

Prayas

Prayas (Energy Group)

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4th March, 2020

Ref No: PEG/2020/14

To,
Secretary, APERC,
Hyderabad.

Subject: Comments/Suggestions '*In the matter of Amendment to Regulation No. 4 of 2017*'.

Dear Sir,

Please find enclosed comments/suggestions by Prayas (Energy Group) on the above mentioned amendments to regulation 4 of 2017.

We request the Commission to take our submission on record.

Thanking you,

Ashwin Gambhir, Ann Josey, Srihari Dukkupati, Sreekumar Nhalur
Prayas (Energy Group).

BEFORE THE ANDHRA PRADESH ELECTRICITY REGULATORY COMMISSION

IN THE MATTER OF:

Proposed Amendment to Regulation No. 4 of 2017 (APERC Forecasting, Scheduling and Deviation Settlement of Solar and Wind Generation Regulation, 2017)

Comments/Suggestions by Prayas (Energy Group), Pune.

With regard to the above F&S regulations, the APTRANSCO has made 'certain observations in adopting the Clauses viz., 2.1 (a), 2.1 (j), 4.1, 6.3 and 2.1 (aa) in day to day operation of grid with mix of VRE generation and conventional generation. A detailed report was prepared by APSLDC consolidating difficulties faced by them in day to day operation of the grid and requested suitable amendments to the said Regulation'.

The Commission has invited public comments on the report submitted by APSLDC vide its public notice dated 13.02.2020.

Our detailed comments on some aspects of the suggested amendments are noted below.

1. Need to continue with existing definition of absolute error for the time being.

The approach paper released by MERC along with its draft F&S regulations in February, 2018 (attached with the submission) lays down a detailed critique of the two possible absolute error definitions based on- i) Available capacity (AvC) and ii) Scheduled Generation. It also lays down the evolution of CERC's error definition and the reasons for the same. We provide excerpts from the paper which further the case for continuing with the existing APERC definition.

Section 4.2.1 of the approach paper notes that,

Earlier, under the IEGC, 2010, while introducing a scheduling and deviation accounting framework for variable Solar and Wind generation by way of a Renewable Regulatory Fund (RRF) Mechanism, the CERC defined the Error formula (deviation from schedule) as a percentage of the scheduled generation, i.e. (Scheduled Generation – Actual Generation)/Scheduled Generation).

However, subsequently, through the 3rd amendment of the IEGC in 2015, the framework for scheduling and deviation accounting for Wind and Solar generation was modified and CERC has defined the Error formula (deviation from schedule) in terms of percentage of the AvC, i.e. (Actual Generation – Scheduled Generation)/Available Capacity).

*The CERC's Statement of Reasons explains that, in order to remove the dependency of the denominator on weather, scheduled generation term has been replaced by AvC in the denominator. Thus, the CERC decided to define the Error percentage normalized to AvC, instead of against the schedule. **This was to ensure that the Error quantum corresponds to the physical impact in MW on the grid, that the forecasting models are aligned to minimize the actual MW deviations, and that the Error definition is valid in all seasons. (emphasis added)***

The concept of Mean Absolute Error (MAE) with linkage to Available Peak Capacity is also aligned with norms adopted globally for denomination of the accuracy of forecasts. The AvC would be equal to the Installed Capacity, unless one or more turbines/inverters are under maintenance or shutdown. Any mis-declaration of capacity when it is actually not available due to maintenance or shutdown would amount to gaming and would be liable to action under the relevant provisions of the EA, 2003 and the proposed Regulations.

Further, section 4.2 of the approach paper gives detailed advantages and disadvantages of both definitions of errors, based on the data analysis of actual wind generation of three sites (pooling substations) for a year. The approach paper compares the two error definitions and makes following observations:

Scheduled Based Error Definition	Available Capacity Based Error Definition
Using scheduled based error results in highly unpredictable distribution of error and there is no clear distribution pattern of the error. For example, in low resource periods the magnitudes of absolute error can become very high as the denominator is very small.	AvC remains relatively constant throughout the year for a generation site irrespective of season. Hence, using AvC based error definition produces some predictable distribution of error.
Given possibility of absolute error magnitude exceeding 100% and ranging till infinity, wider deviation bands would be needed. However, because of wide distribution of errors, it becomes difficult to determine deviation bands and charges. Also, during non-peak seasons, the degree of error in absolute terms would be insignificant but the percentage error value would be significantly higher since forecasts and schedules are much lower in magnitude (MW).	If AvC based error definition is used, then the data analysis for the three locations exhibit the highest concentration of Error values in $\pm 15\%$ Error Band, which corresponds to more than 80% of the actual generation.

The Guiding Principles (GP) suggested by the FoR technical committee for formulating the state level framework for F&S are:

- a. Encouraging scheduling discipline
- b. Ease of implementation (simplicity)
- c. Compatible with State/Regional/National framework
- d. Scalable and flexible
- e. Minimal commercial implications for participants
- f. Enforceable
- g. Continuation of existing transactions without significant modifications.

Both the scheduled based error and AvC based error is enforceable (GP f) and can be used to encourage scheduling discipline (GP a). However, the predictable distribution of AvC based absolute

error, with concentrated spread within 15% band makes AvC based absolute error easy to implement (GP b) and also minimises the commercial implications for participants (GP e).

AvC based error is defined as $(\text{Actual Generation} - \text{Scheduled Generation}) / (\text{AvC})$. Since AvC is more or less constant across the year, the error basically reflects the actual MW deviation on the grid, as acknowledged by CERC (3rd Amendment of IEGC) and hence is more compatible with the framework adopted at the regional level by CERC (GP c, GP g). Using this error definition would also ensure uniformity in the F&S regulations across states (since all states have AvC based error definition), thereby reducing transaction costs and increasing associated ease in accounting and settlement.

Using AvC based error also allows the same error definition and deviation bands to be used for both wind and solar generators (GP d), unlike scheduled based error in which case the error distribution would differ for wind and solar.

Overall, using AvC based error definition enables better adherence to the guiding principles suggested by the FoR technical committee and ensures smooth implementation of the mechanism. **Hence, we recommend that, the AvC based error definition should be continued with for calculating the absolute error.**

2. Allowable error bands

APTRANSCO has suggested a new term, 'Allowable forecast error' defined as, **$(100 * 0.7 (\text{diversity factor}) * \text{quantum of deviation limit set by CERC}) / \text{Installed VRE capacity}$.**

With an installed capacity of 7300 MW and a limit of 250 MW, this works out to be 4.89%. Firstly, the petition seems to have a typographical error. The formula suggested should have the diversity factor in the denominator to arrive at 4.89%.

The present allowable error of 15% as fixed by APERC was based on CERC studies for few pooling stations based on the error formula as presently adopted by APERC. Any change in the allowable error or the formula should be based on a rigorous study of existing data from implementation of F&S since 2017. The study can also highlight if there is a need to have different allowable errors for new and old renewable energy generators. Similarly, predictability and forecasting accuracy of solar power is potentially higher than wind power and hence the 15% allowable error may become lax in the coming years, especially for solar. Whether solar and wind would need separate allowable error bands in the future is also a question before the Commission.

More importantly, the evidence from implementing the F&S regulations in the state should form the basis of finalising the allowable error for wind and solar power. Hence we suggest that APERC should commission an independent detailed study, analysing the experience in implementing the F&S regulations, with a focus on forecasted and actual generation and deviation therein. The draft report and the data analysed in the study should be placed in the public domain for further independent analysis. The report should be finalised only after public consultation. Any amendment to allowable error bands should be done based on the final report. The Commission may consider a timeline of 1.5

months for the study followed by 1 month for public consultation, so that final regulations could be in place prior to the wind season of 2020.

Considering the importance of this data (schedules, actual generation for each pooling station/generator at each 15 min block), we request the Commission to include a section in the regulations, mandating the SLDC to make this disaggregated data publicly available in downloadable spreadsheet formats for each week/month (depending on the settlement period). Based on the data, SLDC should also public a quarterly report to the Commission which should also be publicly available on their website.

Who pays for the deviation charges up to 15% or 10% allowable error?

Under the existing APERC framework, the DISCOMs bears the cost of deviation penalties by wind and solar up to 15% absolute error. We feel that the deviation penalty caused due to wind and solar should be borne by these generators. To operationalise this, we suggest an approach.

- a. First the SLDC calculates the contribution of solar and wind deviation to the total deviation charge for the state at its periphery.
- b. Secondly, they collect deviation charges for wind and solar deviation in accordance to absolute error at each pooling station.
- c. Thirdly, if the total deviation penalties collected from the wind and solar projects are lower than what wind and solar power deviation contributed to the state deviation penalty, then the **balance is additionally recovered from the generators (through their QCAs) in proportion to their deviation.**

In essence, the entire cost of deviation caused due to wind and solar is finally passed back to the generators, thereby allaying the fears of the DISCOM which would have had to bear the brunt in the absence of this provision. We feel that this is the right approach and will further push the growth of renewables in the long run. In fact, Maharashtra had adopted a similar approach.

In line with MERC's approach, we recommend amending Regulation 6.3, by adding following provision below Table in regulation 6.3. This provision should be applicable to the 'None' deviation charges applicable below the 15% error detailed in the Table.

Deviation Accounting

The methodology for deviation settlement for the State shall be as follows:

(a) The Deviation Charge payable or receivable for the State as a whole at the State periphery shall be determined by the SLDC.

(b) The SLDC shall compute the impact of the deviation of the Solar and Wind Energy Generation and its contribution to the Deviation Charge at the State periphery.

(c) The SLDC shall compute the Absolute Error, i.e. the difference between the scheduled and the actual energy injected, in respect of each Pooling Sub-Station and each

Generator feeding energy directly to another Sub-Station, and shall accordingly determine the amounts payable on account of the Deviation Charge in accordance with Regulations 7 and 8 (Section 18 in the case of RERC regulations).

(d) Any shortfall in the aggregate amount of Deviation Charge payable by Solar and Wind Energy Generators at the State periphery and the amount receivable from them by the Pool Account shall be paid by the respective QCAs in proportion to their deviation reflected at the State periphery.

Source: MERC F&S regulations (Regulation 12) and procedure (Regulation 10-12), available at <https://www.merc.gov.in/faces/merc/common/outputClient.xhtml>

3. Penalty levels beyond allowable error

Further, APTRANSO has suggested that any deviation above the suggested level of 5% of ‘allowable forecast error’ be priced at a penal rate of Rs 2/kWh. It has noted that Rs 2/kWh is a combination of Rs 1.6/kWh (adequacy costs) and Rs 0.4/kWh (balancing costs). Adequacy costs is defined as the difference between VRE costs and weighted average pooled variable cost. Balancing costs are due to higher heat rate and auxiliary consumption due to backing down of thermal power plants. Not much detail has been provided to further substantiate this.

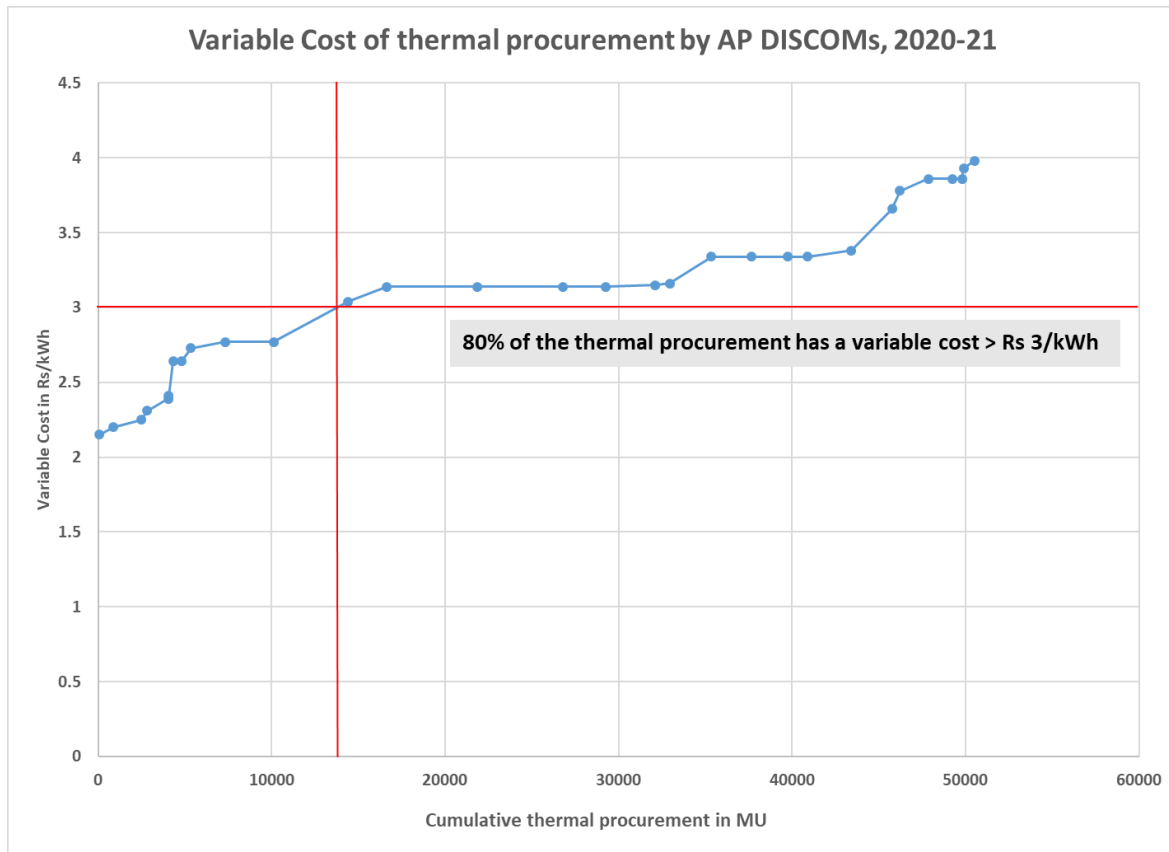
An analysis of the approved power procurement for 2020-21 shows that **even just the variable cost of thermal generation for a significant share (~80%) of the total thermal procurement is above Rs 3/kWh for 2020-21, which is higher than the recently adopted solar tariffs by APERC.** The weighted average variable cost of thermal procurement of 50,505 MUs is Rs 3.15/kWh, while the details of thermal procurement in different bands of variable costs are given the table below.

Table: APERC approved thermal procurement for 2020-21 and its associated variable cost.

Thermal Procurement	Variable Cost	Share in total thermal procurement
MUs	Rs/kWh	%
10,101	< 3	20.0%
33,316	3 - 3.5	66.0%
7,089	3.5 - 4	14.0%

The graph below shows more granular data; wherein cumulative thermal procurement is plotted against its variable cost (lowest to highest).

This suggests that backing down of expensive coal generation to accommodate new solar and wind power (< Rs 3/kWh) can actually save costs for the DISCOMs and would not have any additional burden of adequacy costs.



The other aspect is of Rs 0.4/kWh of balancing costs due higher heat rate and auxiliary consumption due to flexible operation of coal plants. First, one needs to acknowledge that flexible thermal operation is needed not just to accommodate renewables, but also due to variation in load. Further, rather than accounting for such costs in the F&S regulations, the appropriate way is the have a compensation mechanism (akin to *CERC’s Mechanism for compensation for degradation of Heat rate, Auxiliary Power Consumption and Secondary Fuel Consumption due to Part Load Operation and Multiple Start/ Stop of Units*) for flexible operation of thermal plants. APERC should consider amending their tariff regulations to introduce such compensation mechanisms.

Need to move to intra-state ABT based accounting

Deviation penalties for inter-state transactions and for regional entities are parameterised (linked to tariff under their PPAs), while those for intra-state transactions are based on absolute value (absolute value in Rs/kWh). Such absolute values need careful attention and regular revision in line with the wind and solar market prices. Ideally, Andhra Pradesh should move to intra-state ABT based accounting and align the state framework for RE forecasting and scheduling in line with the CERC framework for regional entities. Or else there might arise a situation in which deviation charges under these two frameworks may vary quite widely, even when projects are situated next to each other geographically. This would also remove the need for constant revision of deviation penalties for intra-state transactions.

4. Continue with the practice of allowing revision in forecast and schedule

Regulation 4.5 allows for 16 and 9 revisions of schedule for wind and solar generators closer to real time operation. This should be continued with, since the accuracy of forecast closer to real time is much better than a day-ahead forecast.

Additionally, the CERC has already amended its regulations to enable the implementation of Real Time Markets from 1st April, 2020 which would allow stakeholders to buy and sell power in a half hourly market that too, just 1.5 hours before delivery period. This would enable generators/DISCOMs to reduce their deviation close to real time.

5. Virtual pool

The issue of virtual pool would be addressed if APERC adopts the framework as suggested earlier in point 2 (Who pays for the deviation charges up to 15% or 10% allowable error?), wherein first penalties are levied as per the deviation at each pooling station and the virtual pool comes into play only if these penalties are not enough to cover the entire state DSM penalty on account of wind and solar power. This is similar to the MERC F&S regulations (Regulation 12).

Aggregation and levels of allowable absolute error

The 'Model Regulations on Forecasting, Scheduling and Deviation Settlement of Wind and Solar Generating Stations at the State level' issued by the FoR in 2015 stipulated a recommended level (10/15%) of allowable absolute error at each pooling station based on studies done at few sample pooling stations. For details on this, please see pp.22-23 of the report (<http://www.forumofregulators.gov.in/Data/study/MR.pdf>). Given that the estimation of the stipulated level is based on studies at the pooling station level, the recommended level of error (10% for new projects / 15% for old projects) for which there are no penalties, holds true only when errors are calculated at the level of each pooling station and not aggregated at the level of the state. Errors estimated for the system would necessarily be lower than those estimated for individual pooling stations. As it is true that what matters in terms of system balancing is the aggregate number for wind and solar generation, permissible errors if such a system (aggregation across pooling stations and QCAs) were to be followed would have to be much lower.

6. Forecast by SLDC

Regulation 4.3 of the F&S regulations mandates the APSLDC to undertake forecasting for the entire wind and solar capacity to ensure reliable grid operation. It is unclear if the SLDC is undertaking such forecasting and making it available to any interested generator/QCA. This is pertinent since [recent newspaper articles](#) report the opening of the REMC in APSLDC.

Hence, APERC should direct SLDC to submit details of compliance to this mandate on a periodic basis.

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