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Karnataka Aims to Add 10 GW of Renewable Capacity and 1 GW of Rooftop Solar Over the Next Five years

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Foreword

Karnataka - one of the most attractive states for renewables and solar, has released a new renewable policy that targets 10 GW of renewable energy projects and 1 GW of rooftop solar installations over the next five years. Karnataka is home to approximately 16 GW of renewable energy capacity.

The state is prioritizing grid-connected solar projects, rooftop solar, distributed solar generation, solar-powered charging stations for electric vehicles, and floating solar projects.

In a new Climate Index released by NITI Aayog, nearly half of the 35 Indian States and Union Territories lagged behind the national average score in NITI Aayog's State Energy and Climate Index Round-I, which measures various energy efficiency and climate resilience factors.

The index found Gujarat, Kerala, and Punjab were the top three performers among larger states. The report suggests that most states with a low score struggled with higher Aggregate Technical and Commercial (AT&C) losses and complex tariff structures.

The report says that states could improve their performance by increasing the hours of electricity supplied at affordable rates and improving data availability of hours of electricity supply in rural and urban areas.

Indian solar developers procured almost 10 GW of solar modules in the first quarter of 2022 and stockpiled them ahead of Basic Customs Duty on solar cells and modules, which took effect on April 1. Imports surged by 210% year-over-year. The stockpiling is to save on module costs, which increased by 40% once BCD kicked in.

Rajasthan became the first state in India to surpass 10 GW of cumulative large-scale solar installations, as per Mercom's India Solar Project Tracker. The state has 32.5 GW of installed power capacity, with renewables contributing 55%.

Rajasthan enjoys some of the highest solar irradiation levels in the country, along with other favorable factors like land availability and minimal power curtailment issues. These attractive conditions have also encouraged other states like Maharashtra to develop projects in Rajasthan to procure power.

Total corporate funding–including venture capital funding, public market, and debt financing–into the solar sector globally came to $7.5 billion through 49 deals in the first quarter of 2022, according to Mercom Capital Group's recently published Q1 2022 Solar Funding and M&A Report.

Although financing activity was strong QoQ with robust demand for solar assets, significant headwinds are building up that can slow the momentum considerably.

Continuing supply chain issues, higher inflation, and the interest rate trajectory going forward are already major concerns.

According to the report, the solar project acquisition was the second most recorded to date in Q1 2022. A total of 23 GW of solar projects were acquired in Q1 2022 compared to 13.1 GW in the previous quarter.

Project developers and independent power producers were the most active acquirers in the first quarter, followed by investment firms and funds. The acquisitions were spread across 20 countries globally.

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India Adds 275 MW of New Wind Capacity in Q1 2022

Wind installations fell 56% YoY in Q1, mainly due to the lower tariffs and unfavorable regulatory changes

By : Suriti K. Prasad

India added 275 MW wind power capacity in the first quarter (Q1) of 2022, a 30% quarter-over-quarter (QoQ) increase compared to 212 MW installed in Q4 2021, bringing the cumulative wind installations in the country to 40.4 GW, according to the recent data released by the Ministry of New and Renewable Energy.

The year-over-year (YoY) installations decreased by 56% compared to 623 MW in Q1 2021.

Tamil Nadu, Gujarat, Karnataka, and Maharashtra continued to be the primary markets for wind, accounting for 72% of the cumulative capacity.

Gujarat led the way with nearly 202 MW of wind capacity added in Q1 2022. The state makes up 23% of the cumulative capacity with 9.2 GW of installations. Karnataka added 54 MW of capacity in the quarter and was ranked third with 5.1 GW of wind installations accounting for 13% of the total market share.

Tamil Nadu, which ranks first in cumulative installations, added the remaining 20 MW capacity in Q1 2022. The state now has 9.9 GW of total installed wind capacity, accounting for 24% of the total market share.

Tamil Nadu, Gujarat, and Karnataka accounted for the 275 MW installed in Q1 2022. The remaining states, including Maharashtra, did not have any installations during the quarter.

Wind project auctions have seen low tariffs, compelling developers to choose states with high resource availability for the projects to be economically viable. The three leading states have locations conducive to wind power projects, leading to increased installations.

One of the factors contributing to the decline in wind installations across the country is regulatory changes. Developers are required to seek the Ministry of Defense's approval for all wind project sites.

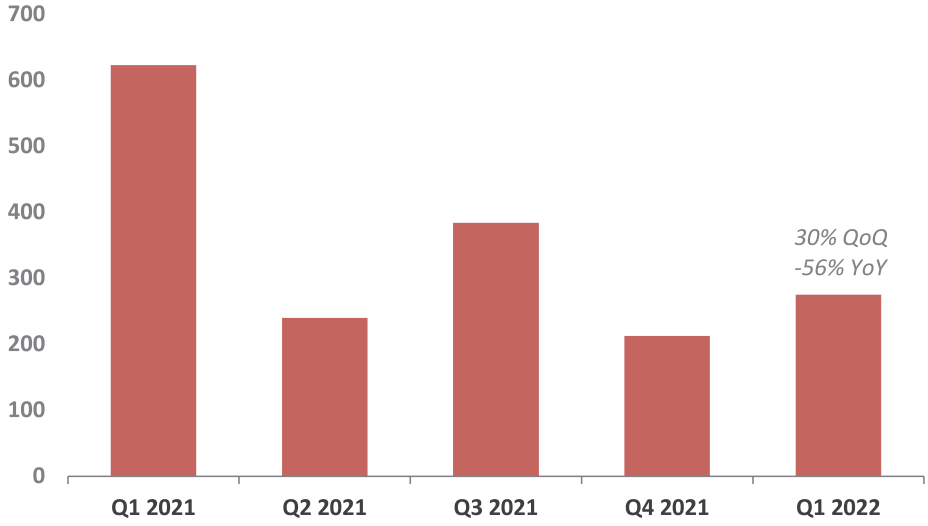
Even though Gujarat installed the highest wind capacity during the quarter, developers were discouraged from installing new projects due to restrictions in acquiring revenue land for central projects where the power is sold outside the state.

According to the Global Wind Energy Council's (GWEC) Global Wind Report, 2022, the Indian wind market outlook for 2022 and 2023 is projected at 3.2 GW and 4.1 GW of onshore wind installations, respectively. The World Bank-Group ESMAP has mapped 174 GW of fixed and floating offshore wind potential off India's coastline; the most substantial resource is found off Tamil Nadu, while a good resource is also available off Gujarat.

Previously, GWEC projected that India, which is currently the fourth largest in terms of installed wind energy capacity, could save an extra 229 million metric tons of CO_2 emissions over the lifetime of a wind farm while also creating more than a million green jobs.

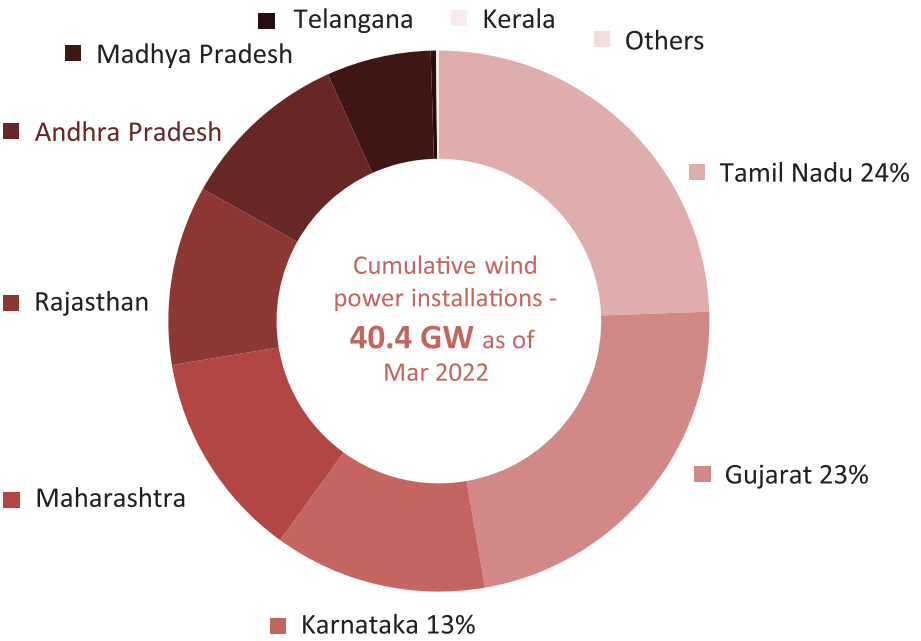
Last month, NTPC Renewable Energy invited expressions of interest (EoIs) to shortlist suitable land banks and parcels to set up wind energy projects in Rajasthan, Maharashtra, Gujarat, Tamil Nadu, Karnataka, Andhra Pradesh, and Madhya Pradesh.

India - Wind Power Installations by Quarter (MW)



Source: MNRE *Mercom India Research*

India - Cumulative Wind Power Installations by States (%)



Source: MNRE *Mercom India Research*

Developers Penalized for Regulatory Glitches

Lack of clarity and directions by the central regulatory commission has led to renewable developers paying for the mismatch in long-term access to the transmission system

By : Arjun Joshi

Renewable energy project developers have been burdened with delay charges imposed by the Central Transmission Utility of India (CTU) for the mismatch between the deployment of long-term access to transmission and the project commissioning date.

CERC needs to officially address the issue to ensure CTU abides by the orders of the Ministry and waves off the charges arising from the mismatch.

Procedure for securing long-term access

Renewable energy developers need long-term access and the right to use the inter-state transmission system to evacuate the power generated by the project to the grid. The application for long-term access is submitted to the CTU once the power purchase (PPA) and power sale agreement (PSA) is signed and the power injection and offtake points are identified. Since the availability of the transmission network is a challenge, developers need to ensure the PPA and PSAs are signed in time to apply for long-term access. Long-term access is generally provided to the developers for 25 years from the scheduled commissioning date of the project.

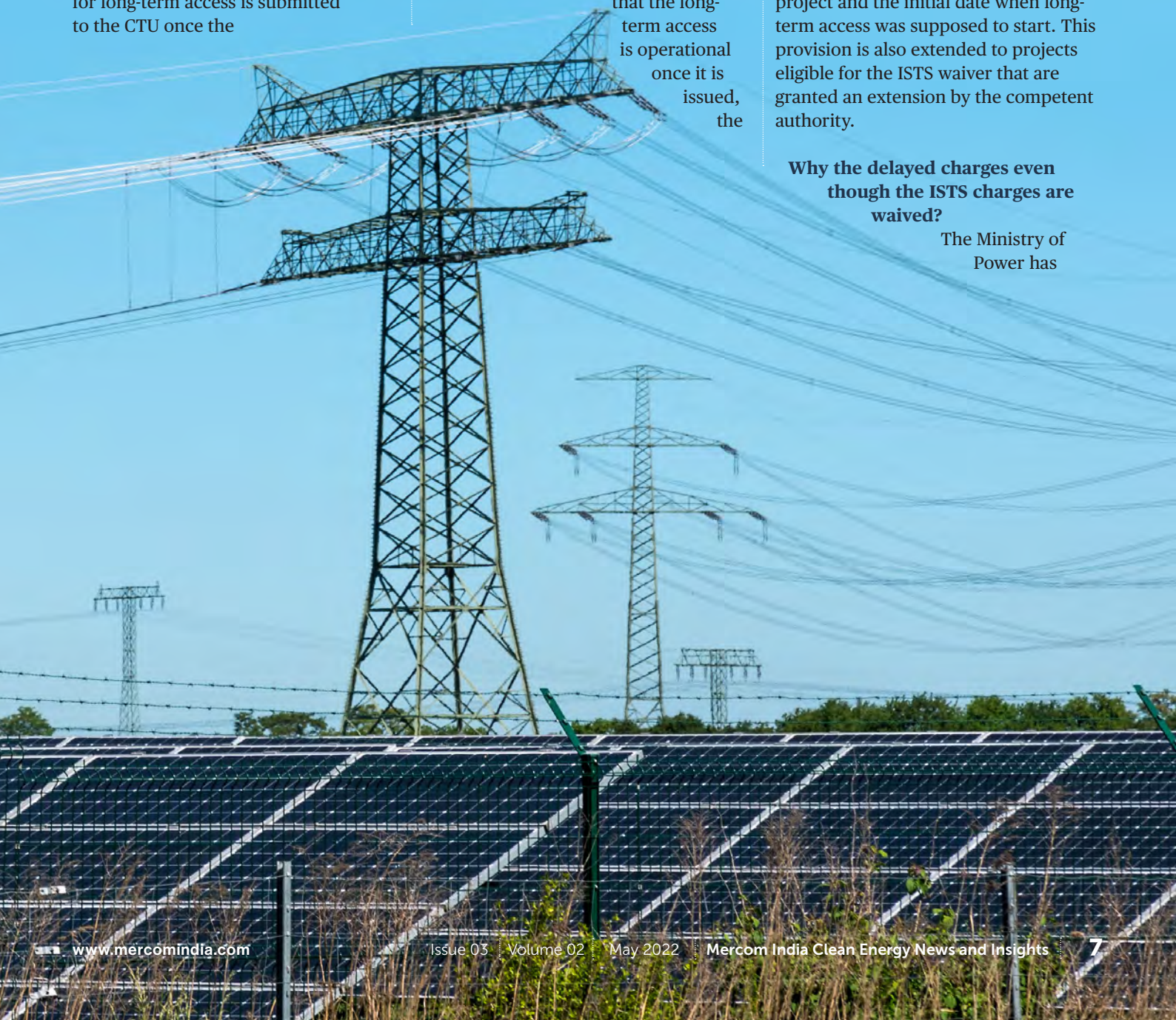
Confusion with the operationalization of the long-term access

But with the disruptions due to the COVID-19 pandemic, the scheduled commissioning dates of many projects have been moved. Also, there is confusion about the start date of the long-term access. While the CTU says that the long-term access is operational once it is issued, the developers note that the long-term access should be considered from the scheduled commissioning date of the project up to 25 years. According to the developers, the operationalization and commencement date of the long-term access must both be the same - the scheduled commissioning date of the project.

The Ministry of Power had previously clarified that when a renewable energy project is granted an extension on its scheduled commissioning date by the concerned implementing agencies, there must be a corresponding change in the commencement and period of long-term access. Such realignment of long-term access was considered to exempt renewable developers from any liability for periods of mismatch in the commissioning of the renewable energy project and the initial date when long-term access was supposed to start. This provision is also extended to projects eligible for the ISTS waiver that are granted an extension by the competent authority.

Why the delayed charges even though the ISTS charges are waived?

The Ministry of Power has



provided for the ISTS charges waiver for solar and wind energy projects commissioned on or before June 30, 2025. The waiver is for 25 years from the date of commissioning of the projects. Then why the delayed charges for the mismatch?

According to the regulations, the ISTS charges are waived for the developers but socialized for the CTU. "Socialized" in this context means the charges are equally borne by the designated ISTS customers, including state transmission utilities and distribution licensees.

So, from the scheduled date of commissioning of the renewable energy projects and the operationalization of the long-term access, the ISTS charges are socialized for the CTU. This means other designated customers, including the DISCOMs, share the charges. But in the gap between the long-term access issue date and the scheduled commissioning of the project (mismatch), the ISTS charges cannot be socialized, which is a loss for the CTU. Hence, they levy these charges to be paid by the developer.

Solution

The Ministry has issued directions to Central Electricity Regulatory Commission (CERC) to amend the CERC (Sharing of Inter-State Transmission Charges and Losses) Regulations 2020. CERC was directed to make provisions for the CTU to extend the long-term access start date in a case where the scheduled commissioning dates of the renewable projects was extended, addressing the mismatch. But the CERC is yet to amend the regulations and notify it.

ISTS charges are waived for solar and wind energy projects commissioned on or before June 30, 2025

According to the developers, despite the Ministry's orders, the CTU has been raising bills for the period of mismatch in commissioning a renewable energy project and the date of operationalization of long-term access in periods before commissioning such renewable projects.

A leading developer Mercom spoke to said that since the developers have a deadline extension to commission the projects, there will be a mismatch in the long-term access approvals.

"Developers were granted long-term access start dates based on the original commissioning date of the projects. Now, if the commissioning dates are moved, developers end up paying the penalty for no fault of theirs. The Ministry has directed CERC that long-term access also must be extended, but no order has been issued yet. This needs to be addressed immediately," he said.

Developers claim CTU is proceeding on the understanding that none of the Ministry's orders referenced above have any application whatsoever to bilateral mismatch liability. Even in cases where long-term access has been granted on existing margins, the CTU is raising bills on renewable power producers who are otherwise eligible for relief under the Ministry's orders.

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Gujarat Sets RPO Target for FY 2023

The GERC issued new amendments to stipulate the energy project criteria and targets to be considered for the state's renewable power purchase obligations

By : Arjun Joshi

Gujarat Electricity Regulatory Commission (GERC) has issued GERC (Procurement of Energy from Renewable Sources) (Third Amendment), Regulations, 2022 to specify renewable purchase obligation (RPO) targets for the period from FY 2022- 23 to FY 2023-24.

The RPO is meant to achieve the target of solar energy equivalent to 8% of the total energy consumption as envisaged by the Government of India.

RPO percentage for FY 2022-23, FY 2023-24, and FY 2024-25 is set at 17%, 18.7%, and 20.7%, respectively.

Background

The Commission published the Draft GERC (Procurement of Energy from Renewable Sources) (Third Amendment) Regulations, 2022 inviting comments and suggestions from the stakeholders.

Stakeholders suggested considering the current developments in the sector and providing sufficient flexibility to fulfill the RPO. There was a need to include definitions of 'renewable energy,' 'renewable energy project,' 'renewable energy with storage,' and 'renewable hybrid energy project' as renewable energy sources to ensure uniformity. This was necessary as the

Commission was incorporating biofuel and large hydropower projects as renewable energy sources.

Suggestions were also received to include green hydrogen and green ammonia as renewable sources to fulfill RPO in line with the Ministry of Power's Green Hydrogen Policy.

Some stakeholders suggested keeping the RPO percentage at 17% for FY 2022-23 and FY 2023-24, the same level as FY 2021-22 since it takes about 18 months for any solar project to be commissioned. Also, there are various challenges in the availability of land, evacuation infrastructures, and a substantial increase in the cost of input material, resulting in delays that could come in the way of meeting the existing RPO targets.

Under such circumstances, the stakeholders suggested continuing the overall target of 17% for FY 2022-23. For FY 2023-24, instead of the proposed 19.85%, they suggested 18.35%.

Commission's Analysis

Replying to the suggestion of considering energy generation from storage, the Commission stated that the storage of energy is not a source of generation. Wind or solar projects with energy storage systems will be considered renewable energy.

The Commission noted that energy storage is an equipment that does not generate electricity. It only functions as a storage of energy (electricity) and releases such stored energy (electricity) as and when required. So, the energy storage system is not a generator per the Electricity Act, 2003. Energy Storage Systems will not be qualified as a renewable energy source of generation.

The Commission stated that energy generated from wind, solar, biomass, bagasse, biogas, MSW, geothermal, tidal, and large hydropower projects qualified as hybrid projects. Energy generated from such projects qualifies for the fulfillment of RPO.

Regarding the suggestion to include green hydrogen and green ammonia as renewable energy sources for RPO fulfillment, the Commission noted that if the electricity consumed to produce hydrogen and ammonia is from renewable sources, it qualifies for RPO fulfillment.

The Commission found the claim of the stakeholders regarding the time taken to commission the projects and other challenges to have merit. Hence, the Commission set RPO percentage for FY 2022-23, FY 2023-24, and FY 2024-25 at 17%, 18.70%, and 20.70%, respectively.

The Commission stated that hydropower imported from outside India would not be considered for meeting the hydropower purchase obligation (HPO). It also allowed the power consumed by obligated entities from solar-wind energy-fed pumped hydro storage to qualify for meeting solar and non-solar RPO and HPO.

GERC reduced the additional surcharge payable by open access consumers to the state distribution companies to ₹0.25 (-$0.003)/kWh to promote open access in the state.

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Corporate Funding for Battery Storage Companies Up by 222% in Q1 2022

Corporate Funding for Storage, Grid and Efficiency companies saw a significant growth driven mainly due to rise in demand and the importance of uninterrupted power

By : Arjun Joshi

Global corporate funding for Battery Storage, Smart Grid, and Energy Efficiency companies in the first quarter (Q1) of 2022 stood at $13.3 billion, according to Mercom's Q1 2022 Funding and M&A Report for Storage, Grid and Efficiency. This was a 166% year-over-year (YoY) increase compared to $5 billion raised in Q1 2021.

Total venture capital (VC) funding for Battery Storage, Smart Grid, and Energy Efficiency companies in Q1 2022 stood at $1.6 billion. This was a 21% YoY increase compared to $1.3 billion raised in Q1 2021.

Battery Storage

Battery Storage companies raised $12.9 billion in corporate funding through 26 deals in Q1 2022, a 222% quarter-on-quarter (QoQ) increase compared to $4 billion raised in 27 deals in the last quarter. This was a 174% YoY increase compared to the $4.7 billion raised in 18 deals during the same period last year.

In Q1 2022, global VC funding in Battery Storage companies stood at $1.1 billion in 21 deals, a 15% increase compared to $1 billion raised through 14 deals in Q1 2021. In a QoQ comparison, this is a 28% fall compared to $1.6 billion raised through 21 deals in Q4 2021. Canada-based long-duration energy storage solutions provider, Hydrostor's $250 million funding from Goldman Sachs Asset Management was the biggest deal this quarter.

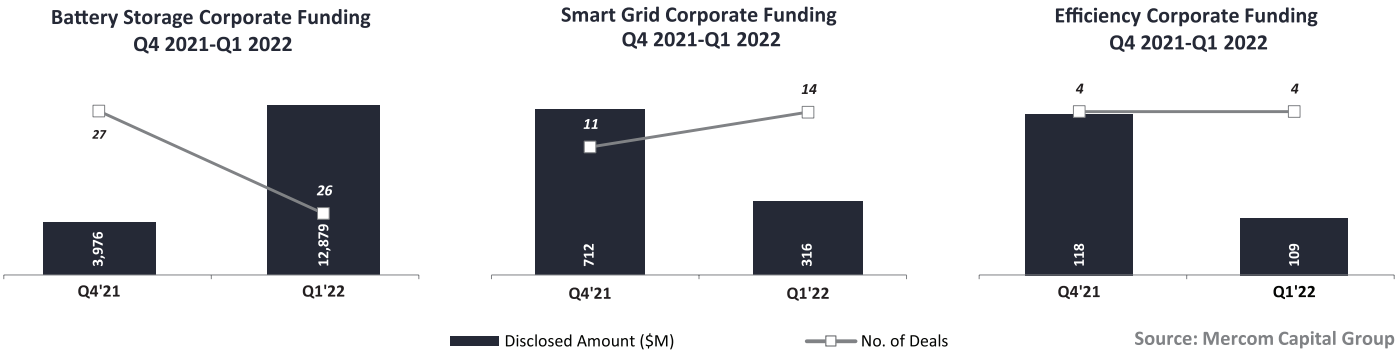
Some of the other top VC funding deals in Q1 2022 included $215 million raised by Sunfire, $200 million by Factorial Energy, $95 million by Viridi Parente, and $65 million by Our Next Energy (ONE).

A total of 27 VC investors participated in Battery Storage funding during the quarter.

The report stated that in Q1 2022, the announced debt and public financing market activity escalated to $11.7 billion in 14 deals, a 216% increase compared to $3.7 billion raised through four deals in Q1 2021. In a QoQ comparison, this is an increase of 388% compared to $2.4 billion raised through six deals in Q4 2021.

In Q1 2022, the sector witnessed five Battery Storage companies' merger and acquisition (M&A) transactions compared to four transactions in the same period last year.

There were 13 Battery Storage project M&A transactions in Q1 2022, compared to nine in Q4 2021.



Source: Mercom Capital Group

Smart Grid

Total corporate funding in the Smart Grid segment was $316 million through 14 deals, a YoY increase of 7% compared to $295 million in 11 deals in Q1 2021.

Smart Grid companies raised $312 million in VC funding through 12 deals in Q1 2022, a 9% growth compared to $287 million raised through 10 deals during the same period last year. Digital electricity supplier Tibber's $100 million funding from Summa Equity Fund III was the biggest deal in the quarter.

Some of the other top VC funding deals in Q1 2022 include $90 million raised by SPAN, $27 million raised by Utilidata, $21 million raised by David Energy, and $18 million raised by JET Charge.

The report stated that the announced debt and public financing market activity in Q1 2022 plummeted to $4 million in three deals, a 99% decrease compared to $484 million raised through a public market financing deal in the last quarter. In a YoY comparison, this is a fall of 50% compared to $8 million raised through one public market financing deal in Q1 2021.

A total of 39 VC investors participated in Smart Grid funding in Q1 2022.

There were three M&A transactions in Q1 2022, compared to two M&A transactions in the last quarter.

Battery Storage, Smart Grid, and Efficiency Top VC Funded Deals in Q1 2022

Company	Amount ($M)
HYDROSTOR	250
sunfire®	215
Factorial	200
tibber	100
Viridi Parente™	95
SPAN	90
GRIDPOINT	75

Source: Mercom Capital Group

Efficiency

In Q1 2022, VC funding for Energy Efficiency companies stood at $109 million raised through four deals, a QoQ decrease of 7% compared to $118 million raised through four deals in Q4 2021.

As per the report, the corporate funding for Energy Efficiency companies also declined 7% to $109 million compared to $118 million raised in Q4 2021.

A total of 13 investors participated in energy efficiency funding in Q1 2022. There were no M&A transactions involving Energy Efficiency companies during the quarter.

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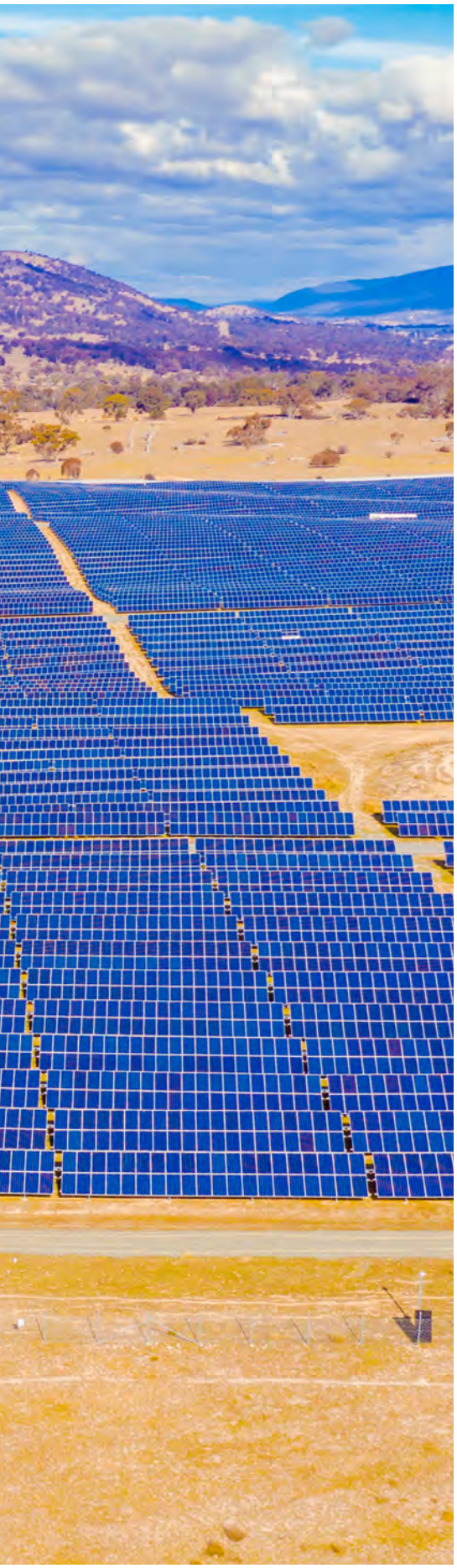


Rajasthan Becomes the First 10 GW Solar State

Rajasthan achieved the 10 GW of large-scale solar installed capacity milestone due to high solar insolation, land availability, and minimal power curtailment issues

By : Satish Shetty

Rajasthan became the first state in India to surpass 10 GW of cumulative large-scale solar installations, as per Mercom's India Solar Project Tracker. The state has 32.5 GW of installed power capacity, with renewables contributing 55%, followed by thermal energy at 43%, and nuclear energy making up for the remaining 2%.

Solar is the predominant source which now accounts for around 36% of the power capacity mix and 64% amongst renewables.

With the country recovering from the COVID-19 pandemic, stalled projects were commissioned, and new projects were tendered across the state. The thermal contribution was the highest during the first quarter of FY 2021-22, but the share of renewables rose through the other quarters, thanks to solar installations.

Rajasthan enjoys some of the highest solar irradiation levels in the country, along with other favorable factors like land availability and minimal power curtailment issues. These attractive conditions have also encouraged other states like Maharashtra to develop projects in Rajasthan to procure power. Other significant projects include the ones developed by NTPC and Solar Energy Corporation of India (SECI) and projects developed under the Rajasthan State Solar Policy.

According to Mercom's India Solar Project Tracker, Rajasthan has over 16 GW of solar projects under development.

SECI-awarded projects amount to 11.6 GW, of which 6.2 GW are interstate transmission system (ISTS) projects. Installations increased despite several projects getting stranded due to the Great Indian Bustard (GIB) issue.

In February 2022, the Ministry of New and Renewable Energy notified that all renewable energy projects under implementation, wholly or partly located in the priority or potential territory of the GIB, are to be granted a 30-day extension on the scheduled date of commissioning following the Supreme Court judgment. These also include the projects whose commissioning is delayed due to non-completion of project transmission infrastructure.

State-owned THDC India recently signed a Letter of Intent (LoI) to build 10 GW solar power projects through a 74:36 joint venture with Rajasthan Renewable Energy Corporation Limited, entailing an investment of ₹100 billion (~$1.33 billion).

In 2019, Rajasthan released its Solar Energy Policy 2019, which aims to achieve a target of 30 GW of solar power by the FY 2024-25. Of this, utility or grid-scale solar parks will account for 24 GW, distributed generation 4 GW, rooftop solar, and solar pumps accounting for 1 GW each.

Floating Solar - Key to Unlock India's Renewables Target

Even with its massive potential to help the country meet its solar target, floating solar continues to lag in installations plagued mainly by higher costs, lack of technical knowledge and policy support

By : Arjun Joshi

As a renewable source of energy, solar power is an essential pillar in India's efforts to address climate change and achieve the ambitious goal of 280 GW of installed solar capacity by 2030.

India's installed renewable energy capacity stood at 150.4 GW, accounting for 38.41% of the overall power mix at the end of the fourth quarter of 2021.

The country's current installed solar capacity is 51.4 GW, according to Mercom's India Solar Project Tracker, which means India needs to install about 25 GW of solar annually until 2030 to achieve the goal.

A possible hurdle in meeting this target would be that solar deployment is land-intensive, and scaling up projects requires sizeable contiguous land parcels, which have its set of challenges.

To keep the pace of development adequate with India's national targets for solar capacity additions, alternatives such as floating solar need to be explored and established. Floating solar or floating photovoltaic (FPV) are solar modules mounted on a structure that floats on a body of water.

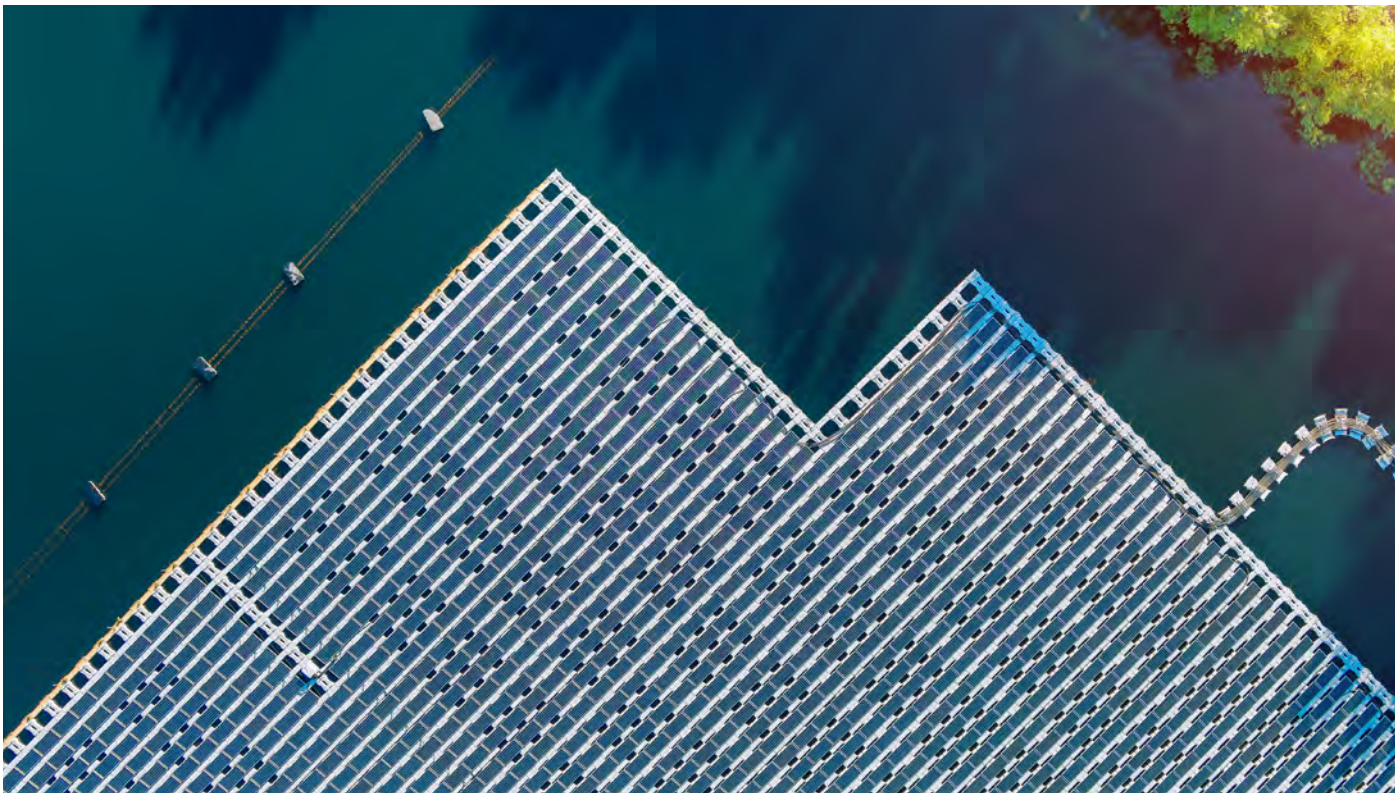
Despite numerous advantages over ground-mounted solar projects, floating solar has seen a considerably lower number of installations in the country; India has about 170 MW of floating solar projects currently in operation compared to 52 GW of solar installed in the country.

Mercom spoke to industry stakeholders who have been managing the floating solar projects to understand the advantages, challenges, and future potential of such projects across India.

Why Floating Solar?

The Energy and Resources Institute (TERI), in its report published in 2020, found that India's reservoirs have 18,000 sq. km of area with the potential to generate 280 GW of solar power through floating solar projects. This translates to India's entire installed solar capacity goal for 2030.

Speaking to Mercom, a top executive of a government-owned oil and gas corporation, said, "We have been in the renewables space with numerous ground-mounted and rooftop solar projects installed at our facilities nationwide. However, as rooftops and land is finite, we had to look for other options. Being a petrochemical complex, we had a huge man-made



reservoir catering to our purpose. We decided to use this reservoir to install a floating solar project."

"Another benefit we noticed is that floating solar project provided shade to the body of water and reduced evaporation from our reservoir. This is particularly useful in areas like ours, susceptible to drought, as water loss due to evaporation can add up over time and contribute to a shortage. There is also a significant reduction in operations and maintenance costs as the water from the reservoirs is used to clean the modules. We didn't have to dig a bore well or channel water through pipes from a faraway source."

Pankaj Kumar, Co-Founder and Director of Quant Solar said, "Solar modules are durable and can perform under high temperatures. But as with other electronics, with higher temperatures come decreased power outputs. Solar panel performance tends to decline as temperatures rise, causing worry among the property owners looking to install modules in a hot and sunny climate. The bodies of water that host floating solar arrays help cool down the solar equipment, which means the modules produce electricity at higher efficiencies in hot climates than they might otherwise."

"Adding floating solar to dams makes sense because dams are generally large, open bodies of water with good road access and pre-existing infrastructure. So the entire project cost can be drastically reduced as there is no need to build a new transmission system," Kumar added.

The Challenges

"One of the biggest challenges floating solar faces is the lack of technical know-how. Currently, there are just a handful of companies in the floating solar space. As more players enter the space and there is more traction, we can increase the size of the knowledge pool. The relatively higher project cost is another challenge that floating solar has gradually overcome. As with any new technology, it will take time for floating solar to become economical. If you see ground-mounted solar, it took nearly a decade for it to become as economical as it is today. Despite being a relatively newer technology, Floating solar will achieve price parity with ground-mounted projects in terms of project costs, in my opinion," Kumar said.

The way forward

Talking to Mercom about the potential of floating solar, Kumar said," If you closely observe the pattern, you can see that the size of floating solar projects has risen year-over-year. A couple of years ago, 2 MW was the size of the biggest floating solar project. Now there are many projects above 20- 30 MW. Soon we will have a 600 MW floating solar project in the backwaters of Omkareshwar Dam in Madhya Pradesh. This clearly indicates the prominent role floating solar will play in India's renewable portfolio in the coming years."

"Companies like Quant solar, which are engaged in research and development of floating solar, should be promoted by the government so that the industry can grow in totality. Government can consider providing grants or opportunities to collaborate with premium institutions like the Indian Institute of Technology or the Indian Institute of Science. This support from the government will also give the push required for more players to come into the floating solar segment and boost the sector as a whole."

"Government should consider bringing the manufacturing of floating structures under the production linked incentive (PLI) program. Without government support, it is hard for any industry to grow." Kumar concluded.

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Solar Module Imports Surge in Q1

Indian solar developers stockpile solar modules to save on costs before the BCD regulations come into effect in April

By : Arjun Joshi

Indian solar developers have procured 9.7 GW of solar modules in the first quarter (Q1) of 2022 and stockpiled them ahead of Basic Customs Duty (BCD) on solar cells and modules, which took effect on April 1. Imports surged by 210% year-over-year compared to 3.13 GW imported in Q1 2021.

Many developers feel domestic module manufacturing capacity is yet to ramp up. They say it will take time for local manufacturing to achieve quality and efficiency compared to imported modules.

The stockpiling is to save on module costs, which increased by 40% once BCD kicked in. The exponential increase in imports of cells and modules was mainly from China. In March alone, the top 20 Indian solar developers imported 4.2 GW of solar modules.

The top five developers accounted for around 38% of the total imports in March. A detailed list of exporters and importers is available by subscribing to Mercom's India Solar Export-Import Tracker.

Jinko Solar was the top supplier during the quarter. TRINA Solar, JA Solar, LONGi Solar, and Canadian Solar were the other top suppliers.

The prices of Chinese modules have increased for seven sequential quarters

The average cost of large-scale solar projects in the fourth quarter of 2021 (Q4 2021) was approximately ₹43 million (-$566,008)/MW, according to Mercom's recently released 2021 Q4 and Annual India Solar Market Update. The average cost increased by 21.6% compared to the same period last year when it was ₹35.3 million (-$488,255)/MW and a 1% rise from the previous quarter when the cost was about ₹4.24 million (-$559,828)/MW.

According to the report, the average selling price (ASP) of polycrystalline modules from China increased by 10% compared to the previous quarter. In contrast, the ASP of Chinese mono PERC modules increased by 1% compared to Q3 2021. The Chinese polycrystalline module ASPs in 2021 recorded the highest rise in recent history, with a 35% increase YoY.

The prices of Chinese modules have increased for seven sequential quarters, a trend that has never been seen in the past ten years. Module prices had only seen an upward trend in just two quarters before the pandemic in the past five years. Solar module manufacturers also believe that prices of Chinese modules are expected to stay high through Q1 2022.

Prices of the Indian modules also increased. The ASP of the Indian polycrystalline modules increased by 3%, and the Indian mono PERC module ASP increased by 1% compared to the previous quarter. Indian modules manufacturers mainly rely on Chinese cells to fabricate their modules. It is to be seen how more expensive Indian modules can get in the light of 25% BCD on Chinese cell imports.

For an in-depth look at the data, analysis, and charts, subscribe to our quarterly market report - Mercom India Solar Update. Detailed solar import and export data by component types, suppliers, manufacturers, and developers are available in Mercom's India Solar Export-Import Tracker.

Gujarat's Largest Rooftop Solar Tender Hits a Snag

The tender to install 1 GW of rooftop solar systems has been postponed due to objections raised by various developers about the high deposit requirements specified for various capacities

By : Satish Shetty

Madhya Gujarat Vij Company Limited's (MGVCL's) empanelment tender, one of Gujarat's largest, to install 1 GW of residential rooftop solar systems in urban and rural areas has hit a roadblock because of the high earnest money deposit (EMD) amounts specified for various capacities.

Rooftop solar tenders and EMD

The MGVCL issued two empanelment tenders under the Phase-II grid-connected rooftop solar program of the Ministry of New and Renewable Energy (MNRE) and the SURYA Gujarat program in Gujarat. One of the tenders was to install 700 MW of residential rooftop solar systems in urban areas. Another one was to install 300 MW of residential rooftop solar systems in rural areas.

The EMD for each bidder, regardless of the capacity they bid for, is about ₹20-₹25 million

When rooftop solar project tenders are floated, the total capacity is divided into capacity ranges. For each capacity range, there is an aggregate capacity specified. Bidders are notified of the minimum and maximum they can bid under each capacity range.

The bidders after that bid for these capacity ranges. When calculating the earnest money deposit amounts for the capacity bid by developers, the project cost of the overall aggregate capacity is considered.

In the rooftop tenders issued by MGVCL, the EMD amounts are charged for the total capacity under each category even if the engineering, procurement, and construction (EPC) companies are bidding for only a part of the aggregate capacity. This has made it difficult for Micro, Small, and Medium Enterprises (MSME) and other small-scale EPCs to bid for the projects.

MNRE recently announced that the EMD of 2% of the estimated project cost would continue for all renewable energy tenders issued on or after January 1, 2022.

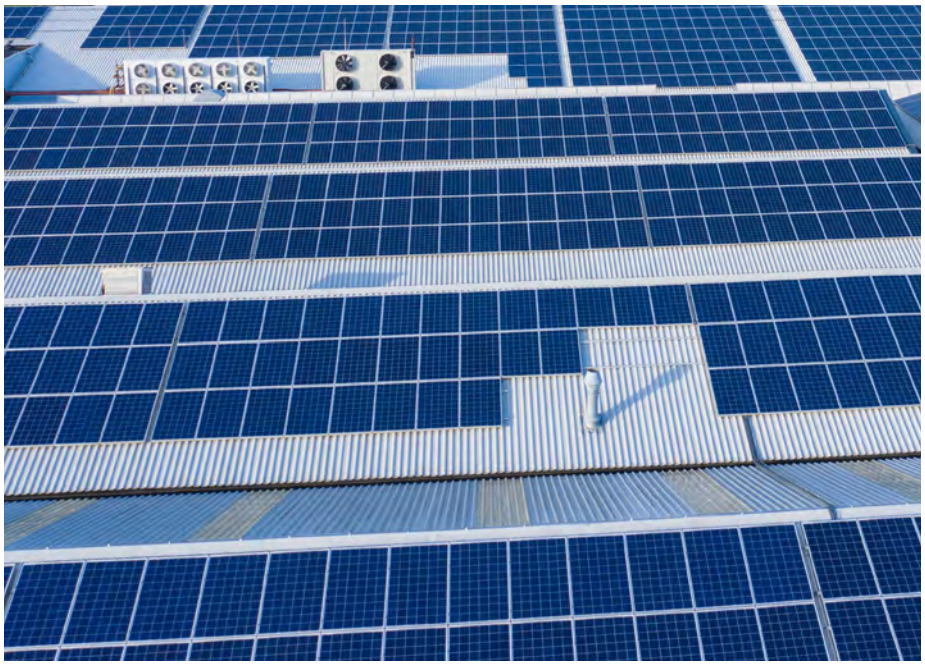
Industry reaction

Mercom India spoke to a few developers to understand how the EMD amount has impacted the bidding for these tenders.

T.S. Jain, Managing Director of Citizen Solar, a Gujarat-based solar module manufacturer, said, "Previously when tenders were issued in Gujarat, the EMD amounts were always in lakhs. For the last two rooftop tenders in the state, it was ₹700,000 (~$9,160) and ₹1.2 million (~$15,704). MGVCL, in its latest tender, has divided the total 1 GW rooftop solar capacity into two tenders, 700 MW for urban areas and 300 MW for rural areas. The EMD for each bidder, regardless of the capacity ranges they have bid for, comes to approximately ₹20-₹25 million (~$261,728 - $327,160). Smaller EPCs who cannot afford this will end up dropping out, leaving just the bigger players to handle the overall capacity."

Shashank Bhavsar, a partner in RE 360, another Gujarat-based EPC company, said, "This is one of the largest rooftop solar capacities tendered in Gujarat and the country. Going with the same conditions as the previous tenders would make the process much easier for all the EPC companies in the state. Earlier the EMD amounts were fixed for the tenders since the quantum was less. Even if they consider increasing the EMD for these tenders to ₹2.5 million (~$32,716), most EPCs can still afford to bid. Currently, it is ten times more than what it should be, which is why most small-scale EPCs will drop out. A few bigger players with their own manufacturing units will be the only ones to win the projects."

A senior executive from another Gujarat-based EPC company said, "The new 700 MW and 300 MW tenders by MGVCL have been halted for a while now due to the disagreement between the bidders and the DISCOM concerning the high EMD amount, which most Micro, Small and Medium Enterprises (MSMEs) cannot afford. If we compare



it with previous rooftop solar tenders in the state, the policy was very different. The developers were required to submit a one-time fixed EMD per category, regardless of the capacity, be it 1 kW, 2 kW, 4 kW, or 10 kW. In the new tenders, a developer must pay a separate EMD for every part they bid. If, as a developer, we wish to bid for 1 kW to 100 kW capacity, we will end up paying approximately ₹25 million (~$327,160) upfront to MGVCL before starting the projects, which is very tough for us. So, most of us have to commit to small capacity ranges, which does not become feasible cost-wise."

What next?

Jain said that most of the participating developers in the pre-bid meeting said the EMD requirement was high. "The DISCOM has said they will approach the MNRE and make the changes only after their approval. After that meeting, we are still waiting for updates and expect the tender deadlines to be extended. At the meeting, we also discussed the impact of basic customs duty on the project cost and requested an extension until March when the prices would stabilize."

Bhavsar said, "The tender norms are as per the MNRE regulations, so their approval on calculating the EMD will be essential. We have been doing this for the last five years in Gujarat and have seen considerable progress in the tender process. The process has become more transparent, and there are guidelines for faster approvals reducing the time to commission the projects, and even setting up the net metering. So, if they continue with the same and just reduce the EMD, we see the sector in the state going a long way."

"In Gujarat, larger capacities like 1 GW or even 2 GW can be easily covered as the acceptance rate is much higher with the new transparent process. Previously moving files through DISCOMs was difficult and the process used to take three to four months. Whereas now the process takes just a month or so, which includes commissioning to set up net meters etc."

"The simplified process alongside feasible EMD amounts, providing an equal platform for all EPC players, will help take the rooftop solar capacities to a new high across the country," Bhavsar said.

With the changes still under discussion and awaiting approval from MNRE, the tender, if amended, will make way for more such tenders across the country with higher capacities rolled out and could ensure more participation from all EPC companies.

If India has to reach the 280 GW of installed solar capacity by 2030, developers feel tender specifications should be made simple, and prohibitive EMD requirements should be avoided.

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Solar Tender and Auction Activity Slumps in Q1

The solar tenders and auction activity dipped in the first quarter as agencies try to clear their previous backlog and DISCOMs await their RPO target finalization

By : Arjun Joshi

Various government agencies floated solar tenders totaling approximately 5 GW in the first quarter (Q1) of the calendar year (CY) 2022, a decrease of 18% compared to the previous quarter, according to Mercom India Research. Tender announcements were down by 52% year-over-year (YoY) compared to the same period last year.

A slowdown in tender announcements by Solar Energy Corporation of India (SECI) in Q1 contributed to the decline in activity.

There was a 91% drop in SECI's tender announcements compared to the previous quarter, as it has been trying to clear the backlog of power sale agreements with the distribution companies (DISCOMs).

The tender activity is expected to resume in the coming quarters.

The growth of solar in states is driven by the renewable purchase obligation of the DISCOMs. Most states are yet to notify their revised RPO targets aligned with 2022 capacity obligations, and many DISCOMs are waiting for these RPO revisions to prepare their plan of action.

Auctions were held for almost 2.7 GW of solar projects in Q1 2022, a 37% drop compared to Q4 2021. The auction activity was down by 66% YoY compared to the same period last year.

Clarity on the basic customs duty applicable from April 1, 2022, is also expected to pave the way for auction announcements in the next few months.

Top agencies issuing tenders

NTPC led the activity, with 35% of the total tenders floated in Q1 2022. Maharashtra State Electricity Distribution Company Limited (MSEDCL) issued 26% of the total tenders floated, followed by Gujarat Urja Vikas Nigam Limited (GUVNL) with 10%, Madhya Pradesh Urja Vikas Nigam Limited with 9%, and Gujarat State Electricity Corporation Limited with 6%.

SECI contributed about 3% of the tenders announced in the quarter, compared to 27.5% in Q4 2021.

Major tenders floated in Q1 2022

MSEDCL issued a request for selection (RfS) to procure 865 MW of solar power from existing and new projects to be developed in the state. The ceiling tariff for the tender was ₹3.10 (-$0.041)/kWh.

GUVNL invited bids from developers to purchase power from 500 MW of grid-connected solar power projects (Phase-XIII).

NTPC Renewable Energy invited bids from developers to set up interstate transmission system (ISTS)-connected energy storage systems of 3,000 MWh capacity with 500 MW renewable energy (solar or wind) capacity anywhere in India.

Important auctions in Q1 2022

In SECI's auction for 1,200 MW, ISTS-connected solar projects (Tranche-X) in Karnataka, Project Eight Renewable Power (Ayana Renewable Power), and SolarOne Energy (Fortum) were declared winners.

NTPC announced the auction results for a balance of systems (BoS) package for the 735 (3*245) MW Nokh solar project in Rajasthan. The winners were Larsen & Toubro, Amara Raja Group, and Jakson Group.

Fortum Power (Alpha Energy), SJVN, Hinduja Renewables Energy, and UPC Renewables (AMSA Solar Energy) were declared winners in the GUVNL's auction to purchase power from 500 MW of grid-connected solar projects (Phase XIII).

Subscribe to Mercom's India Solar Tender Tracker to stay on top of tender activity in real-time.

India Large Scale Solar Tenders and Auctions by Quarter (MW)

Source: Mercom India Research (Mar 2022)

Battery Swapping Policy Proposed by NITI Aayog

In line with the union budget announcement this year, NITI Aayog has released the draft battery swapping policy to address the technical, regulatory and financial aspects

By : Arjun Joshi

NITI Aayog has issued the draft battery swapping policy addressing the key technical, regulatory, institutional, and financing challenges to help India develop battery-swapping ecosystems to unlock the large-scale adoption of battery-swapping.

The policy aims to promote the adoption of battery swapping technology implemented via Battery as a Service (BaaS) business model, ensuring lower upfront costs, minimal downtime, and lower space requirements.

Stakeholders must submit their comments by June 5, 2022.

Battery-swapping caters to the charging requirements of battery-powered electric vehicles (EV) that involves replacing discharged batteries or partially charged batteries of EVs with charged batteries which can be conveniently carried out manually or with mechanical intervention.

There are currently a limited number of battery-swapping service providers engaging with original equipment manufacturers (OEMs) and other stakeholders to develop ecosystems of swapping services. The government announced plans to introduce a Battery Swapping Policy in its Budget 2022-23.

Objectives

The draft policy promotes battery swapping using advanced chemistry cell batteries to decouple battery costs from the upfront costs of purchasing EVs. It also seeks to set technical standards that would enable the interoperability of components within a battery swapping ecosystem. Without hindering market-led innovation, the draft seeks to use regulatory levers to de-risk the battery swapping ecosystem and unlock access to competitive financing.

The policy hopes to encourage partnerships among battery providers, OEMs, and other partners such as financial institutions. It intends to encourage the formation of ecosystems capable of delivering integrated services to end-users and promoting better lifecycle management of batteries, including maximizing the use of batteries during their usable lifetime and end-of-life battery recycling.

Requirements

The policy will only support batteries using advanced chemistry cells with equivalent or superior performance to EV batteries supported under the second phase of the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME-II) Program. Battery providers must demonstrate end-to-end compatibility between batteries and other components of the swapping ecosystem.

Batteries covered under this policy must be enabled with a battery management system (BMS). Manufacturers must ensure that appropriate BMS is in place to protect the battery from conditions such as thermal runaway. Swappable batteries will be equipped with advanced features like the internet of things (IoT) -based battery monitoring systems, remote monitoring and immobilization capabilities, and other required control features to ensure battery safety and security.

Unique identification number

To implement unique traceability across the battery lifecycle, a unique identification number (UIN) must be assigned at the manufacturing stage for tracking and monitoring EV batteries. Various tracking and tracking solutions are used in different industry sectors, and an appropriate system may be applied to EV batteries that are tamper-proof and allow centralized monitoring. The authorities will develop the standard or generic methodology and a detailed definition of the UIN system for EV batteries.

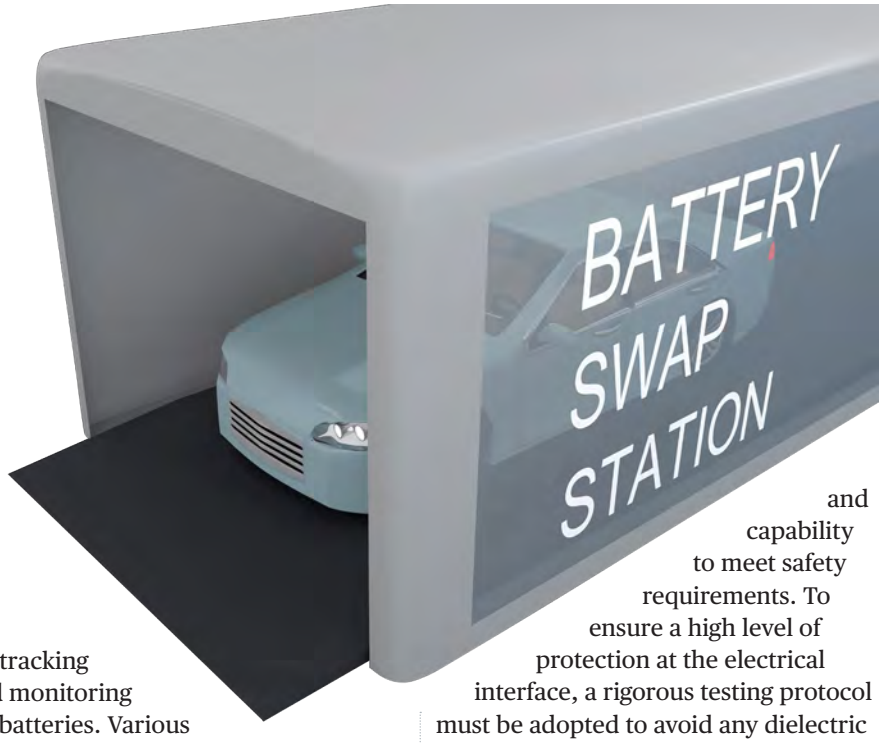
The OEMs will map the required technical data of the battery with the UIN of the battery pack at the manufacturing stage. The battery-swapping operator must store the battery's usage history and required performance data with UIN during EV application. Data must be maintained to facilitate the traceability of EV batteries during the entire lifecycle.

Each battery-swapping station will be assigned a UIN number.

Testing and certification

Batteries must be tested and certified as per AIS 156 (2020) and AIS 038 Rev 2 (2020) standards for the safety of traction battery packs, as well as additional tests that may be prescribed for swappable batteries, which are subject to multiple coupling and decoupling processes at the connectors.

BMS of the battery must be self-certified and open for testing to check its combability with various systems and capability to meet safety requirements. To ensure a high level of protection at the electrical interface, a rigorous testing protocol must be adopted to avoid any dielectric breakdown, arc phenomenon, or any unwanted temperature rise at the electrical interface.



Fiscal support

The draft policy proposes that demand-side incentives offered under existing or new policies for EV purchase can be made available to EVs with swappable batteries. The size of the incentive could be determined based on the kWh rating of the battery and compatible EV. It is also proposed that the ministry or department concerned work out a seamless mechanism for the disbursement of subsidies.

Battery providers will receive the subsidy, provided the battery swapping ecosystem that they represent satisfies the technical and operational requirements. Subsidies may be linked to the UIN of EVs and batteries to ensure no double-dipping.

The policy may specify a minimum contract duration for the contracts to be signed between the EV users and battery providers to ensure that battery providers continue to provide battery swapping services after qualifying for any subsidies.

The policy may also set eligibility criteria based on performance for EVs and swappable batteries, aligned with requirements under FAME II, to ensure only high-quality EVs and swappable batteries get the incentives.

Re-use and recycling ecosystem

To address the safety, reusability, and sustainability of the business models in the second-life application of the used EV batteries, standards for the re-use and re-purposing of the end-of-first-life batteries from EV applications must be developed by the Bureau of Indian Standards.

Nodal agencies

The Bureau of Energy Efficiency (BEE) will be responsible for implementing battery swapping networks across the country.

Transport departments and state transport authorities will be responsible for easing registration processes for vehicles sold without batteries or vehicles with battery swapping functionality.

The Bureau of Energy Efficiency will be responsible for implementing battery swapping networks across the country

Municipal corporations will be responsible for planning, zoning permissions, and land allocation for battery swapping stations.

Energy departments and electricity distribution companies will be responsible for supplying power to battery swapping stations and any policy support concerning power connections.

State electricity regulatory commissions will be responsible for concessional power tariffs, open access, and other regulatory incentives or support for battery swapping services.

As per a recent report, 'Banking on Electric Vehicles in India' by NITI Aayog, the inclusion of EVs in Reserve Bank of India's priority sector lending guidelines could help unlock EV financing of up to ₹3.7 trillion (~$49.27 billion) by 2030.

In September, The Union Government had notified the Production Linked Incentive (PLI) program for automobile and auto components. It is estimated that the PLI program will lead to investments of over ₹425 billion (~$5.72 billion) in five years and incremental production of over ₹2.3 trillion (~$ 31 billion). The program is expected to create over 750,000 jobs.

Share of Solar Rises to 13.2% of India's Total Installed Power Capacity

Renewable Energy capacity saw a marginal increase during Q1 2022, as solar continued to dominate the market share, followed by hydropower and wind

By : Arjun Joshi

India's installed renewable energy capacity, including large hydro projects, stood at 155.26 GW, accounting for a 39% share of the overall power mix at the end of the first quarter (Q1) of 2022, according to data from the Central Electricity Authority (CEA), Ministry of New and Renewable Energy (MNRE), and Mercom's India Solar Project Tracker.

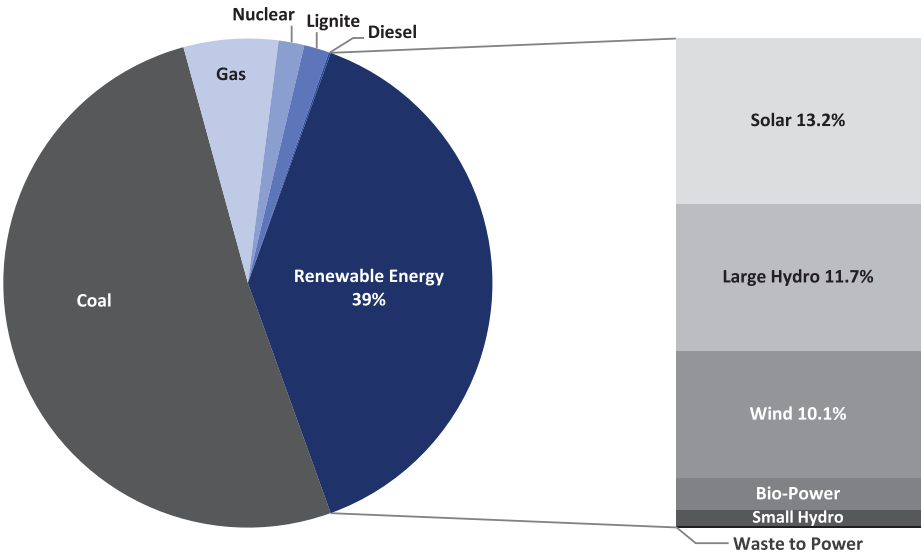
The share of renewable energy increased marginally from the previous quarter when total renewable installations stood at 151.3 GW.

Solar leads among renewables and accounts for 13.22% of India's total installed power capacity and 34% of the total installed renewable capacity in Q1 2022. India had installed a record 10 GW of new solar capacity in 2021, a big jump of 210% year-over-year (YoY) compared to 3.2 GW installed in 2020. In Q4 2021, India added 2.6 GW of solar, a decline of 7% compared to 2.8 GW installed in Q3 2021. The installations increased by 74% YoY compared to 1.5 GW in Q4 2020.

With a total capacity of around 46.72 GW, large hydro accounted for 11.73% of the total installed power capacity in the first quarter of 2022. India had approximately 40.36 GW of wind installations, representing around 10.14% of the total installed power capacity in Q1 2022. Meanwhile, biomass and small hydro accounted for 2.56% and 1.22% of the cumulative installed power capacity.

India - Cumulative Installed Power Capacity Mix (%)

Renewables (including Large Hydro) comprise ~39% of India's total installed capacity, with solar accounting for ~13.2%. Among renewables, solar accounts for ~34% of the installed capacity



Data from CEA, MNRE, Mercom India Solar Project Tracker (Installed Capacity as on 31 Mar 2022)

Source: Mercom India Research

Energy from conventional sources

The installed capacity of conventional power sources was nearly 242.89 GW at the end of Q1 2022. It accounted for 61% of the total installed power capacity - a slight decrease from 61.53% in Q4 2021.

The segment included electricity generated from thermal-based sources, including coal at 51.26%, gas at 6.25%, nuclear at 1.7%, lignite at 1.66%, and diesel at 0.13% of the cumulative installed power capacity.

Coal continues to lead the way with over 204 GW of installed capacity at the end of Q1 2022, a marginal increase from 203 GW in Q4 2021. However, its overall market share declined slightly to 51.26%, compared to 51.66% in the previous quarter.

International Energy Agency had reported that solar energy will witness exponential growth and match coal's share in the Indian power generation mix by 2040 or earlier. The share of coal is expected to decline from 44% in 2019 to 34% in 2040.

Karnataka's Renewable Energy Policy

The government of Karnataka, in its new renewable energy policy, details future development plans for key energy markets and related regulations

By : Rakesh Ranjan Parashar

The Government of Karnataka has announced the new 'Karnataka Renewable Energy Policy,' which will be valid for the 2022-2027 period. The policy aims to project Karnataka as a preferred investment destination for renewables and create an ecosystem for sustainable and green energy development.

The state aims to develop 10 GW of additional renewable projects, with or without energy storage systems and 1 GW of rooftop solar installations in the next five years.

Karnataka is one of the leading states with nearly 15.91 GW of installed renewable energy capacity as of March 2022, according to Mercom's India Solar Project Tracker.

The policy aims to develop key energy markets in the state, including the green energy corridor, renewable energy parks, solar, wind, energy storage, hybrid power projects, biomass, co-generation, waste-to-energy projects, and mini and small hydropower projects.

Karnataka is also home to one of the largest solar parks - Pavagada Solar Park, which has an operational capacity of 2,050 MW.

The Ministry of New and Renewable Energy (MNRE) has already identified sites for park development in Karnataka at Chitradurga, Davangere, and Ballari, with a cumulative development potential of 11.07 GW.

Solar energy projects

Karnataka will focus on developing grid-connected solar projects, rooftop solar, distributed solar generation, solar-powered charging stations for electric vehicles (EVs), and floating solar projects.

Solar projects with a minimum capacity of 1 MW will be considered MW-scale grid-connected solar projects. The project developer will be allowed to develop MW-scale solar projects through the open access route for the sale of energy in the state.

The project developer will be allowed to set up off-grid solar projects within their premises after informing the electricity supply companies (ESCOMs).

If the solar project is set up within the premises of a consumer which is connected to the grid interface of the ESCOMs or the Karnataka Power Transmission Corporation Limited (KPTCL), the developer will have to

pay the grid support charges and other charges as determined by the Karnataka Electricity Regulatory Commission (KERC).

The net metering facility will not be available for projects under this category that are connected to the grid interface of ESCOMs or KPTCL.

Rooftop solar projects

Karnataka will promote grid-connected rooftop solar systems on public and residential buildings, commercial and industrial establishments, and others through net metering and gross metering arrangements per the KERC Regulations, 2016 to meet the target of 1 GW.

The government will also promote peer-to-peer trading of rooftop solar energy and promote pilot projects. The policy will also promote off-grid rooftop solar installations.

Floating solar projects

The government aims to promote floating solar projects on existing dams, reservoirs, and other water bodies. The state will allocate the water body on a long-term lease or rental basis to develop projects under the intrastate transmission system (InSTS) or ISTS programs.

Wind energy projects

As of December 2021, the installed wind energy capacity in the state stood at 5.1 GW. To tap the wind energy opportunities in the state, the policy aims to develop new wind energy projects and repower existing projects.

The selection of projects under the InSTS category will be through a competitive bidding process as per the requirements of the ESCOMs to fulfill their RPO targets fixed by KERC.

The selection of projects under the ISTS category will be through a competitive bidding process conducted by intermediaries such as the Solar Energy Corporation of India (SECI) and NTPC. The project developer can also develop projects under the open access route for the sale of energy outside Karnataka according to the guidelines issued from time to time.

Wind-solar hybrid projects

To tap the wind-solar hybrid energy opportunities in the state and cater to the demand for low cost and higher availability of renewable energy, the policy will focus on developing wind-solar hybrid markets like the hybridization of existing projects and developing new hybrid projects.

The open access charges for wind-solar hybrid projects in the state will be as per KERC regulations.

In the case of hybridization of existing projects by either addition of wind or solar energy, the additional energy from such projects may be purchased by ESCOMs at the tariff discovered thorugh competitive bidding.

Energy storage projects

The state aims to develop energy storage projects, including pumped hydro storage, to integrate more renewable energy into the grid. This will help in peak reduction, managing curtailment, intraday and seasonal variations, and meeting the increasing power demand of the state through renewable energy.

The energy storage service providers can tie up with renewable developers or utilize any energy source to store the energy. The stored energy can be sold to ESCOMs, procurers, or open access consumers within Karnataka or outside Karnataka.

The available open access charges for energy use from the energy storage services in the state will be as per KERC regulations.

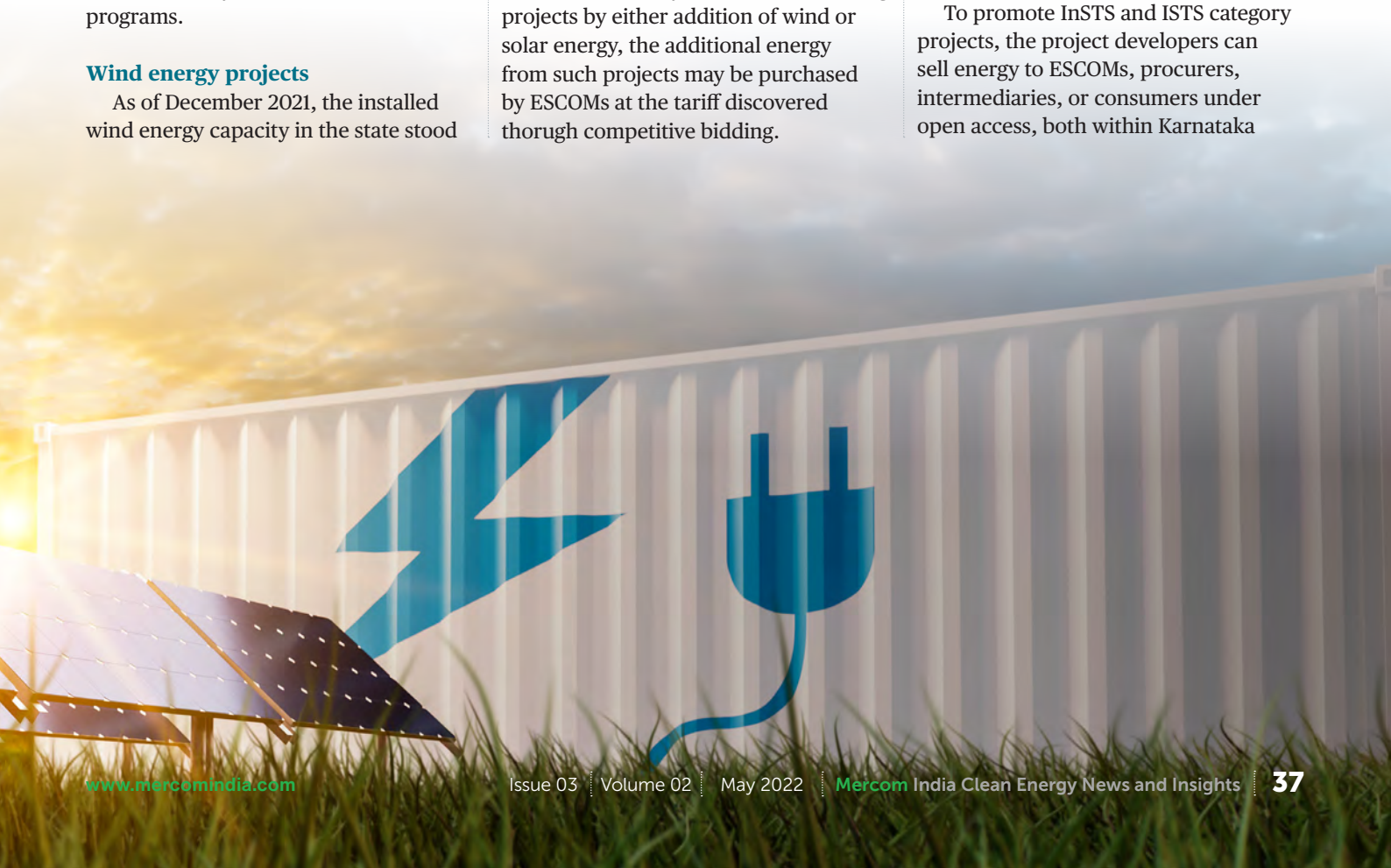
Biomass and co-generation projects

The government will also provide support for the development of biomass projects and co-generation projects in the state.

The developer of the co-generation projects will be allowed to use the power for captive use or sale in power exchange or third-party sale within and outside Karnataka.

Sale of Energy

To promote InSTS and ISTS category projects, the project developers can sell energy to ESCOMs, procurers, intermediaries, or consumers under open access, both within Karnataka



Karnataka: Timeline for Completion of Renewable Energy Projects Under Captive/Group Captive and Third-Party Mode

Renewable Energy Projects	Stipulated Commissioning Timeline From the Date of Government Order	Extension of Time with Payment of Applicable Time Extension Fee
Solar Energy Projects (including Floating Solar)/ Solar Parks with or without Energy Storage	Within 2 Years	Maximum up to 2 years
Wind Energy Projects/ Wind Parks including Hybrid with or without Energy Storage	Within 2 Years	Maximum up to 2 years
Biomass, Co-generation and Waste to Energy	Within 2 Years	Maximum up to 2 years
Energy Storage	Within 1 Year (for Non-Pumped-Hydroelectric Storage (PHS))	Maximum up to 1 years
	Within 4 Years (for PHS)	Maximum up to 2 years
Mini and Small Hydropower Projects	Within 3 Years	Maximum up to 2 years

Source: Karnataka Government

Mercom India Research

and outside the state. The project developer may also set up projects under the renewable energy certificate mechanism in compliance with the Central Electricity Regulatory Commission's (CERC) Regulations, 2010.

It will be the responsibility of the renewable energy developer to acquire or lease the land required for project development.

Projects connected to STU

The project developer will be allowed to connect the project with the state transmission utility (STU) for the InSTS category projects, subject to evacuation feasibility. The project developer will also be responsible for connecting the generation station to the nearest substation.

Time-bound clearance for transmission evacuation approval from KPTCL will be provided within 60 days from the date of the receipt of the required documents. If the power is evacuated using the ESCOM's network, the ESCOM should provide the evacuation approval within 45 days.

For the use of the InSTS network, the transmission charges and losses will be determined by KERC. Wheeling, banking, cross-subsidy surcharge, and any other applicable open access charges will be determined by KERC.

The project developer should comply with the KERC or CERC Regulations on forecasting, scheduling, and deviation settlement mechanism (DSM) related to long-term access (LTA), medium-term access (MTA), short-term access (STA), and connectivity.

Projects connected to CTU

For the use of ISTS by the developer, the applicable transmission charges and losses will be determined by CERC. There will be no banking facility for renewable projects implemented under the ISTS category.

The project developers should comply with the CERC regulations on forecasting, scheduling, and deviation settlement for LTA, MTA, and STA.

Projects connected to CTU through STU

The project developer will be allowed to connect to the nearest available STU substation to connect with the CTU under the ISTS category projects.

The project developer will bear the cost of the existing or new external evacuation infrastructure, including the connecting line, grid substations, and upstream network up to the CTU. The developer will carry out the construction of such network infrastructure at their own cost under the supervision of KPTCL. The developer will also have to bear the transmission charges and losses.

Green energy corridor

Karnataka will encourage private sector investments and public-private partnerships under this policy for developing renewable energy parks. The state will promote the development of the green energy corridor projects as per state and central government guidelines.

Renewable energy parks

The government aims to promote the development of renewable energy parks, with or without storage in the state. The minimum capacity for the solar park will be 25 MW, and the maximum capacity will be determined as per the guidelines of MNRE.

Project development timeline

The timeline for the development of renewable projects under captive, group captive, and third-party sale (both within and outside renewable energy parks) is mentioned below:

The Karnataka Renewable Energy Development Limited (KREDL) is the state nodal agency for the implementation of this policy.

Last October, KREDL reissued the 'Draft Karnataka Renewable Energy Policy 2021-2026' to develop 10 GW of renewable energy projects with and without energy storage. Earlier in March 2021, KREDL had issued the 'Draft Renewable Energy Policy 2021-2026' to develop 20 GW of renewable projects with and without energy storage. Of this target, 2 GW was set aside for rooftop solar.

Subscribe to Mercom's real-time Regulatory Updates to ensure you don't miss any critical updates from the renewable industry.

Ministry Warns EV Companies About Battery Fires

The minister of Road Transport and Highways issued a warning of heavy penalties, mass recall of EVs, and formation of an expert investigation committee following battery fires across India

By : Arjun Joshi

Minister of Road Transport and Highways of India Nitin Gadkari has warned that any electric vehicle (EV) company found to be negligent in its manufacturing process will face heavy penalties, and a recall of all defective vehicles will be ordered.

In a series of tweets, Gadkari said EV companies are encouraged to take pre-emptive action to recall all defective batches of vehicles immediately.

The minister's statement comes in response to a series of accidents and battery fires in EVs in the last few weeks.

Gadkari said that an expert committee had been constituted to inquire into these incidents and recommend remedial steps. The ministry will issue necessary orders on the defaulting companies based on the reports.

The minister also said that quality-centric guidelines for EVs will be issued soon.

In recent days, EVs going up in flames have sparked safety concerns among users. In one of the unfortunate cases, a man and his daughter died of suffocation after their electric scooter, parked outside their house, caught fire. In another incident, an 80-year-old man died while his family members suffered burns when the battery of an electric scooter exploded in their house in Telangana.

While no conclusive reasons have been given for these incidents, experts have hinted that rising temperatures and manufacturing defects could be possible causes of the fires.

The government thinktank NITI Aayog, in the recently-issued draft battery swapping policy, suggested that batteries must be enabled with a battery management system (BMS). The draft also stated that manufacturers must ensure that appropriate BMS is in place to protect the battery from conditions such as thermal runaway.

The draft policy also said that the BMS of the battery must be self-certified and open for testing to check its combability with various systems and capability to meet safety requirements. To ensure a high level of protection at the electrical interface, a rigorous testing protocol must be adopted to avoid any dielectric breakdown, arc phenomenon, or any unwanted temperature rise at the electrical interface.

Several states, including Assam, Maharashtra, Delhi, and Gujarat, have launched state-specific EV policies to bolster EV and related-infrastructure production.

$7.5 Billion in Funding Went into the Solar Sector Globally in Q1

The solar corporate funding as well as mergers and acquisitions slowly gained momentum in the first quarter as the sector prepares for significant headwinds ahead

By : Satish Shetty

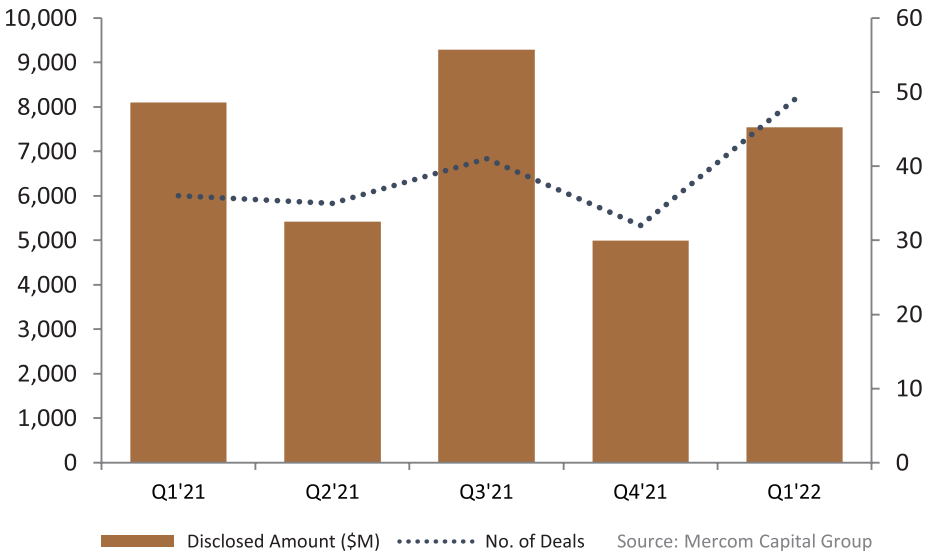
Total corporate funding–including venture capital (VC) funding, public market, and debt financing–into the solar sector globally came to $7.5 billion through 49 deals in the first quarter (Q1) 2022, according to Mercom Capital Group's recently published Q1 2022 Solar Funding and M&A Report.

This was a 51% increase quarter-over-quarter (QoQ) compared to $5 billion raised in 32 deals in Q4 2021 and a decrease of 7% year-over-year (YoY) compared to Q1 2021.

"Although financing activity was strong QoQ with robust demand for solar assets, significant headwinds are building up that can slow the momentum considerably," said Raj Prabhu, CEO at Mercom Capital Group.

"Continuing supply chain issues, higher inflation, and the interest rate trajectory going forward are already major concerns. Adding to this, if the Department of Commerce decides to impose tariffs on module imports from Malaysia, Cambodia, Thailand, and Vietnam, we could be looking at a substantial drop-off in the investment activity," he added.

Solar Corporate Funding Q1 2021-Q1 2022



Source: Mercom Capital Group

In Q1 2022, global VC funding in the solar sector was reported at $1.2 billion in 26 deals, a 19% increase compared to $1 billion in 14 deals in Q1 2021. However, it decreased by 45% compared to $2.2 billion raised in 19 deals in Q4 2021.

The top VC-funded companies in the quarter were: Palmetto, which raised $375 million, Aurora Solar with $200 million, DSD Renewables with $200 million, Aspen Power Partners with $120 million, and PosiGen with $100 million.

The first quarter saw 58 VC and

Solar Top VC Funded Companies in Q1 2022

Company	Amount ($M)	Funding Type	Investors
Palmetto	375	Series C	Social Capital, ArcTern Ventures, Gaingels, Lerer Hippeau, MacKinnon, Bennett & Co
aurora	200	Series D	Coatue, Energize Ventures, Fifth Wall, ICONIQ, Lux Capital, Emerson Collective
DSD	200	Undisclosed	Ares Management Corporation
aspen	120	Undisclosed	Ultra Capital, Redball Power
PosiGen Solar Energy and Energy Efficiency	100	Undisclosed	Energy & Infrastructure Group, Emerson Collective, Irradiant Partners, Activate Capital, The Builders Fund, SJF Ventures, The Kresge Foundation

Source: Mercom Capital Group

private equity investors participating in funding deals.

According to the report, solar public market financing activity totaled $2.5 billion in Q1 2022, a 115% increase compared to $1.2 billion raised in Q4 2021. In a YoY comparison, funding was slightly lower by 9%. There was one initial public offering (IPO) announced during the quarter.

Debt financing activity stood at $3.8 billion, a 137% increase compared to Q4 2021 when $1.6 billion was raised. However, debt financing was down 12% YoY.

The report notes that four securitization deals brought in $1.1 billion in Q1 2022, an 137% increase compared to the previous quarter when $458 million was raised in two deals.

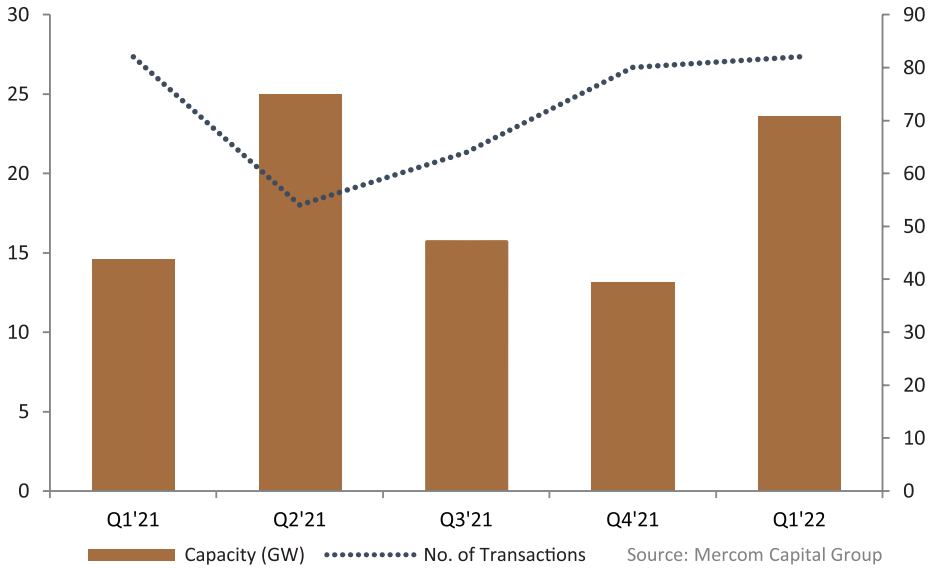
The report also revealed that during Q1 2022, there were 29 solar mergers and acquisition (M&A) transactions, down from 43 in Q4 2021. Solar downstream companies led the M&A activity.

According to the report, the solar project acquisition was the second most recorded to date in Q1 2022. A total of 23 GW of solar projects were acquired in Q1 2022 compared to 13.1 GW in the previous quarter.

Of these, project developers and independent power producers were the most active in the quarter, with over 17 GW of projects being acquired by them, followed by investment firms and funds, which acquired 3.6 GW.

Eighty-two large-scale solar projects were acquired in Q1 2022, spreading across 20 countries globally. The United States led in terms of recorded acquisitions with 17 GW, followed by Spain with 1.9 GW and the United Kingdom with over 1 GW of acquisitions.

Solar Project Acquisitions Q1 2021-Q1 2022 (By GW)



Source: Mercom Capital Group

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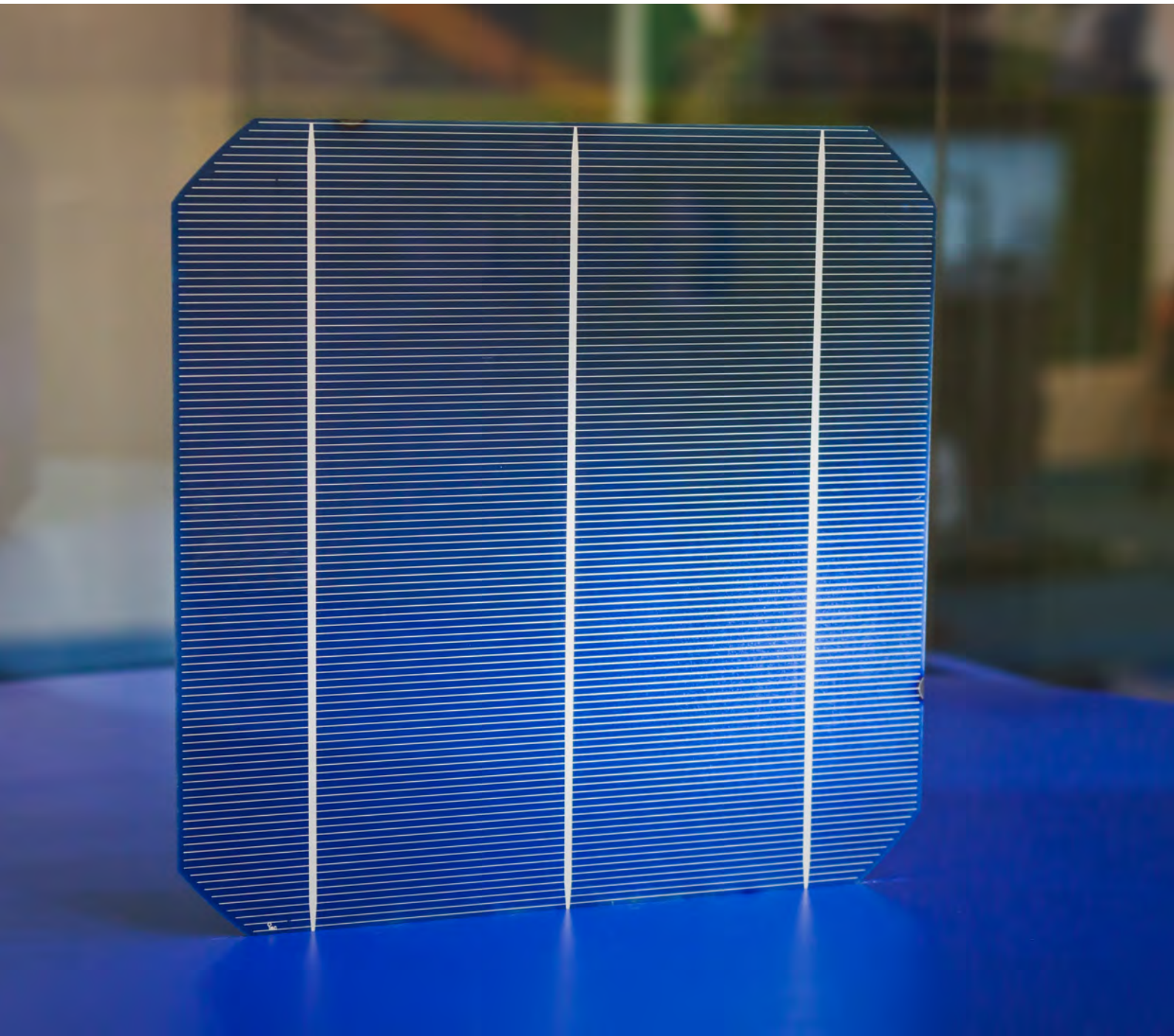
Solar Cell With Electricity Generation Capability During the Night

Researchers at Stanford University developed solar cells that can generate electricity even at night using the radiative cooling method

By : Satish Shetty



Researchers at Stanford University claimed to have developed a solar photovoltaic cell that harvests energy from the environment during the day and night using radiative cooling, avoiding the need for batteries altogether.

In a research paper published in the Applied Physics Letters by AIP Publishing, researchers from Stanford University claim that their device uses the heat leaking from the earth back into space - energy that is on the same order of magnitude as incoming solar radiation.

Standard solar PV cells provide a renewable off-grid source of electricity but only produce power from daytime solar irradiance and do not produce power at night. The researchers at Stanford claim that they have built a device that incorporates a thermoelectric generator that harvests electricity from the temperature difference between the PV cell and the ambient surrounding.

At night, solar cells radiate and lose heat to the sky, reaching temperatures a few degrees below the surrounding air. The device uses a thermoelectric module to generate voltage and current from the temperature gradient between the cell and the air. This process depends on the system's thermal design, which includes a hot side and a cold side.

One of the research paper authors, Sid Assawaworrarit, said, "You want the thermoelectric to have very good contact with both the cold side, which is the solar cell and the hot side, which is the ambient environment. If you don't have that, you're not going to get much power out of it."

According to the researchers, using electricity at night for lighting requires a few watts of power. The current device generates 50 milliwatts per square meter at nighttime with a clear night sky, with an open-circuit voltage of 100 mV, which means lighting would require about 20 square meters of photovoltaic area.

The thermoelectric generator provides additional power on top of the electric power generated directly from the PV cells during the daytime. The system can be used as a continuous renewable power source for both day and nighttime in off-grid locations.

Developing a means to extract energy from existing PV cells at night would alleviate the daytime limitation of PV power generation and reduce or eliminate the need for battery storage in electrical power systems.

The researchers also claim that the setup is inexpensive and, in principle, could be incorporated within existing solar cells, and their construction in remote locations with limited resources is also feasible.

"What we managed to do here is build the whole thing from off-the-shelf components, have a very good thermal contact, and the most expensive thing in the whole setup was the thermoelectric itself," said another author Zunaid Omair.

The team aims to optimize the device's thermal insulation and thermoelectric components. They intend to explore engineering improvements to the solar cell to enhance the radiative cooling performance without influencing its solar energy harvesting capability.

In 2020, researchers at the University of California came up with a solar cell that can work at night. designed a unique solar cell that can generate up to 50 W of solar power per square meter under ideal conditions at night. This is about a quarter of what a conventional solar cell can generate during the daytime.

Recently, a team of researchers from the University of Surrey and Imperial College London collaborated with Amsterdam's research institute AMOLF to develop a method to help achieve a 25% increase in energy levels absorbed by wafer-thin solar photovoltaic (PV) panels.

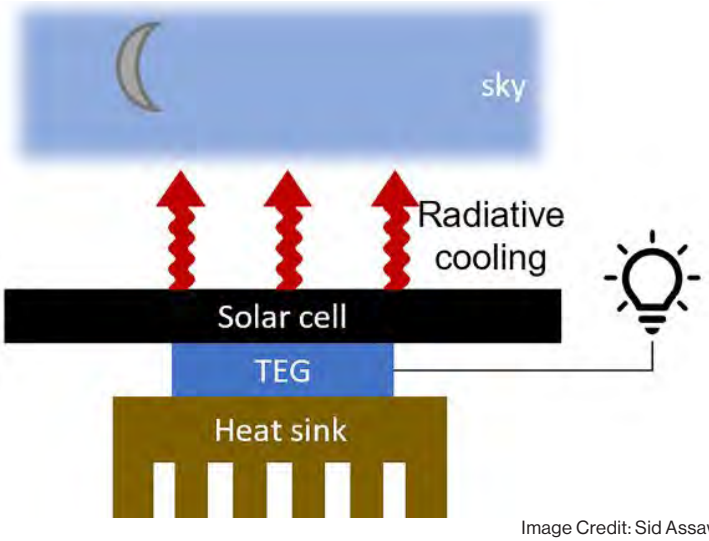


Image Credit: Sid Assawaworrarit

India's First-Ever Energy and Climate Index

The index designed by NITI Aayog ranks all the states for energy efficiency, environmental sustainability, and new initiatives to promote competition and enhance performances

By : Satish Shetty

Sixteen out of 35 Indian States and Union Territories (UT) lag behind the national average score in NITI Aayog's State Energy and Climate Index Round-I, designed to measure various energy efficiency and climate resilience factors.

The State Energy and Climate Index is India's first-ever index, aiming to track the efforts made by states and UTs in the climate and energy sector and provides an in-depth analysis of individual states to help enhance their performance in the sector.

The index expects to encourage healthy competition among the states on different dimensions of energy and climate by ranking them on their efforts to improve energy access, energy consumption, energy efficiency, and safeguarding the environment.

An iterative method was followed to reach the final set of indicators with follow-up meetings held with industry experts. The indicators were selected based on their importance and the availability of reliable annual data from existing data sources; the data used for this analysis is from 2019 to 2020. And for a better comparison, the states were classified as larger states, smaller states, and union territories.

The index consists of six parameters: DISCOM's performance; Access, Affordability, and Reliability; Clean Energy initiatives; Energy Efficiency; Environmental Sustainability; and New Initiatives. The parameters are further divided into 27 indicators.

State Rankings

Post the analysis of all the indicators, the overall score for India worked out to be 40.6.

The analysis found Gujarat with an average score of 50.1, Kerala with 49.1, and Punjab with 48.6 were the top three performers among larger states.

Goa emerged as the top-performing state in the 'Smaller States' category with a score of 51.4, followed by Tripura with 45 and Manipur with 36. Among UTs, Chandigarh at 55.7, Delhi at 55.6, Daman and Diu, and Dadra and Nagar Haveli at 53.2 were noted to be performing well.

In the larger states category, the state with the lowest scoring was Chhattisgarh, averaging 31.7. The analysis noted that the state did not perform well in clean energy initiatives, energy efficiency, environmental sustainability, and new initiatives. Madhya Pradesh,

Bihar, Jharkhand, and Orissa also had greater scope for improvement in terms of clean energy initiatives, energy efficiency, environmental sustainability, and new initiatives.

Though Gujarat is the best-performing state, its performance in terms of environmental sustainability and new initiatives needed improvement, the analysis suggested.

Arunachal Pradesh scored the lowest among the smaller states at 27, alongside Nagaland and Meghalaya at 27.9 and 29.4. Lakshadweep averaging 26.9, was at the bottom of the union territories list.

The three UTs and two states that scored above 50 were Chandigarh, Delhi, Daman & Diu, Dadra & Nagar Haveli, and Gujarat and Goa. Overall, even though more than half of the states scored higher than the average value (40.6), there were a total of 16 states and union territories lagging.

Scope for Improvement

The overall index score and the scores achieved under each parameter leave scope for huge improvements, suggesting that while India may possess a conducive environment and energy-related policies, it is not necessarily translating into transforming the sector.

The analysis in the index suggests that the targeted Direct Benefit Transfer (DBT) could help reduce leakages and improve efficiency. It also recommends a future policy direction to amplify energy efficiency programs and technological innovation and build the EV ecosystem to decarbonize transportation.

The report suggests that most states with a low score struggled with higher Aggregate Technical and Commercial (AT&C) losses and complex tariff structures with their respective DISCOMs. It recommends that the state DISCOMs may benefit from aggressively using the revamped central government reform scheme to upgrade their distribution infrastructure and systems.

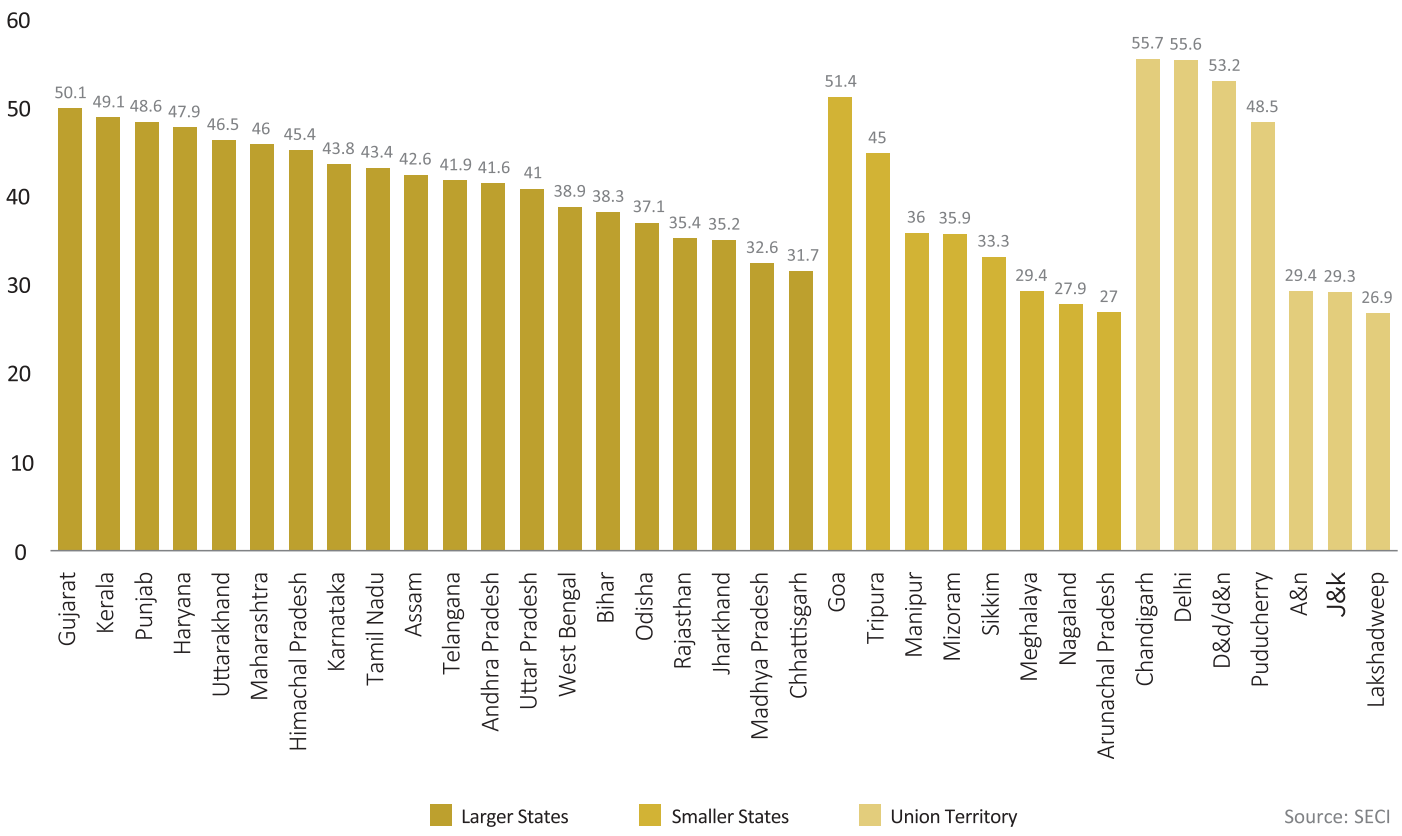
The report said states could improve their performance by increasing the hours of electricity supplied at affordable rates and improving data availability of hours of electricity supply in rural and urban areas.

Shri Amitabh Kant, the CEO of NITI Aayog, said, "Achieving the ambitious climate targets would require a conducive policy environment to encourage investment. The State Energy & Climate Index Round-I will help initiate a dialogue with the states on the energy sector so that much required policy improvements can be made."

In August last year, NITI Aayog and Rocky Mountain Institute (RMI) analyzed the learnings and best practices from domestic and global experience to help state governments consider further reforms to put their power distribution sector on the track to efficiency and profitability.

In December 2021, the Ministry of Power said that 39 out of 55 electricity distribution companies (DISCOMs) had submitted draft proposals under the ₹3.03 trillion (~$40.82 billion) reforms-based result-linked power distribution program.

Final SECI Score



Source: SECI

Power Exchanges to Cap Market Clearing Price at ₹12/kWh

CERC has directed the power exchanges to re-design the software for members to submit their bids in the price range of ₹0/kWh to ₹12 (~$0.16)/kWh for day-ahead and real-time market

By : Arjun Joshi

Central Electricity Regulatory Commission (CERC) directed the power exchanges to re-design their bidding software so that members can submit their buy bids at the maximum price of ₹12 (-$0.16)/kWh for Day-Ahead Market and Real-Time Market. The Commission passed the order in response to a suo moto petition.

Power exchanges have designed the bidding software so that members can submit their bids in the price range of ₹0/kWh to ₹20 (-$0.26)/kWh. In the present scenario, where demand at power exchanges is nearly double the supply volume, buyers place bids at the maximum price range to ensure that their bids are cleared.

The Commission believes that this price moderation will reflect the present market realities and will not significantly impact the volume transacted and safeguard the consumer interests.

Background

The rise in temperature causing the early onset of summers and increase in economic activities with the lifting of COVID-19-related restrictions have contributed significantly to the increase in electricity demand across the country. In March, electricity demand increased substantially and peaked at 199 GW on March 17, 2022. Since then, it has been averaging around 195 GW.

Against this increase in demand, the power sector faced an outage of 58.72 GW of installed generation capacity due to various reasons, of which 4.32 GW of thermal capacity was out due to a coal shortage.

The high price of imported coal has led to a high variable charge for power generated through imported coal-based plants. Similarly, due to an increase in the international gas price, the existing gas-based projects could also not sell power in the market.

Power Exchange is generally the last resort of procurement by the consumers to meet demand when faced with a power shortage. The exchanges have witnessed a desperate buying scenario in the absence of an adequate power supply.

In the Day-Ahead Market at Indian Energy Exchange (IEX), the market-clearing price of ₹20 (-$0.26)/kWh was observed in 31 blocks from February 24 to March 24, 2022. Similarly, the market-clearing price of ₹18 (-$0.24)/kWh and

above was seen in 81 blocks and ₹15 (-$0.20)/kWh and above in 183 blocks.

On March 24, 2022, the market-clearing price was higher than ₹18 (-$0.24)/kWh for 14-time blocks, and it was higher than ₹15 (-$0.20)/kWh for 57-time blocks. On 25-03-2022, the market-clearing price was higher than ₹18 (-$0.24)/kWh for 66-time blocks, leading to an average of ₹18.67 (-$0.25)/kWh for the day.

Buy bids have doubled the sell bids in some time blocks, indicating higher demand and lower supply. The average buy to sell bid ratio was 2.03:1 when the market-clearing price touched ₹20 (-$0.26)/kWh, which is the ceiling price imposed by the exchange. The Commission found that the aggressive bidding by buyers is leading to high prices.

From the sell side, it was observed that up to 99% of the sell bids were in the price band of ₹0.01/kWh to ₹12 (-$0.16)/kWh, while only 1% of the sell bids were higher than ₹12 (-$0.16)/kWh. A similar trend has also been observed in the Real-Time Market segment, where the market-clearing price touched ₹20 (-$0.26)/kWh.

Commission Analysis

The Commission noted that the power exchanges designed the bidding software to allow members to submit their bids in the price range of ₹0/kWh to ₹20 (-$0.26)/kWh. However, in the present scenario, where demand at power exchanges is nearly double the supply volume, buyers are placing bids at the maximum price range to ensure they are cleared.

The Commission observed that while high demand has been the cause of price rise, the absence of adequate supply has also contributed to this trend. Despite the price rise, which generally signals more supply, there has not been a commensurate increase in supply. Based on the Power System Operation Corporation Limited (POSOCO) feedback, the current demand-supply position is likely to persist. Demand will increase as summer intensifies, and supply may not increase until May when wind and hydropower are expected to pick up steam.

Since higher price has not led to a commensurate increase in supply and such a position is likely to remain for some time in the coming days due to supply constraints, 99% of the supply bids have been in the range of ₹12 (-$0.16)/kWh.

The Commission directed the power exchanges, until further orders, to re-design the bidding software in such a way that members can submit their bids in the price range of ₹0/kWh to ₹12 (-$0.16)/kWh for Day-Ahead and Real-Time Market. The exchanges are directed to submit their compliance within two days from the issuance of the order.

The Commission believes that this price moderation will be in keeping with the present market realities and will not significantly impact the volume transacted and safeguard the consumer interests.

The Green Day-Ahead Market traded 205 million units of energy during March with the weighted average price of ₹6.70 (-$0.089)/kWh. It has traded 921 MU since its inception in October 2021.

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Rapid Printing Method to Manufacture Perovskites Solar Cells

Engineers at Dartmouth have developed a printing method that pairs high-speed flexographic printing with rapidly annealed sol-gel inks to manufacture perovskite solar cells

By : Gourav Mishra

Engineers from Dartmouth Engineering in New Hampshire, in their recently published study, 'Eliminating the Perovskite Solar Cell Manufacturing Bottleneck via High-Speed Flexography,' claimed to have developed a rapid printing method to manufacture perovskite solar cells.

The engineers claim that the new method would make the sunlight-to-electricity conversion more efficient.

Even with their abundant absorber material, traditional metal halide perovskites face a scaling-up challenge due to slow production time, resulting in high manufacturing costs. The rapid printing process performed by

engineers in the Dartmouth Engineering lab accelerates the total processing time of solar charge transport layers (CTLs) by 60 times without compromising reliability.

The new printing method pairs high-speed flexographic printing with rapidly annealed sol-gel inks, a method to produce solid materials from small molecules. The ink can be directly coated on the glass substrate in perovskites, coupled with antisolvent extraction.

Flexography is a form of rotary printing in which ink is applied to various surfaces using flexible rubber or other elastomeric printing plates.

The method involved scaling ultrathin nickel-oxide hole transport layers (HTLs) by pairing high-speed flexographic printing with rapidly annealed sol-gel inks to achieve the fastest reported process for fabrication of inorganic CTLs for perovskites. In this method, following the engineering precursor rheology for rapid film-leveling, nickel oxide HTLs were printed with high uniformity and ultralow pinhole densities resulting in photovoltaic performance exceeding that of spin-coated devices. Integrating these printed transport layers in planar inverted perovskite solar cells allows rapid fabrication of high efficiency with a power conversion efficiency greater than 15%.

Dartmouth Engineering Professor William Scheideler said, "Our method prints the solar cell layers with the speed and efficiency of a commercial newspaper printing press. This high manufacturing speed is important because it directly translates to lower cost per kWh, ultimately making solar energy more affordable for a larger population."

The method accelerates the total processing time of solar charge transport layers (CTLs) by 60 times

Researchers worldwide have been performing various experiments to overcome the production scaling issues with perovskites, owing to their promising application for energy-efficient, thinfilm solar cells.

Recently, material scientists at the UCLA Samueli School of Engineering developed a new surface treatment during the manufacturing process of perovskites to overcome the degradation of cells due to prolonged exposure to sunlight.

Earlier this year, researchers at the Karlsruhe Institute of Technology (KIT) in Germany had developed colored solar cells from inexpensive perovskite semiconductor material, which can be integrated into facades or roofs of buildings and imitate the optics of building materials like marble.

Energy Banking Policies and Open Access Solar

According to Mercom India Research, favorable energy banking regulations across various states helped drive up solar open access project development

By : Arjun Joshi

States with favorable energy banking policies witnessed considerable growth in open access solar installations in the calendar year (CY) 2021, as per the analysis published in Mercom India Research's 'Mercom India Solar Open Access Market Report Q4 & Annual 2021.'

The report noted that 1.2 GW of new solar open access capacity was installed in 2021, marking year-over-year growth of 222%.

Other factors contributing to this growth were low landing costs and smoother approval processes of distribution companies for setting up captive and group captive projects.

As of December 2021, the cumulative installed solar capacity in the open access market crossed 5 GW.

Favorable energy banking policy in the states with the most open access installations provided generators with the flexibility of depositing excess power in the grid for later use, which boosted growth.

Banking of energy or power is when the generator supplies power to the grid, not to sell to either the third party or a licensee but to withdraw it from the grid for its use later when needed.

Speaking to Mercom, a top executive from a leading open access developer, said, "Energy banking is the most important factor for the growth of open access solar. Many states like Uttar Pradesh, Maharashtra, Madhya Pradesh, and Chhattisgarh have solid energy banking policies. Favorable energy banking policies in these states have provided the customers with a sense of energy security. This is a major reason for the growth in open access in 2021."

"Also, open access installation is driven by consumers who want to avail more affordable energy than power brought from the commercial and

industrial tariff. You can clearly see that in states where landed open access cost is lower, there will be higher open access installations– like in the case of Uttar Pradesh."

Another developer Mercom spoke to said, "The process of allotting connectivity through a transparent and easy process has attracted many developers to set up open access projects in Uttar Pradesh, as land and connectivity are the major requirements for any project to start with. Further, the waiver on transmission and wheeling charges also imparts good viability in terms of offering savings to clients."

States with Favorable Energy Banking Policies

In 2021, Uttar Pradesh witnessed the most open access solar installations, followed by Tamil Nadu, Maharashtra, Madhya Pradesh, and Karnataka. The top five states accounted for 80% of total installations during the year.

Uttar Pradesh allows annual energy settlement with a banking charge of 6%, allowing 100% of the energy to be banked for captive customers. Withdrawal of banked power is allowed only per the time-of-day (TOD) system, i.e., withdrawal of power in the peak or off-peak hours will not be more than the power banked in that respective time slot.

On the other hand, monthly energy settlement is the norm in Maharashtra with a banking charge of 2%, allowing 100% of the energy to be banked for captive customers and third-party sales. The regulation allows energy to be banked during peak TOD, and it may be drawn during off-peak TOD, but the energy banked during off-peak TOD may not be drawn during peak TOD.

In Madhya Pradesh, the energy settlement is annual with a banking charge of 5%, allowing 100% of the energy to be banked for captive customers and third-party sales.

One of the other top-ranking states, Karnataka, implements its energy settlement annually with a banking charge of 2%, allowing 100% of the energy to be banked for captive customers and third-party sales. The state has no restrictions on energy that is banked. However, in the Draft Karnataka Renewable Energy Policy 2021, the Karnataka government has proposed discontinuing the banking facility. The open access installations would be adversely impacted if banking is curtailed.

However, in a recent ruling, the Karnataka Electricity Regulatory Commission had allowed the carry forward of banked and unutilized renewable energy until August 2022.

Energy banking regulations have been used by states to either curb or boost open access project development, making it a significant factor impacting the cumulative installations.

"Karnataka has always been an attractive state for renewable developers. Captive plants are mostly being installed here. Captive consumers avail good savings in this state. Even after ambiguity in terms of open access charges applicability, banking facility, and captive norms, developers are attracted to this state due to large potential consumers and viability of captive plants," a developer added.

Open access can be a significant contributor to India's pursuit of the adding 280 GW of solar capacity by 2030, with banking energy a key factor.

According to Mercom India's analysis, the low landed cost for open access was identified as one of the other primary factors contributing to the growth of open access installations across India.

Mercom's India Solar Open Access Market Report Q4 and Annual 2021 also gives insights into the short-term transactions, such as the day-ahead market, bilateral contracts, real-time market, and the green-term ahead market within the open access space.

Sungrow's Inverter Manufacturing Capacity in India Rises

In 2021, the share of string inverters in solar installations overtook India's central inverters. Sungrow was the top solar inverter supplier in 2021 and the top string inverter supplier, according to Mercom India Research's latest report, India Solar Market Leaderboard 2022.

Despite the supply chain disruptions that affected the solar sector last year, Sungrow continued its journey on an upward path. In March this year, the company scaled up its manufacturing facility in India to 10 GW. It also launched new products - string and central inverters. Sungrow's SG350HX and "1+X" modular inverter features a maximum output power of 352 kW, supporting large-format high-efficiency bifacial PV modules. Sungrow has over 224 GW of installed capacity worldwide as of December 2021.

Mercom spoke to Sunil Badesra, Country Head, Sungrow India, to discuss the company's plans and his perspective on India's solar industry and the policy regime going forward.

Sungrow is one of the top inverter suppliers to India. How was the market for Sungrow in 2021?

Last year was highly volatile for Sungrow and the whole Indian solar market amid the second Covid wave, but Sungrow managed to grow and hold on to the top position in the Indian market.

Sungrow achieved over 4.2 GW supply in 2021 and a cumulative shipment of more than 12 GW with a market share of nearly 35%. The company diversified the business in India and entered the storage market by grabbing the supply order for India's biggest energy storage project implemented by the Solar Energy Corporation of India (SECI) at Leh. Also, the company increased its solar inverter manufacturing facility in India from 3 GW to 10 GW, which was inaugurated in March this year.

You have had a 3 GW inverter manufacturing capacity in India since 2018 and scaled up to 10 GW solar with the new 7 GW facility in Bengaluru. What was the reason behind this massive expansion?

We expected the Indian market to operate somewhere around 7-8 GW per year when we put up our 3 GW plant four years ago. However, due to various factors affecting the solar sector last year, we saw that figure exceed the 9 GW mark. We are optimistic that India's solar market will do much better in the coming years. So, based on this, we determined that the 3 GW arrangement was inadequate for us, and considering the type of demand that is growing in the market, not only in the inverter but also in the storage front, we thought that it was the ideal moment in 2021 to expand. Therefore, we have decided to increase the factory's capacity from 3 to 10 GW. In the last four years, we have shipped around 15 GW of inverters from the Indian factory, and the shipments have gone to the U.S. market and other projects in Europe. Also, we will cater to neighboring countries such as Sri Lanka, Nepal, and Bangladesh.

Any reason for picking Bengaluru as the manufacturing location?

The electronic supply chain and logistics availability made us select Bengaluru as the manufacturing setup. Also, there are other inverter manufacturers in Bengaluru.

Sungrow supplies central and string inverters. What demand shift have you seen in the past two years, and what is your forecast for 2022 and 2023?

The past two years have seen more and more string inverters with enhanced technology coming into the market, and the share of string inverters has gradually increased to 50%. We are now adding 4.5 GW of annual shipments every year. We have already shipped 12 GW of inverters to the Indian market by the end of 2021, and I think we are the only company in the inverter

segment which has crossed the 12 GW in India.

With the government's 'Make in India' initiative, where do you see the opportunity for inverter component manufacturers in India?

The Indian government is unequivocal in its support to the companies making investments that can comply with the local requirements of the tenders, like 50% local content in all inverters. Sungrow has catered to various customers from the 10 GW manufacturing plant, including residential, commercial & industrial, utility-scale levels, and global customers. Sungrow India has a long-term development plan to help us achieve our renewable energy mission goals. For the success of the 'Make in India' Initiative, Sungrow is willing to continue to lead this market and set the standard for the Indian solar industry. Our commitment to the solar industry is to provide a global standard and quality products with good quality services.

Any challenges you are currently facing in the solar inverter segment in India?

Solar inverter manufacturers suffered two significant setbacks because of supply chain issues. The first was the cost increase, which posed a significant challenge to the sector. Fortunately, Sungrow is the industry leader in inverters, so our products are competitive. The other factor is equipment shortages, particularly in integrated circuit chips and IGBT modules, which directly influence production and deliveries. Because of our large order amounts and long-term relationships, Sungrow has the advantage of being well-supplied by our vendors.

Can you tell us more about your growth trajectory and how you plan to tackle growing competition in the Indian market?

Six years ago, when we entered the Indian market, only European suppliers were there. So, how were we able to carve a niche in the Indian market? About 5-6 years ago, the solar market was entirely operating on a 4 MW block size for utility-scale projects. Then, we shifted that market from 4 MW to 10 MW block size, where customers could save on the balance of system (BoS) cost. We can say that the reduction in BoS is one of the primary reasons for the reduction of tariffs now. Later, from the 10 MW size, we made the solution for 12.5 MW. Now, we are coming up with new product solutions. The new inverter range that we have started proposing to our customers will give them some indirect benefits in terms of BoS or how they will maintain the inverters over 25 years. It is about the block size inverter rating. Initially, the 1,000V market was there, then we shifted to 1,500V, and now a lot of research is happening, where 2,000 or 2,100V solutions are getting worked out.

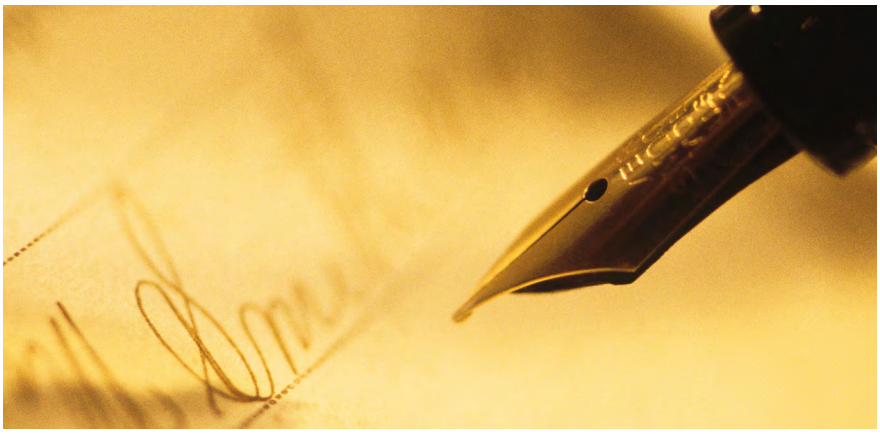
What is your view on the BIS certification for inverters? What hurdles are manufacturers facing?

The BIS regulation has put pressure on international suppliers to comply with Indian standards, and uncertainty in implementation and unavailability of testing facilities are the main obstacles. This has resulted in business loss and capital expenditure for suppliers. Since we had already started manufacturing in India, we did not face many challenges. In my view now, the BIS certification deadline may not be extended any further except for inverters of higher ratings like 200 kW and above and 1,500V inverters.

Do you want to share any other market insights?

Even with recent technological advancements, solar efficiency still has a long way to go. Despite its recent rise, the industry still has many obstacles in the way. The efficiency, dependability, environmental implications, and reliance on government regulations require improvements. These concerns could hinder the industry's growth. I have repeatedly said that I understand the modules' contribution to solar projects is about 60% to 65%. Still, an inverter is also one of the significant components which we cannot ignore, along with the other BoS items. This kind of motivation is crucial for suppliers like us.

Industry News and Policy Briefs



Shell Overseas Investment, a wholly-owned subsidiary of Shell, signed an **agreement with Actis Solenergi** to acquire 100% of **Solenergi Power** for $1.55 billion and the **Sprng Energy group of companies**. Sprng Energy currently has a portfolio consisting of 2.9 GW, out of which 2.1 GW is operational, and 800 MW is contracted with a further 7.5 GW of renewable energy projects in the pipeline.

Torrent Power signed a share purchase agreement to acquire a 100% stake in the special purpose vehicle (SPV) operating a 50 MW solar project in Telangana. The agreement was signed with **SkyPower Southeast Asia III investments** and **SkyPower Southeast Asia Holdings 2**, which own the SPV - Sunshakti Solar Power Projects.

Azure Power announced that its Board of Directors had accepted the resignations of its Chief Executive Officer (CEO) **Ranjit Gupta** and Chief Operating Officer (COO) **Murali Subramanian**.

Reliance Industries signed a letter of commitment (LoC) with **Maxwell Technology**, a wholly-owned subsidiary of **Suzhou Maiwei Technology** – to purchase eight sets of high-efficiency production lines for heterojunction cells (HJT cells), each with 600 MW capacity, to manufacture an annual capacity of 4.8 GW of HJT cells.

The all-India **peak power demand** touched an all-time high of **201.066 GW on April 26, 2022**, surpassing the peak power demand of 200.539 GW met on July 7, 2021. According to a **Ministry of Power** release, the rising power demand reflects the pace of economic growth in the country. The demand is expected to reach 215-220 GW in May-June.

Oil India commissioned the country's only pure green hydrogen pilot plant with an installed capacity of 10 kilograms per day at its Jorhat Pump Station in Assam on Thursday. The procedures to commission the hydrogen plant were completed in just three months

Abu Dhabi-based public joint-stock company **International Holding Company PJSC** announced an investment of $2 billion in three of **Adani Group's companies**. **Adani Green Energy** will receive $500 million out of this investment. **Adani Transmission** will receive $500 million, while Adani Enterprises will receive $1 billion through a preferential allotment route.

Indian Renewable Energy Development Agency (IREDA) recorded its highest-ever loan approvals of ₹239.21 billion (-$3.16 billion) and loan disbursements of ₹160.71 billion (-$2.12 billion) in the financial year (FY) 2021-2022. IREDA ended the year with its best performance to date.

Borosil Renewables announced the acquisition of 100% share capital of **Interfloat Corporation and Glasmanufaktur Brandenbur**, entities engaged in the solar glass manufacturing business, sales, and distribution, in Europe, for a cash consideration and shares equivalent of €52.5 million (-$56.6 million).

Policy Briefs

States

Andhra Pradesh Electricity Regulatory Commission announced tariffs for commercial and industrial consumers for the financial year (FY) 2022-23. According to the new order, the tariffs remained unchanged from the previous year for commercial consumers in Andhra Pradesh connected at 11 kV to 132 kV power lines. However, the tariff for consumers connected to a 220 kV line has decreased by 0.75% from ₹6.70 (-$0.088)/kWh to ₹6.65 (-$0.086)/kWh.

The **Himachal Pradesh Energy Development Agency** released the benchmark costs for grid-connected residential rooftop solar projects for 2022-23 and 2023-24. The new benchmark costs for grid-connected residential rooftop solar systems of 1 kW to 3 kW in size is ₹50,000 ($664)/kW, and for 3 kW and up to 10 kW, it is ₹48,6000 ($645)/kW. For projects of 10 kW up to 100 kW, the cost considered is ₹45,000 (-$598)kW, and for projects above 100 kW and up to 500 kW, it is ₹42,000 (-$558)/kW.

Center

The **Ministry of New and Renewable Energy (MNRE)** invited proposals for pilot demonstration of new and innovative solar applications under **Deutsche Gesellschaft für Internationale Zusammenarbeit** and MNRE's bilateral project. The project's objective– Innovative Solar Areas (IN-Solar)– is to find innovative ways to expand the application of photovoltaics to optimize the use of land.

Central Electricity Regulatory Commission directed the power exchanges to re-design their bidding software so that members can submit their buy bids at the maximum price of ₹12 (~$0.16)/kWh for Day-Ahead Market and Real-Time Market. The Commission passed the order in response to a suo moto petition.

NITI Aayog issued the draft battery swapping policy addressing the key technical, regulatory, institutional, and financing challenges to help India develop battery-swapping ecosystems to unlock the large-scale adoption of battery-swapping.

Major Tender and Auction Announcements in April

This is a list of major tenders and auctions from April. A comprehensive list can be found on Mercom's Tender and Auction Tracker and Alerts. Please contact info@mercomindia.com for more information.

Auctions

Sembcorp (Green Infra Wind Energy) won Railway Energy Management Company's auction to procure **50 MW** of wind power. The tariff-based bidding was held for the power consumption of Railways for traction in Maharashtra.

Jakson Group emerged as the winner in **NTPC**'s auction for the comprehensive operations and maintenance (O&M) of the **260 MW** solar project at the Bhadla Solar Park in Rajasthan.

Other Tenders

Gujarat Industries Power Company issued a notice inviting tender from EPC contractors for 400/33 kV gas-insulated substation at the 1,200 MW pooling substation of its **2,375 MW** solar, wind, and hybrid renewable energy park at Great Rann of Kutch Area.

Solar energy Corporation of India (**SECI**) issued an RfS to set up pilot projects of **500 MW/1,000 MWh** standalone battery energy storage systems under a build, own, operate, and transfer model.

NTPC Renewable Energy issued an invitation for bids (IFB) for the design, engineering, manufacturing, supply, installation, and commissioning of a **250 MW/500 MWh** grid-connected standalone battery energy storage system near Fatehgarh-III ISTS substation in Rajasthan.

BHEL invited an EoI from original equipment manufacturers for the supply and installation of photovoltaic modules, floaters, anchoring and mooring systems, and an annual maintenance contract for three **100 MW floating solar** power projects in Omkareshwar reservoir in Madhya Pradesh.

BHEL invited bids to design, supply, install, and commission a module cleaning system for Maharashtra State Power Generation Company's **50 MW solar** power project at Koudgaon in Maharashtra.

NTPC issued a notice inviting tender from contractors for the **O&M** of a **10 MW solar** project at its Talcher Super Thermal Power Station in Kaniha, Odisha, for three years.

NTPC issued an invitation for bids for the EPC of a grid-connected battery energy storage system with **10 MW** and **40 MWh** rated AC discharge capacity at a 33KV switchgear interconnection point in Ramagundam, Telangana.

Gujarat Industries Power Company issued an EoI to set up **5 MW** and **10 MW** electrolyzer-based **green hydrogen** projects and associated facilities at Vadodara or any suitable site in Gujarat.

Hindustan Petroleum Corporation issued a tender to select a project management consultant to supervise a **10 MW** ground-mounted solar project at Ankleshwar, **Gujarat**.

The **Electricity Department of Daman and Diu** issued a tender for the O&M for five years of multiple rooftop solar photovoltaic systems totaling **4,519 kW** on government buildings in Daman and Diu.

BHEL issued a notice inviting tender for the supply of non-domestic content requirement (**DCR**) monocrystalline solar photovoltaic **modules** of **9.3 MW** capacity.

ITI, a public sector undertaking under the Department of Telecommunications, floated a tender to supply 23,50,080 **polycrystalline solar cells**.

NTPC issued a notice inviting a tender to procure 15,000 and 1,000 solar modules of **300W** for the Bhadla solar project.

NTPC Renewable Energy issued a notice for upcoming invitations for bids to select electrolyzer technology providers to participate in green hydrogen tenders for two years.

The Ahmedabad Municipal Corporation issued an EoI for the empanelment of project management **consultants** for feasibility, detailed project reports, and consultancy of different renewable energy projects to be developed by the Corporation.

Bhubaneswar Smart City invited EoI from **consultants** to avail of carbon credit benefits from its renewable energy, energy efficiency, waste management, and other technology projects for three years.

BHEL issued a tender for the supply of 145.54 metric tons (MT) of **module mounting** structures for its **5 MW** solar project in Bhopal.

Rewa Ultra Mega Solar issued an RfP for consultancy firms to prepare a feasibility study report of three reservoirs in **Madhya Pradesh** to develop **floating solar** projects.

Agency for New and Renewable Energy Research and Technology (**ANERT**) issued an expression of interest to register original equipment manufacturers for supplying modules, solar inverters, batteries, and mounting structures for solar projects implemented by ANERT.

Convergence Energy Services Limited issued an RfP from **Charge Point Operators** for the installation and maintenance of 810 electric vehicle (EV) charging stations for four-wheelers on 16 highways and expressways across India. The installations are on a build, own, and operate model for eight years, which can be extended up to ten years.

Himachal Pradesh Power Corporation issued a notice inviting tender from consultants for registration, monitoring, verification, issuance, and trading of carbon credits for **276 MW** of **hydropower** and **5 MW** of **solar** projects in the state.

Rashtriya Chemicals and Fertilizers issued a notice inviting tender for the **O&M** of a **2 MW solar** project at its **Trombay** unit for two years.

Hindustan Petroleum Corporation invited bids from project management consultancies to set up grid-connected captive solar projects, including rooftop solar, with an aggregate capacity of **1.2 MW** under net metering at various locations of Vijaywada Dharmpuri Pipeline.

BHEL issued a notice inviting tender from global manufacturers of floaters to enter a memorandum of understanding (MoU) for freezing techno commercial conditions and specifications for the design and supply of floaters and associated anchoring and mooring of floaters for various floating solar projects across India.

Top Large-Scale Solar Tenders

Bundelkhand Saur Urja Limited issued an expression of interest (EoI) to develop grid-connected solar projects in the **1.2 GW** Ultra Mega Renewable Energy Power Park in Jalaun, **Uttar Pradesh**.

Punjab State Power Corporation issued a request for selection (RfS) to select bidders to procure power from **1 GW** of grid-connected solar projects with a minimum bid capacity of **50 MW** through a long-term tariff-based competitive bidding process. It also issued another request for selection (RfS) to procure power from **1 GW** of solar projects with a minimum capacity of **5 MW** located in **Punjab**.

Rewa Ultra Mega Solar, on behalf of Madhya Pradesh Power Management Company, issued a request for proposal (RfP) for the development of **750 MW** grid-connected wind-solar **hybrid** power projects in **Madhya Pradesh**.

Gujarat Urja Vikas Nigam issued an RfS from developers to purchase power from **500 MW** of solar projects under **Phase XIV** with a **greenshoe** option of an additional capacity of up to 500 MW.

Bharat Heavy Electricals Limited (**BHEL**) issued a notice inviting tender for module cleaning systems for Gujarat State Electricity Corporation's **100 MW** solar project at **Phase-1** of **Raghanesda** Solar Park.

NHPC issued a notice inviting tender from the engineering, procurement, and construction (EPC) contractors to develop a **75 MW** interstate transmission system (ISTS) connected solar power project. The energy generated will be sold through the power exchanges.

The Uttar Haryana Bijli Vitran Nigam invited an EoI for setting up decentralized grid-connected solar power projects with an aggregate capacity of **28 MW** under Component-A of the Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (**KUSUM**) program.

The Durgapur Projects issued a notice inviting tender for the EPC, including module manufacturing for **20 MW** grid-connected solar projects on its thermal power station.

Kerala State Electricity Board invited bids for the appointment of EPC contractors to develop **11 MW** of ground-mounted, grid-connected **solar** power projects at various locations in **Kerala** under the feeder level solarization of the **KUSUM** program.

Madhya Pradesh Urja Vikas Nigam issued an RfP from renewable energy generators for setting up **8 MW** of grid-connected solar projects under component- C of the **KUSUM** program. The power from the projects will be procured by Madhya Pradesh Power Management Company.

Paschim Gujarat Vij Company issued an EoI to empanel agencies to design, supply, install, test, and commission distributed grid-connected solar projects of approximately **3.94 MW** for agricultural consumers.

Haryana Shahri Vikas Pradhikaran issued a notice inviting tender for the supply, installation, and commissioning of **2.7 MW** of grid-connected solar power projects at various locations of sewage treatment plants, water treatment plants, and waterworks in Ambala, Naraingarh, Kurukshetra and Kaithal in **Haryana**.

Gujarat State Electricity Corporation issued an RfP from EPC contractors to install and commission a **2 MW** grid-connected solar power project at Utran power station in **Gujarat**.

Rooftop Solar Tenders

Madhya Pradesh Madhya Kshetra Vidyut Vitaran Company issued a notice inviting tenders to empanel vendors to design, supply, erect, and commission **20 MW** of residential rooftop solar systems. The implementation is part of Phase II of the Ministry of New and Renewable Energy's (MNRE) Grid-Connected Rooftop Solar Program.

Punjab State Power Corporation issued a notice inviting tender to empanel vendors to install **15 MW** of grid-connected residential rooftop solar systems in Punjab.

Tamil Nadu Energy Development Agency issued a notice inviting tender to empanel vendors to install **12 MW** of grid-connected residential rooftop solar systems in Tamil Nadu.

Madhya Pradesh Urja Vikas Nigam issued an RfP for the standardization of rates and selection of contractors to design, engineer, supply, install, test, and commission grid-connected rooftop solar systems with or without energy storage and off-grid rooftop solar systems with energy storage aggregating to about **11 MW** in Madhya Pradesh.

Madhya Pradesh Urja Vikas Nigam issued an RfP for installing **10.72 MW** of grid-connected rooftop solar systems under renewable energy service company (RESCO) model at various locations in Madhya Pradesh.

Madhya Pradesh Paschim Kshetra Vidyut Vitaran Company issued a notice inviting tenders to empanel vendors to design, supply, erect, and commission **10 MW** of residential rooftop solar systems in Indore.

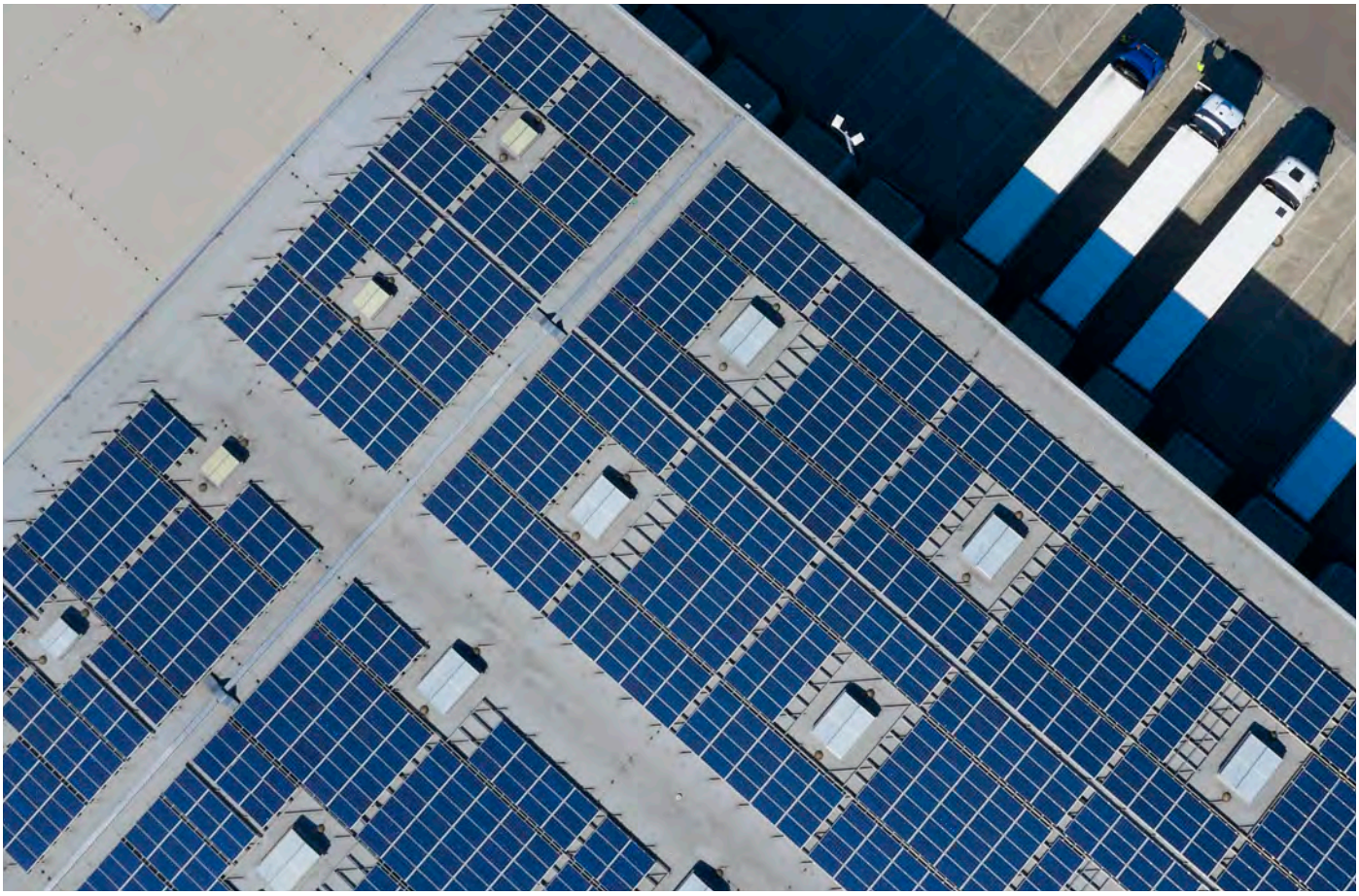
Tamil Nadu Energy Development Agency issued a notice inviting tender for a rate contract for installing **10 MW** of grid-connected rooftop solar systems atop various government buildings in **Tamil Nadu**.

Madhya Pradesh Poorv Kshetra Vidyut Vitaran Company issued a tender to empanel vendors for design, installation, supply, erection, testing, and commissioning, including warranty, comprehensive operation, and maintenance (O&M) of **7.5 MW** grid-connected rooftop solar systems of various capacities.

Gulbarga Electricity Supply Company issued a notice inviting tender to empanel vendors to install **3 MW** of residential rooftop solar systems across seven districts in **Karnataka**.

Assam Power Distribution Company issued a notice inviting tender to empanel vendors to install **1.5 MW** of grid-connected residential rooftop solar systems in **Assam**.

Westend Heights Condominium Apartment Owners Welfare Association in Bengaluru issued a request for proposal to install up to **150 kW** of rooftop solar systems under the Oorja Phase 2 program.



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