RE Capacity Growth in India Needs a Wholesale Change in Approach to Bidding in the FDRE Tenders

Competitively Pricing the FDRE Tenders Requires Risk Management in the Power Markets

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The FDRE tenders have come at the end of a long line of evolution

When it comes to renewable energy (RE) power purchase agreements (PPAs), there is no one structure that rules them all. Globally, the PPA world has seen plain vanilla solar and wind capacity or 'pay-as-produced' (essentially all generation volume is compensated at same rate), to fixed PPA profile (where every hour of the year is defined) to Contracts for Difference or CfD (which dominates offshore wind).

Then there are also battery capacity PPAs (like the recent ones in Gujarat) or 'battery optimisation agreements' (which are seen in markets like Australia with advanced wholesale and frequency control markets). Apart from these, volatility in power markets and different consumer needs has brought different duration PPAs into play (5-year, 10-year PPAs)—shorter durations commanding premium over longer ones.

In India, the state-run power procurement intermediary SECI went through a long evolution in its grammar for RE tenders before it came out with Firm & Dispatchable RE (FDRE) tenders in 2023. FDRE was preceded by: round-the-clock (RTC) tenders, peak power tenders, hybrid wind-solar tenders.

Strictly speaking, 'FDRE' should refer only to fully shaped PPAs, where the utility specifies hourly demand profiles for the entire PPA duration. The demand must be matched every hour. However, FDRE tenders allow up to 25% relaxation annually.

FDRE may not be the final stage in the evolution of renewable energy tenders (as power markets have not yet played a central role in India's transition), but it is the most advanced version so far. These tenders require detailed analysis for bidding.

Similar to SECI's initial RTC tenders, which faced long delays, the FDRE tenders are also experiencing slow progress. Many hourly demand FDRE tenders have either been cancelled or partially awarded. Additionally, limited participation suggests that developers may struggle to assess these tenders effectively.

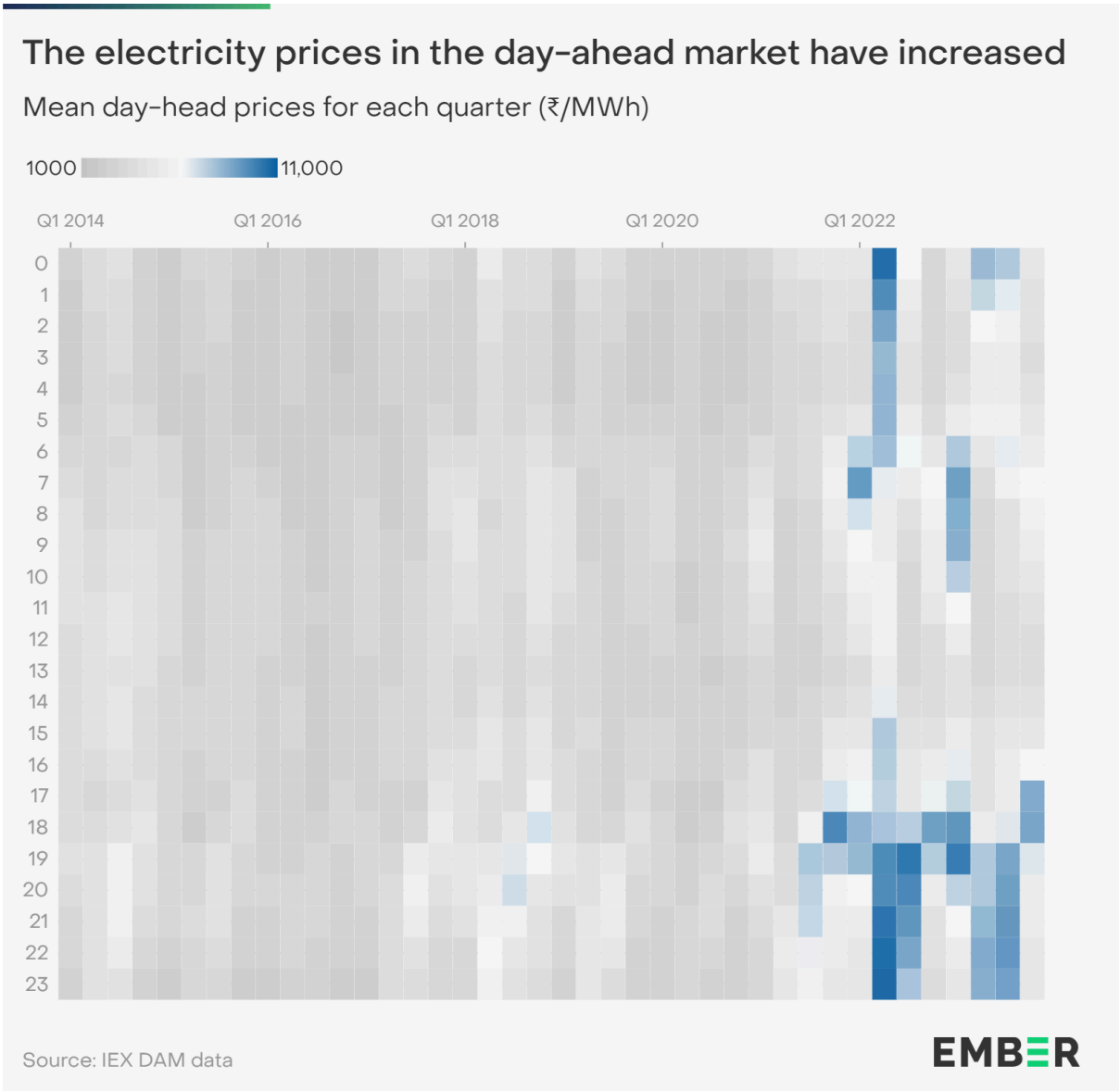
Current discussions on FDRE PPAs are simplistic and ignore the role of power markets—a key piece in the transition

Current discussions attempt to address the complexities of these next-generation PPAs by substituting the real problem with FDREs with a seemingly intuitive, simpler one.

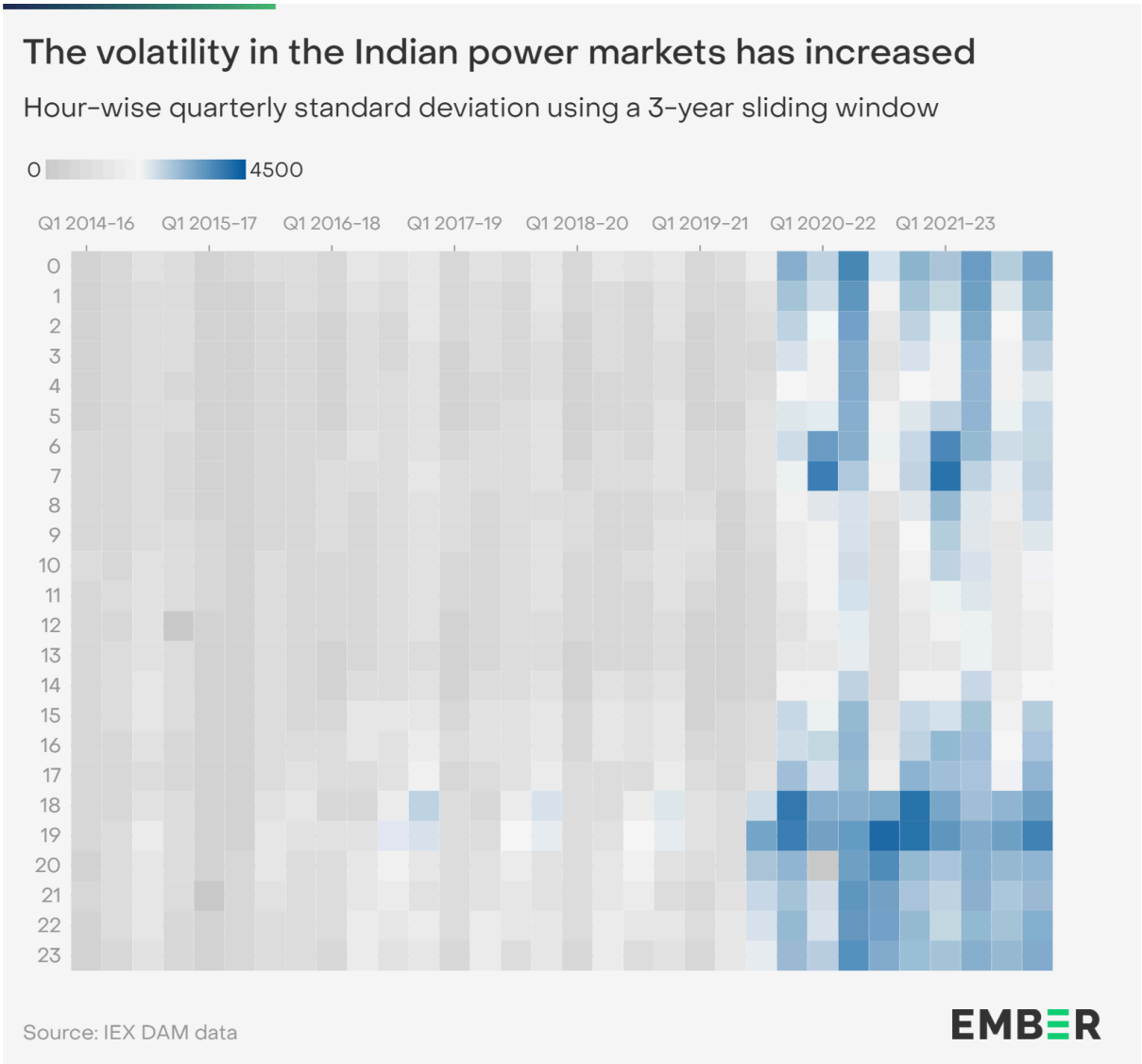
One argument is that Power Purchase Agreements (PPAs) are placing an undue burden on developers to manage the intermittency of renewable energy. A proposed solution is to reduce the Demand Fulfilment Requirement (DFR), which would relax the constraint of meeting the committed hourly demand 90% of the time annually. While we acknowledge that relaxing this constraint, as SECI has done by reducing it to 75%, could be beneficial, further reductions might not meet the expectations of FDRE buyers. It's important to note that in a market dominated by renewable energy, participants, including utilities and private consumers, will likely demand PPAs that fully align with their hour-by-hour energy needs.

Critics argue that fulfilling PPAs necessitates oversizing solar and wind assets, which they view as burdensome. However, this challenge underscores the need for a more robust power market as renewables become more prevalent. For instance, in Germany, power markets deepened from 20% to 50% concurrent with increasing RE share. Excess RE should be seen as an inherent risk to manage in a RE-heavy system, not an inconvenience to avoid. Batteries will also help in actively managing that excess on a daily basis.

A significant aspect of 24/7 PPAs is their impact on the risk profile for developers, particularly concerning the sale of excess renewable energy (RE). As power markets evolve and experience increased volatility, managing excess RE becomes more complex and risky. The heat maps below illustrate quarterly volatility in the IEX day-ahead market, using a sliding 3-year window to calculate the standard deviation for each hour of the day. This volatility reflects the challenges developers face in adapting to fluctuating market conditions while managing excess RE.



The figure below depicts the average hourly IEX prices for each quarter, providing insights into market volatility and price fluctuations.



Eventually, everyone will have to play a part in managing an inherently more complex system through a full diversity of PPAs and growing power markets (including both capacity and energy markets).

A second, albeit minor, argument posits that developers need to focus on finding complementary wind sites to secure 24/7 PPAs. While this point holds some validity, it is not the primary barrier to the success of FDRE tenders.

Is relying on complementary wind sites truly the key for developers and IPPs to meet the requirements of these hourly demand PPAs? Considering that wind is a highly stochastic resource with variable trends year-to-year, depending mainly on its complementarity to fulfill PPA requirements is inherently risky.

All the current thinking, as highlighted above, glaringly misses any discussion on:

- How do you evaluate and manage the inevitable power market risk?
- How do you optimise and trade the batteries?

Without undermining the evolution of PPAs in India, the real focus of the discussions needs to shift to how to correctly price the next-generation PPAs. A price that can deliver the internal returns expectations of the investors, but that is also competitive for the consumers (the utilities). What is the true value of these PPAs in the context of the growing market for renewables? (Note that this will be an ever-evolving value.)

The next-generation PPAs fundamentally change the game for developers & IPPs

In the early phase, pre-2020, of RE growth in India, the game was relatively straightforward for developers and IPPs: install turbines or panels, connect to the grid, and get compensated for the generated power. Whether the generation was 20% or 80% of the total capacity, happening at any time of the day, revenues were assured.

During this phase, developers focused primarily on CAPEX efficiency and the financing structure. By securing cheaper panels and turbines (post all duties) and identifying the best resource sites, they ensured acceptable returns. The goal was to achieve the lowest levelized cost and bid aggressively in tenders.

However, can this approach carry developers through the next phase of growth, aiming for RE (including large hydro) to reach 50% of installed capacity—the current 2030 goal? Is focusing solely on the levelized cost of RE technology still sufficient?

The next-generation PPAs essentially transfer some of the risks previously absorbed by consumers to the developers. This shift requires a different approach to bidding on these tenders, addressing new challenges and risks associated with higher RE integration into the grid.

Developers in India need to evolve into Version 2.0—sophisticated power market players

Developers and IPPs in India need to be ready to meet the challenges in the next stage of the transition by evolving their structures along with the PPA/tender landscape. They need to thoroughly evaluate and handle the higher risks in the new PPA structures.

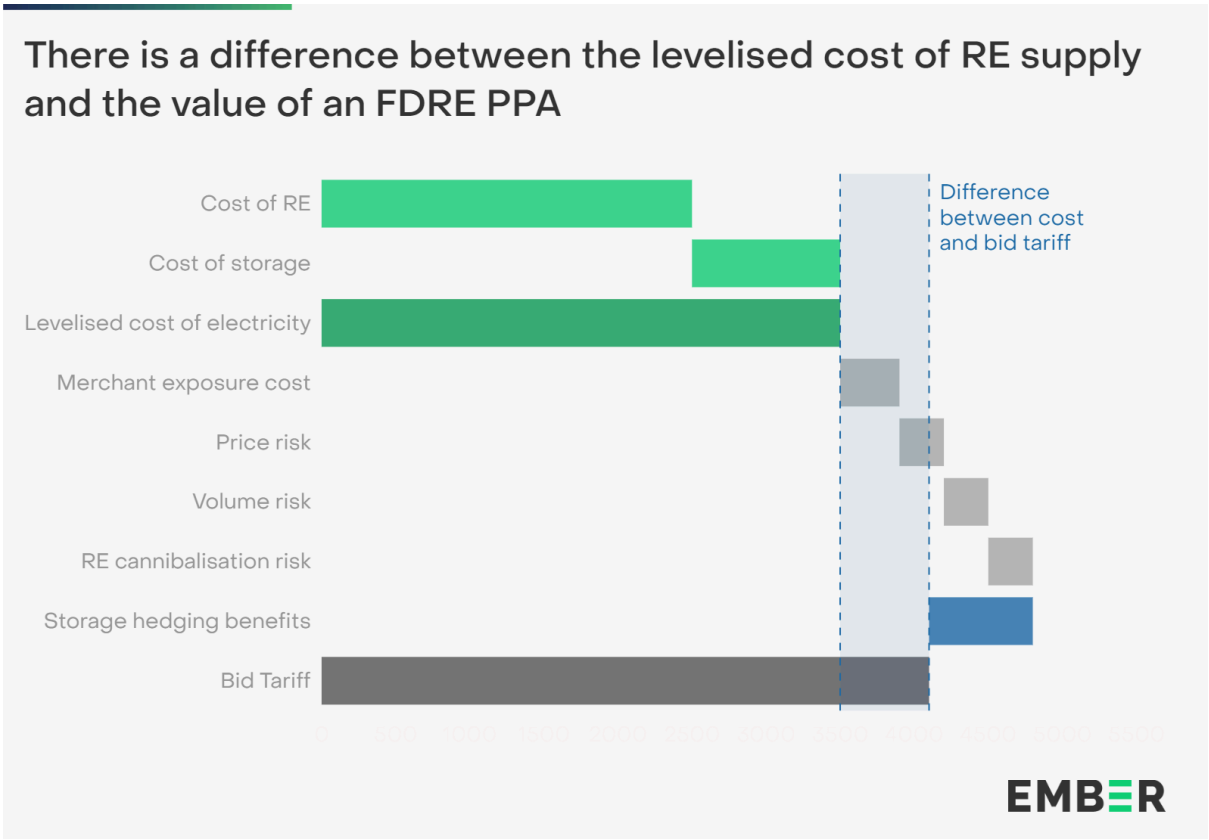
Shifting focus from efficiency gains in EPC contracting and other CAPEX savings, Developers 2.0 need to emphasize topline optimization through trading and portfolio management. IPPs should strengthen their market modeling and power trading functions, as current competencies in the Indian renewable energy sector are weak by international IPP standards.

This evolution into Developers 2.0 will equip players to manage the higher volatility in power markets as renewables continue to grow.

Developers need to have a clear market price outlook and quantify the market risks to competitively price the next-generation PPAs

Below we look at a framework to think about the real cost of the FDRE PPAs that's fair to developers as well as competitive for the buying utilities.

Figure 2: A framework to understand the true costs of an FDRE PPA.



Developers 1.0 in India have focussed on the first two bars as seen in the figure above. These cover only the technology costs over the lifetime of the generating asset, to get to a levelised cost of renewable generation. While the simple levelised cost helps to understand how the cost of underlying technology is changing, it does not fully capture the costs associated with serving the next-generation PPAs in an evolving power market.

To level up to version 2.0, developers need to consider a full 25 or 30-year outlook on the market price—fully variable price across the project life. This will enable them to assess the additional costs that will be imposed by the merchant exposure of part of the oversized RE capacity.

Further on top of this, there are multiple risks for the RE asset to meet the PPA requirements over its life:

1. Price risk: Volatility in market prices can be higher or lower than expected, affecting revenue. For instance, in 2023 in India, price volatility posed significant challenges. I.e., what if due to an increase in volatility like in 2023 in India, prices are much higher or lower in a year than expected?
2. Volume risk: Weather uncertainty introduces the risk of lower-than-expected solar and wind generation, impacting the ability to meet PPA commitments as well as lower generation and revenue.
3. Cannibalisation risk: As more renewable energy generation enters the market simultaneously, it can drive down prices. This geographical and temporal concentration of RE generation can lead to self-cannibalization, where additional RE capacity reduces its own profitability. In extreme cases, this can even result in negative prices in certain markets

Each developer will need to define their level of risk tolerance to competitively price their bid. For example, systematically overestimating the risk on price (in an extreme case, not assuming any revenues from the market) will lead to unreasonably high bid prices and underestimation of returns. Each developer's approach to bidding will depend on their risk management practices. Effective risk management will enable developers to balance potential returns with acceptable risk levels, ensuring competitive and sustainable bids.

Finally, energy storage exerts downward pressure on the final PPA cost by helping mitigate risks, primarily cannibalisation risk. It serves as a physical hedge against market risks. However, to fully optimise battery operation, IPPs must have active trading capabilities in place. This ensures that the benefits of energy storage are maximised, effectively balancing risks and reducing overall costs.

We would like to note that similar methodologies for valuing PPAs are well-established and practised in mature PPA markets like Europe. Developers in India can draw inspiration from these successful practices, adapting them to local conditions to better manage risks and optimise returns.

A risk management-based approach to bidding will not only enable discovery of competitive pricing in the latest FDRE tenders, but will also help catalyse the growth of power markets in India—which the current discussion fails to see.