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India's Q1 2021 Solar Installations Up 88%

Mercom India Research's Q1 2021 India Solar Market Update reveals large-scale solar projects totaling 1,749 MW were added during the quarter along with 307 MW in rooftop solar installations



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CONTENTS

Volume 01 | Issue 04 | June 2021

04

POLICY

Haryana Releases Draft Solar Policy

The policy focuses on rooftop solar projects and small-scale distributed solar systems besides exploring the potential of megawatt-scale solar projects and parks

10

POLICY

National Electricity Policy – Preparing India's Power Sector for the Future

The national policy covers guidelines on optimal generation mix, transmission, distribution, grid operation, power markets, regulatory process, and energy efficiency

16

POLICY

Production-Linked Incentive for Battery Storage

The government is considering battery storage as one of the ten critical sectors under the PLI program in a push for manufacturing advanced batteries domestically

18

POLICY

Renewable Projects Get Time Extension Amid Covid-19 Surge

MNRE has stated that renewable projects could claim extension due to the resurgence of the Covid-19 pandemic but cautioned developers not to use it to terminate PPAs

21

POLICY

Union Territories Revamp Tariffs for Renewables

The central electricity regulator has mandated the filing of tariff petitions on time every year. The union territories that have been so far deferring tariff determination have been actively submitting the petitions

26

POLICY

Regulators Mulling Ways to Reduce Retail Power Tariffs

Regulators from 12 states have suggested measures, highlighting the need for a coordinated effort between the central and state governments to contain high retail power tariffs

32

MARKETS

Solar Imports and Exports Surge in Q1 2021

With the pandemic waning in Q1 2021, solar imports and exports soared QoQ. However, commercial activities have since slowed down with the second wave of the Covid-19 pandemic

34

TECHNOLOGY

Molecular Glue Boosts Efficiency of Perovskite Solar Cells

Researchers at Brown University have identified the weak link in the cells and increased their functionality by devising a glue that keeps a key interface inside cells from degrading

CONTENTS

Volume 01 | Issue 04 | June 2021

38

TECHNOLOGY

Rechargeable Cement-Based Batteries – New Sustainable Building Materials

Researchers have devised a rechargeable prototype of a high-rise concrete structure mixed with short carbon fibers capable of storing energy like a giant battery with huge commercial potential

42

MARKETS

Off-Grid Solar Product Sales Slide

The study by GOGLA noted that sales of off-grid solar products in India have been on a downward trend since 2018, which seems to have been accelerated by the Covid-19 crisis

46

MARKETS

Policy Hurdles, Volatile Market Cast Shadow on Rooftop Solar

Although the pandemic has accelerated the C&I consumers' plan to go solar, developers are confronting slow business activity due to the policy uncertainty and inability to close deals

52

POLICY

Regulatory Approval for Tariffs Discovered in Gujarat Solar Auction

The Gujarat Electricity Regulator has approved the tariffs in a recent solar auction and also directed the DISCOM to sign PPA after adding a late payment surcharge clause

54

MARKETS

India's Q1 2021 Solar Installations Up 88%

Mercom India Research's Q1 2021 India Solar Market Update reveals large-scale solar projects totaling 1,749 MW were added during the quarter along with 307 MW in rooftop solar installations

58

POLICY

National Mission for Biomass Use in Coal Power Plants

The mission's purpose is to address rampant air pollution caused by the burning of farm stubble and reduce the carbon footprint in thermal power generation

60

NEWS IN BRIEF

Industry News and Policy Briefs

A compilation of important news and policy updates on the Indian solar and other clean energy technologies

64

TENDERS & AUCTIONS

Major Tender and Auction Announcements in May

This is a list of major tenders and auctions from May. A comprehensive list can be found on Mercom's Tender and Auction Tracker and Alerts.

Foreword



Despite a lot of potential, the rooftop segment is still struggling in India and makes up just 13% of the installed capacity to date.

The energy costs for commercial and industrial (C&I) units in India account for around 30%-40% of the operational expenses. Embracing solar seems like the most logical step towards saving the cost, and the pandemic has only accelerated that

decision. However, C&I consumers are enduring challenges every step of the way when installing a solar system.

Part of the problem started when the Ministry of Power announced in December last year that it would be mandating net metering for loads up to 10 kW and gross metering for loads exceeding 10 kW. After wide criticism by stakeholders, the ministry, in April 2021, decided to allow net metering for loads up to 500 kW. This was a good four months of policy uncertainty. This ended up being a huge snag for the industry, which was witnessing significant demand.

Rooftop installers have reported that the inquiries from the C&I consumers have more than doubled even during the lockdown from the second wave of COVID in the country. During the first quarter and early second quarter, installations came to a standstill even with growing demand only because of the confusion in the net metering regulations. Now with the cap at 500 kW, most consumers are considering smaller capacity installations to ensure they get the net metering benefit.

Dropping the net metering cap from 1 MW to 10 kW was a serious blow to the rooftop solar market at a time when it was on the rise, generating economic activity and creating jobs. The most important thing the government can do is to ratify and approve net metering for loads up to 500 kW and remove any ambiguity in the market so that the sector can resume activity with complete certainty.

Mercom India's new open access report indicates, more open access projects were added in Q1 2021 than all of 2020. The open access market is providing an alternative opportunity for developers and investors who do not participate in auctions for large projects, considering they are highly competitive and limited to specific geographies. The developers can choose the customers to offtake the power they produce and earn an attractive return on investment. For DISCOMs, this measure works as a new avenue to bring private investment into the sector and address the shortage of electricity and encourage green power generation.

There is huge pent-up demand for open access despite restrictive policies. With the right, consistent, supportive policies, a substantial amount of investment inflows can be unlocked. The government's proposal to cap net metering for rooftop solar at 500 kW is also leading many consumers with larger power demand to consider open access solar as a solution.

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Haryana Releases Draft Solar Policy

The policy focuses on rooftop solar projects and small-scale distributed solar systems besides exploring the potential of megawatt-scale solar projects and parks

By : Rahul Nair





The New and Renewable Energy Department, Haryana, issued the draft 'Haryana Solar Power Policy, 2021', and requested government stakeholders to send their comments.

The new policy will supersede the Haryana Solar Power Policy, 2016.

The draft notification identifies Haryana as an agrarian state with several geographical constraints such as high cost and paucity of barren land within its borders, with low potential for wind or hydropower. It adds that the state must focus mainly on rooftop solar projects and small-scale distributed solar systems besides exploring the potential of megawatt-scale solar projects and parks.

The notification adds that efforts are being made to promote the usage of solar energy with suitable incentives and policy frameworks for the agriculture sector and the solarization of electrical vehicle (EV) charging stations.

The solar power systems installed and commissioned during the operative period will be eligible for the benefits and incentives declared under this policy, for 25 years from their date of commissioning or for the life span, whichever is earlier, until otherwise notified by the state government.

Only new plants and machinery will be eligible for installation under this policy. In the case of solar thermal power projects, fossil fuel beyond the ceiling allowed under the Ministry of New and Renewable Energy (MNRE) will not be used. No fossil fuel will be allowed.

Renewable Purchase Obligation

The capacity installation targets for the distribution companies (DISCOMs) will be based on the Renewable Power Purchase Obligation (RPO) defined by Haryana Electricity Regulatory Commission (HERC) from time to time. To achieve the solar RPO, the government plans to install large-scale solar projects by the Haryana Power Generation Corporation on its land or government land, or solar parks. Solar installations could come up on canal top, canal banks, waterworks and reservoirs, rooftop solar systems under

net-metering, and gross metering on government buildings, among others.

The regulators have to estimate the entire cost incurred towards purchasing solar power in the annual recurring revenue order issued from time to time. Consumers will be allowed to set up projects to fulfill their RPO regardless of their contract demand.

Projects for sale of power to the DISCOMs below 2 MW

DISCOMs may procure power from distributed solar projects up to 2 MW capacity, at pre-fixed levelized tariff as determined by HERC, subject to the spare capacity available at the nearest substation. As per the RPO, 20% of the targeted solar power purchased by DISCOMs will be reserved for such small generators below 2 MW capacity.

Individuals and micro, small and medium enterprises with land will be allowed to sell power from only one

C&I units will be allowed to consume 90% of annual consumption from captive solar projects





such project with a maximum of 2 MW capacity to the DISCOMs.

Large-scale solar projects for captive/ third-party sale

The state will also provide transmission and banking facilities for setting up solar projects for captive consumption or third-party sale within Haryana. For third-party sale outside the state, the transmission facility will be provided under open access by the state power utilities, while the banking facility may be provided by the state in which power is being consumed as per their regulations.

Any industrial or commercial unit in the state will be allowed to consume 90% of its annual consumption from the solar project.

Panchayat land on lease or rent

The state government may facilitate the lease or sub-lease of panchayat land at reasonable rates through any government agency or directly through the panchayat for setting up solar projects for a minimum period of 30 years.

Land Ceiling Act for setting up solar projects

The land area where solar projects

are set up will be out of the scope of the Land Ceiling Act of the government.

Preference to solar projects with storage

Ground-mounted solar project installation with storage will be promoted and given preference in granting approvals. The preference will

State wants to solarize electrical vehicle charging stations

also be given in the tariff if purchased by the Haryana Power Purchase Centre. The state will also promote solar projects with storage systems for captive use and third-party sale.

Rooftop grid-connected solar projects

Installation of rooftop solar systems of capacities in the range of 1 kW to 2 MW at industries, public and private

institutes, schools, colleges, commercial and social institutions, charitable trust buildings, hospitals, and residential buildings will be promoted for their captive use with or without net metering facility as per the HERC Regulations. The rooftop solar systems may be installed either on the capital expenditure model or the renewable energy service company model.

Virtual net-metering

Virtual net-metering (VNM), including group virtual net-metering, may be promoted in urban areas. These would be encouraged, and eligible consumers would be facilitated, especially those located in the urban centers of Haryana who have constraints like access to adequate rooftop areas or inaccessible rooftops.

With virtual net metering, consumers can own a part of a collectively-owned solar power generating system. All energy produced by such a solar system will be fed into the grid through an energy meter, and the exported energy, as recorded by that meter, will be credited to the electricity bill of each participating consumer based on beneficial ownership.

Power evacuation facility



All expenses for power evacuation, transmission, distribution, and synchronizing equipment required for installation will be as per the orders of the HERC on renewable energy.

DISCOMs will bear the cost of extra-high voltage and high voltage

Virtual net-metering will be promoted in urban areas

transmission lines up to 10 km. If the distance between the interconnection point and point of grid connectivity is more than 10 km, then the cost of the transmission line for the distance beyond the 10 km will be borne equally between the project developers and the licensee, only if the power is to be supplied to DISCOMs under approved power purchase agreements.

Banking

The banking facility will be allowed for captive and third-party solar generation projects for six months

from the date of power banked by the licensee, and the developer will pay the difference of unscheduled interchange charges at the time of injection and at the time of withdrawal.

The banking facility will be allowed for the grid-connected rooftop solar systems to be installed for captive use and third-party sale on the same lines as ground-mounted solar projects.

Manufacturing units

A 10% tax exemption on total applicable tax will be provided by the Industry & Commerce Department, Haryana, for setting up manufacturing units of devices and equipment related to solar power, for a limited period. Land for setting up such units will be allotted on priority.

Solar energy-based EV-charging stations

New & Renewable Energy Department will implement the program per MNRE guidelines and invite the bids. The grid connection to the EV-charging stations will be provided by the DISCOMs. The total power produced will be counted towards the solar RPO of the DISCOMs.

The DISCOMs and HPPC will get a separate tariff category approval from

HERC, for drawl of additional power from the grid by such charging stations, apart from generating solar power. Per unit charges to be levied for charging of EVs will not be more than ₹5 (-\$0.068)/kWh in addition to per unit charges of DISCOMs.

Exemption of wheeling, transmission, cross-subsidy charges, and additional surcharges

Wheeling and transmission charges will be exempted for all captive solar projects that have already been approved, in March 2019, by HAREDA.

The cross-subsidy surcharges and additional surcharges are not applicable for captive solar projects.

In case projects are set up for third-party sale, cross-subsidy surcharge and additional surcharge will be similar to normal open access consumers as determined by HERC from time to time.

Solar cities

The notice also says that the state will promote the concept of solar cities and solar villages. In solar cities and solar villages, 20% of the energy requirement will be met from solar energy.

HERC had earlier announced that open access solar consumers in the state would not have the net-metering facility. 



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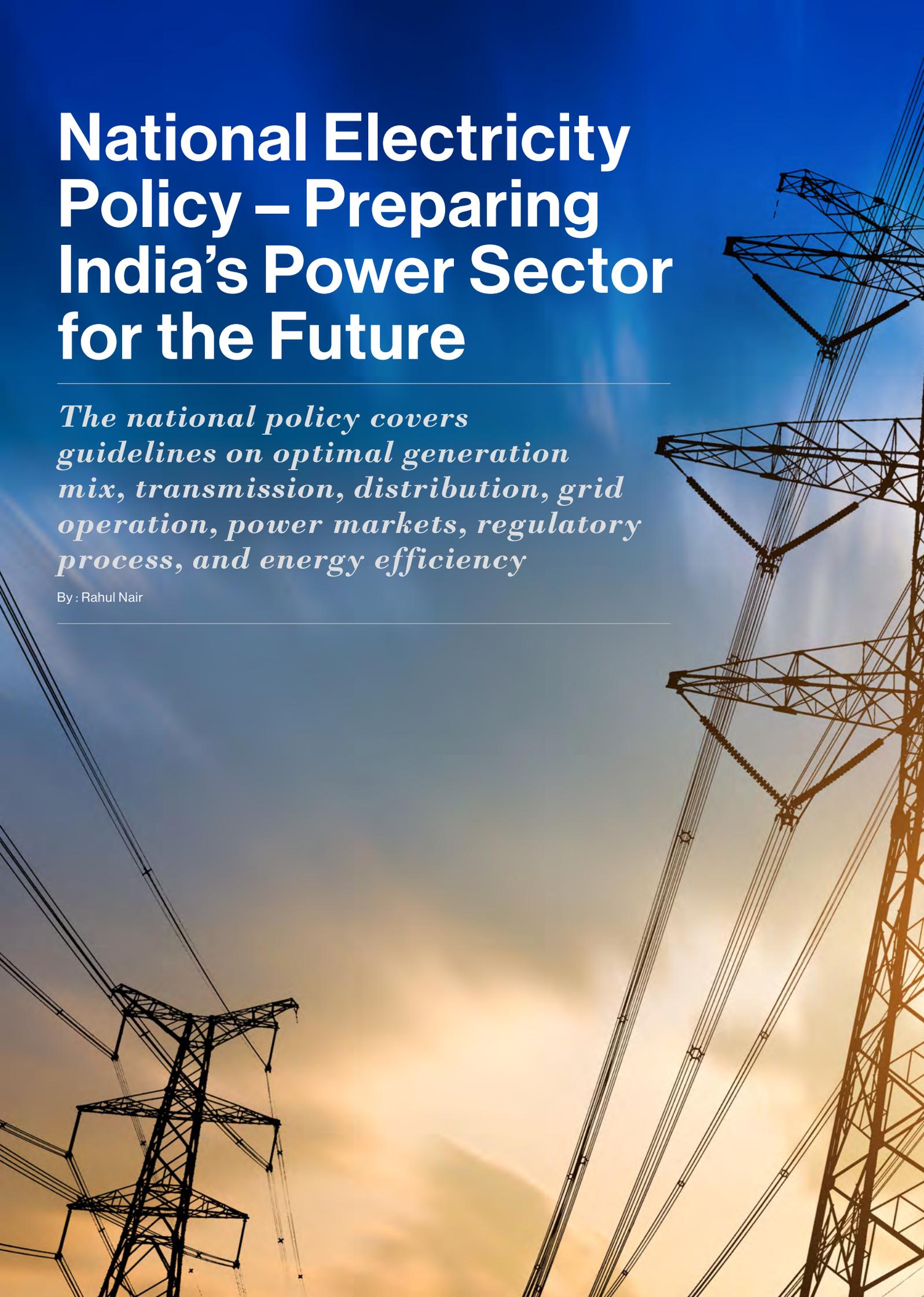


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National Electricity Policy – Preparing India's Power Sector for the Future

The national policy covers guidelines on optimal generation mix, transmission, distribution, grid operation, power markets, regulatory process, and energy efficiency

By : Rahul Nair





The Ministry of Power (MoP) has released the draft National Electricity Policy (NEP) 2021 and invited suggestions from all stakeholders.

The MoP has created an expert committee that includes members from state governments, the Ministry of New and Renewable Energy, NITI Aayog, and the Central Electricity Authority (CEA).

Stakeholders such as Central Public Sector Undertakings, Solar Energy Corporation of India, power transmission companies, financial institutions like Reserve Bank of India, Indian Renewable Energy Development Agency, HDFC Bank, ICICI Bank, industrial, solar, and wind associations, and state governments, have to present their suggestions to the expert committee.

The NEP 2021 covers multiple areas, including optimal generation mix, transmission, distribution, grid operation, power markets, regulatory process, and energy efficiency, among others.

Here are some areas related to clean energy.

Optimal Generation Mix-Renewable Energy Source and Cogeneration

According to the draft, as of March 31, 2020, the total installed capacity through renewable energy sources was about 87 GW, while the government has set a target of 175 GW generation capacity from renewables by 2022.

The long-term requirement of balancing capacity needs to be reassessed by the CEA in consultation with various stakeholders to meet the variable generation by renewable sources.

The draft NEP encourages electricity generation from renewable sources due

to its environmental benefits that couple with energy security. The MoP also wants to encourage hybrid renewable energy like wind-solar, solar-biomass, solar mini-hydel, etc., with or without energy storage systems.

According to attorney Aditya K. Singh, an Associate Partner at Link Legal, “NEP is emphasizing on the growth of renewables as well as reliability of generation. Keeping these objectives in mind, the policy proposes promotional measures for hybrid renewable energy generation and energy storage systems.”

The draft further states that barring waste to energy generation, all future procurement of power from renewable sources must be through tariff-based competitive bidding.

The draft states that the tariff of the renewable energy generators must cover the risk of curtailment of power by DISCOMs for reasons other than grid security or transmission constraints.

Singh said, “The NEP has also realized the pain of the developer that merely giving a must-run status to renewable energy generating stations is not solving the problem and generators

The draft NEP encourages electricity generation from renewable sources



are witnessing curtailment in generation due to economic reasons in various states.”

The draft further recommends swift implementation of differential tariffs between peak and off-peak hours for consumers and generating stations, to appreciate the peaking power value.

According to Singh, a two-part tariff will be a game-changer, “There will be certain practical challenges like determination of the variable cost for wind and solar assets. I believe, once DISCOMs see that even if they are issuing curtailment instructions and are liable to make payment for 90%-95% of the agreed tariff (this will be estimated fixed cost for solar and wind), then they will be discouraged to issue frivolous curtailment notices.”

The draft has noted that renewable purchase obligations (RPOs) supported by renewable energy certificates (RECs) have not functioned satisfactorily. The draft suggests market-based options while removing shortcomings of the existing RPO-REC-based system.

The draft also talks about an intra-state level cost-sharing mechanism to address issues concerning the flow of

power from states where intermittent renewable sources of energy are concentrated. Power from these states is transmitted to other states, and the former is left to bear the variability of generation.

Aditya said, “NEP also appears to suggest that the regulator should move towards implementing light-touch regulation mechanism. This is a welcome step, and the regulator should follow it in its letter and spirit.”

The draft also encourages solar rooftop installations and states that one way to promote solar PV systems, particularly in household applications and small industries, is through net metering. Singh added, “NEP also

Draft highlights promotion of hybrid renewables and energy storage

appears to encourage rooftop solar. NEP should also suggest that there should not be any cap on net metering.”

Creation of Electric Vehicle Charging Stations

According to the draft, certain tariff-based measures are needed for electric vehicle (EV) public charging stations and a separate consumer category based on a specific charging load. ‘Time of the Day Tariff’ can be employed to avoid charging load during peak demand hours.

The draft suggests provisions for injecting power back into the grid whenever an EV is parked and connected to chargers. Aggregators may be allowed to aggregate the demand of multiple public charging stations to purchase renewable energy using open access.

Smart Meters

According to the draft, automation and smart metering can play a pivotal role in bringing positive transformation in the distribution sector. The draft suggests that all new electricity connections come with smart prepaid





meters or simple prepaid meters. It further says that existing meters should be replaced with smart meters in the next three years from the date of the issuance of the NEP 2021.

In a recent notification, the CEA said that in the case of open access consumers connected to a distribution system, smart meters could be used as interface meters, provided they comply with the recommended regulations.

Grid Operation

According to the draft, grid reliability has become an issue because of rapid grid expansion and the integration of renewable sources of energy. Forecasting and scheduling renewable sources should be mandatory, and a margin of error should be specified, beyond which deviation charges would become applicable.

Regulatory Process

According to the draft, wherever power or transmission service is procured based on guidelines issued by the Central Government under section 63 of the Electricity Act, 2003, the role of the appropriate commission is primarily to ensure compliance with the process. Section 63 of the Electricity Act refers to regulations of adopting tariffs

discovered in the competitive bidding process.

According to Singh, “NEP’s statement about the limited role of the regulator while adopting section 63 tariff is also encouraging, and it is reiterating specific provisions of the Act. This statement can be an aid for interpreting Section 63 of the Act in future tariff disputes to argue that if bidding guidelines procedure has been followed then, the Commission will

Solar projects are urged to consider robotic, dry cleaning, and save water

have no option except to adopt it.”

He further added, “Other considerations like prevailing market price are giving weapons to regulatory commissions for delaying/non-adoption of the tariff. NEP has a very clear role of

the regulator to ensure compliance to the process, and not sit on the wisdom of the bid evaluation committee.”

Power Markets

According to the draft, a new entity called aggregators may be created to aggregate demand, renewable power generation, demand response, micro-storage, and others, to help small consumers, prosumers, and producers reach the market. This would help promote open access, which is presently allowed for consumers with loads of 1 MW and above.

Environment

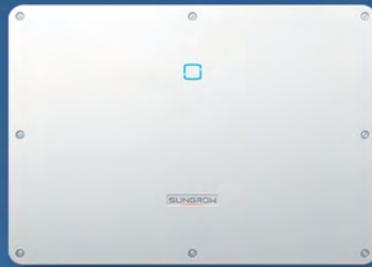
The draft states that solar PV projects must consider robotic dry cleaning instead of water cleaning, based on cost-benefit analysis.

While manual cleaning is one of the options, several robotic technologies have entered the market, providing a cost-effective method to clean solar panels compared to manual cleaning. The Ministry of New and Renewable Energy has also recommended efficient water utilization for cleaning utility-scale solar projects. The ministry said that project developers should try and minimize wastage and use robotic cleaning technology. ☺

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Production-Linked Incentive for Battery Storage

The government is considering battery storage as one of the ten critical sectors under the PLI program in a push for manufacturing advanced batteries domestically

By : Rakesh Ranjan Parashar

The Union Cabinet has approved the 'National Program on Advanced Chemistry Cell Battery Storage' under the production-linked incentive (PLI) initiative. According to

the Cabinet's notification, the program aims to achieve 50 GWh of advanced chemistry cell, and 5 GWh of niche advanced chemistry cell manufacturing capacity with an outlay of ₹181 billion (-\$2.46 billion).

In November last year, the government had said that it would allocate ₹1.45 trillion (-\$19.61 billion) under the PLI program to ten critical sectors over the next five years. Some of these sectors include high-efficiency

solar modules, advanced chemistry cell batteries, automobiles, and auto components.

Advanced chemistry cell batteries are the new-generation storage technologies that can store electric energy either as electrochemical or chemical energy and convert them to electric energy. It is expected that this new technology will play a vital role in the fields of consumer electronics, electric vehicles (EVs), advanced electric grids, and rooftop solar in the coming years.

While many companies have started investing in this new technology, it is still very small compared to global numbers, and imports from other countries are meeting the demands.

Under the program, the battery storage manufacturers would be selected through a competitive bidding process, and the manufacturing facility would have to be commissioned within two years. The incentive will be disbursed after that over five years.

The amount of incentive will be

An outlay of ₹181 billion is planned for advanced chemistry cells manufacturing

expanded with increased specific energy density and higher local value addition. Each selected manufacturer would have to commit to setting up an advanced chemistry cell manufacturing facility of a minimum 5 GWh capacity and ensuring a minimum 60% domestic value addition at the project level within five years.

The program's implementation is expected to attract a direct investment of ₹450 billion (-\$6.11 billion) and

facilitate the country's demand creation for battery storage. This acquires all the more importance given the intermittent nature of solar and wind power and the need for battery storage to provide on-demand power.

It is estimated that the measure would also lead to net savings of ₹2 trillion (-\$27.16 billion) to ₹2.5 trillion (-\$33.95 billion) as a result of a reduction in oil imports due to greater EV adoption, as the advanced chemistry cell batteries would boost EV segment.

The program will also provide impetus to the research and development process to achieve higher specific energy density and cycles in the advanced chemistry cell batteries.

In April, the Union Cabinet approved the Ministry of New and Renewable Energy's proposal to implement the PLI program for the 'National Program on High-Efficiency Solar PV Modules' to achieve gigawatt-scale manufacturing with an outlay of ₹45 billion (-\$605 million). 



Renewable Projects Get Time Extension Amid Covid-19 Surge

MNRE has stated that renewable projects could claim extension due to the resurgence of the Covid-19 pandemic but cautioned developers not to use it to terminate PPAs

By : Rakesh Ranjan Parashar





iving relief to solar developers amid the Covid-19 crisis, the Ministry of New and Renewable

Energy (MNRE), in its latest notification, has stated that the renewable energy projects with their commissioning dates on or after April 1, 2021, could claim extension owing to the second surge of the Covid-19 pandemic. MNRE has, however, cautioned developers that the time extension should not be used as a ground for the termination of the power purchase agreement or claiming any increase in the project cost, including interest during construction or upward revision of the tariff.

The Ministry made it clear that the actual extent of the time extension will be decided in due course depending on the developments related to the Covid-19

Developers cannot claim upward revision of tariff because of extension in project completion

pandemic in the coming weeks.

Also, the Ministry clarified that on receipt of an application for the time extension, the implementing agency would not initiate any coercive action on the project to recover the penalty on delayed commissioning until the extended time frame is decided upon.

Once the project is granted an extension, the intermediate milestones of the project will also be extended as per the leeway granted. The developer should pass on the benefits of the extended deadline to other stakeholders down the value chain, including engineering, procurement, and construction contractors, material and equipment supplier, and original equipment manufacturers.

The Ministry took this decision based on the resurgence of the Covid-19 pandemic and the lockdown measures being put in place by several state governments in localized fashions to contain the pandemic.

Last year, during the Covid-19

outbreak and the subsequent lockdown, the Ministry had issued a notification stating that all under-development renewable projects would be given an extension of five months. The extension applied from March 25, 2020, to August 24, 2020.

MNRE had also issued a notification denying requests for another five-month extension for commissioning renewable energy projects, stating that these extensions would not be granted routinely from now on.

Again, MNRE clarified that the extension provided by implementing agencies on account of the first wave of the Covid-19 pandemic should in no case be more than six months, including the five-month blanket extension given earlier. However, the Ministry said that if the implementing agencies felt the need for an extension beyond six months, they should make a reference for consideration of MNRE with due justification and supporting documents. ■





Union Territories Revamp Tariffs for Renewables

The central electricity regulator has mandated the filing of tariff petitions on time every year. The union territories that have been so far deferring tariff determination have been actively submitting the petitions

By : Rahul Nair

The Joint Electricity Regulatory Commission (JERC) for the state of Goa and Union Territories has determined the levelized tariff for ground-mounted and rooftop solar projects in the Union Territories of Daman & Diu.

For rooftop solar projects installed from July 2019 to March 2020, a levelized tariff of ₹4.73 (\$0.06)/kWh was

approved. For rooftop solar projects installed in the financial year 2020-21, ₹4.72 (\$0.06)/kWh is set. For ground-mount solar projects of 1-3 MW, a tariff of ₹6.31 (\$0.08)/kWh is determined, and the tariff of a ground-mount solar project of 6 MW capacity is set as ₹5.97 (\$0.08)/kWh.

A petition was filed by the Electricity Department, Daman & Diu, which stated that the total installed solar capacity

in the union territory is about 14 MW. Of the total capacity, 10 MW is ground-mounted and the remaining is rooftop solar installations.

The Commission is of the view that had the petitioner filed the petition in time, then the problem of determining the tariff from the date of the commercial operation would not have arisen. But since they failed to do so, the Commission calculated year-wise tariff

and averaged it.

A similar case was with the union territory of Dadra and Nagar Haveli. The state distribution company had failed to file the petition to determine the levelized tariff in time and submitted the petition late.

The petition further stated that as per the Renewable Energy Policy, 2017, all high-tension/extra-high-tension (HT/EHT) consumers were directed to install solar rooftop units at 5% of the contract demand. As of now, about 20.6 MW of rooftop solar systems have been installed by HT/EHT consumers.

The petition covers the basis, assumptions, and projections of individual elements constituting the determination of levelized tariff for power from ground-mounted solar PV projects and rooftop solar systems.

The petitioners stated that the tariff for the power generated from 10,000 kW ground-mounted solar PV plants, 4,137 kW rooftop solar systems, and an additional 279 kW rooftop solar systems were commissioned before March 31, 2019, was required to be determined as per JERC Regulation, 2015.

The Commission has observed that the petitioner has failed to file the petition for determining the levelized tariff in time and submitted the petition for these systems at a later stage. Therefore, the tariff for these systems cannot be determined retrospectively

and the consumers were burdened for no fault of theirs.

The tariff of these plants would be applicable from April 1, 2021, onwards.

The Commission reiterated that the petitioner did not file this petition immediately after commissioning of the said projects and delayed the filing of the petition, which they failed to explain. Therefore, the Commission has taken a serious view regarding the casual approach of the petitioner and

Total installed solar capacity in Daman & Diu is about 14 MW

directed them to avoid repeating the lapse in the future.

The petitioner cannot be allowed the power purchase cost on these projects up to FY 2020-21 but will be entitled to recover the power purchase cost from April 01, 2021.

The project life of each solar plant shall be considered for 25 years from the date of commissioning of the respective solar plant.

The Commission also directed the petitioner to segregate the solar assets

considered in this order from the 'Fixed Assets Register' of the electricity department and filing an annual performance review of FY 2021-22 and the aggregate revenue requirements petition of FY 2022-23.

In 2018, the Diu Smart City became the first in the country to run on 100% renewable energy during daytime hours.

Meanwhile, in 2019, the JERC, in its order, directed the Electricity Department, Daman & Diu, to bid sensibly and purchase renewable energy certificates in the remaining months of the financial year 2019-20 to meet its renewable purchase obligation targets.

The Commission made it clear that it was unhappy with the electricity department of Daman & Diu as it had failed to exhibit any seriousness about meeting the shortfall in its renewable purchase obligation target.

Goa, Andaman & Nicobar Islands, Lakshadweep Islands, Puducherry, Daman & Diu, Dadra & Nagar Haveli, and Chandigarh

The JERC also announced the generic tariffs for solar, wind, and small hydro projects in Goa, and the UTs of Andaman & Nicobar Islands, Lakshadweep Islands, Puducherry, Daman & Diu, Dadra & Nagar Haveli, and Chandigarh.

The tariff order is effective from April 1, 2021, to March 31, 2022, or until

The following tariffs were determined by the Commission based on the merits of the petition:

Daman & Diu: Levelized Tariff Approved by the Commission

Types of Solar Projects	Petitioner's Submission		Approved by Commission	
	₹ /kWh	~\$/kWh	₹ /kWh	~\$/kWh
A. Rooftop Solar PV Project				
i) Rooftop solar PV project installed before implementation of Joint Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2019	7.86	0.11	6.15	0.08
ii) Rooftop solar PV project installed after notification of Joint Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2019 (from Jul 19 to Mar 20)	5.93	0.08	4.73	0.06
iii) Rooftop solar PV project installed in FY 2020-21	5.93	0.08	4.72	0.06
B. Ground-Mount Solar PV Project				
i) 1 MWp	8.65	0.12	6.31	0.08
ii) 3 MWp	8.65	0.12	6.31	0.08
iii) 6 MWp	8.65	0.12	5.97	0.08

Source : JERC

Mercom India Research



further orders of the Commission, whichever is later. It will be applicable for the renewable energy projects commissioned during the year.

According to the regulations, the generic tariff determined by the Commission will act as a ceiling tariff. To procure renewable power, the distribution licensee will have to file a petition to adopt tariffs under Section 63 of the Act.

Generic tariff for solar projects in Lakshadweep is ₹6.94 (\$0.090)/ kWh

For renewable energy technologies like biomass power projects with fuel cost components, the single-part tariff will carry two components: fixed cost

component and fuel cost component.

The Commission also pronounced that the generic tariff would be determined based on the year of commissioning of the project on a levelized basis for the tariff period. The body further noted that to compute levelized tariff, the discount factor equivalent to a post-tax weighted average cost of capital would be considered.

Solar PV projects

For solar (gross metering) projects, the Commission considered the useful life as 25 years. The normative capital cost for solar projects in the mainland areas without capital subsidy is considered as ₹50 million (\$674,000)/MW and ₹60 million (\$810,000)/MW in island areas.

Debt to equity ratio of 70:30 of the capital cost is considered for the projects. The return on equity for the mainland areas is taken as 14% grossing up with an Alternate Minimum Tax rate of 17.47%. The return on equity for the island areas is taken as 14%.

An interest rate of 9% and 10% is considered on the debt portion for mainland and island areas, respectively. The working capital interest rate is 10% and 11% for mainland and island areas, respectively.

The depreciation for the solar projects is calculated at a rate of 5.83% for the first 12 years and 1.54% subsequently for the remaining useful life of 13 years.

The operation and maintenance expense for the first year is set as 1.5% of the capital cost for mainland areas and 2% for island areas. The escalation rate of operation and maintenance expenses for subsequent years is considered as 3.71% for the rest of the project's useful life.

The above parameters are considered with a discount factor of 8.67% for mainland areas and 9.76% for island areas. As a result, the generic tariff for solar projects (gross metering) commissioned between the date of the issue of this order to March 31, 2022, was determined as ₹4.68 (\$0.063)/kWh for Goa, Dadra & Nagar Haveli, Daman,

JERC: Generic Tariff for Solar PV Projects for FY 2021-22 For the State of Goa and Union Territories

States/Union Territories	Tariff Period (Years)	Levelized Tariff		Benefit of Accelerated Depreciation (if availed)		Net Levelized Tariff (upon adjusting for accelerated depreciation benefit, if availed)	
		₹/kWh	~\$/kWh	₹/kWh	~\$/kWh	₹/kWh	~\$/kWh
Goa	25	4.68	0.06	0.34	0.005	4.34	0.06
Chandigarh	25	4.96	0.07	0.36	0.005	4.60	0.06
Dadra & Nagar Haveli	25	4.68	0.06	0.34	0.005	4.34	0.06
Daman	25	4.68	0.06	0.34	0.005	4.34	0.06
Diu	25	4.68	0.06	0.34	0.005	4.34	0.06
Puducherry	25	4.68	0.06	0.34	0.005	4.34	0.06
Andaman & Nicobar Island	25	6.75	0.09	0.49	0.007	6.27	0.08
Lakshadweep	25	6.75	0.09	0.49	0.007	6.27	0.08

Source: JERC

Mercom India Research

Diu, and Puducherry. For Andaman & Nicobar Island and Lakshadweep, it is considered as ₹6.75 (\$0.090)/kWh and ₹4.96 (\$0.067)/kWh for Chandigarh.

For solar projects commissioned up to March 31, 2021, the generic tariff was ₹4.82 (\$0.064)/kWh for Goa, Dadra & Nagar Haveli, Daman, Diu, and Puducherry. For Andaman & Nicobar Island and Lakshadweep, it was ₹6.94 (\$0.092)/kWh and ₹5.10 (\$0.068)/kWh for Chandigarh.

Wind projects

For wind projects, the Commission considered the useful life as 25 years. The normative capital cost for wind projects in the mainland areas without capital subsidy was considered as ₹52.5 million (\$709,429)/MW and ₹62.5 million (\$840,000)/MW in island area of Andaman and Nicobar and ₹70 million (\$940,000)/MW in Lakshadweep.

The other parameters are the same as

what is considered for solar projects.

The generic tariff for wind projects (gross metering) commissioned between the date of the issue of this order to March 31, 2022, is determined as ₹4.92

Diu Smart City, first in the country to run on 100% renewables during daytime hours

(\$0.07)/kWh for Goa, Dadra & Nagar Haveli, and Chandigarh. For Daman, Diu, and Puducherry, it is considered as

₹4.66 (\$0.06)/kWh, ₹3.40 (\$0.05)/kWh, and ₹4.21 (\$0.07)/kWh, respectively.

For Andaman & Nicobar Island and Lakshadweep, it is considered as ₹6.65 (\$0.09)/kWh and ₹6.70 (\$0.09)/kWh, respectively.

For wind projects commissioned up to March 31, 2021, the generic tariff for Goa, Dadra & Nagar Haveli, and Chandigarh was ₹5.06 (\$0.07)/kWh. For Daman, Diu, and Puducherry, it was ₹4.79 (\$0.064)/kWh, ₹3.50 (\$0.047)/kWh, and ₹4.34 (\$0.058)/kWh, in that order.

For Andaman & Nicobar Island and Lakshadweep, it was set as ₹6.83 (\$0.091)/kWh and ₹6.88 (\$0.092)/kWh, respectively.

Small hydro projects

For small hydro, the Commission considered the useful life as 35 years. The normative capital cost for small hydro projects in the mainland areas

JERC: Generic Tariff for Wind Energy Based Projects for FY 2021-22 for the State of Goa and Union Territories

States/Union Territories	Tariff Period (Years)	Levelized Tariff		Benefit of Accelerated Depreciation (if availed)		Net Levelized Tariff (upon adjusting for accelerated depreciation benefit, if availed)	
		₹/kWh	~\$/kWh	₹/kWh	~\$/kWh	₹/kWh	~\$/kWh
Goa	25	4.92	0.07	0.36	0.005	4.56	0.06
Chandigarh	25	4.92	0.07	0.36	0.005	4.56	0.06
Dadra & Nagar Haveli	25	4.92	0.07	0.36	0.005	4.56	0.06
Daman	25	4.66	0.06	0.34	0.005	4.32	0.06
Diu	25	3.40	0.05	0.25	0.003	3.16	0.04
Puducherry	25	4.21	0.06	0.31	0.004	3.91	0.05
Andaman & Nicobar Island	25	6.65	0.09	0.48	0.006	6.17	0.08
Lakshadweep	25	6.70	0.09	0.48	0.006	6.21	0.08

Source: JERC

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JERC: Generic Tariff for Small Hydro Projects for FY 2021-22

Type of SHP		Tariff Period (Years)	Levelized Tariff			Benefit of Accelerated Depreciation (if availed)		Net Levelized Tariff (upon adjusting for accelerated depreciation benefit, if availed)	
			₹/kWh	₹/kWh	~\$/kWh	₹/kWh	~\$/kWh	₹/kWh	~\$/kWh
Mainland	Lower than or equal to 5 MW	35	4.49	0.06	0.29	0.004	4.2	0.06	
	Above 5 MW and lower than or equal to 25 MW	35	4.08	0.05	0.27	0.004	3.81	0.05	
Islands	Lower than or equal to 5 MW	35	6.89	0.09	0.46	0.006	6.44	0.09	
	Above 5 MW and lower than or equal to 25 MW	35	5.91	0.08	0.39	0.005	5.52	0.07	

Source: JERC

Mercom India Research

without capital subsidy was considered as:

- Below or equal to 5 MW - ₹9 million (-\$1.05 million)/MW
- Above 5 MW and below or equal to 25 MW - ₹7 million (-\$956,095)/MW

Projects in island areas:

- Below or equal to 5 MW - ₹105 million (-\$1.41 million)/MW
- Above 5 MW and below or equal to 25 MW - ₹90 million (-\$1.2 million)/MW

The depreciation for the small hydro projects is calculated at a rate of 5.83% for the first 12 years and 0.87% subsequently for the remaining useful

life of 23 years.

The generic tariff for small hydro projects (gross metering) commissioned between the date of the issue of this order to March 31, 2022, is ₹4.49 (\$0.06)/kWh for projects below or equal to 5 MW on the mainland. For projects above 5 MW and lower than or equal to 25 MW, the generic tariff is ₹4.08 (\$0.05)/kWh.

For small hydro projects in islands, the generic tariff is ₹6.89 (\$0.09)/kWh for projects below or equal to 5 MW. For projects above 5 MW and lower than or equal to 25 MW, the generic tariff is set

at ₹5.91 (\$0.08)/kWh.

In comparison, for small hydro projects commissioned up to March 31, 2021, the generic tariff was ₹4.63 (\$0.062)/kWh for projects below or equal to 5 MW on the mainland. For projects above 5 MW and lower than or equal to 25 MW, the generic tariff is ₹4.21 (\$0.056)/kWh.

For small hydro projects in islands, the generic tariff was ₹7.09 (\$0.094)/kWh for projects below or equal to 5 MW. For projects above 5 MW and lower than or equal to 25 MW, the generic tariff is set at ₹6.08 (\$0.081)/kWh. 


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Regulators Mulling Ways to Reduce Retail Power Tariffs

Regulators from 12 states have suggested measures, highlighting the need for a coordinated effort between the central and state governments to contain high retail power tariffs

By : Rakesh Ranjan Parashar





In a recent meeting, the Forum of Regulators discussed factors affecting the cost of power and stressed the need to analyze and evolve measures to reduce or contain the retail tariff.

The working group made certain recommendations, highlighting the need for a coordinated effort by the central and the state governments to address high retail tariffs.

The Forum considered the data from 12 states - Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Odisha, Uttar Pradesh, and Uttarakhand. Cumulatively, these states account for 50% of the total energy consumed in the country.

The working group observed that the power purchase cost was the largest contributor to the average cost of supply, with an average of more than 70% share in the cost for a distribution company (DISCOM). Following the power purchase cost, transmission charges, and operation and maintenance expenses contributed a major share.

External factors

Coal

The panel observed that coal cost

was a major contributor to the power purchase cost. The increase in coal price was 28% higher than the estimated price increase based on the weighted average of the wholesale price index and consumer price index. The group recommended that the coal sector be brought under an independent regulator at the earliest.

Also, there was a need for the electricity regulators to monitor and suitably regulate the station heat rate and gross calorific value of coal-based power projects. Coal pricing also needed to be regulated as in other sectors since it is currently a monopoly.

Railway freight

The working group noted that the railway freight charges increased 40% in the past four years. The members recommended that the railways be brought under an independent regulatory body. They also suggested that the central government consider subsidizing railway freight for a distance beyond 750 km.

Clean energy cess

The committee questioned the rationale of continuing with the clean energy cess considering the increasing investment in renewables. If it was to

be continued, then the proceeds from this cess should be brought back to the electricity sector to mitigate the incremental cost of new environmental norms, the panel proposed. Since 2010 as of the financial year 2019-20, over ₹1.15 trillion (-\$15.6 billion) has been collected in clean energy cess.

Power purchase cost is the largest contributor to the average cost of supply

In January 2020, the Prime Minister's office proposed waiving the cess on coal to reduce the financial strain on distribution companies, besides helping the thermal power projects install flue gas desulfurization to curb pollution.

The history of clean energy cess

In 2010, the government created the National Clean Energy Fund (NCEF) to sponsor the cost of research and



innovative projects using clean energy technologies by public and private sector entities. The idea was to collect tax from the polluting coal industry to fund clean energy. The cess, which was ₹50 (-\$0.74)/ton when it was introduced in 2010, was raised to ₹100 (-\$1.5)/ton in 2014 and ₹200 (-\$3)/ton in the 2015-2016 budget. It was again doubled from ₹200 (-\$3)/ton to ₹400 (-\$6)/ton in the 2016-17 budget.

In March 2017, the fund was rebranded as Clean Environment Cess from the earlier Clean Energy Cess to include river cleaning and other projects.

In April 2017, the government enacted a bill that said it would utilize the Clean Environment Cess (India's version of carbon tax) collected on coal to finance the Goods and Services Tax (GST) Compensation Fund, a non-lapsable fund that will form part of the public account of India.

New environmental norms

India had initially set a 2017 deadline for thermal power plants to comply with emissions standards installing flue gas desulphurization (FGD) infrastructure to cut toxic sulfur dioxide emissions. The deadline was later moved to separate timelines for different regions, ending in 2022. The Ministry of Power also proposed a ₹835 billion (\$11.70 billion) plan to meet the cost of development of FGD units at coal plants.

With the implementation of new environmental norms (FGD installation), the cost per unit of energy will increase substantially. This increase in cost should be compensated from the clean energy cess, which has been collected from the consumers of the electricity sector, the panel suggested.

Norms for disposal of fly ash

As per the draft notification issued by the Ministry of Environment, Forest, and Climate Change, the cost of transportation of fly ash is to be borne by the thermal power projects, which will substantially impact the cost of power generation. The group recommended that the central and state governments partially bear the cost of transportation of fly ash.

Details of Coal Consumption and Clean Energy Cess Since 2010

Year	Coal Consumption for the Power Sector	Clean Energy Cess	
	Million metric tonne (MMT)	₹ million	~\$ million
2010-11	396	9,900	136
2011-12	438	21,880	300
2012-13	485	24,270	333
2013-14	493	24,660	338
2014-15	498	37,330	512
2015-16	518	94,920	1,302
2016-17	535	196,180	2,692
2017-18	608	243,200	3,337
2018-19	629	251,440	3,450
2019-20	622	248,830	3,144
Total	5,222	1,152,610	15,544

Source: MOSPI

Mercom India Research

Internal factors

High transmission costs

The group recommended that transmission planning be based on accurate demand forecasts by the DISCOMs and the state transmission utilities in the future.

Over ₹1.15 trillion has been collected in clean energy cess between 2010 and 2020

Also, the central government should share the cost of the stranded assets by utilizing the clean energy cess, the team noted. As the cess is being collected from the power sector, it should provide relief to the sector, the members opined.

All the state electricity regulatory commissions (SERCs) should decide

a normative threshold above which projects should be selected through tariff-based competitive bidding, the members said.

Back in 2017, the Ministry of New and Renewable Energy had amended the guidelines for the disbursal of grant for the development of intra-state transmission system under the green energy corridor project in the states of Andhra Pradesh, Himachal Pradesh, Gujarat, Karnataka, Madhya Pradesh, Rajasthan, Maharashtra, and Tamil Nadu. The grant was part of the clean energy cess.

Generation assets are stranded

As in transmission assets, the fixed cost of stranded generation assets is being paid for by the consumers without getting any benefit. In addition, the additional stranded capacity cost estimated on account of renewable energy integration is in the range of ₹1.02/kWh. As per the suggestions proposed by the group, the government should extend help to DISCOMs to meet the fixed cost of the power purchase agreements (PPAs) associated with the stranded assets.



Return on equity to be made realistic

The performance of DISCOMs has a significant impact on retail tariffs for consumers. Therefore, there is a need to link recovery of return of equity with the performance of the utilities, based on indicators such as supply availability, network availability, and aggregate technical and commercial loss reduction, the body suggested.

Impact of depreciation on tariff

The depreciation rate should be rationalized, and the period of depreciation should be extended. The team suggested the tenure be extended to 15 years from 12 years. Accumulated depreciation, over and above debt repayment, should be used to reduce the equity base for return on equity, they added.

The growing share of renewable energy

The group observed that although green power was available at ₹2.50 (-\$0.034)/kWh or less, the costs of transmission and balancing cost were eating into the benefits it could have brought. The group suggested that apart from large-scale renewable projects, the focus in the future should also be on the distributed generation that would minimize transmission infrastructure and help reduce the cost.

The case for short-term PPAs

The group also proposed that the 25 years' life of PPAs for new projects contracted through competitive bidding is too long. They insisted that shorter duration PPAs with exit clauses should be promoted.

Shorter-term PPAs with exit clauses suggested to reduce retail power tariffs

Cost optimization through greater use of market

As per the suggestions proposed by the group, the power purchase cost could be reduced if the Merit Order Dispatch was followed strictly and the power market and other platforms were used for the optimization of power procurement.

Trading margin be curtailed

The group also noted that although the average trading margin was in the range of ₹0.03 (-\$0.0004)-₹0.04 (-\$0.0005)/kWh, the ceiling of ₹0.07 (-\$0.0009)/kWh set by the Central

Electricity Regulatory Commission (CERC) was being misused by public sector traders. The group proposed that the CERC should look into the matter and cap the same at ₹0.02 (-\$0.0003)/kWh. Solar Energy Corporation of India's trading margin of ₹0.07 (-\$0.0009)/kWh is already being disputed by generators.

Waiver of water usage charges for hydro projects

According to the suggestions, the matter of waiver of water usage charges for hydro projects should be taken up by the Ministry of Power.

Distribution level efficiency in operation

The SERCs should provide a long-term trajectory for loss reduction and ensure that the DISCOMs follow the trajectory, the panel said, adding that common regulation also needed to be brought in to curtail the losses of DISCOMs.

Other suggestions

Apart from the suggestions mentioned above, the panel proposed that all future generation projects, except hydropower and nuclear projects, should be set up only through competitive bidding. Also, the norms for operation and maintenance expenses should be made more stringent, the members added. @

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Take mechanical load into consideration, Difference on BOS (USD/W)	standard	+2.06%

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Solar Imports and Exports Surge in Q1 2021

With the pandemic waning in Q1 2021, solar imports and exports soared QoQ. However, commercial activities have since slowed down with the second wave of the Covid-19 pandemic

By : Rakesh Ranjan Parashar



In the first quarter (Q1) of the calendar year (CY) 2021, India imported solar cells and modules amounting to \$259 million (-₹18.93 billion), a 132% increase compared to Q4 CY 2020. The numbers are 72% higher than \$150.57 million (-₹10.83 billion) during the same period last year.

The increase in imports was a result of improved demand due to the waning impact of the Covid-19 pandemic in Q1 2021. However, commercial activities have again slowed down because of the second wave of the pandemic that is ravaging the country right now.

Solar exports also registered a significant growth of 293% and stood at \$28.5 million (-₹2.08 billion) compared to \$7.25 million (-₹528.4 million) in Q4 2020. The figures showed a marginal decline of 19% compared to \$35.09 million (-₹2.51 billion) during the same period last year.

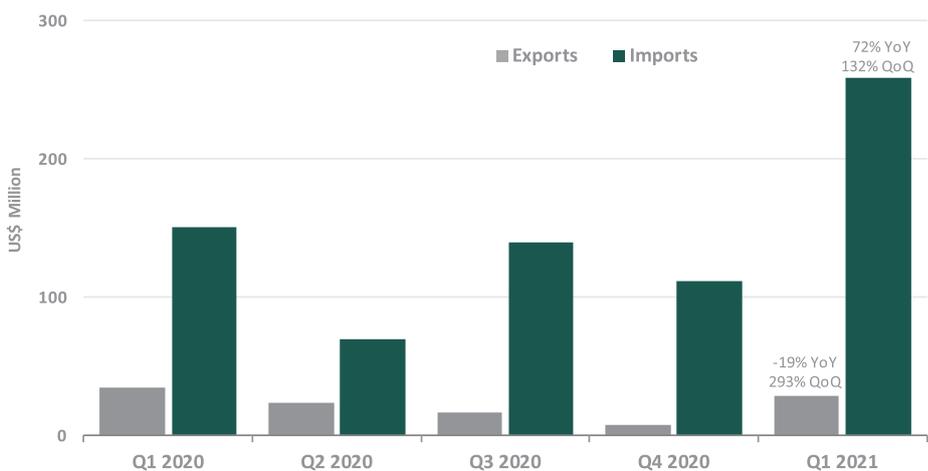
Solar Imports in Q1 2021

China was the largest exporter of solar modules and cells to India in Q1 CY 2021, followed by Thailand, Vietnam, Malaysia, and Taiwan.

Solar Exports in Q1 2021

The United States continued to be the largest market for solar exports from

India Solar Cell and Module Quarterly Import-Export Activity (\$M)



Data from Department of Commerce

Source: Mercom India Research

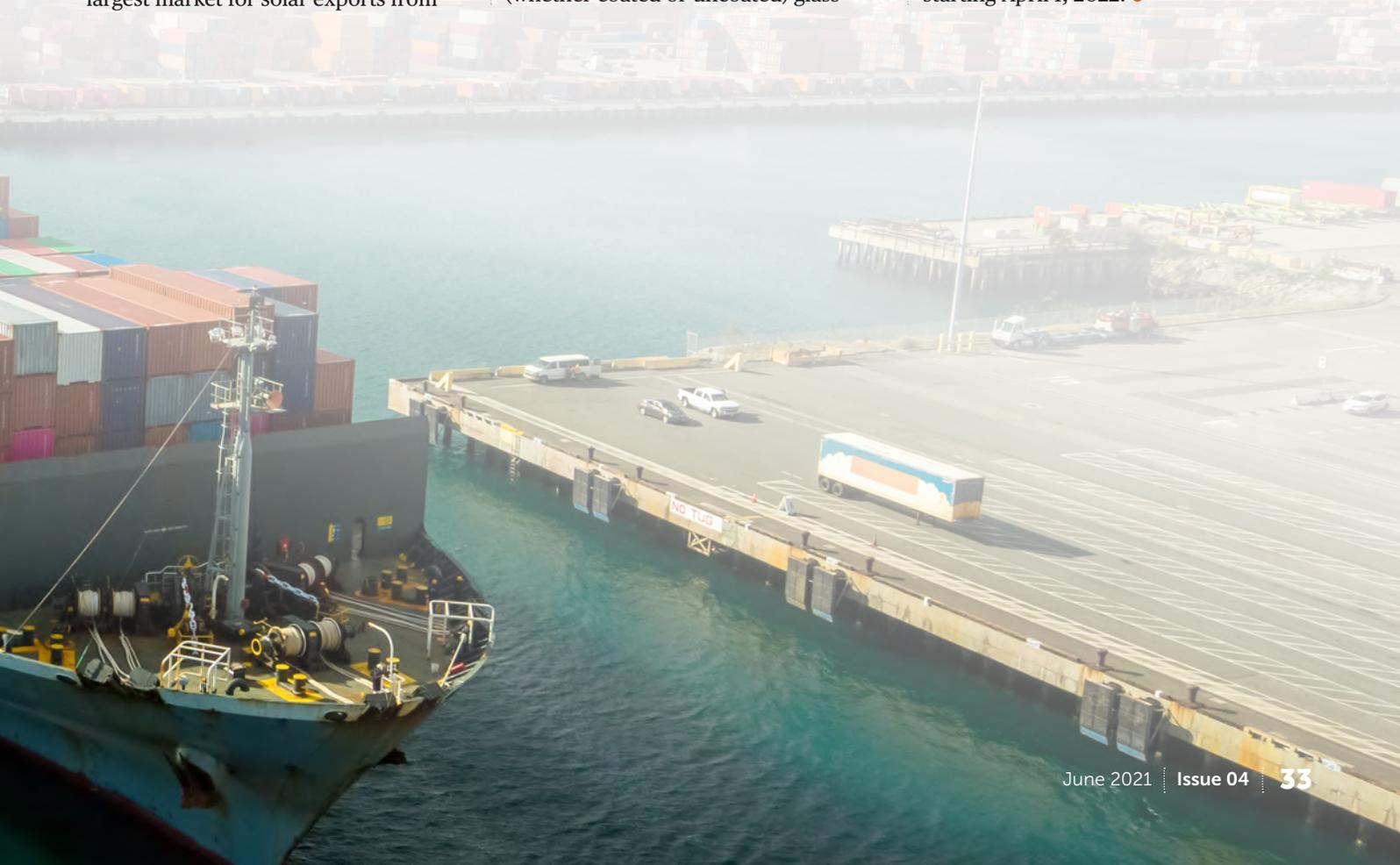
India, followed by Nigeria, South Africa, Congo, and Saudi Arabia.

In CY 2020, India imported solar cells and modules worth \$475.78 million (-₹34.7 billion), a 78% drop from CY 2019. Exports had also declined by 67% for a total value of \$84.16 million (-₹6.14 billion) in CY 2020 compared to \$253.01 million (-₹18.45 billion) in 2019.

In March this year, the Ministry of Finance notified the levy of a countervailing duty on the cost, insurance, and freight value on the imports of textured and tempered (whether coated or uncoated) glass

from Malaysia. The countervailing duty imposed under the notification would be applicable for five years. In December last year, the Directorate General of Trade Remedies (DGTR) had announced that it would levy countervailing duty on tempered glass from Malaysia to mitigate the benefits enjoyed by producers of the glass in Malaysia.

Also, in March, the Ministry of New and Renewable Energy (MNRE) announced the basic customs duty on imported solar cells and modules starting April 1, 2022. 📌



Molecular Glue Boosts Efficiency of Perovskite Solar Cells

Researchers at Brown University have identified the weak link in the cells and increased their functionality by devising a glue that keeps a key interface inside cells from degrading

By : Srinwanti Das



In a step toward improving the long-term reliability of perovskite solar cells, a research team at Brown University has devised a molecular glue that keeps a key interface inside cells from degrading.

In a study published in the journal *Science*, the researchers explained that the treatment dramatically increases cells' stability and reliability over time while also improving the efficiency with which they convert sunlight into electricity.

Commenting on the emerging clean energy technology, Nitin Padture, a professor of engineering at Brown University and senior author of the new research, said, "There have been great strides in increasing the power-conversion efficiency of perovskite solar cells. But the final hurdle to be cleared before the technology can be widely available is reliability - making cells that maintain their performance over time. That's one of the things my research group has been working on, and we're happy to report some important progress."

Padture's research group won a \$1.5 million grant from the U.S. Department of Energy to expand its work.

Perovskites are a class of materials with a specific crystalline atomic structure. When a little over a decade ago, researchers showed that perovskites are very good at absorbing light, the findings led to a flurry of research into perovskite solar cells. The efficiency of those cells has rapidly increased and is now comparable to traditional silicon cells, the researchers said. The difference is that perovskite light absorbers can be made at near-room temperature, whereas silicon needs to be grown from a melt at a temperature approaching 2,700 degrees Fahrenheit. Perovskite films are also about 400 times thinner than silicon wafers. The comparatively easier manufacturing processes and the use of less material make perovskite cells cheaper. These cells can be potentially made at a fraction of the cost of silicon cells, the experts said.

Perovskite cells could cost a fraction of what silicon cells cost

While the efficiency improvements in perovskites have been remarkable, Padture said that making the cells more stable and reliable has remained challenging. Part of the problem has to do with the layering required to make a functioning cell. Each cell contains five or more distinct layers, each performing a different function in the electricity-generation process. Since these layers are made from different materials, they respond differently to external forces, he added. Also, temperature changes that occur during the manufacturing process and

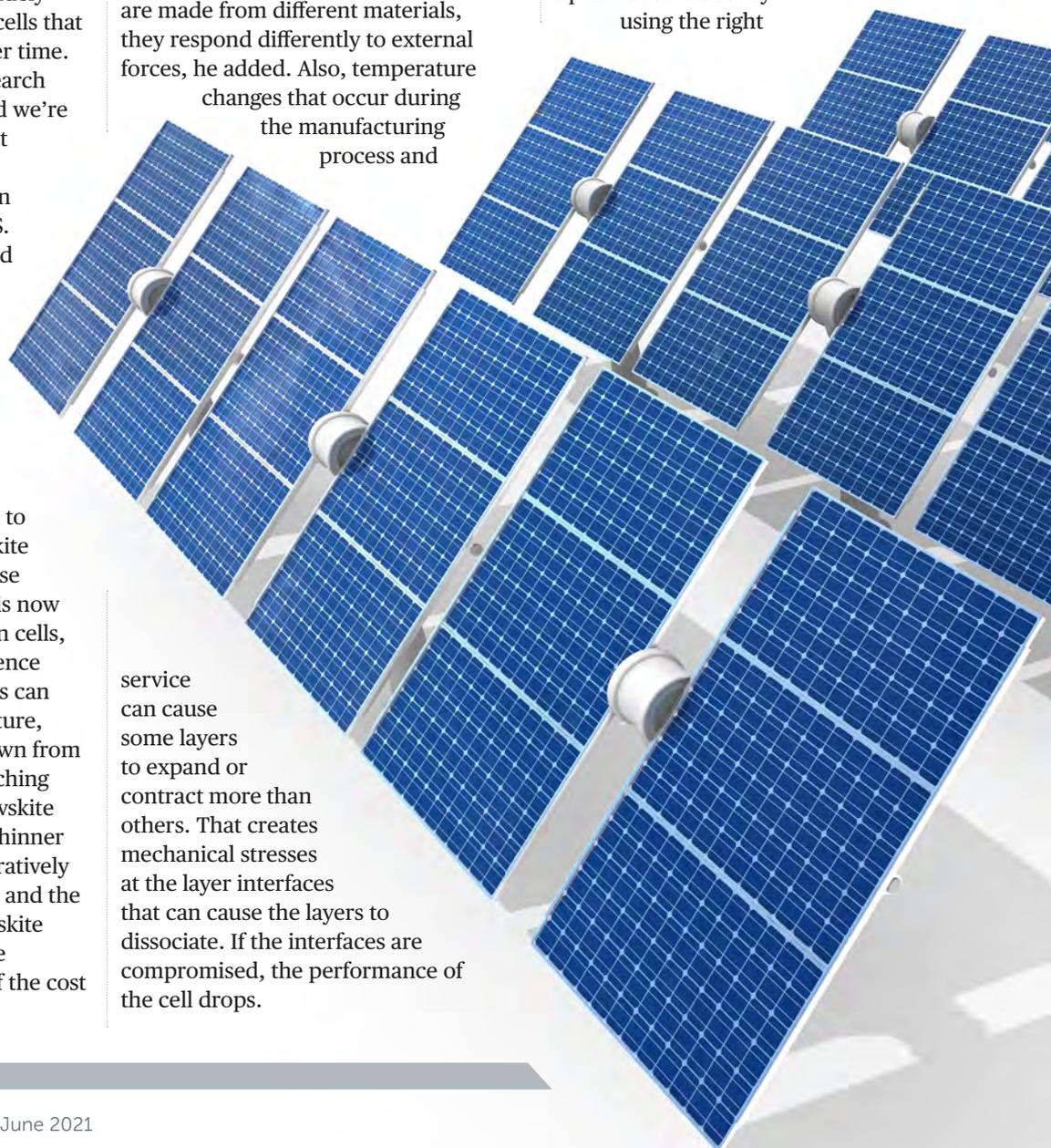
service can cause some layers to expand or contract more than others. That creates mechanical stresses at the layer interfaces that can cause the layers to dissociate. If the interfaces are compromised, the performance of the cell drops.

The weakest of those interfaces is between the perovskite film used to absorb light and the electron transport layer, which continues to carry current through the cell.

"A chain is only as strong as its weakest link, and we identified this interface as the weakest part of the whole stack, where failure is most likely to take place," said Padture, adding, "If we can strengthen that, then we can start making real improvements in reliability."

To achieve that, Padture and his colleagues began experimenting with compounds known as self-assembled monolayers (SAMs).

"This is a large class of compounds," Padture said, elaborating further that when these are deposited on a surface, the molecules assemble themselves in a single layer and stand up like short hairs. By using the right



formulation, strong bonds between these compounds and all kinds of different surfaces could be formed, the researcher explained.

Padtare and his team found that a formulation of SAM with silicon atom on one side, and iodine atom on the other, could form strong bonds with both the electron transport layer (which is usually made of tin oxide) and the perovskite light-absorbing layer. The team hoped that the bonds formed by these molecules would strengthen the layer interface. The researchers seemed to be heading in the right direction.

“When we introduced the SAMs to the interface, we found that it increases the fracture toughness of the interface by about 50%, indicating that any cracks that form at the

the study retained 80% of their peak efficiency for around 700 hours of lab testing. Meanwhile, the SAM cells were still going strong after 1,300 hours of testing. Based on those experiments, the researchers project the 80% efficiency life of the SAM cells to be about 4,000 hours.

“One of the other things we did, which people don’t normally do, is breaking open the cells after testing,” said Zhenghong Dai, a Brown doctoral student and lead author of the research.

In the control cells without the SAMs, the researchers saw damages such as voids and cracks. But with the SAMs, the toughened interfaces looked unaffected, they revealed. The improvement reportedly surprised the researchers.

Padtare said the improvement in toughness did not come at the cost of

SAMs would potentially add little to the production cost, Padture said.

The researchers plan to build on this success. Having strengthened the weakest link in the perovskite solar cell stack, they’d like to move onto the

Perovskite films are about 400 times thinner than silicon wafers

next weakest link until they’ve fortified the entire stack, they said. That work will involve strengthening not only the interfaces but also the material layers.

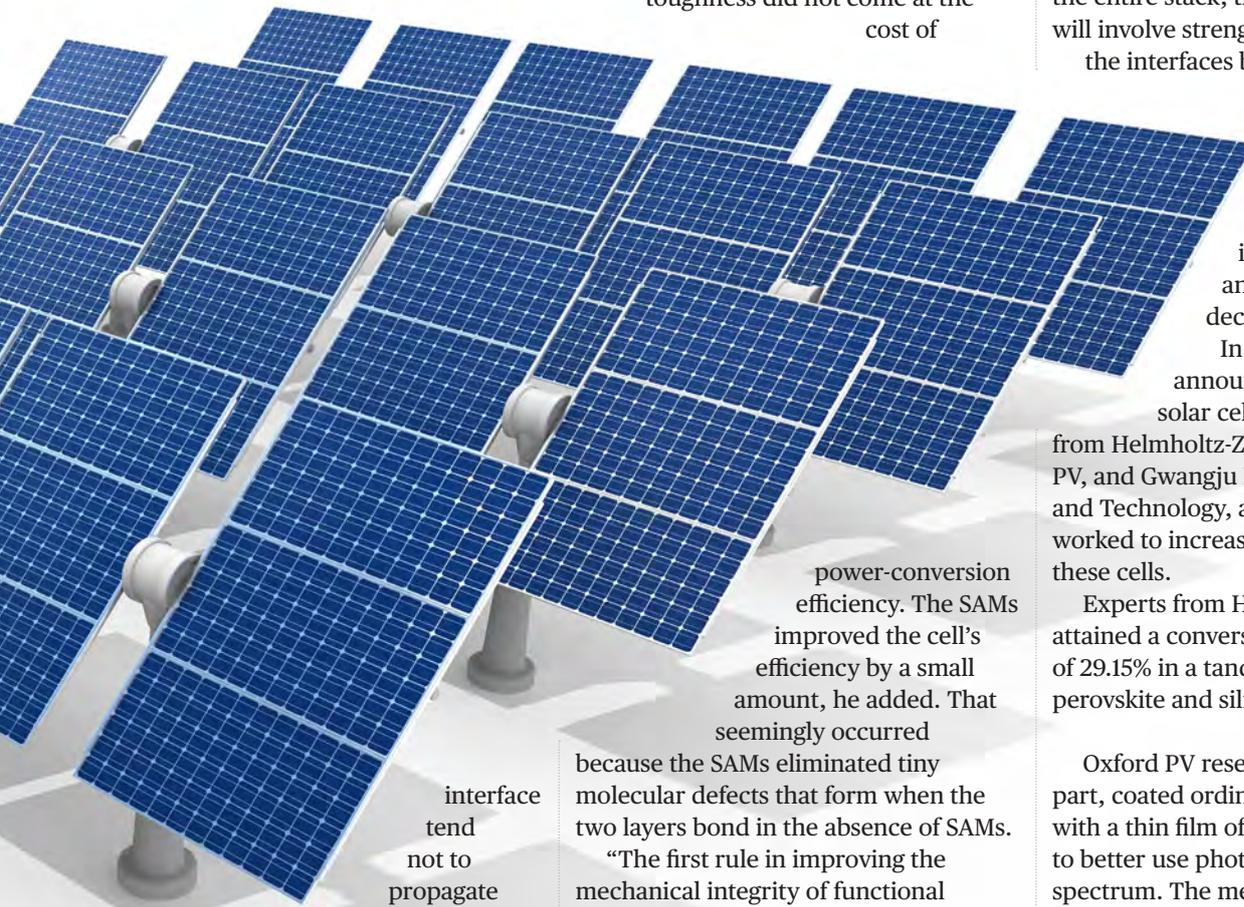
“This is the kind of research that’s required to make cells that are inexpensive, efficient, and perform well for decades,” Padture said.

In a long list of research announced on perovskite solar cells, research teams from Helmholtz-Zentrum Berlin, Oxford PV, and Gwangju Institute of Science and Technology, among others, have worked to increase the efficiency of these cells.

Experts from Helmholtz-Zentrum had attained a conversion efficiency record of 29.15% in a tandem solar cell made of perovskite and silicon.

Oxford PV researchers, on their part, coated ordinary silicon solar cells with a thin film of perovskite material to better use photons across the solar spectrum. The method resulted in 29.52% efficiency.

Scientists from South Korea-based Gwangju Institute used L-alanine as an additive to perovskite materials to passivate defects and increase grains in perovskite solar cells to overcome the problem. They confirmed that solar cell efficiency increased to 20.3% from 18.3%. 



Padtare said. “Therefore, in effect, the SAMs become a kind of molecular glue that holds the two layers together,” he elaborated.

Testing solar cell function showed that the SAMs increased the functional life of the perovskite cells to a large extent. Non-SAM cells prepared for

interface tend not to propagate very far,”

because the SAMs eliminated tiny molecular defects that form when the two layers bond in the absence of SAMs.

“The first rule in improving the mechanical integrity of functional devices is ‘do no harm,’” Padture said. “The fact that we could improve reliability without losing efficiency - and even improving efficiency - was a nice surprise,” he said.

The SAMs themselves are made from readily available compounds and easily applied with a dip-coating process at room temperature. So, the addition of

power-conversion efficiency. The SAMs improved the cell’s efficiency by a small amount, he added. That seemingly occurred

Rechargeable Cement-Based Batteries – New Sustainable Building Materials

Researchers have devised a rechargeable prototype of a high-rise concrete structure mixed with short carbon fibers capable of storing energy like a giant battery with huge commercial potential

By : Srinwanti Das

Researchers from Chalmers University of Technology, Sweden, have published a paper outlining a new concept for rechargeable batteries made of cement. Developed by scientists attached to the varsity's Department of Architecture and Civil Engineering, the concept involves a high-rise concrete structure capable of storing energy like a giant battery.

The ever-growing need for sustainable building materials for the future prompted Emma Zhang, a former associate at the university, to join Professor Luping Tang's research group. The team has now developed the first

such concept for a rechargeable cement-based battery.

The concept involves a cement-based mixture mixed with small amounts of short carbon fibers. This, the researchers said, increases the conductivity and flexural toughness. Then, embedded within the mixture is a metal-coated carbon-fiber mesh - iron for the anode and nickel for the cathode. The team said that they have settled for the particular prototype after a lot of testing.

Zhang said that very low-performance results from earlier studies investigating concrete battery technology forced them to think out of the box and come

up with another way to produce the electrode. "This particular idea that we have developed - which is also rechargeable - has never been explored before. Now we have proof of concept-at-lab scale," Zhang explained.

Tang and Zhang's research has produced a rechargeable cement-based battery with an average energy density of 7 Wh per square meter (or 0.8 Wh per liter). Energy density is used to express the capacity of the battery, and a modest estimate is that the performance of the new Chalmers battery could be more than ten times that of earlier attempts at concrete batteries. The energy density is still low in comparison to commercial





batteries, said the researchers. They, however, added that the limitation could be overcome owing to the huge volume at which the battery could be constructed when used in buildings.

The fact that the battery is rechargeable is its most important quality, and the possibilities for utilization if the concept is further developed and commercialized are almost staggering, feel the researchers. The researchers see applications that could range from powering LEDs, providing 4G connections in remote areas, or cathodic protection against corrosion in concrete infrastructure.

“It could also be coupled with solar cell panels, for example, to provide electricity and become the energy source for monitoring systems in highways or bridges, where sensors operated by a concrete battery could detect cracking or corrosion,” suggests Zhang.

The concept of using structures and buildings in this way could be revolutionary because it would offer an alternative solution to the energy crisis by providing a large volume of energy storage, the experts said.

Concrete, which is formed by mixing cement with other ingredients, is the world’s most commonly used building material. The researchers feel that although from a sustainability perspective, concrete is far from ideal, the potential to add functionality to it could offer a new dimension.

“We have a vision that in the future, this technology could allow for whole sections of multi-story buildings made

“Since concrete infrastructure is usually built to last fifty or even a hundred years, the batteries would need to be refined to match this or to be easier to exchange and recycle when their service life is over. For now, this offers a major challenge from a technical point of view,” Zhang elaborated.

While technologies such as these are breaking ground, a new joint study published by the European Patent Office

The concept involves a cement-based mixture mixed with small amounts of short carbon fibers

of functional concrete. Considering that any concrete surface could have a layer of this electrode embedded, we are talking about enormous volumes of functional concrete,” Zhang added in an optimistic note.

The idea is still at a very early stage, said the researchers. The technical concerns need to be addressed before the commercialization of the technique.

and the International Energy Agency has highlighted the need to accelerate innovation in clean energy technologies to meet climate goals. The report stated that clean energy innovations slowed between 2017-19 and grew only by an average rate of 3.3%. This progress is only a quarter of the average annual growth rate recorded a decade ago (+12.5% for 2000-13), the study noted.

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Off-Grid Solar Product Sales Slide

The study by GOGLA noted that sales of off-grid solar products in India have been on a downward trend since 2018, which seems to have been accelerated by the Covid-19 crisis

By : Srinwanti Das

The Global Off-Grid Lighting Association (GOGLA) has published its latest off-grid solar market semi-annual sales and impact report. The data used has been collated from July to December 2020.

The report has been generated by including data on products sold by 100 of the 237 affiliate companies, which are connected to the partner organizations involved in the reporting process.

The report noted that sales of off-grid solar products in India totaled 405,000 units between July and December 2020.

According to the report, sales in India have been on a downward trend since 2018, which seems to have been accelerated by the Covid-19 crisis.

After reaching the lowest volumes on record, volumes increased slightly by 3% compared to the first half of 2020. However, this is a 48% decrease compared to the second half of 2019, the study pointed out.

The Indian economy contracted by 9.6% in 2020 due to the pandemic, with poorer households particularly affected. In response, the Indian government announced several stimulus packages with a total worth of \$15 billion (15% of GDP), including credit guarantees for small and medium enterprises and \$200 million business loans for rural companies through the rural development fund.

Microfinance institutions (MFIs), the main distribution channel for off-grid

solar products, were more affected by the crisis than banks, given that the Reserve Bank of India allowed a three-month loan moratorium at the beginning of the pandemic for bank borrowers, but not MFIs. This aggravated the situation for the MFI borrowers, already suffering from jobs and income losses.

While India emerged as the largest cash market for off-grid solar products, with 1.2 million units sold with a value of \$58 million for the second half of 2018, sales of off-grid solar products in India fell by 50% in the first half of 2020 compared to the second half of 2019. The sales were also down 59% compared to the first half of 2019 due to the adverse economic effect of the





Covid-19 outbreak, noted another report by GOGLA.

Other factors that influenced sales in India over the last few rounds are the 99.99% electrification rate reached through the grid extension under the 'Saubhagya' initiative in 2019 and

Sales of off-grid solar products in India dipped 48% in the second half of 2020

the duty on import of solar products to stimulate local manufacturing. Moreover, companies have anecdotally shared that off-grid customer demand is shifting towards larger systems, which can offer more energy services, as well

as components such as DC light bulbs and inverters.

In an earlier report, GOGLA had highlighted that the Indian private player-driven market for solar lanterns and solar home systems is expected to reach ₹26,178 million (-\$327 million) by 2023.

South Asia

In South Asia, sales of off-grid solar products totaled 479,000 units between July and December 2020, the lowest volumes recorded since regional reporting began in 2015. The downward trend continued since the second half of 2018 and was accelerated by the Covid-19 crisis in 2020. However, sales volume remained fairly stable for the first time, with a 3% drop compared to the first half of 2020. This is 43% lower compared to the second half of 2019.

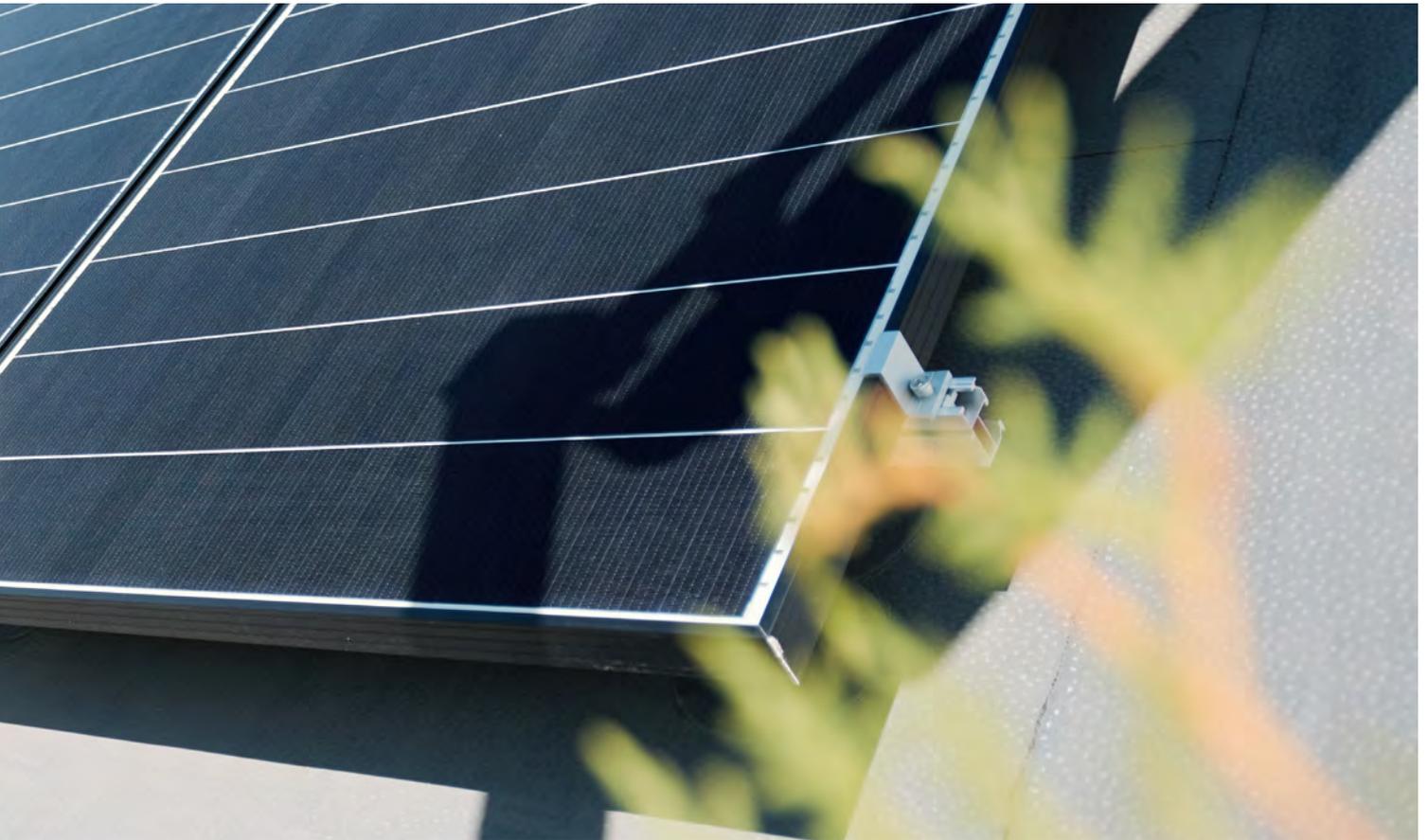
Global

In the second half of 2020, global off-grid solar lighting sales grew by 19% compared to the first half of the year, totaling 3.6 million products. The report, however, notes that sales growth is at the lowest level since 2015.

Only a third of solar lighting companies reported stable or increased sales compared to the second half of 2019, with more than half reporting sales decreases of over 25% and a third reporting sales reductions of more than 50%. These reduced sales volumes and the wider impacts of the pandemic continued to add pressure on off-grid companies, with some previously buoyant enterprises reporting zero, or low, sales in the second half of 2020.

The research noted that more robust sales levels were seen where the sector received dedicated support to respond to the crisis, such as relief funding or government incentives. Sales have also spiked where innovations have helped the industry to adapt to the changing market environment.

Globally, the price of hardware and components increased due to raw material volatility and supply shortages, which also had a significant impact on the off-grid sector. Affiliates reported that prices for some materials rose by over 50%. Similarly, companies experienced price increases for freight and transport and delays in processing exports from manufacturing centers.



Mercom had earlier reported that solar companies in India had complained of shipping/freight charges shooting up substantially in the range of 500%-800% in the fourth quarter of 2020.

In addition, the pandemic continued to put pressure on off-grid solar companies, with some previously buoyant companies reporting zero, or low, sales in the second half of 2020.

Yet, despite the setbacks created by the pandemic, interest in off-grid solar and efficient appliances at the consumer level has not dimmed and, while equity funding into the sector has dropped by a worrying 46% compared to 2019, overall investment in 2020 remained stable (\$316 million), the report further noted.

Solar home systems recorded sales of 620,000 units in the second half of 2020. This is a 10% increase compared to the first half of 2020, but a 25% dip compared to the second half of 2019 when a new sales record of 830,000 units was reached.

Solar water pumps and refrigeration units represented a mere 2% and 1% of off-grid appliance global sales, with 8,000 and 4,100 units, respectively.

Solar water pumps experienced the largest relative increase amongst all appliance types, with a 134% increase of sales volumes compared to the first half of 2020 and 8,038 units sold,

Microfinance institutions were more severely affected by the pandemic compared to banks

predominately in sub-Saharan Africa. Compared to the volumes recorded in the second half of 2019, sales of solar water pumps have decreased by 71% globally. However, the report partially attributes the drop to lower

participation of solar water pump companies in the sales data collection for the research period.

Estimated impact

Despite off-grid solar solutions providing the fastest and most affordable way to electrify hundreds of millions of people, across 2020, the reversal in the growth of the off-grid solar market led to an estimated 10-15 million people missing out on improved energy access.

Five million people are undertaking more economic activity as a direct result of owning an off-grid solar system. These systems are estimated to have unlocked an additional \$6.3 billion in income over the last ten years. Coupled with the savings that smaller off-grid products, such as lanterns and multi-light kits, have created for households, the sector's benefit to the finances of millions of low-income households is over \$18 billion.

In January this year, the World Bank had issued a notification expressing interest to fund an 'Off-Grid Solar Energy Access Report' to chart out an investment roadmap for sub-Saharan African countries. 🌍

Policy Hurdles, Volatile Market Cast Shadow on Rooftop Solar

Although the pandemic has accelerated the C&I consumers' plan to go solar, developers are confronting slow business activity due to the policy uncertainty and inability to close deals

By : Srinwanti Das





The energy costs for commercial and industrial (C&I) units in India account for around 30%-40% of the operational expenses. Embracing solar seems like the most logical step towards saving the cost, and the pandemic has only accelerated that decision. However, C&I consumers are enduring challenges every step of the way when installing a solar system.

In many states, rooftop solar tariffs are about 50% lower than the retail tariffs, making them the cheapest source of power with the flexibility of design to suit the needs of the consumers.

However, as of March 2021, out of India's cumulative solar installations of 41 GW, only 5.4 GW came from rooftop solar. In Q1 2021, India added 2,056 MW of solar installations, of which 307 MW was from rooftop solar, and the C&I segment contributed to 78% of these installations.

Shedding more light on the C&I engagement in the segment, Shriprakash Rai, Senior Director, and Head, C&I Business at Amp Energy, said, "About 70% of the installed solar rooftop or distributed generation capacity in India is accounted for by C&I consumers. The C&I sector consumes around 49% of the electricity generated in India, but only 3.5% of the power procured by India's C&I segment is from renewable energy

sources."

The cost factor

The cost benefits are the primary reason behind the adoption of rooftop solar by C&I customers over the years.

"Rooftop solar appeals to C&I customers since it helps them make considerable savings on their electricity bills while meeting their sustainability targets," added Rai.

5.4 GW of rooftop solar has been added in the country as of Q1 2021

Sharing his rooftop solar experience with Mercom, Achal Jain, owner of Naulakha Group, recalled that since SunSon Energy installed a rooftop solar system for him three years ago, he has seen his power bills dip by 50% at his soap and other essential products factories in Delhi and Alwar in Rajasthan.

Jain said that he had first installed rooftop solar at his residence. Once he

realized the benefits of saving power and cost, he decided to install the systems at his factories. "I have 50 such installations of varying scale across my factories," he informed.

Basava Textiles, in their search for alternate energy to mitigate surge in electricity charges, installed rooftop solar at their factory, generating 1.4-1.5 million units per year. They expect to realize the returns on their investments within three years.

Power-intensive industries such as automobiles, railways, airports, heavy engineering and cement, pharmaceuticals, data centers, leather, and textiles with the electricity cost making up a significant portion of their operating costs are most likely to adopt rooftop solar.

The high premium placed on land also makes rooftop solar viable for several C&I customers who are faced with a land crunch or wish to do away with the hassle of scouting and acquiring land for a solar project to meet their power demands.

Speaking for C&I consumers that operate in rental or leased spaces, Anurag Johri, Principal Director and Utilities Lead for Accenture's India operations, said, "Although we have several measures in place to meet our sustainability targets, since Accenture doesn't own any of the office spaces



in India, it becomes difficult to set up rooftop solar installations. In such cases, the property owners should undertake the responsibilities to procure power through a cost-effective and space-sensitive green energy mode like rooftop solar systems.”

Net metering and gross metering tussle

Why is a segment with such immense market potential and alluring price benefits still lagging in capturing the C&I market?

Part of the problem started when the Ministry of Power (MoP) announced in December last year that it would be mandating net metering for loads up to 10 kW and gross metering for loads exceeding 10 kW. The directive sent tremors in the industry, which believed the move by the Ministry would make rooftop investments unattractive.

After wide criticism by stakeholders, the Ministry, in April 2021, decided to allow net metering for loads up to 500 kW. This was a good four months of policy uncertainty. This ended up being a huge snag for the industry, which was witnessing a massive demand.

In many states, rooftop solar tariffs are around 50% lower than retail tariffs

This crucial last quarter of the financial year is when the businesses make investments to save on taxes and costs.

Speaking to Mercom, an executive attached with a solar developer said, “Demand spiked especially in the first few months since the lockdown eased. In the past six months, we have not installed any rooftop project above 1 MW as we were unsure how the policy would turn out. We made sure these existing projects had minimal energy banking conditions. The strategy was to make sure the plants consumed everything that the system generated.”

Financing projects

The Reserve Bank of India (RBI) has introduced several policy measures to enhance liquidity and ease the financial stress caused by the Covid-19 pandemic. With the higher availability of funds, financing is no more an issue in the rooftop solar segment.

“Tata Capital and State Bank of India are actively financing rooftop solar at lower interest rates. Even for utility-scale projects, the interest rates are as low as 8.5%-9.5%. The Indian Renewable Energy Development Agency is lending at 10%-11%,” said a representative from a solar developer.

“The issue, however, is that the loans take a long time to be processed,” he complained.

“Access to low-cost funding or channelizing funding into the sector is the need of the hour. The Indian Renewable Energy Development Agency, for example, must have a separate line of funds dedicated to rooftop solar,” he added.

Price volatility

A prime challenge in the post-pandemic climate is market volatility.

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While there are huge business opportunities, developers are unable to close deals amid fluctuating project costs.

“Module prices are rising within weeks even before developers get approval on a module quote from the clients, making it difficult to give quotes or submit project reports for loans,” said

High premium on land also makes rooftop solar viable for several C&I customers

a project developer.

While more C&I consumers recognize the benefits of rooftop solar, developers are not pushing for projects as raw material, module prices, and procurement have turned out to be challenging.

“Just two weeks back, we submitted a quote for installation. Even before

we could finalize, we realized that commodity prices shot up, including iron, copper, and aluminum. Iron prices have gone up by 30%, which is unprecedented,” shared an executive on behalf of a developer.

“The situation is very uncertain, and we are neither able to give quotes or submit project reports for loans. The financial models are going for a toss. I am proposing an open book model now without quoting a price for modules. The business opportunity is huge, but we are unable to close deals,” he said.

Approval woes

Despite the multiple benefits of rooftop solar, many from the C&I segment voiced their concerns about the government approval challenges that are overshadowing other advantages.

While Jain, on his part, brought up the year-long struggle of getting approval for a 5 kW net metering system in Rajasthan, another C&I consumer blamed the distribution companies (DISCOMs) for not granting net metering approvals out of fear of losing out on income.

“I am not able to put in place uniform practices across my factories in Alwar and Delhi since the energy regulations are not similar,” said Jain.

“Behind the meter project should be allowed to be set up without permits or approvals, other than the statutory safety permits. As they do not inject energy into the grid, therefore no metering, net billing, or gross metering is needed,” suggested Rai.

The consensus among stakeholders is that net metering should be allowed for all customers without restrictions on the capacity limit to maximize capacity utilization, and regulations should be uniformly applied across the country.

Elaborating on the role of the DISCOMs, a C&I consumer said, “Public DISCOMs are using regulatory frameworks to hinder rooftop solar installations and resisting the transition.” He also added that if rooftop solar has to grow, gross metering needs to be entirely done away with.

The buzz around rooftop solar among C&I consumers has only become stronger after the prolonged Covid-19-related economic uncertainties in the country. The industry has to deal with the market fluctuations and surprises, but the government must ensure conducive and uniform policies and do away with the procedural and approval delays if they are serious about the targets set for the rooftop solar sector in the country. 📍



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Regulatory Approval for Tariffs Discovered in Gujarat Solar Auction

The Gujarat Electricity Regulator has approved the tariffs in a recent solar auction and also directed the DISCOM to sign PPA after adding a late payment surcharge clause

By : Rahul Nair

The Gujarat Electricity Regulatory Commission (GERC) has allowed Gujarat Urja Vikas Nigam (GUVNL) to adopt the tariff discovered through a competitive bidding process for procuring power from grid-connected solar photovoltaic (PV) projects in

Gujarat.

The Commission directed GUVNL to sign and execute the power purchase agreement (PPA) within 30 days after adding the late payment surcharge clause.

Earlier this year, GUVNL had floated a tender to purchase power from 500

MW of grid-connected solar PV projects to be set up in the state under Phase XII. Successful bidders were to set up the projects, including the transmission network up to the delivery point. In addition, bidders were to secure all necessary permits and clearances required to set up the project, including



GUVNL 500 MW Phase XII Solar Tender: Auction Results

Bidder/Developer	Capacity	Quoted Bids/Tariff		% Over Winning Bid
	MW	(₹/kWh)	(\$/kWh)	
Sprng Energy	120	2.20	0.0304	-
NTPC	150	2.20	0.0304	-
Coal India	100	2.20	0.0304	-
TP Saurya (Tata Power)	60	2.20	0.0304	-
SJVN	70*	2.21	0.0305	0.45%
Total	500			

*SJVN Limited bid for 100 MW but won only 70 MW

Note: \$1 = ₹72.46

Source: Mercom India Research

connectivity and land registration.

The tender had received a good response and was oversubscribed. The bidders' list included Ayana Renewable Power, ReNew Power, Aljomaih Energy & Water Company, NTPC, Coal India, Tata Power, Torrent Power, Juniper Green Energy, Sprng Energy, Vector Green, and SJVN.

Eventually, Sprng Ujjvala Energy, NTPC Renewable Energy, Coal India, and TP Saurya - a Tata Power subsidiary - were declared winners in the auction.

Sprng Ujjvala Energy won a capacity of 120 MW, quoting ₹2.20 (-\$0.030)/kWh. Meanwhile, NTPC Renewable Energy, Coal India, and TP Saurya won 150 MW, 100 MW, and 60 MW, respectively, quoting ₹2.20 (-\$0.030)/kWh. SJVN had quoted 100 MW at ₹2.21 (-\$0.030)/kWh and won 70 MW capacity under the bucket filling method.

In the second week of May, the Commission passed the order to adopt the tariff discovered through a transparent, competitive bidding process, as mentioned in the table below.

The Commission has directed GUVNL to sign the PPA with the successful bidders, in compliance with the stipulations of the Electricity (Late Payment Surcharge) Rules, 2021. The copies are to be submitted to the Commission after the late payment surcharge clause is added before signing the PPA.

After executing the PPAs, the Commission has also directed the

It is proposed that auction tariffs need to be approved within 60 days, failing which it is deemed to be adopted

GUVNL to publicly disclose the names of the successful bidders and the tariff quoted by them on its website for 30 days to ensure transparency.

Mercom had spoken to the stakeholders after this auction was concluded, intrigued by the low tariff, especially since the implications of basic customs duty was to be factored. One of the winning bidders had commented that the biggest challenge with Solar Energy Corporation of India auctions is that the tariff approval is delayed by Central Electricity Regulatory Commission and so is the PPA. The delay doesn't occur in the GUVNL auction and for the lenders, these regulatory approvals are important.

This auction by GUVNL concluded on March 22, 2021, and in less than two months, the state commission has approved the tariff. This is one of the

reasons the GUVNL auctions have found robust participation and aggressive tariffs.

Tariff adoption delays

Tariff adoption was earlier mostly a formality and complied on time so that developers could start the construction of power projects. But that has not been the case anymore. Several state regulatory commissions have been delaying the procedure of tariff adoption due to many reasons, and this procedure has become a major pain point for developers. Responding to developers' request to address this, the Ministry of New and Renewable Energy (MNRE) amended its competitive bidding guidelines, saying, in case the distribution licensee approaches the appropriate Commission for the adoption of tariff and the Commission does not decide on the tariff within 60 days of submission, the tariffs will be deemed to have been adopted by the appropriate Commission. Also, if the tariff adoption is delayed by over 60 days, the time provided for financial closure and the scheduled commissioning date will be extended.

Even the draft plan for amending the Electricity Act, 2003, proposed for a 60-day window for commissions to adopt a tariff discovered through a transparent bidding process, failing which the tariff will be deemed to have been adopted.

Despite all the efforts of the ministries, the delays in tariff adoption persist. ☹️

India's Q1 2021 Solar Installations Up 88%

Mercom India Research's Q1 2021 India Solar Market Update reveals large-scale solar projects totaling 1,749 MW were added during the quarter along with 307 MW in rooftop solar installations

By : Rahul Nair





India added 2,056 MW of solar in the first quarter (Q1) of 2021, a 37% increase quarter-over-quarter (QoQ), compared to 1,505 MW installed in the fourth quarter of 2020. These findings were revealed in Mercom India Research's latest Q1 2021 India Solar Market Update.

Solar installations in Q1 2021 were up by 88% year-over-year (YoY) compared to 1,090 MW added during the same period last year. Solar capacity additions in India in Q1 2021 were the highest in a quarter since Q3 2019.

According to the report, solar installations improved considerably in Q1 2021, with developers completing their delayed projects from last year. Commercial and industrial businesses were rapidly installing rooftop solar, taking advantage of cost savings during challenging market conditions.

In Q1 2021, large-scale solar projects totaled 1,749 MW, up by 43% QoQ, and 307 MW were added in rooftop solar installations, an 8% growth from the last quarter.

“With the second wave of the pandemic hitting the country, the industry is battling solar modules and

other component price rise and volatility. Even more concerning is the uncertainty in procurement as the market is fluid. Policy restrictions and duties have added to the price rise and unpredictability,” said Raj Prabhu, Chief Executive Officer at Mercom Capital Group.

The report forecasts solar installations of roughly 7 GW in 2021

The report forecasts solar installations of approximately 7 GW in 2021 as project timelines are extended due to the second wave of Covid-19. The report goes into a detailed analysis of three different forecast scenarios based on Best, Medium, and Worst-case scenarios.

The report details the effect of the lockdown imposed on major states due to the second wave of the coronavirus pandemic since the end of April 2021,

along with labor issues and supply disruption affecting construction activity.

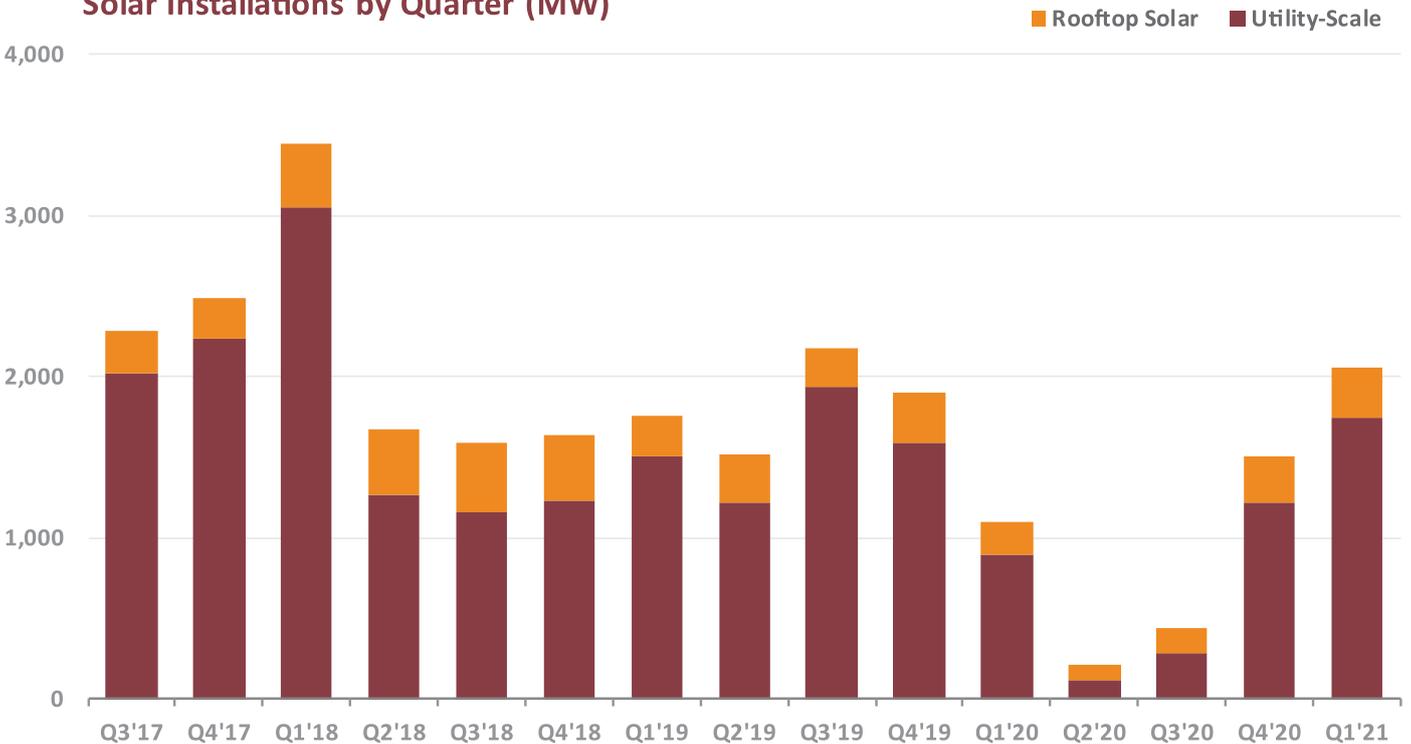
The average selling prices of solar modules have risen sharply along with other components, including iron, copper, aluminum, and steel. Freight charges are high all over the world, and the dearth of shipping containers is also widespread. The shortage of solar glass and backsheets continue to be issues of concern, according to the report's findings.

“Due to the targeted lockdowns, this time around, disruptions and labor issues are not as widespread as last year. However, most of the lockdowns are in important solar states like Rajasthan, Maharashtra, and Uttar Pradesh, which will significantly impact installation totals this year,” added Prabhu.

According to the report, at the end of Q1 2021, cumulative solar installations reached 41 GW. Of this, 35.5 GW was from large-scale projects, while 5.4 GW was from rooftop solar installations.

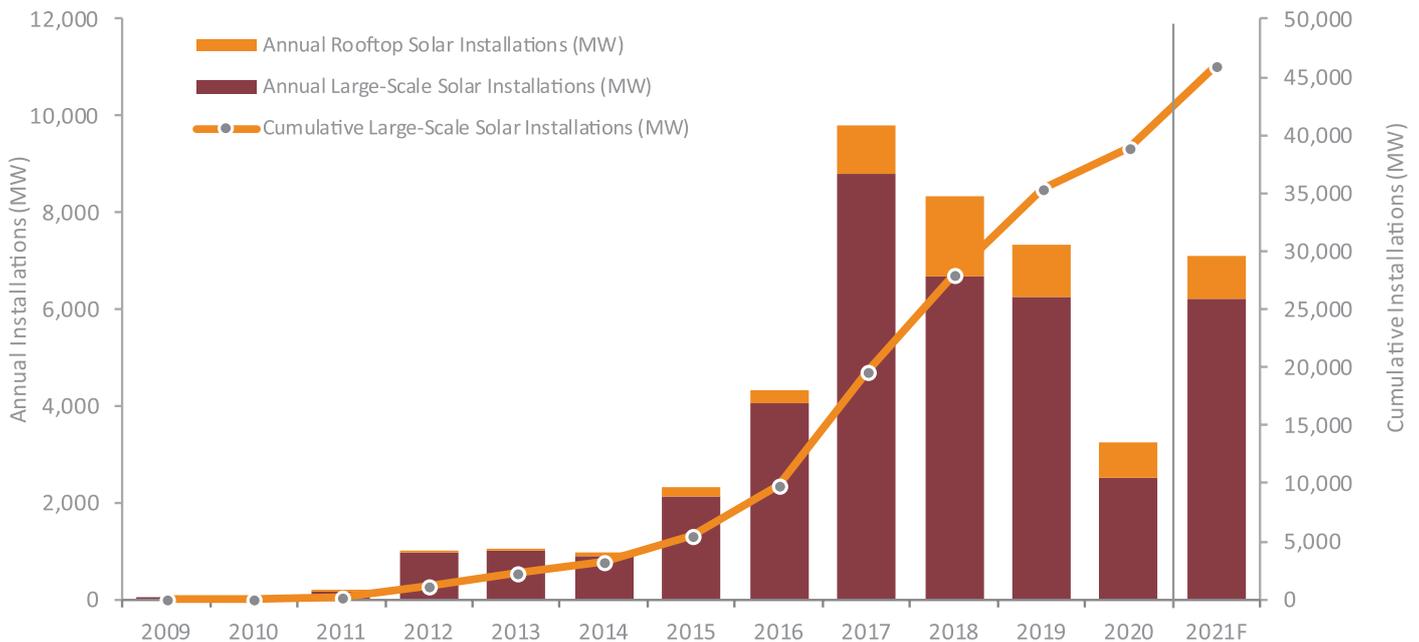
The large-scale solar project development pipeline stands at 53.6 GW, along with 24.1 GW of projects tendered and pending auction at the end of Q1 2021.

Solar Installations by Quarter (MW)



Source: Mercom India Research (Mar 2021)

India Solar Demand Forecast (MW)



Source: Mercom India Research (Mar 2021)

In Q1 2021, Rajasthan, Uttar Pradesh, Gujarat, and Andhra Pradesh were the top states. The top five states accounted for 81% of the installations in the quarter.

The report has identified a surge in demand for rooftop solar, especially from the industries that see solar as the best choice for reducing their operating expenses. The pandemic has prompted several industries to go solar. Although opportunities are flooding, installers face a dilemma as module procurement has been a difficult affair with soaring prices.

“The solar industry is grappling with how to move forward amid so much uncertainty. Bidding for auctions in the future will be extremely challenging, and developers must give themselves a lot of room to factor in the risks and price volatility. This is the first time we have seen module prices rise four quarters in a row in the last five to six years. Bidding low in anticipation that module prices will perpetually fall is an extremely risky strategy in today’s market,” Prabhu noted.

According to the report, solar installations accounted for 33% of

all power capacity added in Q1 2021. Renewables as a whole, including wind and hydro, made up close to 50% of capacity additions in the quarter.

Key Highlights from Mercom India Research’s Q1 2021 India Solar Market Update

- In Q1 2021, India added 2,056 MW of solar installations, an increase of 37% compared to 1,505 MW installed in Q4 2020. YoY installations rose by 88% compared to 1,091 MW in Q1 2020
- In Q1 2021, 1,749 MW was added from large-scale solar installations and 307 MW from rooftop solar
- Rooftop solar installations increased 8% compared to 285 MW added in Q4 2020. YoY the installations were by 58%, compared to 194 MW installed in Q1 2020
- The cumulative installed solar capacity in India was about 41 GW at the end of Q1 2021
- The large-scale solar project pipeline in India stands at 53.6 GW, with 24.1 GW tendered and pending auctions at the end of Q1 2021
- Mercom forecasts installations of approximately 7.1 GW for CY 2021
- Solar now represents 10.7% of the total installed power capacity in India as of Q1 2021



National Mission for Biomass Use in Coal Power Plants

The mission's purpose is to address rampant air pollution caused by the burning of farm stubble and reduce the carbon footprint in thermal power generation

By : Rahul Nair

The Ministry of Power (MoP) has decided to set up a national mission to use biomass in coal-powered thermal power plants.

The main purpose of the mission is to address rampant air pollution caused by the burning of farm stubble and reduce the carbon footprint in thermal power generation. The proposed national mission on biomass will also contribute

to the National Clean Air Program.

The Haryana Electricity Regulatory Commission, while determining the levelized tariffs for biomass power projects last year, addressed the serious environmental issues arising from the burning of paddy stubble in the state and the National Capital Region. The Commission said that such power projects using paddy straw as a fuel could help meet the National Green

Tribunal and the Haryana government's social objectives and concerns.

The mission would further support the country's energy transition targets and move towards cleaner energy sources. The program will be applicable for at least five years.

The initiative has been undertaken with multiple objectives.

One of the objectives is to increase co-firing from 5% to higher levels. This

is aimed at having a larger share of carbon-neutral power generation from the thermal power plants.

The program will also support research and development activity in boiler design to handle the higher amount of silica and alkalis in the biomass pellets. It will also address constraints in the supply chain of biomass pellets, agro-residue, and transport to the power plants.

Another objective of the mission includes looking into regulatory issues in biomass co-firing.

The modalities of operation and the structure of the mission are in the finalizing stage.

The Mission would have a steering committee headed by the secretary (MoP). It would include all stakeholders such as the Ministry of Petroleum & Natural Gas, Ministry of New & Renewable Energy (MNRE), etc. The executive committee would be headed by the member (thermal) from the Central Electricity Authority.

NTPC will also play a larger role in providing logistic and infrastructure support in the proposed national mission. Last year, NTPC invited bids for biomass pellets to use as fuel alongside coal at its thermal power stations to help mitigate the air pollution caused

by farmers burning crop residue in the open.

The mission would have full-time officers from the Central Electricity Authority, NTPC, Damodar Valley Corporation, Neyveli Lignite Corporation, or other participating organizations.

Five sub-groups have also been proposed under the mission. Sub-group 1 would be responsible for researching the properties and characteristics of biomass. The second would carry out the technical specification and safety aspects, including research in boiler design, etc., to handle the pilot project

The mission aims to address rampant air pollution caused by the burning of farm stubble

for a higher amount of co-firing of biomass with coal in pulverized coal-fired boilers. The third sub-group would have the task of resolving issues concerning the supply chain during the mission period and sensitization program. The fourth one would be in charge of selecting designated labs and certification bodies to test agro-based biomass pellets and municipal solid waste pellets, while the fifth sub-group would be formed on the regulatory framework and economics of biomass co-firing in coal-powered thermal power plants.

In 2019, MNRE had issued a notice clarifying the eligibility of power generated from the co-firing of biomass in thermal power plants as renewable energy. The government had stated that the power generated from the co-firing of biomass in thermal power plants is renewable energy and eligible for meeting the non-solar renewable purchase obligations.

Last year, the MNRE had extended the validity of its biomass-based cogeneration program. The program was extended until March 31, 2021, or until the recommendations of the 15th Finance Commission come into effect, whichever comes first. The program was set to end in March 2020. 

Industry News and Policy Briefs

Adani Green Energy signed a **share purchase agreement** to acquire a **100% stake in SB Energy India from Soft Bank Group (80%) and Bharti Group (20%)**. The transaction marked the largest acquisition in the renewable energy sector in India. The transaction valued SB Energy India at an enterprise valuation of about \$3.5 billion (-₹260 billion). The transaction is expected to be completed by August 2021.



Torrent Power announced the results for **Q4 of FY 2020-2021**. As per the financial statement released by the company, the company reported a total comprehensive income of ₹13 billion (-\$177.61 million) in FY 2021, **up by 13%** compared to ₹11.5 billion (-\$157.11 million) during the same period last year.

The **Solar Energy Corporation of India** paid nearly ₹4.33 billion (-\$58.99 million) to solar and wind developers for the power it purchased in March 2021. These disbursements accounted for 70.5% of the total amount disbursed by the agency during the month.

The figures reportedly **rose** mainly due to the **acquisition of all four Odisha distribution companies** and higher execution of solar engineering procurement and construction projects.



Adani Renewable Energy Holding Four, a wholly-owned subsidiary of **Adani Green Energy**, transferred 74% shareholding of **Mundra Solar Energy to Adani Tradecom LLP**. In all, 7,400 equity shares were transferred to Adani Tradecom at face value of ₹10 (-\$0.14) each aggregating to ₹74,000 (-\$1,015).



Virescent Renewable Energy Trust, a platform created by global investment company KKR to acquire renewable energy assets in India, announced that it had acquired 76 MW of solar projects from Singapore-based **Sindicatum Renewable Energy**. Backed by **KKR**, Virescent will acquire Sindicatum's assets spread across Gujarat, Rajasthan, and Uttar Pradesh. In Gujarat, Sindicatum operates two solar projects.

Tata Power declared its financial results for **FY 2021** and recorded a 14% growth in consolidated revenues at ₹330.79 billion (-\$4.49 billion) compared to ₹289 billion (-\$3.9 billion) in FY2020.

Adani Green Energy released its audited financial results for FY ended March 31, 2021. The company's total income for FY21 went up by 34% YoY with ₹35.2 billion (-\$476.48 million) from the sale of energy for FY21, up by 25% at 5,482 million units.

According to data released by the **Ministry of Power, distribution companies owed ₹120.25 billion (-\$1.62 billion)** to renewable energy generators (excluding disputed amounts) in overdue payments across 283 pending invoices at the end of March 2021.

The **Central Electricity Regulatory Commission** granted **Pranurja Solution Limited** the registration right to establish and operate a power exchange. This would be the third power exchange in India after **India Energy Exchange** and **Power Exchange India**. Pranurja is a consortium of PTC India, BSE Investments, and ICICI Bank.



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Policy Briefs

States

The **Punjab State Electricity Regulatory Commission** invited comments, suggestions, and objections to the staff paper for revising the renewable purchase obligation (RPO) regulations to factor in **hydropower purchase obligation**. The roadmap is being created in line with the Ministry of Power’s letter issued on January 29, 2021 asking distribution companies to include large hydropower projects commissioned after March 8, 2019, in their RPO targets.



The **New and Renewable Energy Department, Haryana**, issued the draft **‘Haryana Solar Power Policy, 2021’** and requested government stakeholders to send their comments within 15 days from the date of the notification on **April 22, 2021**. The new policy will supersede the Haryana Solar Power Policy, 2016.

The **Haryana Electricity Regulatory Commission** issued regulations for **establishing tariffs** from renewables, RPO, and renewable energy certificates for FY 2021-22 to FY 2024-25. These regulations will apply to grid-connected renewable projects of up to 2 MW capacity where the Commission determines the tariff.

The **Maharashtra Electricity Regulatory Commission** allowed for revisions in contract demand up to two occasions for high-tension commercial and industrial (C&I) consumers and up to one occasion for low-tension C&I consumers in a billing cycle up to March 31, 2022.

The **Punjab State Electricity Regulatory Commission** set additional surcharge payable by consumers availing power through open access sources in the state. For **open access consumers** (partial and full) availing power beyond the contract demand maintained with the distribution licensee, the **additional surcharge** determined is **₹1.16 (-\$0.016)/kWh**. **Partial open access consumers** availing power up to the contract demand need to pay **₹0.83 (-\$0.011)/kWh** as the **additional surcharge**.

Center

The **Forum of Regulators** discussed factors affecting the cost of power and stressed the need to analyze and evolve measures to reduce or contain the **retail tariff**. The working group made certain recommendations, highlighting the need for a coordinated effort by the central and the state governments to address high retail tariffs.

Giving relief to solar developers amid the Covid-19 crisis, **MNRE**, in its notification, stated that the **renewable energy projects** having their commissioning dates **on or after April 1, 2021**, can claim extension owing to the **second surge of the Covid-19 pandemic**.



The **Union Cabinet** approved the **‘National Program on Advanced Chemistry Cell Battery Storage’** under the **production-linked incentive** initiative. According to the Cabinet’s notification, the program aims to achieve **50 GWh of advanced chemistry cell**, and **5 GWh of niche advanced chemistry cell manufacturing capacity** with an outlay of ₹181 billion (-\$2.46 billion).

The **Ministry of Power** issued a notification directing the **state electricity regulatory commissions (SERCs)** to issue tariff orders for FY 2020-21 at the earliest. Furthermore, the Ministry asked the SERCs to strictly comply with the directions of the Appellate Tribunal for Electricity and issue tariff orders, adhering to the provisions of the **Electricity Act, 2003**.



The **Ministry of Power** decided to set up a national mission on the use of biomass **in coal-powered thermal power plants**. The main purpose of the mission is to address rampant air pollution caused by the burning of farm stubble and reduce the carbon footprint in thermal power generation.

In the wake of the disruptive second wave of **Covid-19** across the country, the **Ministry of New and Renewable Energy (MNRE)** announced that for renewable energy projects that are implemented after **April 1, 2021**, the submission of physical copies would be waived off.

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Major Tender and Auction Announcements in May

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



Top Large-Scale Solar Tenders

The Indian Renewable Energy Development Agency (IREDA) invited bids to set up manufacturing capacities for vertically integrated high-efficiency solar modules under the **production-linked incentive (PLI) program**. Manufacturers setting up any solar production facilities will be eligible to apply for the incentive under the program.

The Maharashtra State Electricity Distribution Company Limited (MSEDCL) launched a tender to develop **500 MW** of interstate or intrastate grid-connected **solar projects** on a long-term basis. The company also invited bids to

procure **500 MW** of **wind-solar hybrid power** on a long-term basis from grid-connected **interstate and intrastate projects**.

SJVN Limited floated tender for end-to-end services, including design, engineering, supply, erection, testing, and commissioning of a **75 MW** solar project at **Parasan Solar Park** in **Uttar Pradesh**.

The Railway Energy Management Company Limited (REMCL) issued a tender to develop a **15 MW** solar project with a **7 MW/14 MWh** battery energy storage system (**BESS**) on railway land at Butibori in Nagpur.

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Rooftop Solar Tenders

The Punjab Energy Development Agency released a tender for the design, manufacture, supply, erection, and commissioning of **5 MW** of grid-connected rooftop solar projects on government buildings in the state.

The Airports Authority of India invited bids for comprehensive operation and maintenance (**O&M**) of a

2 MW rooftop solar project for three years at the Netaji Subhash Chandra Bose International Airport in Kolkata. The Company has also invited bids for facility management and comprehensive operation and maintenance (**O&M**) of the **1.5 MW** grid-connected **rooftop** solar project at the integrated cargo complex, Chennai Airport.

Other Tenders

The Odisha Renewable Energy Development Agency initiated a tender to select solar power generators to set up **500 MW** of solar projects under **Component A** of the Pradhan Mantri Kisan Urja Suraksha evam Utthan Mahabhayan (**KUSUM**) program on a build, own, and operate basis.

The Madhya Pradesh Urja Vikas Nigam published a tender to set up **270 MW** of grid-connected solar power projects of capacity **500 kW to 2 MW** under **Component A** of the **KUSUM** program.

Uttar Pradesh New and Renewable Energy Development Agency issued a tender for setting up 106 MW of grid-connected solar projects of **0.5 MW, 1 MW, and 2 MW** capacity under **Component A** of the **KUSUM** program.

Central Electronics floated tenders for **1.75 million multicrystalline** solar cells. The company also released a tender to procure **500,000 multicrystalline solar cells** with a wattage capacity of **4.68 W** and higher.

Rajasthan Electronics and Instruments invited bids to procure **40,000 solar cells** of the **monocrystalline** passivated emitter and rear cell (**PERC**) category of **5.64 W** capacity.

The Chhattisgarh State Renewable Energy Development Agency announced a tender to standardize the rates for the supply of **solar modules** of different capacities (**75 W -**

315 W) for solar applications in the state.

The Gujarat State Electricity Corporation issued a tender for the supply and replacement of degraded **polycrystalline solar modules** installed at the 1 MW ash dyke solar project in **Gandhinagar**.

Bharat Heavy Electricals Limited released a tender for the supply of **2,250 MT of module mounting structure** (3mm and above) for the **500 MW** solar project at **Neemuch Solar Park** in Madhya Pradesh. The park is being developed by Rewa Ultra Mega Solar.

The Solar Energy Corporation of India (**SECI**) published a tender to select **land banks** and parcels to set up a **100 MW** solar project in Chhattisgarh.

The **Agricultural Marketing Department**, Government of Andhra Pradesh, invited bids to install **112 grid-connected solar cold storage rooms** across the state.

The Paschim Gujarat Vij Company, on behalf of other distribution companies (DISCOMs) of Gujarat, launched a tender to procure **68,245 bi-directional solar static meters** (single-phase, 2-wire, 5-30 Ampere) for downloading data from rooftop solar systems.

The **Department of Atomic Energy** issued a tender for the **O&M** of a **12 MW** solar project at a heavy water plant in **Manuguru**, Telangana.

LED expo

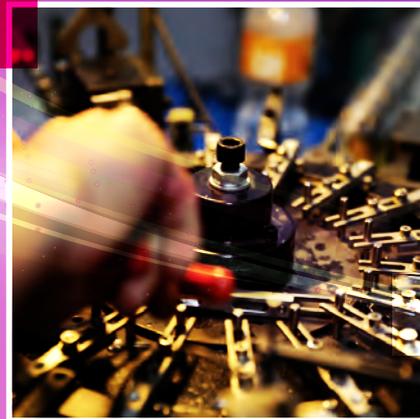
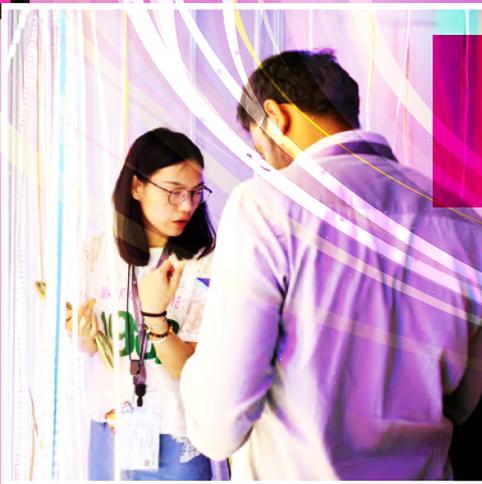
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Reissued and Amended Tender

The **IREDA** extended the deadline for the **5 GW** grid-connected solar projects (**Tranche-III**) under the central public sector undertaking (CPSU) program (**Phase-II**). IREDA has also issued **amendments** to the request for selection issued for the projects, and the **ceiling tariff** for the projects has been increased to **₹2.45 (-\$0.033)/kWh** from the earlier **₹2.20 (-\$0.030)/kWh**.

SECI revised the bid submission deadline for the **1,785 MW** solar tender (**Tranche IV**) floated for Rajasthan. One of the modifications states that the cells and modules used in the project will have to be sourced only from the models

and manufacturers included in the 'approved list of models and manufacturers (**ALMM**),' as published by the Ministry of New and Renewable Energy (**MNRE**). Bidders have also been asked to take note of the memorandum issued by MNRE on March 9, 2021, regarding the **basic customs duty** on solar cells and modules while responding to the RfS.

Rising Sun Energy extended the bid submission deadline for engineering, procurement, and construction (EPC) of **190 MW** grid-connected solar projects at **Nokh Solar Park** in Rajasthan.

Auctions

TP Saurya, a Tata Power subsidiary, was declared the winner in the Maharashtra State Power Generation Company's auction for setting up **250 MW** of grid-connected solar photovoltaic projects at the **Dondaicha Solar Park** in Dhule, **Maharashtra**.

SJVN Limited won a **100 MW** solar project in the Gujarat Urja Vikas Nigam's auction. The projects are to be

set up at the Raghanesda Solar Park in Gujarat (**Phase-X**). SJVN quoted a tariff of **₹2.64 (-\$0.036)/kWh** for the 100 MW capacity.

NHPC awarded the **EPC** contract to **Tata Power Solar Systems** to develop a **40 MW** solar project in the Ganjam district of Odisha. The total estimated value of the contract is **₹1.88 billion (-\$25.76 million)**

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