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# Response to CERC Draft DSM Regulation 2024

From:

M/s Athena Jaipur Solar Power Pvt. Ltd.  
M/s Athena Bhiwadi Solar Power Pvt. Ltd.  
M/s Athena Hisar Solar Power Pvt. Ltd.  
M/s Athena Karnal Solar Power Pvt. Ltd.

24th May-2024

# DSM regulations & revisions- Impact on developers

In light of increased RE penetration, regulations for RE were revised commercially to achieve grid stability, without addressing its key technical driver viz weather forecasting accuracy; no improvement in accuracy, while causing severe commercial losses to developers.

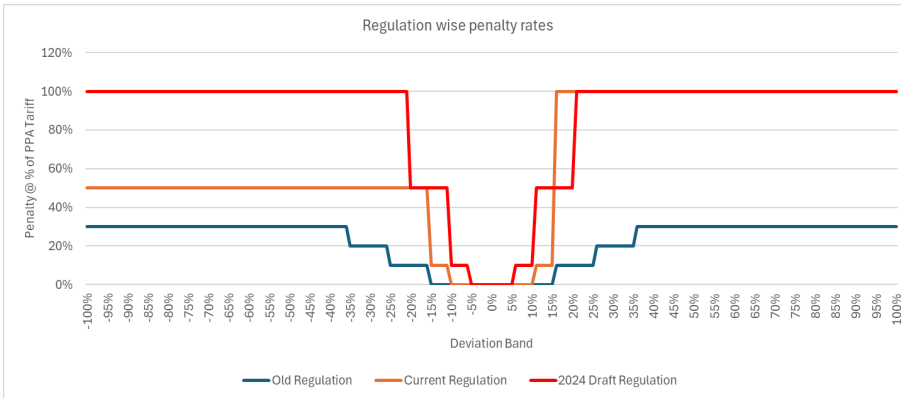
## Background

- CERC issued DSM regulations in the following years
- 2014 Principal regulation (1<sup>st</sup> regulation in India)
- 2022 Regulation 2022 (Revised regulation)
- 2024 Draft regulation

## What were the changes in subsequent revisions (2022 and 2024-draft)

- the penalty bands were made narrower, forcing the RE developers to be more accurate in generation forecasting.
- Max penalty for deviation increased from 30% to 100% of PPA tariff.
- The gate closure timing for revising the generation forecast made more stringent – increased from 1 hrs to 2 hrs.

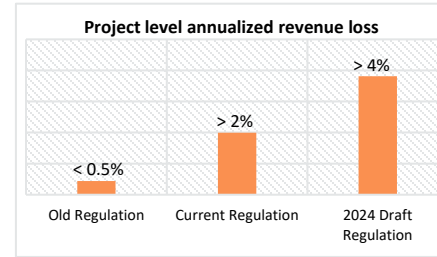
	2014	2022	2024 Draft
Penalty free band	+/- 15%	+/- 10%	+/- 5%
Max penalty	30% of tariff for dev > +/- 35%	100% of tariff for dev > +15%	100% of tariff for dev > +/- 20%
50% Penalty	-	-15% dev	> +/- 10% dev



## Commercial Impact to RE Developers

- From 2014 to 2022 regulations - 4x increase in penalty amount wrt 2014
- From 2022 to 2024 regulations – 2x increase in penalty amount wrt 2022
- From 2014 to 2024 regulations – 8x increase in penalty amount wrt 2014**

With the proposed regulation, the penalty amount is expected to be in the range of 4-7% of annual revenue of the project, rendering the current projects with locked in tariffs commercially unviable.

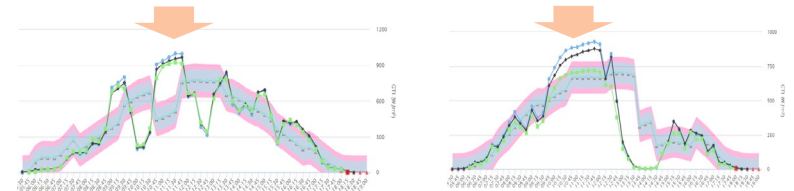


Deviation	% of Time Blocks	% Penalty
0 to 10%	77%	0%
10 to 20%	14%	13%
20 to 100%	9%	87%

~90% of penalty incurred in <10% of instances

### Reason

- Abrupt change in weather due to localized clouds
- Current technology unable to forecast such instances

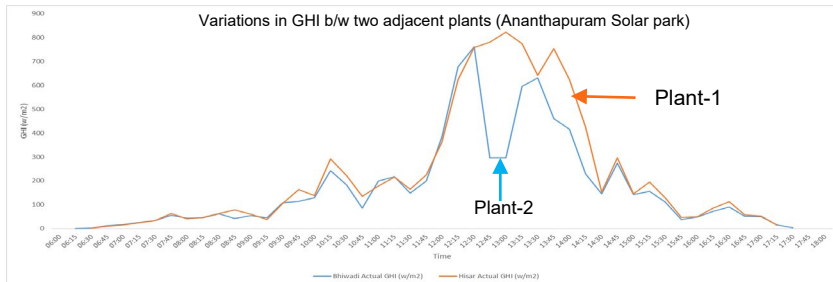


# Weather forecast accuracy- technical limitations

While numerical and satellite-based cloud vector models are not accurate to predict local cloud formations, the key driver to sudden fluctuations in solar irradiation, radars (government-based infrastructure) is yet to evolve in this direction

## Why weather forecasting agencies are unable to achieve accuracy ? Appendix-1

- 1 Due to fluctuating irradiation caused by
  - localized cloud formation
  - fast moving clouds
  - Momentary clouds
  - Low level clouds
- 2 Limitation in spatial resolution: Current least resolution by WF agencies is 2 x 2 km which is too large for an accurate prediction
- 3 Limitation in temporal resolution: currently the WF agencies can provide their best possible forecast 2 hours in advance, while the regulation does not allow to revise the schedule in this time band
- 4 Technological limitations: the existing method and current technologies such as Numerical model / AI model/ satellite-based cloud vector forecasting model/ cloud sensors etc. are not capable enough to address the above issues to achieve the desired accuracy.
- 5 Infrastructure Limitations: It is understood that radars which could perhaps be more accurate, are currently not available in adequate numbers in the country and are government controlled.



The graph depicts significant irradiation variation between two closely situated (~1 km apart) solar project sites, recorded on the same day.

## Initiatives taken by RE developers

1. In response to the 2022 amendment, in the national interest of improving the S&F accuracy, Solar developers and QCA agencies engaged the services of various expert weather forecasting agencies
2. RE developers have started sharing real time data with these agencies so that they can improve the algorithms for AI based models.
3. RE developers have started to share the weather data with government agencies to improve the numerical models.

## Initiatives taken by CEA

1. Chairperson CEA, in parallel during Feb 2023, constituted an expert committee, to improve the accuracy of weather forecasting. The expert committee is represented by Government agencies and RE developers.
2. During May 2024, IMD showcased existing weather products to the RE developers. Most of these products, based on radar technology, focuses on rainfall or lightning prediction and not on movement of cloud, the primary cause for weather fluctuation (inaccuracy). IMD is working to strengthen this infrastructure and the prediction models
3. NCMRWF is working to improve the accuracy of forecasting based on Numerical model. Government and RE developers are working to share more data to validate this model.

## Conclusion

1. **Currently there is a limitation in achieving the expected forecasting accuracy. This has been acknowledged by IMD and NCMRWF in public platforms such as (a) NLDC Workshop held on 21<sup>st</sup> and 22<sup>nd</sup> May-24 (b) IMD training program on use of RADAR held on 7<sup>th</sup> May-24.**
2. CERC relied on commercial mechanism to drive Generation forecasting accuracy without making a reality check regarding the available technologies for weather forecasting and their respective accuracies.
3. RE developers, weather forecasting agencies and Govt. departments should continue to work collaboratively, lead by Govt. agencies, to achieve desired weather forecasting accuracy.
4. Regulators should periodically consult IMD and NCMRWF to evaluate the maturity of weather forecasting technology and align the commercial regulations accordingly. **Till such time the applicable regulation should be rolled back to 2014 Regulations.**

## Appendix-1

### Technical Reasons for Not Achieving Forecast Accuracy

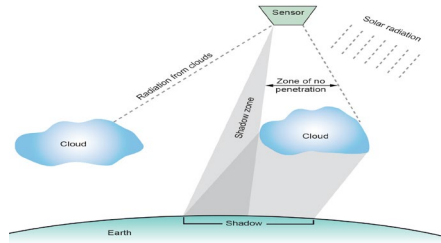
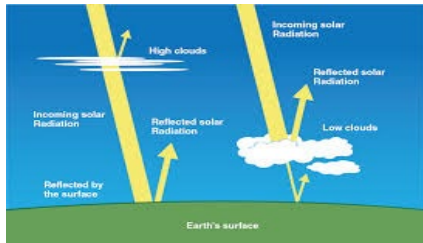
# Appendix-1: Technical limitations in achieving weather forecasting accuracy

currently there is a severe mismatch between the existing technological maturity and accuracy in forecasting solar irradiation vis a vis the stipulated accuracy in revised CERC regulations

- Energy forecast primarily depends on weather forecast, which is provided by specialized weather forecasting agencies, domestic (private & government) and international.
- Since the government weather forecasting agencies could not achieve desired accuracy of 2022 regulations, developers also worked collaboratively with best in class domestic & international independent weather forecasters.
- However, due to technological limitations, none of the experts have so far been able to significantly improve the accuracy of weather prediction beyond the 2022 prevailing levels.

## 1 Abrupt weather fluctuations- caused by:

- Localized cloud formation and movements
- Momentary/ Fast moving clouds
- Low level and layered clouds

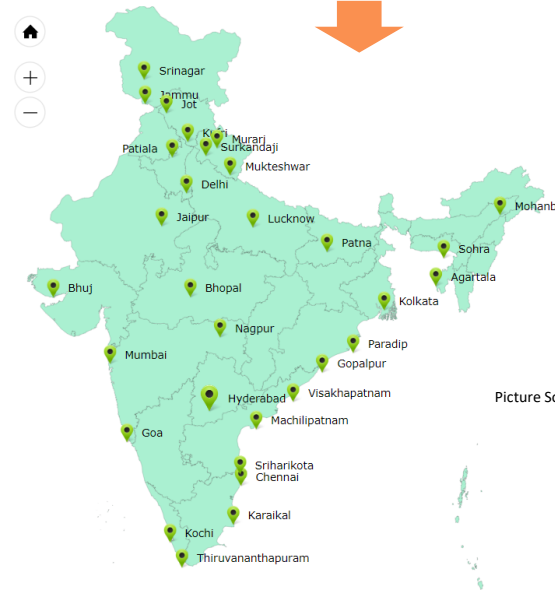


## 2 Existing models need to evolve from meso to micro scale

- NWP model,
- Statistical Methods,
- Synoptical Methods

## 3 Infrastructure Limitations:

- Inadequate numbers of AWS and Radars (to capture micro scale data)
- **Locations of AWS and radars not aligned with RE intense zones**



Picture Source: IMD Website

- ## 4 Spatio-Temporal Resolution:
- The spatial and temporal resolutions used by weather forecast agencies are insufficient to meet the accuracy standards required by regulators for power forecasts from generators, as mandated by DSM commercial regulations.

# Appendix-1: Illustration of abrupt GHI fluctuations

Localized cloud phenomenon not predicted due to technical limitations, resulting in deviations

