

TOO CLOSE TO THE SUN?

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Too close to the Sun?

India is bullish on solar energy, with prime minister Narendra Modi keen to replicate this Gujarat success across India to reduce the impact of climate change. Rohini Mohan finds out if the government's approach to solar, in the wake of the promise it made in Paris last week, is sustainable

Have you brought goggles?" Mukesh Goswami asked this writer. "It's so sunny out," he added, beaming. It was morning noon in Charanka in northwest Gujarat, and Goswami was surrounded by a sea of solar panels, all staring mouth

agape at the sun. Hot, white sunlight glinted off their black surfaces. About 240 kms from Ahmedabad, past acres of blinding salt pans, beyond herds of goats sprawling for kilometres, just before the white sands of the Little Rann of Kutch, arid, sunny Charanka village is the wellspring of Prime Minister Narendra Modi's big solar designs. Here in 2012, Modi, then Gujarat chief minister, inaugurated India's first solar park. Gujarat was the first state to have a solar policy in 2010, launch a pilot for rooftop solar panels in its capital of Gandhinagar, and also pioneer a canal-top solar installation built by US company Sun Edison. The state was already well electrified when Modi took over, but his government went on to build transmission infrastructure and policies to encourage solar, even while continuing to bank heavily on coal-based energy.

Atop the Charanka viewing tower, a young electronic engineer Hitesh Patel was moved as much by the proximity to the border with Pakistan as he was by the 5,417 acres of glimmering solar panels below us. "It's a matter of such pride," said Patel. "Modi will now be in Paris talking about India's solar future." Three days later at Paris, Modi announced the largest renewable energy target in the world. He launched a global solar alliance with 121 countries, and created what is being called the billionaire's fund, with corporate heads like Jack Ma, Mukesh Ambani, Bill Gates, Mark Zuckerberg and Ratan Tata pledging to finance green technology innovations.

The big targets and political backing for solar have created euphoria in the market, but there is scepticism about India's approach of focusing largely on utility-scale solar parks and aggressive pricing. Nearly 25 solar parks have been signed, and developers have been bidding at drastically lower tariffs. The lowest today stands with Sun Edison Inc for a 500MW plant in Andhra Pradesh, whose power NTPC will buy for 25 years at ₹4.63 per kWh. US-based Sky Power won a bid to sell power at ₹5.05 in Madhya Pradesh in July 2015.

While this suggests solar prices could compete with coal-based thermal power (₹6 per kWh for new plants), even without subsidies, most experts and developers believe it is not sustainable. They worry that too much too soon could prematurely burn a rising sector.

GUJARAT MODEL

The roots of India's approach to solar lie in the Gujarat solar ecosystem, which, corrected for scale, is what the NDA is now trying to build nationally. D.J. Pandian, Gujarat's former energy secretary who managed the development of Charanka and the state solar policy under Modi, said solar was "very

personal" to Modi. "He used to say it is the natural gift from *Surya Bhagwan*, the all-powerful Sun God. He also knows it is clean energy, with potential to reduce carbon footprint," Pandian recalled. Modi's excitement about a successful one megawatt solar installation he set up in 2010 in Gandhinagar's Pandit Deendayal Upadhyay Petroleum University campus. "But Narendra Modi is never satisfied with small ideas, no?" asked Pandian, smiling. "So next came the solar park idea for 214 MW, then 1,000 MW for Gujarat. Now for India, he wants 100,000 MW." He described the Charanka solar park as Modi's "PhD in solar energy" before he evangelised it nationally. In 2014, the NDA upped the 2012 target of the National Solar Mission from an installed capacity of 20GW to 100GW. At the Paris climate summit last week, India pledged to produce 40% of its energy from non-fossil sources by 2030, and 175GW by 2022.

By pitching for solar, the Modi government is not only offsetting emissions from coal energy, but also addressing energy insecurity. India's energy bill is high, dependent as it is on imported coal, oil and gas. Over 300 million people still have no access to electricity and sustainable economic growth will need alternative sources of clean energy.

India plans to produce around 25 times more solar in the next 7 years, and much of this will be through solar parks (see Solar Target by 2022). "But we've come a long way from Charanka," said Kanika Chawla, research fellow from the Delhi-based consultancy Council on Energy, Environment and Water. There is a growing consensus among government officials for non-fossil energy. The cost of photovoltaic panels has fallen drastically — the chief reason for solar power to become cheaper than it was five years ago. Unlike Gujarat, which offered to pay a fixed tariff (₹ per kWh) higher than cost of production for 25 years to attract solar developers, today, solar projects are allotted by reverse bidding (the lowest bidding company wins). Consulting firm Bridge to India found that investments of more than ₹116 billion are expected from private developers and about 660 MW will be added next year.

Even in emulating a tried-and-tested model, however, gaps remain. Regulatory and infrastructure inefficiencies are not being addressed as they were in Gujarat. From a capacity today of a mere 2,900MW, India is reaching for 100GW, which means it must add 150GW of capacity annually for 7 years. No country has ever done this before. Germany, the second largest solar producer, has less than 40 GW capacity today, and China, the largest solar country, has a little over 40 GW. Policies and infrastructure to transmit and distribute solar energy are still weak, and 21 of the 29 state power distribution companies (discoms) are financially debt-ridden, unable to purchase any power generated in their state. These are not only inefficiencies, but also risks for developers.

Even optimistic players like Pashupathi Gopalan, Asia-Pacific President of American solar major

India's Biggest Greenhouse Gas Emitters...



Coal accounts for a large majority of India's energy-related greenhouse gas emissions

...And the Push to Offset Their Impact



The clean energy push will not suffice to counter even the emissions from petroleum

Solar Target By 2022 VS Existing Capacity



Radical Fall in Solar Tariffs in India

Oct 2014 ₹6.01 per kWh First Solar (US based) for a 42MW plant in Andhra Pradesh
Jul 2015 ₹5.05 per kWh SkyPower Solar (Canada company) for a 500MW plant in Madhya Pradesh
Nov 2015 ₹4.63 per kWh Sundison Inc. (US based) for a 500MW plant in Andhra Pradesh
Price for new coal-based thermal power ₹4.5-6 per kWh

Solar energy is finally comparable with thermal power in terms of price

Sun Edison, among the first companies to set up in Charanka, admit that the long road to solar still has regulatory obstacles. "Gujarat was a phenomenally good experience," said Gopalan. "But even there, there were surprise costs at a later stage, which made the project more expensive." The central government is making coherent efforts to address policy and discom reform. Under Modi, the NDA has pushed solar friendly policies like competitive auctions for private solar projects, and reforms for impoverished discoms. "But the ground reality is not consistent," added Gopalan.

The two biggest challenges for solar the world over are need for land to mount solar panels, and building the expensive, time-consuming infrastructure to connect to the grid. "Solar parks are a great solution, because the government does both, and then invites private developers who just come install their panels," said Vinay Rustagi, MD of consultancy Bridge to India. Bulk transmission of an unstable power like solar needs a strong grid and high-voltage substations, which are expensive. Their transmission lines are time-consuming to build. Even before states catch up to these requirements, they are allotting massive projects. In 2014-15, BJP ruled Rajasthan, whose discom is ranked second, made agreements with companies such as Sun Edison, Adani Enterprises, Reliance Power and Azure Power to develop solar parks for a total capacity of 28GW. In 2015, it overtook Gujarat in installed capacity. Madhya Pradesh is following suit. More states are inviting bids for solar projects, but they have different policies on subsidies, their infrastructure is at different capacities, and the financial health of their discoms vary widely. "Even Charanka flooded in September, with all projects down for 2 weeks," said Rustagi.

Moreover, fixed long term price agreements can punish early adopters. In 2012, Gujarat Urja Vikas Nigam Limited (GUVNL) had offered ₹13 per unit of electricity for 25 years. Average industry tariffs are now down by half, but GUVNL is stuck paying this feed-in tariff. Despite its top-ranked discom, Gujarat has barely expanded its solar power capacity, with only one agreement in 2015 with Torrent Power, because it is now a power surplus state. On the other hand, "developers may not bid for solar park projects in other states at all if their discom is ranked low. The risks are too high," said Tata Power Solar CEO Ashish Khanna. Discoms like those in New Delhi, Tamil Nadu, Chhattisgarh and Uttar Pradesh are too indebted to honour power purchase agreements with solar developers.

Besides, private power producers may not be able to sustain low tariffs, experts warn. In February 2014, a major Indian solar company, Welspun, sold its 80.8% stake in a joint venture with the Leighton Group to reduce its debt. Even as it made the lowest bid in India, Sun Edison's stocks suffered in the US market due to a global crash in solar company stocks, forcing the biggest US solar company to sell its assets globally. In a conversation in Bengaluru, Gopalan dismissed this as "regular asset reshuffling". "Our prices are

not that different from others. For the Andhra project (with NTPC, the biggest and most profitable Indian power utility), the highest bid was ₹5.17. We're in the same ballpark," he added. Varun Sivaram, energy advisor to the New York Governor and a fellow at Stanford University wondered if "the point of this [Sun Edison] project might be low loading, or developing a project at an unsustainable tariff just so the company gains on the ground experience on a mega project and can be more competitive in future development".

Otherwise, low rates could only work if solar panel prices or panels from China dropped considerably in 2016. But INR/USD exchange rate could offset that fall, and Sivaram felt "much of the low hanging fruit in lowering solar panel costs has already been harvested." Mehta, who heads the National Solar Energy Federation, an association of private solar companies, called the low tariffs "totally unsustainable and bad for the sector at this stage." He believed realistic solar prices were around ₹5.50, since the cost of production at utility scale was ₹5.5-6 crore per megawatt. "Lower than ₹5.50-6 is just financial engineering," he said.

COST FACTOR

Many developers believe technological change should be the real driver for a fall in solar tariffs. "Even in a household, people who bought poor-quality solar panels were turned off for life. If we don't invest in technology, and rush to slash prices, it will help neither energy security nor climate action," said Tata's Khanna.

In line to India's 100GW target, "the type and range of price might be 'detrimental' for solar energy in the long run. If the same environment persists, or if discom default, I fear that some foreign developers may shut shop in India and go back," said Rustagi. He suggests sticking to the government-issued feed-in tariffs for rapid scaling up of capacity. "This is what the rest of the world does," said Rustagi. "Once price discovery has been done using market mechanisms, government can announce feed-in tariffs. It provides market clarity and allows private developers to plan for the future." These benefits outweigh the risk of paying a potentially higher tariff to the private sector. Interestingly, solar tariffs today don't need to go much lower. Thermal power is still cheaper, but its cost will rise over time with the cost of coal. "₹4.63 is not even necessary for solar to outcompete new coal, which can run up to nearly ₹6 per kWh," said Sivaram. Perhaps it is not Charanka then that is driving the conceptual framework of solar, but thermal handover of big projects and cheap power. "This solar panel will work for 20-30 years, just on its own," said Madhuban, an Ahariya woman who was employed as a security guard at Charanka watchtower, as she wiped a bit of dust off a solar panel at Charanka. "Therpa! Ki baat hai. (It's about patience)." Rohini Mohan@timesgroup.com