

# Wind Assets' Performance on a Gloomy Turn, Solar Sparkles

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## Synopsis

In this report, CareEdge has analysed the generation performance of its monitored operating portfolio comprising 8.4-GW wind assets and 14.5-GW solar assets, which is reflective of the country's overall operative renewable energy portfolio. The actual PLF for FY20, FY21 and FY22 from these assets have been compared with the designed estimate of the respective assets.

- The generation performance of wind assets has witnessed a significant decline over FY20-FY22, in contrast to the steady performance put up by solar assets.
- In FY22, 6.9-GW (82%) of the monitored wind assets reported underperformance vis-à-vis the designed estimates while the corresponding figure was 7.0-GW (49%) of the monitored solar assets portfolio.
- Further over the three-year period, ~53% of the 8.4-GW wind assets could not achieve the designed estimates as against only ~31% of solar assets (out of 8.3-GW assets operating for all the three years).
- Extent of underperformance vis-à-vis designed estimates has remained lower than 3% for solar assets as against the 4-15% range for wind assets.
- Higher underperformance of wind assets has been witnessed in Andhra Pradesh and Tamil Nadu, followed by Maharashtra and Karnataka.
- Given the higher risks for wind plants even post commissioning, CARE Ratings believes it is incumbent for a wind project to possess stronger debt coverage metrics and higher liquidity reserves than a solar project to counterbalance such concerns. This is critical as the majority of the operational wind assets principally rely on weak counterparties, i.e., state discoms who often stretch the payment cycle.
- The credit profile of entities in the sector has been supported by the availability of adequate liquidity in the form of debt service reserve account (DSRA) and cash balances coupled with healthy financial flexibility and strong parentage.
- CareEdge outlook on the renewable energy sector remains stable, driven by adequate availability of resources, Government's strong policy support and the presence of creditworthy central nodal agencies as intermediary procurers.

## Renewable Energy in Focus

With climate change becoming a major cause of concern globally, focus on non-fossil fuel-based generating capacities is growing. From 22-GW renewable energy (RE) capacity at the end of FY12, India itself has risen to 110 GW as of FY22-end, reflecting a compounded annual growth rate (CAGR) of around 17.5%.

Out of 110 GW, solar and wind account for 54 GW and 40 GW of the installed capacity, respectively. After accounting for large hydro plants, the non-fossil fuel-based operational capacity was 157 GW. Going forward, with India setting up targets to achieve 50% of the cumulative installed capacity from non-fossil-fuel-based energy resources, the regulatory framework is expected to remain supportive.

In the initial few years of RE development in India, stakeholders were more cautious, especially about the performance of the solar modules in Indian conditions, and whether these modules would operate at the envisaged levels for the entire project life. The reservations with respect to equipment performance were limited for the wind sector given the long track record of wind turbines globally. Furthermore, with the advancement of technology

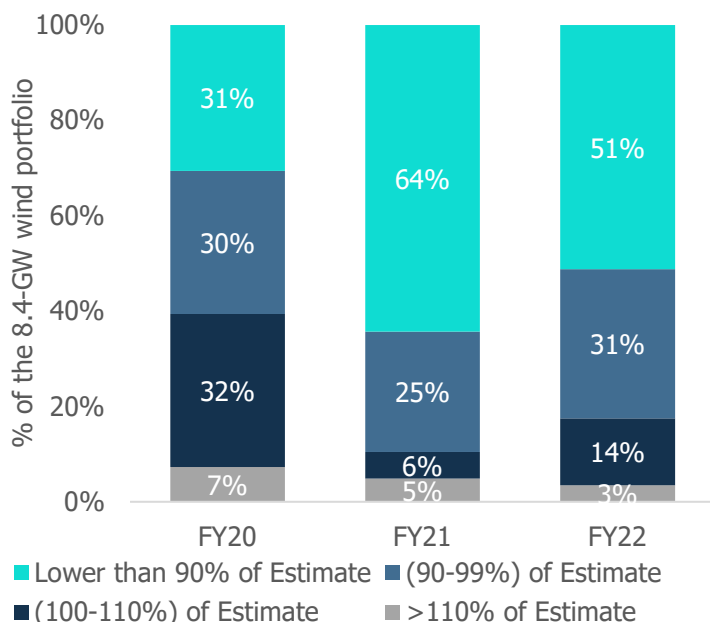
resulting in a higher hub height and larger rotor diameters, there was a significant increase in the envisaged wind plant load factors (PLFs). However, there were reservations regarding the achievability of these PLFs in the Indian conditions.

Through this analysis paper, CareEdge, in its monitored portfolio, has analysed the actual operating performance of both wind and solar power projects and ascertains whether the actual asset performance has been in line with the designed estimate for both the sources. The monitored portfolio consists of projects from most of the top RE developers; it is diversified across various states and has exposure to a wide variety of project equipment.

### Operational Performance of Monitored Wind Power Projects

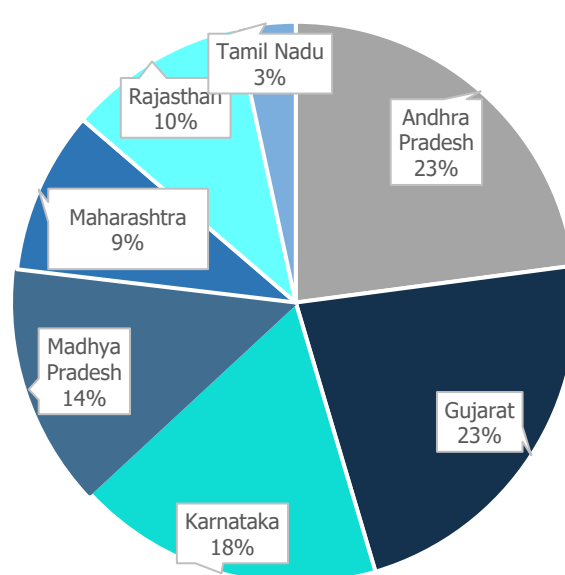
The operational performance of wind portfolio of around 8.4 GW from FY20 to FY22. Approximately 78% of the overall portfolio is based in four states, viz., Gujarat, Andhra Pradesh, Karnataka, and Madhya Pradesh.

**Exhibit-1: PLF of Monitored Wind Portfolio vis-à-vis Designed Estimate**



Source: CARE Ratings

**Exhibit-2: State-wise Mix of Monitored Wind portfolio**

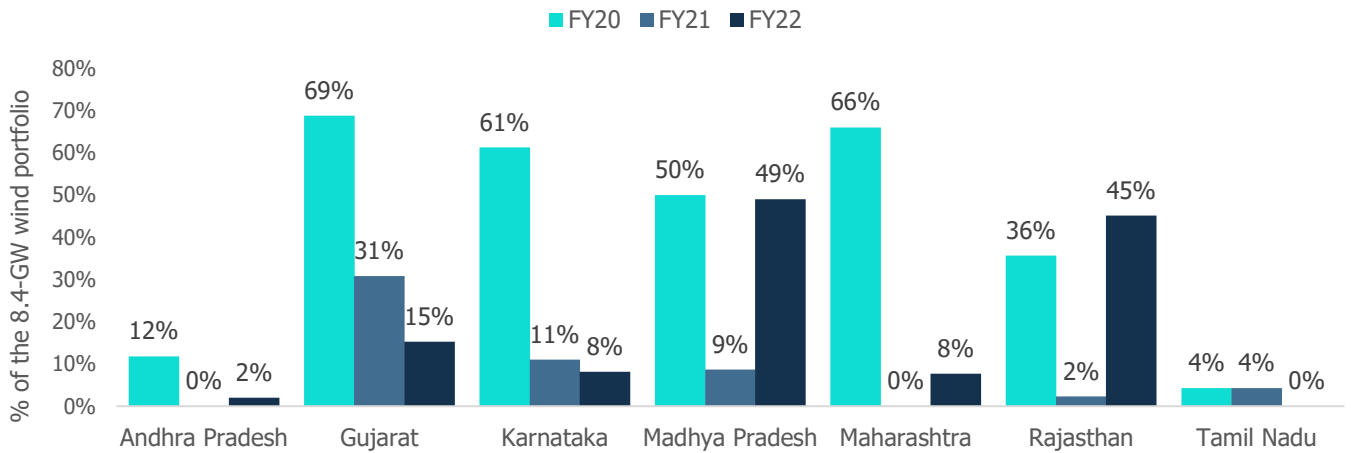


Source: CARE Ratings

### Key Takeaways

- Wind power generation for only 11% and 17% portfolio was above the designed estimate in FY21 and FY22, respectively, whereas 39% capacity exceeded the designed estimate in FY20.
- It is noteworthy that around 4.5 GW out of the 8.4-GW monitored portfolio could not achieve the designed estimates in any of the three years under review.
- On an aggregate basis, the portfolio has underperformed in all three years with a degree of underperformance vis-à-vis designed estimates, at a consolidated basis being 4%, 15% and 10% in FY20, FY21 and FY22, respectively.
- The underperformance was the highest in FY21; albeit some recovery in FY22.
- Underperformance is majorly attributable to:
  - Lower wind speeds and grid curtailments in some of the key wind-rich states.
  - Operating issues for projects with certain original equipment manufacturers (OEMs) resulting in lower machine availability.

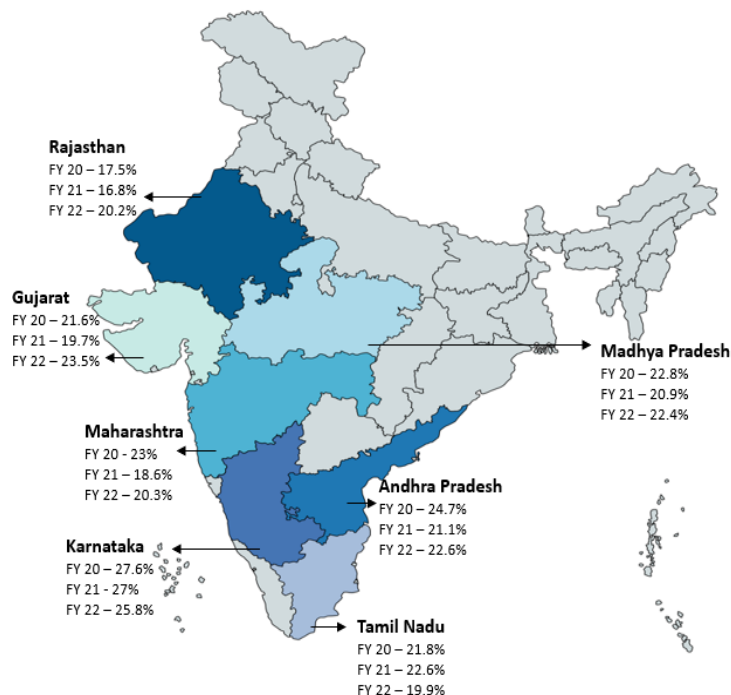
**Exhibit-3: Trends for Percentage of Wind Capacity Meeting Designed Estimate**



Source: CARE Edge Ratings

- Over the past three years, the degree of underperformance has been witnessed to a higher extent in Andhra Pradesh and Tamil Nadu followed by Maharashtra and Karnataka.
- The extent of grid curtailments, especially in the high wind season, has been considerably high in Andhra Pradesh and Tamil Nadu. In 2021, the Appellate Tribunal for Electricity (APTEL) also passed an order to compensate developers for grid curtailments and issued strict directions against grid curtailments to all states. Whether the same is followed in practice will be a key monitorable going forward.
- Within CARE Ratings-monitored portfolio, 49% of the capacities in Madhya Pradesh, 45% in Rajasthan and 15% in Gujarat performed at PLFs better than the designed estimates. Most of the capacities in the balance states performed below the designed estimates in FY22.

**Exhibit-4: Median PLFs of Wind Power Projects over Last 3 Years**



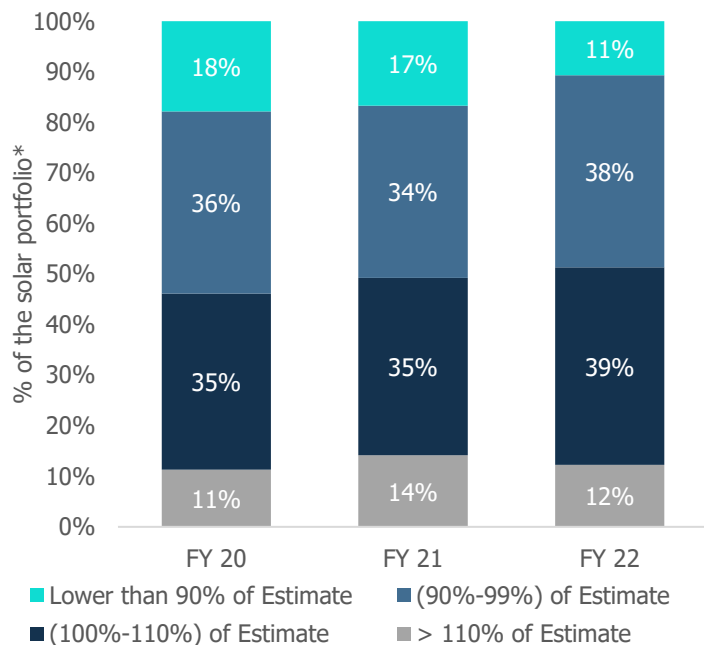
Source: CARE Edge Ratings

- The median PLFs have witnessed an uptick in FY22, with all states other than Karnataka and Tamil Nadu registering a recovery.
- Despite the generation performance being subdued for the CARE Ratings-monitored portfolio, there have been limited adverse rating movements. Notwithstanding the issues around delays in receipt of invoices from the counterparties, the entities in the sector have been supported by availability of adequate liquidity in the form of debt service reserve account (DSRA) and cash balances coupled with healthy financial flexibility and strong parentage. Moreover, consolidation in the market has also aided improvement in the credit profile for the entities in the sector. Furthermore, refinancing as well as the benign interest rates over the last 18 months have aided companies in maintaining their credit profile.

**Operational Performance of Monitored Solar Power Projects**

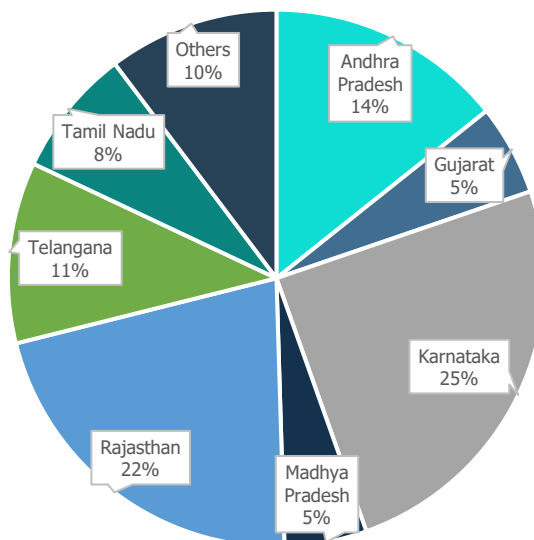
CareEdge analysed the operational performance of solar portfolio of around 8.3 GW, 13.1 GW and 14.4 GW in FY20, FY21 and FY22, respectively. This significant increase in the monitored portfolio capacity for solar assets has been due to the growth in installations over the last few years.

**Exhibit-5: PLF of Monitored Solar Portfolio vis-à-vis Designed Estimate**



Source: CARE Edge Ratings  
\* % on the left axis represents proportion of 8.3 GW, 13.1 GW, and 14.4 GW solar capacity in FY20, FY21 and FY22, respectively

**Exhibit-6: State-wise mix of Monitored Solar Portfolio**



Source: CARE Edge Ratings; Others include Maharashtra, Punjab, Uttar Pradesh, Delhi, Bihar and Chhattisgarh

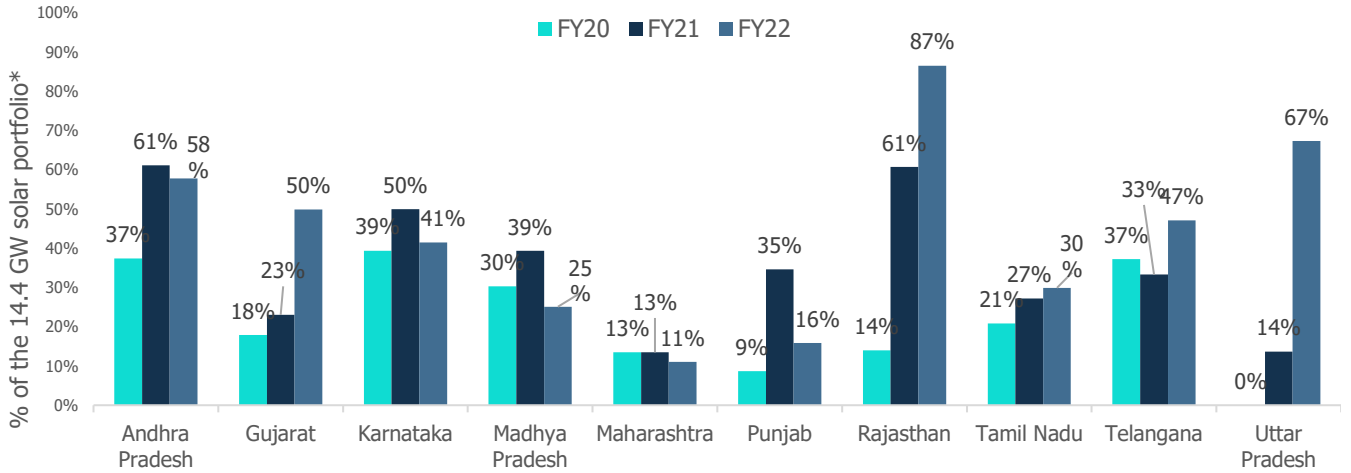
**Key Takeaways:**

- The operational performance of solar projects has been relatively stable as compared to wind projects. Solar power capacity for around 50% of the portfolio was above the designed estimate in the last three years.
- On the other hand, a negative deviation of more than 10% from the benchmark level was observed only in 11% of the portfolio in FY22 as against 17%-18% previously, indicating stabilization of the underlying assets.
- It is noteworthy that 2.6 GW out of the 8.3-GW capacity, which was operational for FY20-FY22, could not achieve the designed estimate generation in any of the three years. As compared to the wind assets, the

performance of solar assets is much more stable with a lower percentage missing on the designed estimates.

- On an aggregate basis, the performance of the solar portfolio has been broadly in-line with the designed estimate generation levels with minimal deviation ranging from 0% to 3.0% during FY20-FY22.

**Exhibit-7: Trends for Percentage of Solar Capacity meeting P90 estimate**

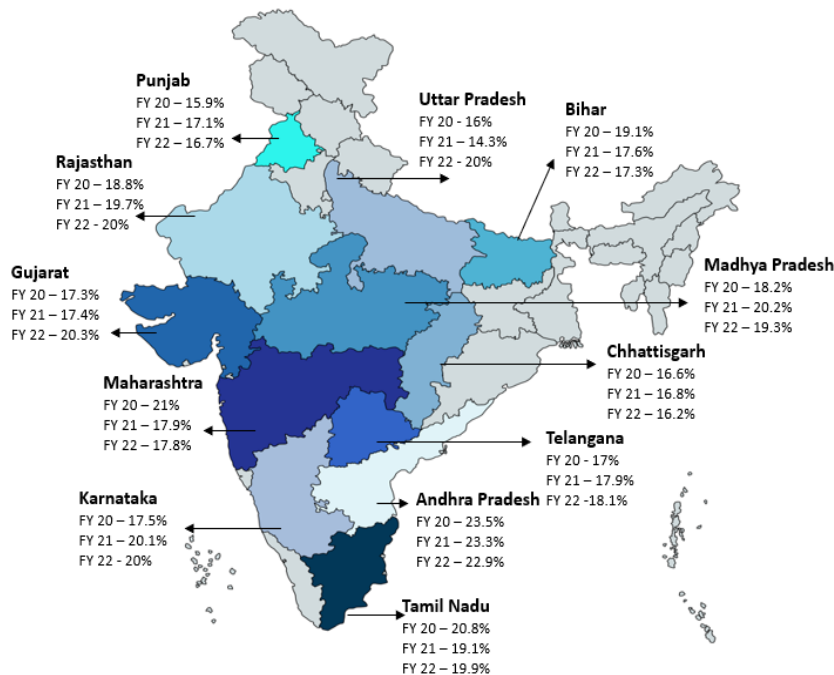


Source: CARE Edge Ratings

\*% on the left axis represents proportion of 8.3 GW, 13.1 GW, and 14.4-GW capacity in FY20, FY21 and FY22, respectively, for each of the state

- Relatively high proportion of capacities in Andhra Pradesh and Rajasthan have achieved generation levels in-line with designed estimates, whereas capacities in Madhya Pradesh, Tamil Nadu and Punjab have underperformed.

**Exhibit-8: Median PLFs of Solar Power Projects over Last 3 Years**



Source: CARE Edge Ratings

- Median PLFs in key solar power generating states remain largely stable between 17% and 21% levels. Within the states, higher PLFs have been observed in Andhra Pradesh, Rajasthan, and Karnataka.
- The y-o-y PLFs in various states have been on the rise, primarily on account of change in the ratio of DC:AC for the more recent plants vis-à-vis the plants set earlier. The newer plants are set at a DC:AC mix of 1.4x to 1.5x, whereas initially there used to be limited top-ups.

### **CareEdge View**

"As observed from the various data points in this article, wind assets have significantly underperformed, whereas solar assets have shown steady performance. On a portfolio basis, the deviation of underperformance vis-à-vis designed estimates have remained lower than 3% for solar assets as against the 4-15% range for wind assets. Given such extent of variation in the performance between two asset types in the RE sector, the stakeholders from a debt perspective shall demand stronger coverage metrics from wind projects along with necessary provisions in the form of working capital and liquidity reserves as necessary safeguards. The need for such safeguards shall increase if the said plant has weak state discoms as an off-taker, which further leads to receivable-related risks"

"Notwithstanding the issues around delays in receipt of invoices from the counterparties (especially state distribution utilities), the entities in the sector have been supported by availability of adequate liquidity in the form of debt service reserve account (DSRA) and cash balances coupled with healthy financial flexibility and strong parentage. Moreover, consolidation and refinancing on account of benign interest rate cycles has aided companies in maintaining their credit profile" said Ms. Rajashree Murkute, Senior Director – Corporate Ratings.

CareEdge outlook on the RE sector remains stable, driven by adequate availability of resources, government's strong policy support and the presence of creditworthy central nodal agencies as intermediary procurers. However, some of the headwinds for the sector pertaining to regulatory uncertainties in key states, exposure to interest rate risk given the hardening of yields and poor health of most of the ultimate distribution utilities.

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