

14. **Transfer of REC to discom:** Transfer of REC (to meet deficit vis-à-vis schedule) is specified by procurement of RECs which has to be through power exchange. REGenCo may have REC issued to them for over-injection. **These RECs are owned by REGenCo and it should be considered for transfer to discoms without involving power exchange.** As monthly energy account will be prepared by RPC or SLDC. **It will be appropriate that REC regulations are modified to facilitate issue of RECs by NLDC based on the statement prepared by RPC or SLDC (duly verified by RPC).** Further, transfer may attract tax, it may be arbitrarily determined unless consideration is specified. It is proposed that consideration of transfer may be Rs.10 per certificate (that is, equal to fee paid by generating company for issue of REC, so that in getting REC issued and transferred to discom, REGenCo is not burdened financially). **Following additions is suggested in reg. 1B of CERC (deviation settlement) Regulation.**

**"Provided that transfer of RECs as per sub clause (v),(vi) and(vii) can consists of:- (1) the RECs issued to Seller as per clause (viii), (ix) and (x); and, (2) of the RECs purchased by seller through Power Exchange. Provided that consideration for transfer of RECs shall be Rs.10 per REC payable by Buyer / distribution licensee to central nodal agency"**

Yours truly

(Shanti Prasad)

**BEFORE THE CENTRAL ELECTRICITY REGULATORY COMMISSION**

3<sup>rd</sup> and 4<sup>th</sup> floor, Chanderlok Building,  
36, Janpath, New Delhi-110001

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Proposed Framework on Forecasting, Scheduling & Imbalance Handling for Renewable Energy (RE) Generating Stations based on wind and solar at Inter-State Level and amendments to relevant CERC regulations.

AND, IN THE MATTER OF:

Shanti Prasad,  
41-A, RSEB Officers' colony,  
D-Block, Vaishali Nagar,  
Jaipur-302021.

Commenter

**Affidavit verifying the comments**

I, Shanti Prasad, son of Sh. Shiv Dutt Joshi aged 73 residing at 41-A, RSEB Officers' colony, D-Block, Vaishali Nagar, Jaipur-302021 do solemnly affirm and say as follows:

1. I am a Commenter in the matter
2. The statement made in paragraphs 1 to 14 of the comments are true to my knowledge.

I Solemnly affirm, this 28th day of April 2015 that the contents of above affidavit are true to my knowledge & no part of it is false and nothing material has been concealed.

(Shanti Prasad)

Ex-Chairman, RERC