

Solar power in India inches closer to grid parity



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On December 2nd 2011, when the discount bids were opened for the allotment of solar PV projects to eligible developers under India's National Solar Mission, a sense of disbelief permeated the solar industry. While it was expected that there would be aggressive bidding and offers of steep discounts from the bidders, no one would have anticipated that the lowest winning bid would touch Rs. 7.49 (US\$0.15)/kWh. This bid price, offered by the French developer Solairedirect SA for a 5MWp project, represented a more than 50% discount on the reference price of Rs. 15.39 (US\$0.31)/kWh and was about 50% less than the Feed-in Tariff (FIT) for a similar scale PV system in Germany (€21.56/kWh).

A total of 20 project developers including Solairedirect won 27 solar PV projects totaling 350MWp in this round of bidding. Each bidder was allowed to place three bids totalling 50MWp, with each bid not exceeding 20MWp. Some of the other winners include Sun Edison, Azure Power and Mahindra Solar. Fonroche Energy SA, another French solar firm, also won a project. Maintaining its reputation as the most preferred solar project destination, Rajasthan bagged a whopping 24 projects out of the total 27. The total size of these 24 projects comes to 300MWp out of the total 350MWp allotted. The states of Tamil Nadu, Andhra Pradesh and Maharashtra got one project each and the most surprising fact was that Gujarat, which is the leader in solar energy in India, did not get even one project.

This bidding was the second round in Phase 1 of the Jawaharlal Nehru National Solar Mission (JNNSM). The mission targets a grid-connected solar capacity addition

of 20GW by 2022 (half of which will be PV). The mission is divided into three phases and the target for Phase 1 of the mission (2010–2013) is to establish 500MWp of solar PV projects. Even though India is blessed with abundant sunshine, grid-connected solar installations in India are few in number. As of November 2011, the total size of the installations stood at 143.5MWp, whereas the corresponding number at the beginning of 2011 was a mere 22MWp. The growth trajectory for solar PV installations in India is given in Fig. 1.

Even though these numbers pale in comparison to a cumulative installed capacity of more than 17GWp in Germany (2010), India is expected to become a solar leader in a few years' time.

In the first round of bidding of Phase 1 carried out in December 2010, projects totalling 150MWp were allotted. The first round also saw aggressive bidding and resulted in some exorbitant discounts being offered on the deals. The lowest bid winner in that round offered Rs. 10.95 (US\$0.22)/kWh against a reference price of Rs. 17.91 (US\$0.36)/kWh. Some significant changes to the rules were made in the second round of bidding, the broad strokes of which are outlined in Table 1.

It is remarkable to note that the prices could crash from Rs.17.91/kWh to Rs. 7.49/kWh in a span of one year.

While the lowest price offered in the second round of bidding was Rs.7.49/kWh, the highest winning bid was at Rs. 9.44/kWh and the average winning bid price was Rs. 8.80/kWh. The details of bid price breakup are given in the following section.

Potential reasons for low bidding rates

One major reason cited by industry experts for the huge discounts offered is the interplay between the falling global module prices and the date of commissioning of these projects. The project developers have about 14 months left to commission the project; in this case, the projects must be connected to the grid – free of penalties – by February 2013 at the latest. Given that PV power plants can be installed and commissioned within two to three months, procurement and

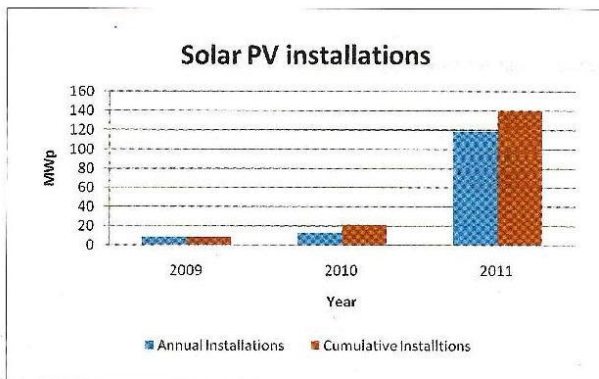


Figure 1. The growth trajectory for solar PV installations in India from 2009 – 2011.

	Round 1	Round 2
Bidding completion date	December 2010	December 2011
Total volume of allotment	150MW	350MW
Maximum size of project	5MW	20MW
Maximum number of projects per bidder	1	3
Total capacity per bidder	5MWp	50MWp
Reference price/kWh	Rs. 17.91	Rs. 15.39
Lowest bid price/kWh	Rs. 10.95	Rs 7.49/kWh
Project commissioning timeline	12 months from date of signing Power Purchase Agreement (PPA)	13 months from date of signing PPA

Figure 1. Differences in rules and guidelines from Round 1 (2010) to Round 2 (2011) of the bidding process.

construction could feasibly start as late as September 2012. Analysts argue that most project developers expect module prices to fall significantly before they start procuring PV modules. Furthermore, this expected drop in project capital expenditure was factored in while offering significant discounts.

However, some industry insiders say that this reasoning is only partly true. They suggest that some of the more established and experienced project developers have already entered into module purchase agreements at very attractive rates with some leading

global thin-film PV module manufacturers, aiding in their achieving of financial closure on more attractive terms.

"A number of developers in the second batch who have won large capacity allocations have about 120–200MW of planned solar capacity under various stages of bidding, execution, commissioning over the next 12–18 months. This could have played a major role in deciding the tariffs quoted," says Mr. Vineeth Vijayaraghavan, industry expert and Editor of Panchabuta, a renewable-energy and cleantech industry newsletter focused on India.

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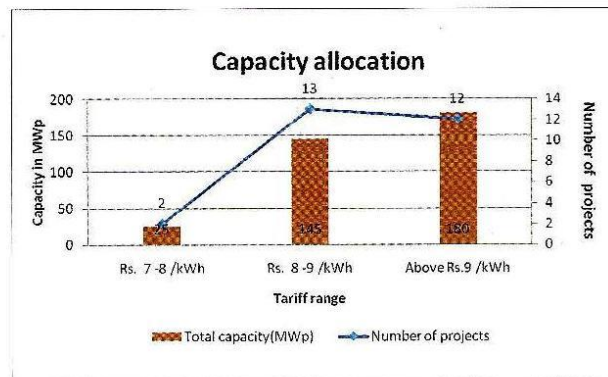


Figure 2. Capacity allocation and number of projects installed in relation to tariff level allocated.

"A number of these developers are also considering capacity addition under the REC mechanism apart from bidding under the various state and central government policies. They are bidding for various tenders floated by utilities and in discussions with obligated entities to add solar capacity," adds Mr. Vijayaraghavan.

Technology selection and financing

One very interesting dynamic in the whole bidding process is the National Solar Mission's local content requirement mandate. According to this mandate, if the project developer chooses crystalline silicon (c-Si) technology for its projects, it must procure PV modules that are made in India. The PV cells that go into making these modules should also be manufactured in India. However, this local content requirement mandate is not applicable to thin-film technology, which means that thin-film PV modules can be imported for these projects.

Thin-film technology is relatively less expensive than crystalline silicon (c-Si) technology and is widely considered to be better suited to the hot climatic conditions of India. More importantly, procuring thin-film PV modules from the global giants like First Solar opens up new avenues for easier financing. Not only is the bankability of the products of such companies relatively high, the Export-Import (EXIM) banks of the respective countries also provide very attractive financing options. The US EXIM bank and the Overseas Private Investment Corporation (OPIC) have been very active in providing financing for these projects. In the current fiscal year, the US EXIM bank provided loans worth US\$176.4 million to six solar projects in India, and the bank currently has a pipeline of US\$600 million for solar projects in India. OPIC has also been financier for projects by leading developers like Azure Power.

The advantage of obtaining financing from the EXIM bank and OPIC is that the total cost of financing (including currency hedging and insurance) comes to between 6% and 9%. However, the financing cost

for loans available from Indian banks will be in the range of 12-15%. Equally important is that most Indian banks are reluctant to offer project financing, and so most developers have no choice but to opt for recourse-to-balance-sheet financing. Given these financing challenges, importing PV modules and opting for multilateral financing is turning out to be an attractive option. As mentioned earlier, some of those developers that won projects are reducing

the overall project cost by reducing their capital expenditure and securing lower cost financing.

Prominent winners and losers

The major winners of the bid are Welspun Solar and the Mahindra Solar-Kiran Energy consortium, with both winning the maximum possible 50MWp each. Green Infra and Azure Power came in next with a total allocation of 35MWp each, while Welspun Solar, Azure Power and Mahindra Solar were also successful in the first round of bidding. SunEdison and SaiSudhir Energy also were successful in both of the bidding rounds.

Firms like CCCL, Oswal Woolen Mills and Punj Lloyd, which won projects in the first round of bidding, were unsuccessful this time around. Public sector oil major Hindustan Petroleum Corporation (HPCL) also did not succeed in the bidding.

Implications

The drastic reduction in the tariffs that resulted from the reverse bidding has changed the industry dynamics of solar in many ways. However, two areas that will see the maximum impact are the Gujarat policy and the attractiveness of Renewable Energy Certificates (RECs).

Impact on Gujarat policy

The state of Gujarat has been one of the pioneers of solar energy in India. The state announced its solar policy (different from the JNNSM) in 2009 and had allotted projects totaling about 1,000MW (PV and solar thermal) in the state. Apart from Gujarat, the states of Rajasthan and Karnataka each have their separate policies, but unlike JNNSM and other states, Gujarat has a predetermined feed-in-tariff for 25 years and does not use the reverse-bidding mechanism to allot projects. As a result, project developers under the Gujarat state policy do not have to resort to discounts, which in turn ensure relatively higher returns for projects in this state compared to JNNSM or other states.

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Gujarat policy makers would have taken note of the fact that none of the projects that won JNNSM bidding opted for Gujarat. This is attributed to the delays in acquisition of land for solar plans and also the delays in project commissioning caused by inadequate power evacuation infrastructure. It has been found that many solar PV projects, even though fully installed, are unable to connect to the grid because of such delays in building power transmission lines. Rajasthan, where most of the projects under the JNNSM second round will be commissioned, has done a commendable job of creating land banks for solar projects. Indeed, Gujarat could learn from this proactive approach in order to avoid issues related to land acquisition.

The successful reverse bidding process for the second round of bidding under the JNNSM now raises two questions for the policy makers in Gujarat. First, should they do away with the predetermined feed-in tariff mechanism and adopt the reverse bidding process? The advantage of adapting the reverse bidding process is that the state will be able to realize lower tariffs, which means that it has to make lower fund allocations towards subsidizing solar power. The second and equally important question is the transparency in the selection process. The JNNSM reverse bidding process was non-controversial and is considered very fair and open; however, the same cannot be said about the Gujarat policy. The policy makers will have to analyze these factors before they announce the policy guidelines for the next phase of projects in Gujarat.

Renewables Purchase Obligation (RPO) and Renewable Energy Certificates (RECs)

The electricity regulators in the country have mandated the purchase of renewable power for the various utility companies and captive power producers. This mandate is called the Renewables Purchase Obligation (RPO) and features a specific solar energy purchase component. The Solar RPO is about 0.25% of the total electricity purchase and could slightly vary from one state to another. Under the RPO mechanism, the utility companies and other obligated entities can buy solar power directly from power producers or can buy Renewable Energy Certificates (RECs) of proportional value at a trading exchange.

In India, REC trading started in March 2011 and the trading of non-solar RECs has been gaining momentum. However, no solar project has been registered under the REC mechanism because projects under this mechanism are not considered bankable and face serious difficulties in achieving financial closure under the project financing mode. The conclusion of the JNNSM bidding will impact the REC mechanism in two ways:

1. Since the capacity allocation targets under Phase 1 of the JNNSM have been met, project developers

will have to wait for more than a year before more capacity allocation will take place. Rather than wait for this to happen, serious project proponents are likely to turn to developing solar PV power projects under the REC mechanism.

2. The tariffs under the REC mechanism are at least 25% higher than the tariffs being realized under the JNNSM reverse bidding. The RECs are designed to trade within the Rs. 9.3/kWh–Rs. 12/kWh price range. A solar power producer can sell the electricity at the rate of fossil fuel (about Rs. 3/kWh) AND also sell the RECs. In the worst-case scenario, the power producer will realize Rs. 12.3/kWh (Rs. 3 + Rs. 9.3/kWh), which is significantly higher than the average tariff of Rs. 8.80/kWh realized under the JNNSM. However, the downside for the REC mechanism is that the price band mentioned above is only applicable for the next five years, and is expected to drop after 2017. This creates an uncertainty among the investors and lenders, which is making it difficult to achieve financial closure for these projects. However, the significant upside in this mechanism could attract more investors towards the REC approach.

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Conclusion

The second round of reverse bidding of the JNNSM brings Phase 1 of the mission to a close from an allocation perspective. The challenges related to achieving financing closure and commissioning the projects on time will now begin. With some very serious and financially strong entities winning the projects, there is a certain level of confidence in the industry that most of the projects will be connected to the grid on time. This is a massive improvement in sentiment compared to the first round of allocation that took place a year ago. The successful conclusion of the auction will help the solar PV industry take root and it is also expected to shorten the time required to achieve grid parity. ■