CERC (Deviation Settlement and Related Matters) Regulations, 2024 [Draft]

CERC notified for Deviation Settlement Mechanism (DSM) on 30th April 2024. The key highlights of this draft regulations are given below:

Objective: The governing body have monitoring the grid events namely frequency excursions and frequency fluctuations. To ensure smooth and secure grid operation the new regulation have been designed accordingly.

New definitions added in the draft regulations

- Contract rate: An alternative method of calculation have been introduced. It is weighted average ACP of the Day Ahead Market segments of all power exchanges for that time block.
- To allow high cost power generate to participate in the DSM, High price-Day Ahead Market (HP-DAM) have been included in I-DAM.
- The states with RE installed capacity of more than 1000MW less than 5000 MW will be identified as 'RE Rich State' and state with more than 5000 MW as 'RE Super Rich State'.
- Normal rate will be calculated based on summation of fraction I-DAM, Real Time Market, RTM and Ancillary service charges.

The draft regulation can be accessed here

1. **Approach to Deviation Settlement Mechanism (DSM):** The rising RE penetration and associated uncertainty of generation, along with uncertainty of electricity demand remains key challenges in ensuring power system stability. Power system stability is influenced by two critical and dynamic parameters – **(i) System frequency and (ii) Market prices.** To ensure that DSM is able to provide appropriate signal to minimize power system imbalance thus ensuring power system stability, it is suggested that the above two ingredients should be integral part of the DSM structure for all system constituents with limited exceptions.

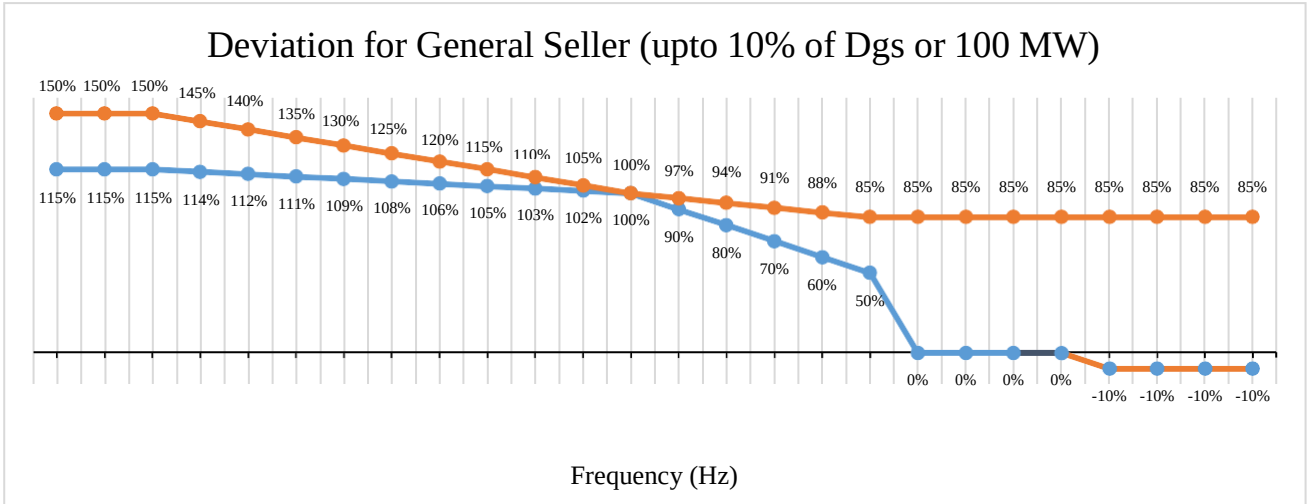

Figure 1: Deviation Charges for General Seller

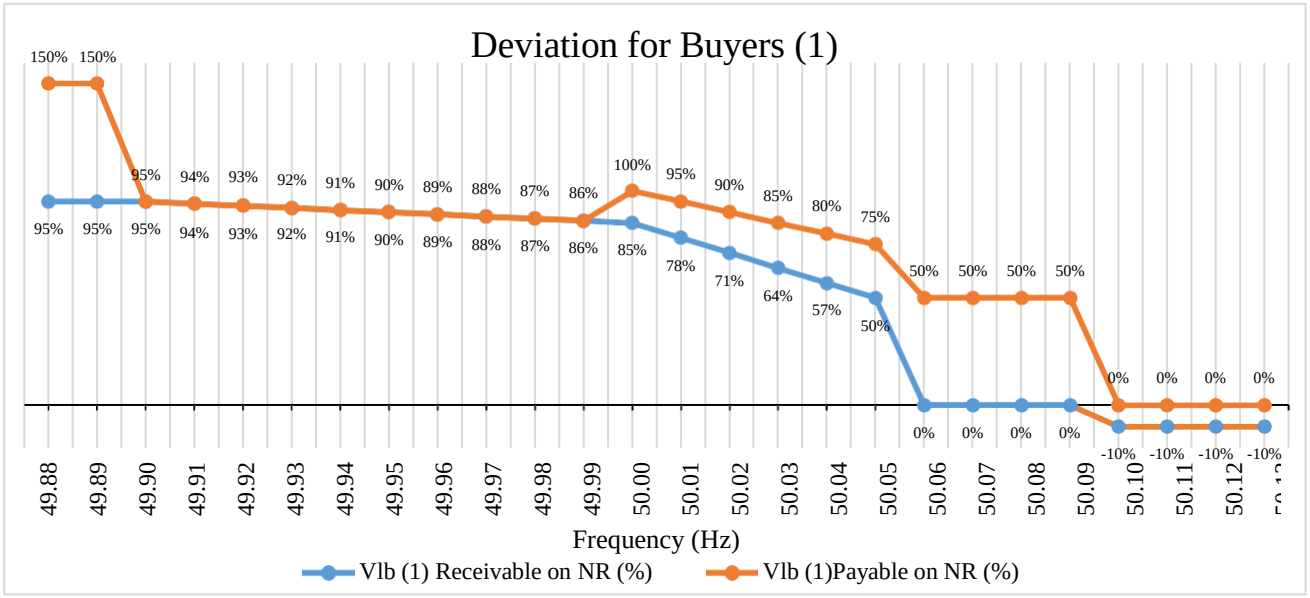

Figure 2: Deviation Charges for Buyers

The evolution of DSM regulations has witnessed numerous turns in it approach to address the immediate as well as emerging problems of power system stability. **It has become a rather complex mechanism providing differentiated signals for system participants (Figures 1 & 2) for arresting deviation even while the system is affected the same way irrespective of the source of deviation.** Greater uniformity, with few exceptions, would ensure its simplicity and would provide long-term regulatory certainty.

2. **DSM for Wind-Solar (WS) Generators:** Given rising share of RE, it is imperative that greater responsibility of addressing the deviation are now passed on to the RE generators, which have hitherto being subject to a light-handed approach both in term of approach to determine percentage deviation as well as applicability of DSM charges. Increasing burden for DSM falls on the final consumers who would pay for deviations as the cost of Ancillary Services deployment is socialized. Given higher RE target, there is a **need to adopt a tighter tolerance for error band with graduated DSM charges for WS generation**.

3. **New Definition of RE Rich and RE Super Rich state:** Use of renewable capacity (connected to the intra-state system) as basis for definition is inadequate in addressing the challenges posed by Variable Renewable Energy (VRE). For example a **RE rich state with solar capacity would have no impact on its imbalances during non-solar hours**. Similarly state with higher wind potential will have limited impact of lean winter months. **RE Rich and RE Super Rich state should be defined on the basis of <u>RE injection rather than RE capacity</u>, and be differentiated across high/low RE injection periods of day.** Such definition should be dynamically updated on weekly basis, based on actual RE generation share across time blocks of the day of the preceding week. The respective RLDCs may periodically update the same every week on an identified day.

4. **Methodology for Calculation of Deviation for Renewable Energy Projects:** Proposed Clause 6 (2) states that "*Deviation in a time block for WS seller shall be computed as follows…… Deviation-WS seller (D_{WS}) (in %) = 100 x [(Actual Injection in MWh) - (Scheduled generation in MWh)]/* ***[(Available Capacity****)]"(emphasis added).*

All deviations, irrespective of the source, have the same impact on the stability of the grid. Going forward, renewable generators, which would contribute significantly to the energy basket, are expected to reduce deviations through better forecasting or through technological means including energy storage system.

Given the rising share of renewable capacity in the near future, variability and uncertainty associated with WS generation would place even greater stress on the power system. Share of energy generation from such sources would be significant, particularly during solar hours/ high wind season, making the power system vulnerable to forecast errors. Thus, increasing emphasis should now be placed on tightening the DSM regulations for the variable renewable energy sources so as to ensure grid security along with greater RE penetration.

Use of available capacity as a denominator for forecasting error reduces the percentage error while the absolute error (in MW) remains the same. This influences the applicability of penalty as per (percentage) error band while actual penalty payable would still depend on the rate of penalty and the quantum of deviation. Apart from using a 'pseudo' definition for scheduling error, WS generators were also been subject to a wider error band. As a next step**, it is suggested to use a true or near true definition of scheduling (forecasting) error. As a transition, the Commission may consider a graded path for implementation of weighted average of the available capacity and schedule generation for the denominator (Table 1). Alternate approach is to continue with the existing definition but tighten the error band and applicable penalty for deviation.** A new approach base on **Maximum Potential Generation is suggested below.**

Table 1: Proposed methodology for computation of deviation for WS seller

Year	Applicable Weightage		Minimum Allowable Volume Limit
	Available capacity	Scheduled generation	
2025-26	75%	25%	Wind: 12%, Others: 6%
2026-27	50%	50%	Wind: 14%, Others: 7%
2027-28	25%	75%	Wind: 15%, Others: 8%

In case of <u>change in the definition</u> of deviation, the percentage volume limits should also be aligned so as to make the transition smoother. Analysis of past data can help evaluate the impact of change in definition of deviation. Transition from existing approach to suggested one may be graduated over a year with higher cut-off percentage for lower band percent deviation. For example, deviation for buyer at maximum volume for solar can be set at 8% (in place of the proposed 5%) and for wind this can be set at 15% (in place of the proposed 10%) with firm timeline for implementation. The deviation band for wind and solar generators, as suggested in the draft, should thus be applicable within

1 year.

5. **Maximum Potential Generation Profile - An alternative proposal for calculation of deviation for WS seller:** The assessment of deviation for wind and solar generators is undertaken with respect to **available capacity** This has artificial effect of reducing percentage deviation as available capacity is higher, and remains the same across the year. Interestingly, the **available capacity for WS generators remain <u>constant throughout the day/year</u> (Figure 3).** Due to higher numerical value of declared capacity for the early morning hour and late afternoon, the calculated percentage deviation is significantly and artificially lower. This anomaly should be addressed.

   A new concept of **Maximum Potential Generation Profile (MPGP)** can replace existing provision for available capacity as a reference for estimation of deviation by wind and solar generators. WS generators would self-declare daily time-block wise MPGP to be used as the reference in place of available capacity for calculation of deviation. MPGP would be declared on a weekly basis and would remain constant for entire week. **This would be a significant improvement over the current approach, which treats the denominator to be constant throughout the day/year, while keeping providing a time block-wise fixed denominator for a week.** This is illustrated in Figure 3. Adoption of such methodology would bring about conceptual clarity to the definition of percentage deviation while still providing a firm and known denominator for calculation of the same.

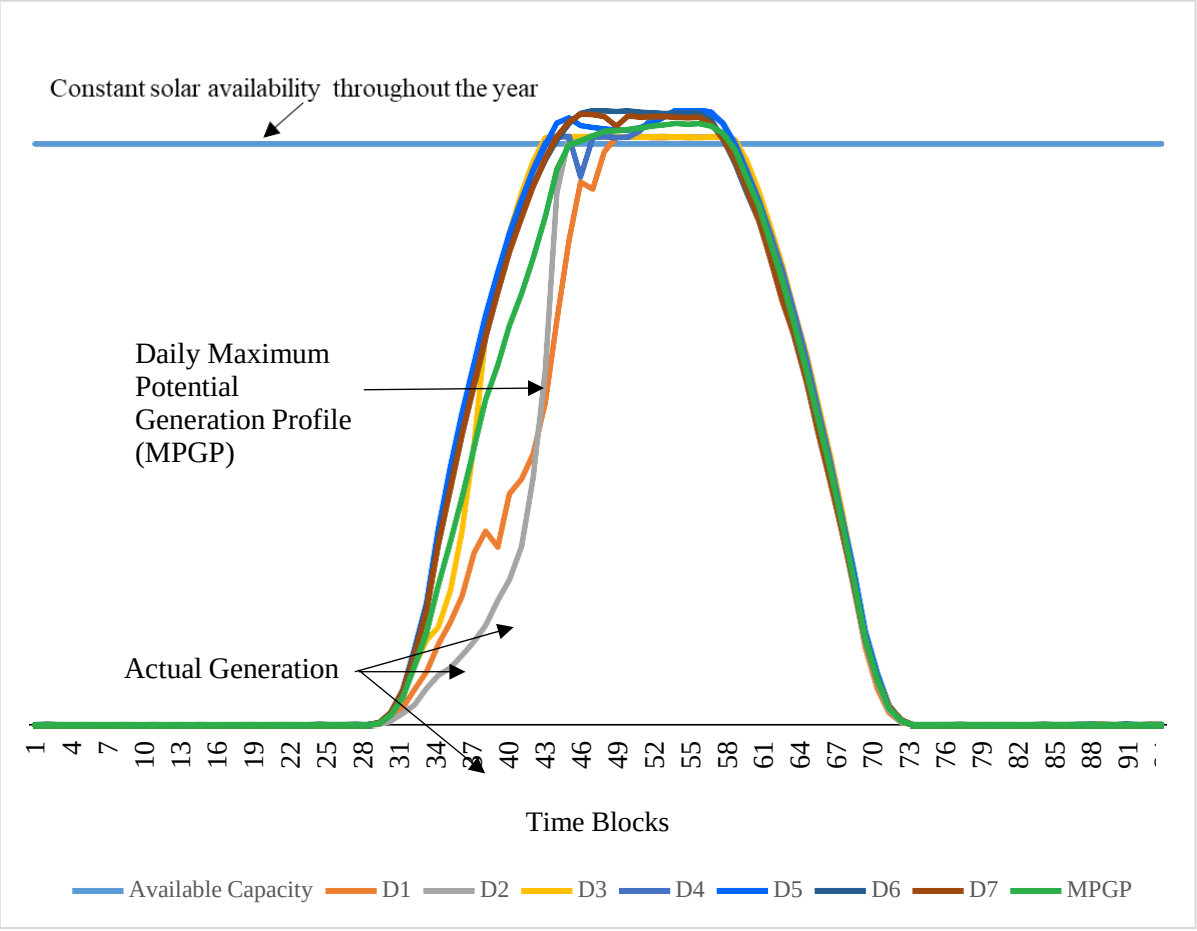

Figure 3: Proposed Denominator for Deviation Calculation - MPGP

6. **Common Deviation Portfolio for Conventional Generators?:** SCED is an optimization layer that allows the system operator to determine 'optimal' schedule for the power system by 'rescheduling' marginal conventional plants. A mechanism for **'common deviation portfolio'** across the generation assets of a generation company within region would assist generators in addressing deviations as well as meet the flexibility requirement, especially during the **'partial outage'** conditions. 'Beyond reasonable control' mentioned in the context of 'partial outage' needs greater definitional clarity. Online system to record 'partial outages' with searchable archive would bring greater transparency in the existing approach. **Deviation can be partially or fully offset through a common pooling arrangement across the stages of a generating station. Implementation of the similar offset mechanism may be explored for pooling deviations of multiple stations of a generating company within a region.** Data analysis of past performance may help reveal potential impact of the same.

7. **Localised 'Market' for depooling Deviation Charges at the pooling Station: 'Common deviation portfolio'** for WS generators connected at a common ISTS sub-station would help reduce risk for WS generators. Depooling disputes due to differing forecasting efficiency (incentive not to improve?), delayed payment of DSM charges, localized 'outages' for some WS generators etc. can be addressed through the proposed mechanism. In case of pooling of deviation within WS generators, settlement of deviation among the generators participating in a 'deviation portfolio' can be done through a **localized 'market' for deviation settlement.** Generators with better forecasting accuracy (thus lower deviation) can 'trade' deviations with 'others'. **This would provide greater incentive for improvement in forecasting efficiency as well as investment in energy storage system by participants in the common pool.** This may also help address common issue of using 'contract rate', which is calculated based on contract rate of individual RE generators (for the purpose of deviation charges). The mechanism would be useful for the QCA and the participating RE generators.

8. **Improving Forecasting for Wind and Solar Generators - Pooling of Weather Data and Public Data Access:** The weather forecast data and models provide daily forecast within every 6 hour interval. This is based on data collected across the IMDs weather stations. Each WS generator also has their own 'weather stations'. **Pooling of weather data across all Wind, Solar, Hydro and other generators is the need of the hour**. This should be made available and archived **as a public good,** thus helping to significantly improve forecasting accuracy. Capturing cloud movement (particularly through ground based instruments) with socialised data can further help improve solar forecasting.

   The generation schedule as well as actual injection RE generation data across the REMCs located in different regions could provide significant insights and empower stakeholders in developing better forecasting tools and research. **Unavailability of such data, especially for intra-state RE generators, restricts the capability of the stakeholders including researchers to develop better forecasting tools for RE generation. Hence, the availability of data in public domain from REMCs should be prioritised.**

   It is suggested that the deviation for WS generators during the **'declared' extreme weather events** (e.g. cyclones, in consultation with IMD) in the **impact zone** and for the **impact duration should be exempted for WS sellers in such region.**

9. **Deviation for Energy Storage Services (ESS):** As per the Clause 8(5), *"Charges for Deviation, in respect of a Standalone Energy Storage System (ESS), shall be at par with the charges for Deviation for a **general seller other than an RoR generating station or a generating station based on municipal solid waste or WS seller** as specified in Clause (1) of this Regulation"* and Clause 8(6) *"Charges for Deviation, in respect of an ESS co-located with WS Seller(s) connected at the same interconnection point, shall be as follows:*
*i) Such seller shall provide **a separate schedule for WS and ESS** components through the Lead generator or QCA at the interconnection point;*
*ii) **Deviation corresponding to WS component** shall be charged at the **same rates as applicable for WS Seller** being a generating station based on solar or hybrid of wind-solar resource in accordance with clause (4) of this regulation; and*
*iii) **Deviation corresponding to the ESS component** shall be charged at the same rates as applicable for **a standalone ESS** in accordance with clause (5) of this regulation"(emphasis added).*

It is to be noted that there can be the following four possible configurations of the ESS -

a) ESS co-located with the respective RE (WS) generator
b) Co-contracted ESS (but not co-located, especially for PSP)
c) Shared ESS Asset within a common pooling area (by QCA)
d) Standalone ESS (without any contractual linkages)

It is suggested that the deviation for an ESS bundled with RE, under configurations **(a), (b) and (c),** should be calculated **as per the methodology defined for the respective technology.** Separate deviation calculation for the ESS and the RE technology would severely penalise the generators as they would not be able to mitigate the RE resource variability and the corresponding DSM penalty. This may further discourage the installation of/ bilateral contract with the ESS by the RE generators.

In case of **standalone ESS** without having any contractual linkages with RE generators (configuration (d)), the lowest deviation band for the BESS should be 0.5 %. Furthermore, it is also suggested that the deviation range for pumped storage plants (PSPs) may be differentiated from the battery energy storage system (BESS) as PSPs cannot respond as fast. **Adoption of deviation charges for standalone (untied) ESS capacity (in part or full) at par with a WS seller or a general seller would provide significant gaming opportunity for the ESS.**

10. **Shifting Gate Closure Nearer to the Despatch:** Uncertainty with respect to WS forecast would remain a challenge. Hour-ahead RE forecast is more reliable than about 2 hour ahead forecast. Long-term target should be to **move gate closure for WS generators near to the block of delivery (4 blocks)** with simultaneous shift in the SCED and Ancillary Services market. The prevailing Grid Code provides for a gate closure, beyond which, revision in schedule is not permitted. Since RTM market closes 6-7 blocks ahead, gate closure can happen only soon after that. **To enable WS generators to provide better forecast, the gate closure may be moved close to the block of delivery. This would mean that the RTM timeline would also need to be moved closure to the block of delivery. Realignment of gate closure would also further assist tightening of DSM regulation for the WS generators.**

11. **Extending the scope for the definition of Contract Rate:** In the proposed clause 3 (j) *"Contract rate means the tariff for sale or purchase of power, as determined under Section 62 or adopted under section 63 or approved under section 86(1)(b)……"*

The definition covers the prices of electricity discovered u/s 62 and u/s 63 or price discovered in the Power exchanges. It is suggested that the definition should also include in its scope, the **prices discovered from other market segments** such as other products traded on power exchanges, Discovery of Efficient Electricity Price (DEEP) and Surplus power portal (PUShP).

12. **Correction in the definition of Reference Rate (RR):** Proposed clause 3 (x) states that *" Reference Charge Rate or RR means (i) in respect of a general seller whose tariff is determined under section 62 or section 63 of the Act, Rs/kWh energy charge as determined by the appropriate Commission, or (ii) in respect of a general seller whose tariff is* ***not determined under section 62 or section 63 of the Act****, the daily weighted average ACP of the Day Ahead Market segments of all the Power Exchanges, as the case may be" (emphasis added).*
The section 63 of the EA 2003, the Commission is empowered to adopt and approve the tariff discovered though a bidding process. The proposed clause may thus be rephrased as below

"Reference Charge Rate or RR means (i) in respect of a general seller whose tariff is determined under section 62 or section 63 of the Act, Rs/kWh energy charge as determined by the appropriate Commission, or (ii) in respect of a general seller whose tariff is not ***determined under section 62 or a under section 63 of the Act****, the daily weighted average ACP of the Day Ahead Market segments of all the Power Exchanges, as the case may be"* (emphasis added).

13. Windfall gain to MSW for under-injection: The proposed deviation band and the applicable DSM charges for MSW generators provide windfall gain to such generators, who can under inject by 20% while still receiving 50% of their approved tariff, which are significantly higher (Rs. 8+ per kWh). This would incentivise MSW generators to give artificially higher schedule thus influencing deviation across the grid and thus collect windfall gain (Table 2). The 20% deviation band for MSW should be reduced to at least 10%.

Table 2: Windfall gain to MSW generator for under-injection

Available Capacity (kWh)	Schedule (kWh)	Actual Generation (kWh)	Deviation (kWh) Under-injection	Reference Rate (Rs./kWh)	Receipt as per @RR (Rs.)	Actual generation cost (Rs.)	Payable to the pool @0.5*RR (Rs.)	Windfall gain (Rs.)
a	b	c	d = c-b	e	f = e*b	g = e*b	h = 0.5*e*d	i = f-g-h
100	100	80	20	10	1000	800	100	100

14. **Normal Rate (NR) of Charges for Deviations:** As per the draft regulation, determination of Normal Rate of Charges (NR) for deviation considers the following:

(a) 1/3 [Weighted average ACP (in paise/kWh) of the Integrated-Day Ahead Market segments of all the Power Exchanges];

(b) 1/3 [Weighted average ACP (in paise/kWh) of the Real-Time Market segments of all the Power Exchanges]; and

(c) 1/3 [Ancillary Service Charge (in paise/kWh) computed based on the total quantum of Ancillary Services deployed and the net charges payable to the Ancillary Service Providers for all the Regions].

The key **difference between energy market (power exchange) and ancillary service** is that the market outcome of the former is dependent on competing buyers and sellers, whereas in the latter case, the decision for quantity of procurement is undertaken by the system operator, while 'price discovery' is primarily dictated by the 'regulated' tariffs. Integrated-Day Ahead Market (I-DAM) does not capture the uncertainties close to the real time and does not provide correct value of resources for the NR. It is suggested that Commission shall consider **providing higher weightage to Ancillary service and Real Time Market** for determination of NR and gradually decrease weightage of I-DAM over-time

15. **Windfall Gain for Merchant Seller for Over-injection:**

During periods of high market prices discovered in I-DAM or RTM (especially when MCP = Price cap) and actual system frequency is below 50 Hz[1], a general (merchant) (particularly coal based merchant power plant) whose ECR may range Rs. 3-4/ kWh will find it lucrative to over inject and make windfall gain. **A merchant generator may even be tempted to withhold capacity as this would also 'improve' the chances for a higher market price. In the absence of a block-wise or daily deviation limit, such withholding of capacity and over-injection may be gamed consistently as merchant capacity is significantly lower to overall generator capacity of system during such time blocks and some over-injection by a MPP would not have much impact on system frequency.** In contrast, a TPP whose tariff is approved u/s 62 or adopted u/s 63 of EA 2003, would be incentivised in a limited and desirable manner to over inject.

[1] System frequency below 50 Hz and higher market prices are most likely to be coincide and thus provides a consistent opportunity to game.

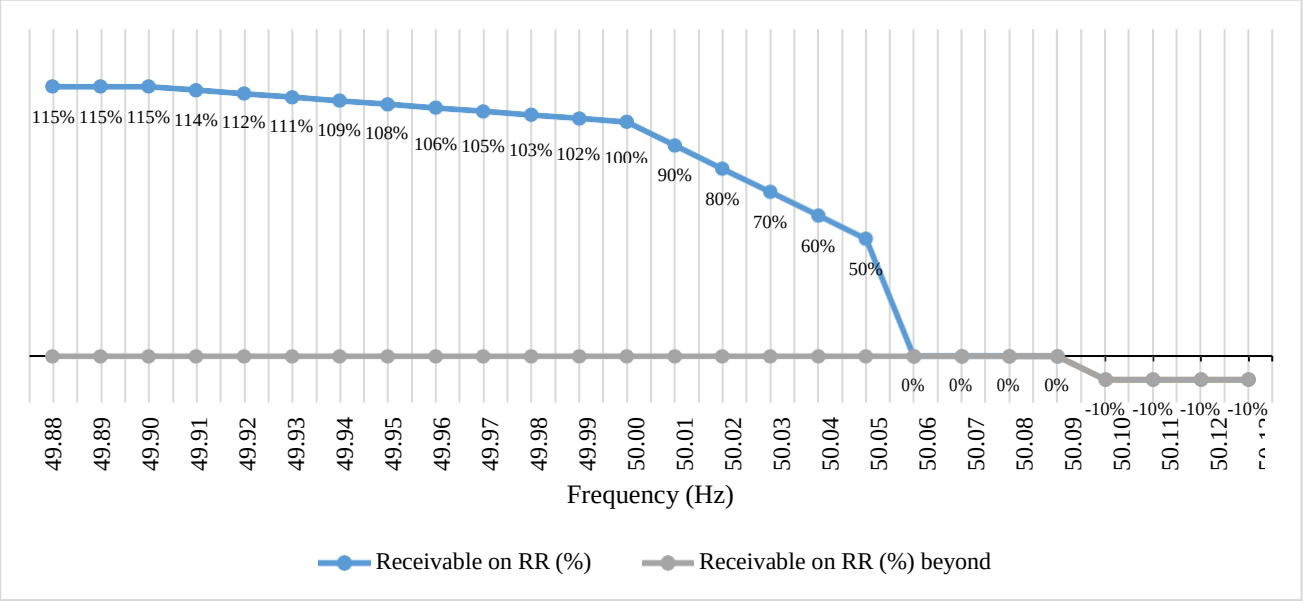

Figure: Charges of Deviation for Over Injection by General Seller (≥10% of Dgs (or 100 MW) and beyond

16. **Capping of RR for Over-injection by a Merchant Power Plant:** As per the Suo-moto order issued by CERC 04/SM/2023, a cap of Rs.10/ kWh on market price of electricity for power exchange product (DAM, TAM, DAC, GDAM, Intra-day) and Rs.20/ kWh for HP-DAM was placed. **Over-injection, when the system frequency is below 50 Hz, attracts more than 100% of the Reference Rate, which may be Rs. 10 per kWh for the merchant power plants at times. Hence, it is desirable that the Reference Rate applicable for the merchant generators be capped at** the highest tariff determined under Section 62 for the coal based power plants from those **scheduled for the respective time block.**

17. **Block-wise and Daily Deviation Limit:** In the absence of any limit on block-wise/daily deviation, there is greater possibility of gaming the deviations for financial gains. It is suggested that maximum percentage limit of 5% per block and 1% per day, as prevalent under the erstwhile `UI framework, may be introduced. Overall daily limit would address some of the anomalies mentioned above as well.