

India's 'head in the sand' over solar grid integration challenges

Grid | Curtailment of PV generation is an increasingly common phenomenon in India as the country's solar capacity expansion outstrips the grid's ability to accommodate it. Tom Kenning reports on efforts being made to address the problem and the role storage could play in providing a solution

Despite the 'must-run' status of renewable energy generation in India, now enshrined in national electrical grid codes, curtailment has still hit several states and many wonder whether enough is being done to accommodate the huge projected additions of solar and wind capacity in the coming two years. At a roundtable of more than 30 CEOs at the recent REI Expo in Delhi, it was noted that India is in a massive excess power supply situation, albeit temporary, and that the distribution companies (discoms) are unclear whether they still need to procure renewable energy generation. Many have tipped energy storage to come to the rescue for any grid integration troubles, but there's still no policy on storage. While the issues are clearly well known to the government, it can appear at times that both the government and the various solar developers are ploughing on with new capacity, without enough tangible action on these transmission constraints.

To give an indication of just how important the issue is for the solar sector and the central government's goals, Dr. Rahul Walawalkar, executive director of the India Energy Storage Alliance (IESA), says: "Based on our interactions with the concerned authorities it is clear that grid constraint is the most important challenge that could prevent India from meeting the 100GW by 2022 target."

Government awareness

At an early stage, the government started working on 'green energy corridors' to transmit solar from renewable energy-rich states to areas of high power demand such as the big cities. It also freed up energy trading by waiving inter-state transmission charges. There are two phases of these green energy corridors, says Pankaj Batra, who oversees planning around integration of renewables into the



Credit: Tom Kenning

grid at the Central Electricity Authority (CEA). One is complete to a large extent, while the second one is being implemented.

However, this infrastructure does not benefit every solar PV project. Ministry of New and Renewable Energy (MNRE) secretary Anand Kumar has stated publicly that India is well aware of the challenge of intermittent power in the renewables sector and thus the government is now also looking to focus on hybrid systems and improving forecasting and scheduling rules, but perhaps most tellingly, Kumar called out for international partners to come in and show India the way on grid management.

There is clearly, therefore, admission of the issue at a government level, also signified by the fact it has already conducted a number of studies, including one in partnership with the US-based National Renewable Energy Laboratory (NREL)

India's grid is struggling under the weight of new capacity additions from solar and wind

a few months ago, says Vinay Rustagi, managing director, Bridge to India. There have also been talks about the Ministry of Power developing a 15-point agenda plan to deal with transmission and distribution issues etc.

"So all that is very positive," adds Rustagi. "But I think the tsunami is going to reach us before most of these things become operational and effective."

Discom tactics

Discoms and the transmission companies do have many reasons to hide behind if they cannot absorb this new renewable energy generation.

"In the past in India, the way the grid has been balanced has been either by way of by load shedding – if demand is too high, you cut down the customers – or if the generation is too high, you cut down the suppliers without compensating. That has been the historical practice and I



Credit: MNRE

Green energy corridors have been devised to ease pressure on the grid from renewables capacity additions

think not enough attention is being paid even today in anticipation of the actual capacities that are coming up and how those issues are going to be resolved,” adds Rustagi.

“It’s head in the sand right now,” adds Kuljit Singh, partner, transaction advisory services at consultancy EY. However, Singh also says there have been changes in the competitive bidding guidelines, which provide that if a solar developer is confronted with grid issues, it can receive a form of deemed generation benefit, so power purchase agreements (PPAs) become more like take-or-pay PPAs. However, Singh notes that this still exposes some of the earlier projects to the problem.

For example, Indian conglomerate Adani went public on an early project, by submitting a petition to the regulator in the state of Tamil Nadu claiming that power produced from its 648MW Kamuthi solar project was being curtailed. In this case, the discom was likely to have been put off by the high tariff of around 7 rupees per unit (US\$0.107), and solar’s must-run status was clearly flouted.

Referring to the general lack of urgency on grid issues, Rustagi says: “This is unfortunately a classic Indian way of operating both for the public and the private sector. Everybody is focused on the here and now because there are always enough challenges and frustrations and enough

problems to deal with, and there are very few people actually thinking about how this is going to play out.”

For Rustagi, it was clearly visible when multiple solar tenders were coming out in 2014 and 2015 that India could not actually sustain such a large amount of capacity and this has been partly the reason for the current and ongoing hiatus in solar tender issuance in India, while some old tenders have even been cancelled.

“It is a typical Indian syndrome that people are focusing on auctions, execution and financing, because curtailment is not a problem here and now, but we see that as a major issue that is going to come up in the next two to three years.”

Southern states

The crunch point will be most felt in southern India, whose states have the highest penetration of renewable energy, but the lowest power demand.

“Historically the southern grid in India has been isolated from the rest of the Indian grid and it was very congested, so in that last two years curtailment for the wind sector in Tamil Nadu was as high as 30%,” says Rustagi. “Now that situation improved last year and it may improve even more, because a lot of investment has gone into the southern grid, but I think it is inevitable that as renewable capacity rises, more and more curtailment risk will continue to occur.”

Other affected states include Rajasthan in the north west and Madhya Pradesh in central India. Together with the south, these states could soon have around 30-40% of their total power demand coming from renewables, which is a huge percentage coming from intermittent and unpredictable sources, says Rustagi. This makes the issue far more complex than simply adding green corridor and transmission capacity. The key is being able to absorb that power and it will need a lot of policy-level reform, particularly in making the power demand itself more resilient and flexible.

“It means a lot of ancillary market reforms in terms of making coal and gas more flexible. Progress on all those fronts, including on the storage front, is actually much slower than we would have expected it to be given how fast the renewables sector is growing,” adds Rustagi.

What can developers do?

To prevent or alleviate these grid troubles, developers can be selective

in their project locations. They need to examine how the project is connected to the grid, whether it is a state grid or a national grid and at what voltage level, and whether it is a high- or low-tension grid. Rustagi says all these can have a huge impact on the risk of curtailment.

“Some developers are already quite smart on these things,” adds Rustagi. “So you will find developers who are selling power only to NTPC or SECI [state-owned off-takers], they are connecting only to the national grid. If you are in a solar park connecting right at the power grid substation at, let’s say 765kV etc. then your risk of curtailment is almost minimal barring some technical defaults. So there are ways in which the developers can manage, mitigate and minimise that risk.”

Unfortunately, not every developer is as savvy; there are a dozen large developers who know the market well, but there are “literally hundreds of developers of all sizes across India,” says Rustagi. Multiple firms are building 1-10MW projects and many do not have the capability to manage this grid integration risk.

Must-run

Curtailment is a cause of major apprehension for any solar developer, but the new bidding guidelines, mentioned earlier, have offered some hope in that respect

Pankaj Batra of the CEA says that the financial implications of purchasing solar and wind are working in their favour as it now makes economic sense for discoms to purchase this renewable energy, since the prices have come down so low in comparison to thermal power.

The ‘must-run’ concept remains largely on paper, but is not enforced. Madhya Pradesh has already announced intentions to remove the must-run status and it remains unclear just how much protection developers have from discoms flouting the rules.

“It does look likely that more and more states will over a period of time say that must-run status is not practically or technically feasible and we have to schedule all this power and it has to go through some kind of common grid dispatch norms,” adds Rustagi.

At a recent IESA meeting in Delhi, the CEA also discussed the potential for bringing the leeway for forecasting inaccuracy down from 15% to 5%. This is just an idea at the moment, but while it presents a challenge to solar plant operators, it would also help the cause of the discoms

in balancing the grid. Moreover, it would also pave the way for energy storage providers to integrate their systems with solar plants to help ease sudden power fluctuations and improve forecasting abilities (see box). However, such a policy will ultimately need the backing of the Central Electricity Regulatory Commission (CERC). It is CERC that lays down the guidelines to be adopted by states, but states also have the freedom to accept or reject CERC guidelines.

If grid constraints do really start to impact the sector, the resolve prime minister Narendra Modi has for progressing solar is so huge – for him it is a pet project – that one can imagine drastic action will be taken. It's still not clear just how much disruption the industry will face in the meantime, but India has the advantage of being able to learn from the mistakes of mature solar markets, such as Germany. And if anyone heeds the calls from MNRE secretary Kumar, India may well get a much needed boost of expertise from foreign grid management experts to get to grips with what is clearly an increasingly pressing issue. ■

Storage to the rescue

Dr. Rahul Walawalkar, executive director of the India Energy Storage Alliance (pictured), discusses the on-going debate about mandating storage with large-scale solar projects and the current status of storage in India



"The Central Electricity Authority (CEA) committee formulating these regulations believes mandating storage with solar/wind is an option for the long run. In addition, ancillary services market regulations are expected to be formalised in due course and energy storage assets can play a crucial role in the space. The Central Electricity Regulatory Commission (CERC) has released a staff paper on energy storage-related regulatory changes, and is expected to release the final approach paper before end of the year.

"The Solar Energy Corporation of India (SECI) last year even released a request for proposals for six projects for solar plus 10% storage to demonstrate the advantages of hybrid projects. The Indian renewable energy industry has also realised this and is exploring hybrid solutions with energy storage that can offer more sustainable and scalable solutions in India.

"Unfortunately current regulatory mechanisms and the focus on lowest cost reverse bid-based auctions have created a challenge in implementing this. Under current regulations, solar power projects are deemed must-run plants and hence they can't be backed down by the utilities for any reason including grid constraints. Although backing down of generation is clearly visible in some parts in recent times the developers are banking on the regulations to bail them out. Also there is too much focus on just building additional transmission capacity, and not sufficient effort is provided on improving flexibility of the system and improving utilisation of the T&D infrastructure.

"Nearly 50MWh of energy storage projects are under auction in India. A few developers did evaluate the feasibility of setting up battery pack assembly to cater to this market. The solar industry is playing a wait and watch game to decide on back-end assembly/manufacturing or partnering with international suppliers to cater to this demand.

"The global energy storage industry is actively looking at the Indian market and has already deployed over 1GWh of li-ion based solutions in India in the past two years for the telecom tower market. This year, various Indian manufacturers such as Acme, Delta and Exicom have set up >1GWh annual assembling capability for manufacturing li-ion packs. Also the anticipated electric vehicle market has resulted in multiple global players considering li-ion cell manufacturing in India as well. Suzuki has announced the first gigawatt-scale cell manufacturing plant to be built in Gujarat and we anticipate that with the right policy support at least two such manufacturing plants will be announced in next six months.

"We anticipate that India could get at least 3-5GWh annual cell manufacturing capacity by 2020. In the meantime, India will continue to be a large importer for advanced energy storage solutions.

"The recent solar power project tenders have created a strong interest among solar developers towards energy storage. The interest is likely to sustain in the near future. IESA has witnessed very strong interest from solar developers, and over 20 such companies including Sterling & Wilson, Hero Future Energies, Vikram Solar are part of IESA and are actively developing capabilities in this area."

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