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India Installs 7.3 GW of Solar in 2019

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Foreword

Solar installations declined by 12% in 2019. Multiple reasons led to a decline in solar additions in 2019, including: elections, a slowing economy, liquidity issues, tariff caps, lack of financing, curtailment, payment delays, and PPA renegotiations in Andhra Pradesh.

The Indian economy and the solar industry badly need a jolt to get back up and running.

Tariff caps have single-handedly killed the momentum in the solar sector leading to retenders and cancellations along with undersubscribed auctions. Developers have refused to bid at the tariff levels specified by state agencies leading to tender deadline extensions or retenders after raising the upper tariff ceiling. This trend of extensions and retenders has also led to a delay in auction activity, which has pushed project commissioning timelines forward, effectively shifting 2-3 GW of projects to next year. In this tough environment, tariff caps have added a big challenge for developers. Removing tariff caps could be the single most important action to take at this time to revive the solar sector.

More alarming is that rooftop solar installations fell by 33% in 2019. Rooftop solar continues to face hurdles resulting in a decline in installations in 2019 after several years of positive growth.

Even though distributed generation, and especially rooftop solar, have multiple benefits of reducing air pollution, reducing T&D losses, meeting RPO goals, and providing freedom for consumers to generate their own power, states have been discouraging net-metering and making it very difficult for rooftop installations for fear of losing revenues. We expect challenges in the rooftop market to continue in 2020.

The outbreak of Coronavirus could be the 'black swan' event that could disrupt the world economy and the solar industry along with it. The outbreak has led to Chinese production shut-downs, and a shortage of cell and module supply in the short-term could be a possibility. We could see some projects getting delayed due to supply issues in the first quarter, but beyond that, it all depends on how the outbreak is controlled.

The government just announced that Coronavirus will be covered in the force majeure clause and should be considered as a case of natural calamity. Although there will be issues and disputes along the way, it is still good news for the industry.

We are forecasting solar installations of approximately 8.5 GW, but a lot will depend on the effects of Coronavirus on the solar supply chain and the project delays that may result from it.

According to our estimates, solar installations will be in the 65-70 GW range by 2022 based on the current market conditions. In an optimistic scenario - the economy starts improving in the second half of the year along with lending; component prices continue to go down, and if the government makes a big push to reach the installation goal by announcing a slew of auctions - we could see installations of up to 80 GW by 2022.

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Mercom India
clean energy news and insights

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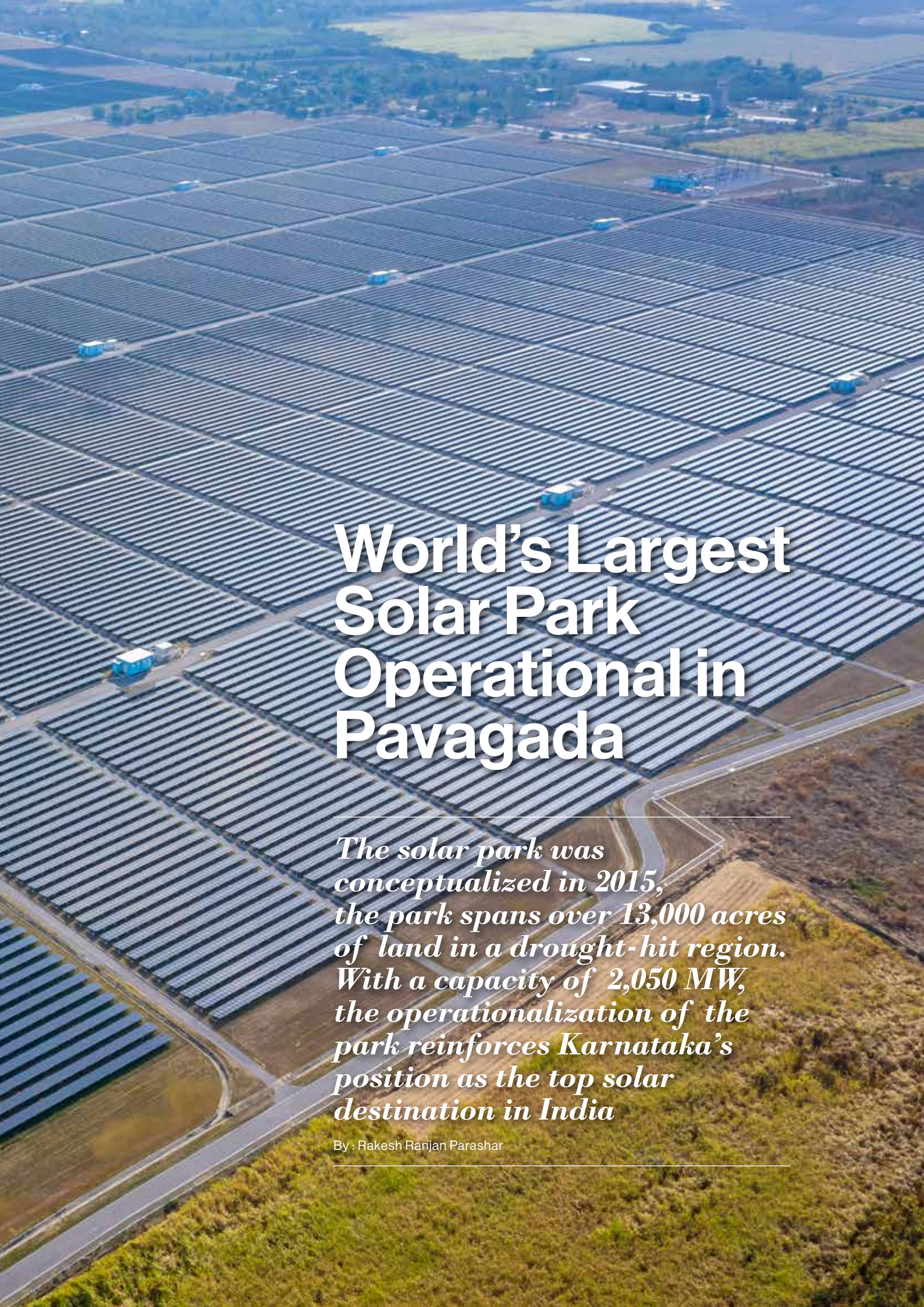

World's Largest Solar Park Operational in Pavagada

The solar park was conceptualized in 2015, the park spans over 13,000 acres of land in a drought-hit region. With a capacity of 2,050 MW, the operationalization of the park reinforces Karnataka's position as the top solar destination in India

By : Rakesh Ranjan Parashar

The government of India devised the concept of solar parks to facilitate the growth of solar energy in the country and meet the cumulative target of 175 GW renewable power installed capacity by December 31, 2022. The main idea behind setting up these parks was to eliminate the challenges associated with land acquisition and transmission connectivity. The Pavagada Solar Park in Karnataka is now the largest operational solar park in the world.

The Pavagada Solar Park, located in Tumakuru district of Karnataka, has been developed by the Karnataka Solar Park Development Corporation Limited (KSPDCL), a joint venture between the Solar Energy Corporation of India (SECI) and the Karnataka Renewable Energy (KREDL). Initially, the plan was to build a solar park of capacity 2,000 MW spanning over 13,000 acres of land. Later, an additional capacity of 50 MW was added.

The final 200 MW capacity developed by SB Energy (SoftBank) has now been commissioned, getting the world's biggest solar park up and running. Earlier, KSPDCL had informed that it expected the entire 2,050 MW at Pavagada to be operational by December 2019.

A KSPDCL official told Mercom, "The entire 2,050 MW of solar projects in Pavagada is operational and generating power. After SB Energy commissioned its final 100 MW of solar project on December 17, 2019, the solar park was officially fully operational."

Out of the total 2,050 MW capacity, the National Thermal Power Corporation (NTPC) implemented 600 MW of solar PV projects, SECI implemented 200 MW, while KREDL implemented 1,250 MW.

The Pavagada Solar Park was conceptualized in February 2015, and the park's development began in January 2016. The park is divided into eight blocks of 250 MW each and has dedicated high voltage supply lines, pooling stations, and a pooling substation for evacuation. The mere magnitude and scale of the solar park make clear that this project has taken an equally huge amount of planning, hard work, and time to get the projects running.

NTPC implemented 600 MW, SECI implemented 200 MW, while KREDL implemented 1,250 MW

A unique feature of the Pavagada Solar Park is that land used in the entire park is leased, which has lowered the park's cost. The KSPDCL is paying farmers ₹21,000 (-$323)/acre/year with a 5% escalation every two years for land that is being utilized for solar park development. Since Pavagada is a drought-hit area, this arrangement worked for both parties.

A year later, grid-connected solar projects totaling 400 MW were commissioned. The process of conceptualizing and developing the required infrastructure for those projects took more than two years.

When the Mercom team visited the Pavagada Solar Park in November 2017, the development of park infrastructure was well underway, and it was expected to take a few more months before the evacuation infrastructure for the entire 2 GW was up and running.

Karnataka is the top solar state in India with approximately 7.1 GW of large-scale solar projects in operation and approximately 1 GW of projects under the development pipeline. The state boasts of a renewable share of 62% in its power mix, followed by thermal power and nuclear with 35% and 2.5%, respectively. The share of solar in the total installed power capacity is 22%.

The fully operational Pavagada solar park is a significant achievement and an example of a mega project executed successfully amid a plethora of infrastructural and policy challenges. This park serves as a model for all other solar parks in the country.

List of Projects Developed at Pavagada Solar Park

Project Developer	Capacity (MW)
Tata Power	400
ReNew Power	350
Fortum Solar	350
Avaada Energy	300
SoftBank Energy	200
Adani Green Energy	150
ACME Solar	100
Azure Power	100
Rattan India	50
Karnataka Renewable Energy Development Ltd. (KREDL)	50
Total Capacity	**2,050**

Mercom India Research

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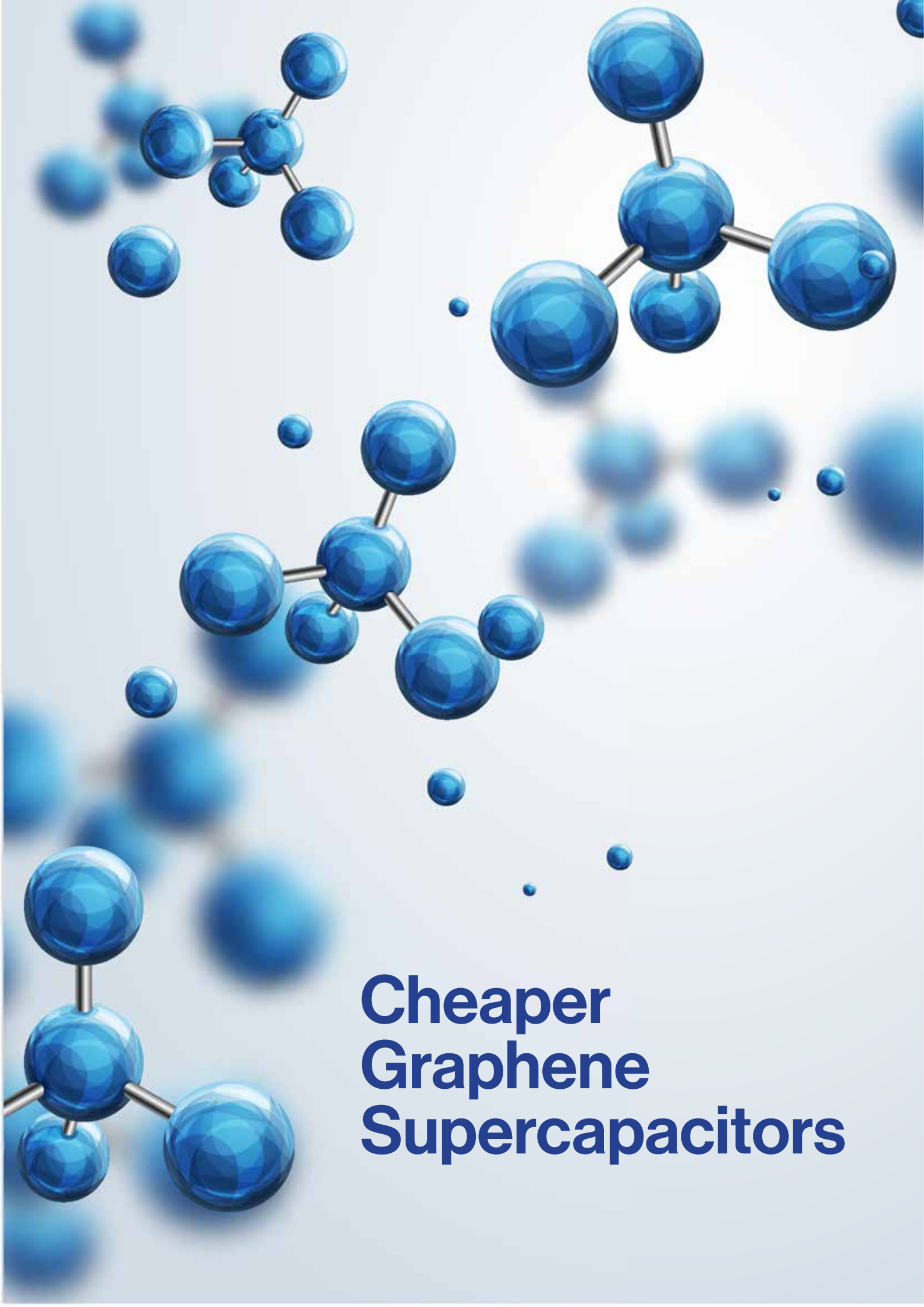


Cheaper Graphene Supercapacitors

The new process for generating functionalized graphene jointly developed by IISER and SPEL Technologies Pune is expected to be more cost-effective

By : Nithin Thomas Prasad

Graphene is a revolutionary form of carbon that could have wide-ranging impacts in several fields. It is, however, very expensive to make. Supercapacitors are electrical devices that are used to store a large amount of electrical charge. They are known as double-layer capacitors or ultracapacitors.

Graphene-based supercapacitors can store almost as much energy as lithium-ion batteries, charge, and discharge in seconds and maintain all these over tens of thousands of charging cycles.

The Indian Institute of Science Education and Research (IISER) and SPEL Technologies Pune have jointly developed a technology for generating functionalized graphene at lower costs.

This process will be used for the development of graphene-based supercapacitors for energy storage, according to the Department of Science and Technology (DST). The supercapacitors will be fabricated at SPEL.

The DST is a department within the Ministry of Science and Technology in India, established to promote new areas of science and technology and is a nodal department for organizing, coordinating, and promoting scientific and technological activities in the country.

Supercapacitors store and release energy with the help of a layer of electrolytes. Electrolytes are electrically conductive material that can be solid, liquid, or somewhere in between. Electrolytes are very crucial components in the performance of electrochemical supercapacitors.

This new way of reducing graphene oxide is claimed to lead to the formation of self-healed ambient stable, reduced graphene oxide (rGO).

The release also stated that the cost of raw materials for the production of one gram of rGO is estimated to be less than ₹700 (-$9.81). This is much lower than is currently commercially available.

The 'High-Performance Graphene-Based Super Capacitor' project is supported and funded by the Technology Mission Division (Energy and Water), DST, under the Material for Energy Storage Program.

The DST is supporting research on energy materials through a Materials for Energy Conservation and Storage Platform (MECSP). The MECSP will support research and development for the entire spectrum of energy conservation and storage technologies from early-stage research to technology breakthroughs in materials, systems, and scalable technologies to maximize resource use efficiency.

Four centers have been developed under DST - MECSP on supercapacitors, batteries, and hydrogen. These centers include more than 20 elite institutions and 80 research personnel working on materials and next-generation devices in batteries, supercapacitors, solid-state hydrogen storage, and fuel cells.

Reduced graphene oxide could be made for less than ₹700/gram

In recent years, researchers at the Massachusetts Institute of Technology (MIT) and other institutions have developed a new class of liquids that can enhance the efficiency and stability of supercapacitors. They have also developed methods to reduce the flammability of these devices.

ReNew Power Raises $450 Million

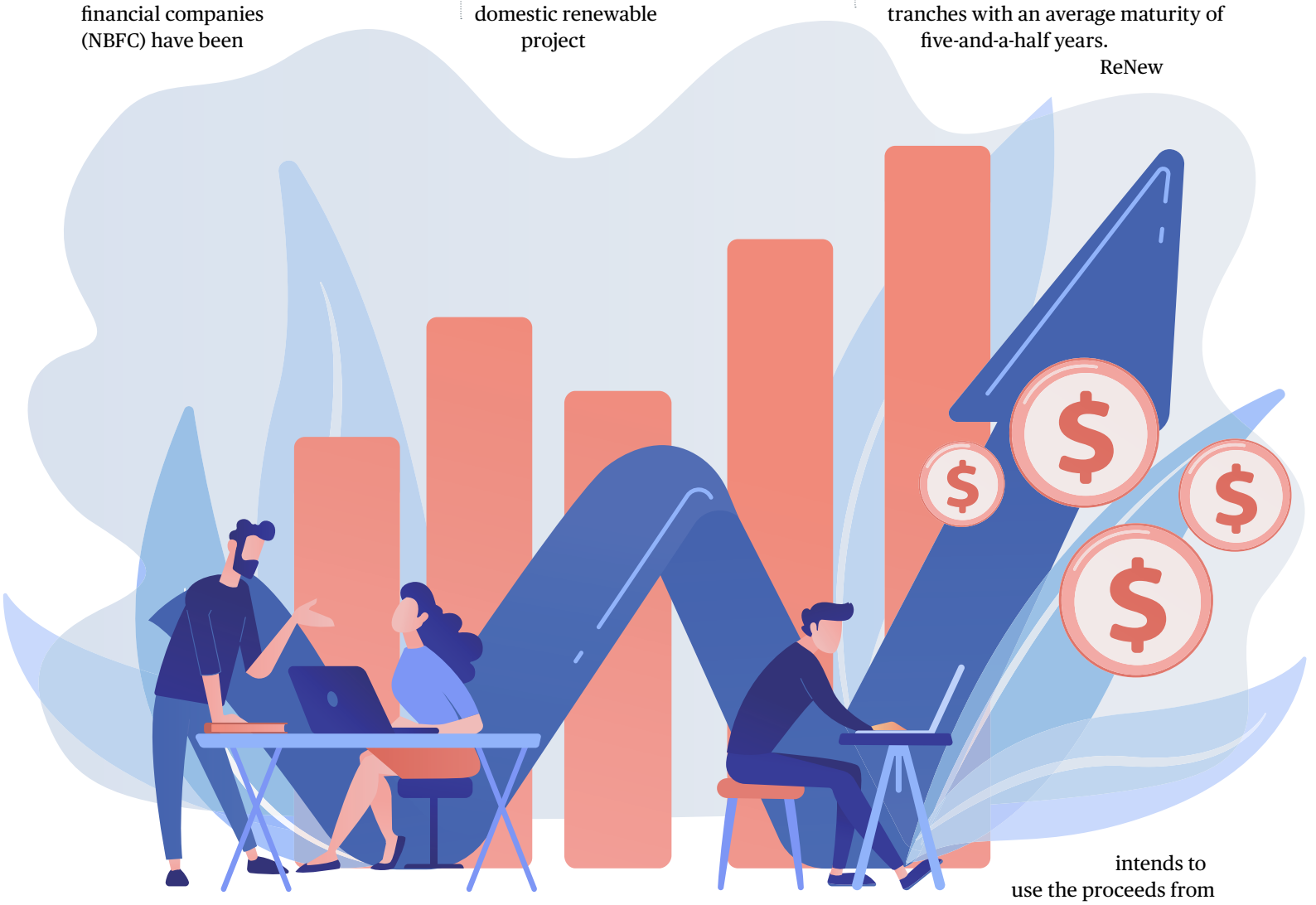
The company has raised funds through a dollar bond issue priced at a coupon rate of 5.875% to be issued in two tranches

By : Nithin Thomas Prasad

Funding has been a challenge for the renewable sector over the past year. Non-banking financial companies (NBFC) have been struggling after defaults on several payments to creditors, and larger financial institutions have been reluctant, especially for project development.

ReNew Power Private Limited, a domestic renewable project developer, has raised $450 million (-₹31.96 billion) through a dollar bond issuance. Mercom confirmed the deal with the parties involved.

The bonds were priced at a coupon rate of 5.875% and will be issued in two tranches with an average maturity of five-and-a-half years.



ReNew intends to use the proceeds from the dollar notes to refinance existing borrowings, including trade credit facilities of the holding company.

It added that part of the proceeds of nearly $65 million (-₹4.61 billion) would be used to meet future capital expenditure requirements.

Commenting on the development, D Muthukumaran, the Chief Financial Officer of ReNew Power, told Mercom, "The strong demand for our bonds is a vote for the company's business strategy and its healthy leverage levels. Interests from big investors from the U.S. and Europe is an added positive indicating availability of sustained long-term capital for companies with strong fundamentals like ours."

According to Mercom India Research, ReNew Power was second in terms of large-scale solar projects installed in India in the first half of the year with a market share of 12.9%.

ReNew Power earlier announced a joint venture partnership with South Korea's GS E&C for the construction of a 300 MW solar power project in Rajasthan.

Part of the proceeds of nearly $65 million would be used for future capital expenditures

Earlier, the company announced that it raised $300 million through a rights issue. According to its press statement, Goldman Sachs, Abu Dhabi Investment Authority (ADIA), and Canada Pension Plan Investment Board (CPPIB) subscribed to the issue with each of the shareholders infusing $100 million into it.

In February 2019, ReNew Power raised debt financing of up to $350 million (-₹24.91 billion) from the Overseas Private Investment Corporation (OPIC) to support the construction of new wind and solar power projects in India. In April 2019, the company, through its wholly-owned subsidiary Ostro Energy acquired two subsidiaries of Suzlon Energy; Shreyas Solarfarms Limited (20 MW) and Aalok Solarfarms Limited (10 MW).

As of December 2019, ReNew Power had a portfolio of over 2 GW of large-scale solar projects in operation in the country, with about 1.7 GW capacity under development.

Government Proposes Waiving Carbon Tax on Coal

The move sends a wrong signal when the focus should be on supporting and funding renewable energy sources considering India has some of the most polluted cities in the world

By : Nithin Thomas Prasad

The Goods and Services Tax (GST) Compensation Cess, earlier called the Clean Energy Cess, was India's version of the carbon tax introduced as a relief for states for the loss of revenue following the implementation of GST in the country. The government may now be considering scrapping the cess to help overburdened state distribution companies. This might have unfavorable consequences for the renewable energy sector.

From 2010-2017, about ₹864 billion has been collected through the Clean Environment Cess

According to a communique reviewed by Mercom, the Indian Prime Minister Narendra Modi's office has proposed

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waiving the GST Compensation Cess on coal to reduce the financial strain on distribution companies, besides helping the thermal power projects install flue gas desulphurization to curb pollution.

This proposal comes in light of the mandate to implement flue gas desulphurization (FGD) at thermal power projects in the country. The resulting investment in the FGD process is expected to result in increased power prices for customers.

FGD is the process of removing sulfur dioxide from exhaust flue gases of fossil-fuel power plants, and sulfur oxide emissions from processes like the incineration of waste material.

Earlier, the Ministry of Power proposed a ₹835 billion ($11.70 billion) plan to meet the cost of development of Flue Gas Desulfurization to improve air quality and to conform to new norms notified by the Ministry of Environment Forest and Climate Change for power plants.

Projects which have the FGD facility at their sites would have to sell power at a higher cost after factoring in implementation costs. The communique stated that even with financing, the power tariff would increase by ₹0.30 - 0.35 (-$0.004 - 0.005)/kWh and would further burden DISCOMs that already owe power developers over ₹844 billion (-$11.83 billion in outstanding dues).

The National Clean Energy Fund was created in 2010 to fund the cost of research and innovative projects using clean energy technologies by public and private sector entities. The fund has evolved under the NDA administration and was rebranded as the Clean Environment Cess, from the earlier Clean Energy Cess, to include river cleaning and other projects. 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.

From 2010 to 2017, about ₹864 billion (-$13.3 billion) has been collected through the Clean Environment Cess, out of which only ₹296 billion (-$4.6 billion) was transferred to NCEF. Ministry of New and Renewable Energy (MNRE) had only received about ₹171 million (-$2.6 billion) to that point.

The National Clean Energy Fund was created in 2010 to fund the cost of research and innovative projects using clean energy technologies

The Government of India then enacted a bill to utilize the Clean Environment Cess (India's version of carbon tax) collected on coal, to finance the GST Compensation Fund, a non-lapsable fund that will form part of the public account of India.

The Goods and Services Tax (Compensation to States) Act, 2017 which came into force in April 2017, states that coal cess, along with other cesses on pan masala, tobacco, aerated water etc., would constitute GST Compensation Fund and would be utilized to fund the States for five years to compensate them for potential losses on account of GST implementation. After five years, any amount left was to be shared on a 50% basis between the Center and States.

The PMO explained that by waiving the ₹400 (-$5.61)/ton cess, the increase in tariff would not be transferred to customers. Consequently, the requirement of subsidies from the government would also not increase, and this would make up for losses to the GST compensation cess.

This move, while positive for the Indian coal industry would, however, would make coal power slightly more competitive with solar and wind energy.

The total power capacity installed in India stood at 366 GW at the end of September 2019, with coal accounting for 53.8% and renewable energy capacity (including large hydro), making up 35.7% of the total installed power capacity in the country.

"The amount of clean energy cess fund going towards renewable energy and MNRE was only about 20% in 2017. The funds were already being diverted to river cleaning, water and sanitation, and other areas. The impact of this proposal on renewable energy development is likely to be minimal," said Raj Prabhu, CEO of Mercom Capital Group.

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Budget 2020 Has Nothing for Electric Vehicles

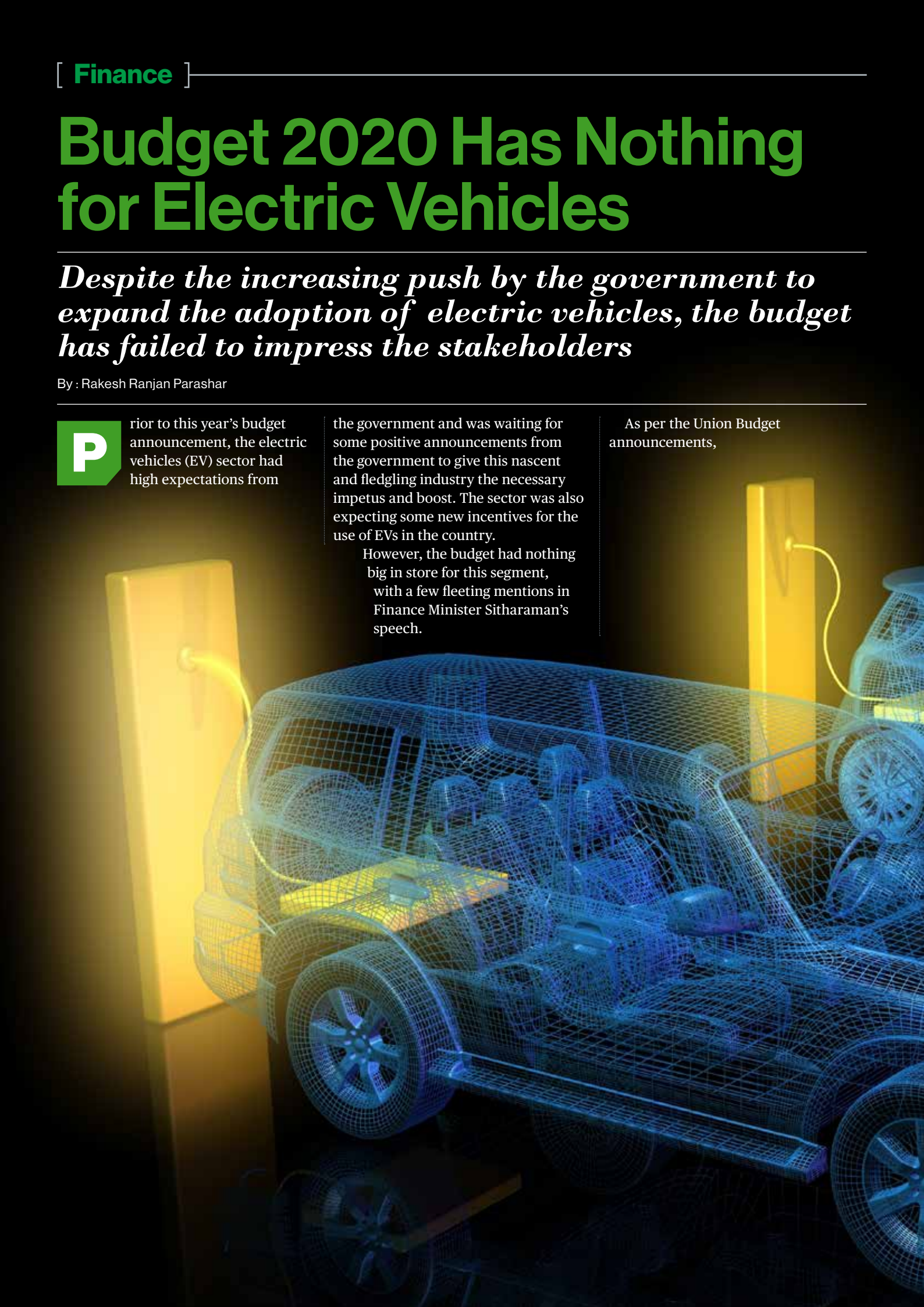
Despite the increasing push by the government to expand the adoption of electric vehicles, the budget has failed to impress the stakeholders

By : Rakesh Ranjan Parashar

Prior to this year's budget announcement, the electric vehicles (EV) sector had high expectations from the government and was waiting for some positive announcements from the government to give this nascent and fledgling industry the necessary impetus and boost. The sector was also expecting some new incentives for the use of EVs in the country.

However, the budget had nothing big in store for this segment, with a few fleeting mentions in Finance Minister Sitharaman's speech.

As per the Union Budget announcements,



Union Budget 2020-2021: Budget Outlay for Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles (FAME India)

Program	2017-18 Actuals		2018-19 Actuals		2019-20 BE		2019-20 RE		2020-21 BE	
	₹ Million	~$ Million	₹ Million	~$ Million	₹ Million	~$ Million	₹ Million	~$ Million	₹ Million	~$ Million
Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles (FAME India)	1,650	23.1	1,450	20.3	5,000	69.9	5,000	69.9	6,930	96.8

*Note: BE - Budget estimates; RE - Revised Estimates *$1 = ₹71.57* *Mercom India Research*

imported EVs are going to get more expensive, with the government increasing the customs duty on various kinds of such vehicles as the government pushes for local production. The government has allocated ₹6.93 billion (-$96.8 million) for the Faster Adoption and Manufacturing of (Hybrid) and Electric Vehicles in India (FAME-India) program for the financial year 2020-21.

The government has allocated ₹6.93 billion for the FAME-India program

To promote easy adoption of EVs, the government has increased the number of EVs to be supported for the fiscal year 2020-21 through demand incentives on electric buses to 5000 as compared to 1,650 announced in the last budget. Similarly, the number of EVs to be supported in the current year through demand incentives on electric four-wheelers has been increased to 3000 as compared to 1,650 announced in the last budget. The number of EVs to be supported in the current year through the demand incentives on electric three-wheelers has been decreased to 15,000 from 16,500, and the number of EVs to be supported in the current year through demand incentives on electric two-wheelers has been increased to 40,000 from 33,000 as announced in the last budget.

As per the budget announcements, the target for the number of charging stations to be put up on highways and cities has been set at 2,600. The target for the share EVs to be sold for the financial year 2020-21 has been fixed at 0.30%, and the employment generation for the fiscal year 2020-21 has been set at 1,50,000.

Development of Automobile Industry: Faster Adoption and Manufacturing of Electric & (Hybrid) Vehicles in India (CS)

FINANCIAL OUTLAY		OUTPUTS 2020-21				OUTCOME 2020-21			
(2019-20)	(2020-21)	Output	Indicators	Targets 2019-20	Targets 2020-21	Outcome	Indicators	Targets 2019-20	Targets 2020-21
₹5 Billion (~$73 Million)	₹6.92 Billion (~$97 Million)	1. Promote easy adoption of EVs through demand incentives	No. of EVs to be supported in current year through demand incentives on electric buses	1,650	5,000	1. Increase in adoption of electric and hybrid vehicles	Share of EVs in total number of new vehicles sold in %	0.52%	0.30%
			No. of EVs to be supported in current year through demand incentives on electric four-wheelers	1,650	3,000	2. Improve India's global position in EV industry	Employment generated (in terms of number of people)	3,40,000	1,50,000
			No. of EVs to be supported in current year through demand incentives on electric three-wheelers including e-rickshaws	16,500	15,000		% increase of EV models in the market	10%	20%
			No. of EVs to be supported in current year through demand incentives on electric two-wheelers	33,000	40,000	3. Reduce emissions and increase fuel savings	Total fuel saved (billion litres)	1.68	1.56
			Demand incentives to be disbursed	₹2.71B (~$40M)	₹6B (~$84M)		Total Emission savings till life of the vehicle (million tons CO2)	0.765	3.5
		2. Establish a network	Number of charging stations to be setup in current year in cities and highways	330	2,600				
			Number of charging stations to be setup in current year, on highways	66					
			No. of operational charging stations as percentage of total charging stations set up till date	100%	100%				
		3. Create stakeholder awareness and interest through Information, Education &. Communication (IEC) activities	No. of IEC activities to be conducted in current year	3	10				
			Estimated reach (in number of people) of IEC activities	16,500	5,00,000				
			Total number of OEMs to be registered under the scheme	5	-				
			Total number of EV models to be approved under the scheme.	9	-				

Source: DHI *Mercom India Research*

Speaking on the budget announcements, Maxson Lewis, Managing Director, Magenta Power, said, "There is absolutely nothing for the EV sector in the budget. There is no mention of the plans for the existing initiatives, such as the FAME program. This is understandable as the government cannot be seen pushing a new disruptive technology on the automotive sector which is already reeling under the burden of BS-VI and the heavy investments that are involved. Indirectly, however, the budget has some positive support for the startups. The fledgling EV industry will be driven by startups and the multipronged approach will favor the startups in the EV space."

Finance Minister Nirmala Sitharaman in her budget speech also proposed to increase the basic customs duty (BCD) on commercially built units (CBUs) of electric buses and trucks from 25% to 40% and semi-knocked down (SKD) units of electric bus, trucks, and two-wheelers from 15% to 25%. The SKD units of electric passenger vehicles and three-wheelers saw the BCD being doubled from 15% to 30%. The government increased the BCD on completely knocked down (CKD) units

2,600 charging stations to be installed on highways and cities

Changes in Customs Duty under Phased Manufacturing Program for Electric Vehicles (with effect from April 1, 2020)

Category of Electric Vehicles	Rate of Duty	
	From	To
Completely Built Units (CBUs) of buses and trucks	25%	45%
Semi Knocked Down (SKD) units of buses, trucks and two-wheelers	15%	25%
Semi Knocked Down (SKD) units of passenger vehicles and three-wheelers	15%	30%
Completely Knocked Down (CKD) units of passenger vehicles, three-wheelers, two-wheelers, buses and trucks	10%	15%

Source: IndiaBudget.gov.in *Mercom India Research*

of electric passenger vehicles, bus and trucks, three-wheelers, and two-wheelers from 10% to 15%. The revised BCD will be into effect from April 01, 2020.

"On the issue of the BCD, the intent is good. A decade ago, the same thing happened with the solar sector, and the neighboring countries who developed large manufacturing capacities were essentially dumping goods which hampered the domestic manufacturing capabilities in solar which have now slumped to an assembly line at best in India. The government didn't want to repeat that same mistake and hence the move to push for EV manufacturing to be developed within the country. However, the messaging could have been better," he added.

The proposed hike in customs duty on completely and semi-knocked down kits and CBUs is in line with the phased manufacturing plan outlined by the Department of Heavy Industry (DHI) in 2019 and will serve as a blow to those manufacturers assembling imported kits from China.

Speaking to Mercom India, Omprakash Upadhyay from Tata AutoComp said, "The announcements in the budget are going to promote the Make in India initiative and the government is promoting localization which is a good thing. The government has taken many positive steps in the last few years, which shows the positive intent of the government. One thing that the government can do is that it can promote a common protocol for e-buses. Now, all the manufacturers are promoting their own protocols. The government should also look at tax exemptions on semiconductor devices that are used in EVs and imported from other countries. Overall, we're happy with the budget."

There is still a shortage of proper infrastructure for developing and manufacturing electric vehicles in India, and most manufacturers continue to import important components such as lithium-ion batteries, electric motors, and other parts from other countries.

"We welcome the steps to boost electronics manufacturing. Power electronics and electronic manufacturing is an essential part of advanced storage and EV ecosystem. We hope that this new plan can boost component manufacturing in India and reduce reliance on imports for Indian companies," said Rahul Walawalkar, President, India Energy Storage Alliance (IESA).

The basic customs duty on commercially built units of electric buses and trucks is proposed to increase to 40%

"IESA was given the push under NITI Aayog's mission National Mission on Transformative Mobility and Battery Storage for indigenous manufacturing. We were anticipating a clear allocation of resources for accelerating e-mobility and setting up of Giga factories, which were missing in the budget. We hope the finance ministry provides clarification on this," he added.

The government has emphasized the need to promote the manufacturing and use of EVs in the country, and over the last few years, many states have come up with policies to promote wider adoption of EVs. The EV sector in India saw a lot of positive moves in 2019, with the launch of FAME India – II, introduction of tax exemptions for buyers, subsidies for manufactures, Goods, and Tax (GST) cuts, and duty imposition on imports to push domestic production.

Recently, the Department of Heavy Industries (DHI) approved 2,636 electric vehicle charging stations in 62 cities across 24 states and union territories under the second phase of the program. According to the government's statement, nearly 106 proposals were received from the public and private entities for the deployment of approximately 7,000 EV charging stations.

The government wants to make India the hub of EVs and over the past few years, has come out with a slew of announcements aimed at fostering wider adoption of EVs. It's not a far-fetched idea, but there are still many hurdles that need to be overcome. The government has not come up with temporary sops, perhaps because of a limited fiscal room given the sluggish pace of economy and credit crunch.

Adding duties on components of an industry that is yet to take off will make it extremely challenging for EVs to take off in India.

2020 Budget Creates New Uncertainties for Solar

2019 wasn't a great year for the renewable industry. However, with a budget allocation of ₹220 billion for 2020 the government is trying to give some hope to the investors

By : Anjana Parikh

On February 1, 2020, the Finance Minister Nirmala Sitharaman presented the Union Budget 2020-21 in Parliament with a focus on three main points: Aspiration India, Economic Development for all, and Building a Caring Society.

Considering the present state of the economy and the renewable industry, Union Budget 2020 tried to give some hope to the investors and taxpayers as the finance minister announced the Budget for the financial year (FY) 2020-21, with a budget allocation of ₹220 billion (-$3.08 billion) for the power and renewable sector.

In her second budget announcement, Sitharaman said, "Our government has brought a paradigm shift in governance-structural reform and inclusive growth. Fundamentals are strong, ensuring macroeconomic stability. Inflation was contained, banks were cleaned up and recapitalized. Companies provided exit through the Insolvency and Bankruptcy Code. Steps for the formalization of the economy were taken up. Goods and Services Tax (GST) has been historic."

The budget 2020 outlay is ₹12.99 billion ($181.5 million) for wind power, ₹21.5 billion ($300.4 million) for solar, ₹45 billion ($628.8 million) was toward

the power supply program of Deendayal Upadhyay Gram Jyoti Yojana (DDUGJY), and ₹5.74 billion (-$80.2 million) for the power system development fund.

The National Infrastructure Pipeline, announced last year with an outlay of ₹103 trillion (-$1.44 trillion), consists of more than 6,500 projects across sectors including clean and affordable energy.

Considering the confusion and uncertainty revolving around GST, the government said that a simplified return format for GST would be introduced from April 2020. It has decided to transfer the due balances out of collections from 2016-17 and 2017-18 into the GST Compensation Fund in two installments. Now, the transfers to this fund would be limited only to the collections made through GST compensation cess.

The government also underlined its ongoing efforts to provide clean energy through solar power and Ujjwala program that provides clean cooking fuel to households.

"Committed to doubling farmers' income by 2022, the budget points out that integrated farming systems in rainfed areas would be expanded. Multi-tier cropping, beekeeping, solar pumps, solar energy production in the non-cropping season would be added.

Talking about India's farmers, she said that the Pradhan Mantri Kisan Urja Suraksha Evam Utthan Mahabhiyan (PM KUSUM) serves many of India's sustainable development goals, such as energy independence, higher income for farmers, reduced use of fossil fuels, reduced emissions, lower import bill, relieve load on national power grid and ease cross-subsidy burden on industry. The government plans to expand PM-KUSUM to provide two million farmers to set up standalone solar agricultural pumps and 1.5 million farmers to set up grid-connected pumps.

The budget allocation for KUSUM program is ₹7 billion ($97.8 million).

Sitharaman further said that under the program, farmers with fallow lands would be able to generate solar power to sell to the grid.

The government has proposed a basic customs duty of 20% on imported cells and modules

Highlighting the importance of solar, the minister added that a large solar capacity would be developed along the railway tracks on lands owned by the Indian Railways. The government aims to electrify 27,000 km of railway tracks, she said. Besides this, for solar cells not assembled (8541 40 11) and for those assembled in modules or made up into panels (8541 40 12), the government has proposed a basic customs duty of 20%

Union Budget 2020-2021: Outlay on Major Programs

Program	2017-18 Actuals		2018-19 Actuals		2019-20 BE		2019-20 RE		2020-21 BE	
	₹ Million	~$ Million	₹ Million	~$ Million	₹ Million	~$ Million	₹ Million	~$ Million	₹ Million	~$ Million
Solar Power	18,900	264.1	19,040	266.0	24,800	346.5	17,890	250.0	21,500	300.4
Wind Power	7,500	104.8	9,500	132.7	9,200	128.5	10,260	143.4	12,990	181.5
"Kisan Urja Suraksha evam Utthaan Mahabhiyan (KUSUM)"	-	-	-	-	-	-	-	-	7,000	97.8
Green Energy Corridor	5,000	69.9	5,000(BE)*	69.9	5,000	69.9	-	-	-	-
Deen Dayal Upadhyaya Gram Jyoti Yojna (DDUGJY)	50,500	705.6	38,000	530.9	40,660	568.1	40,660	568.1	45,000	628.8
Integrated Power Development Scheme	39,000	544.9	38,970	544.5	52,800	737.7	56,630	791.3	53,000	740.5
Strengthening of Power Systems	11,600	162.1	28,020	391.5	14,780	206.5	18,600	259.9	18,430	257.5
Power System Development Fund	10,000	139.7	5,440	76.0	10,350	144.6	5,740	80.2	5,740	80.2

Note: BE - Budget estimates; RE - Revised Estimates **$1 = ₹71.57* *Source: IndiaBudget.gov.in* *Mercom India Research*

(At the moment, it is unclear how all this will play out. We will follow-up with more details as they emerge).

The budget has also provided incentives for states that are taking measures for cleaner air in big cities (with a population above one million). For this, ₹44 billion (-$615 million) has been allocated in the budget.

To provide support to infrastructure projects, an investment clearance cell to be set up through a portal and will provide end-to-end facilitation, support, pre-investment advisory, information on land banks and facilitate the center and state approvals.

The government will also create a single investment cell to expedite the grant of licenses to promote entrepreneurship. Sitharaman also proposed to reduce the corporate tax rate for new companies in the manufacturing sector to 15%. This is for companies that start manufacturing by March 31, 2023.

The dividend distribution tax has also been abolished. Moreover, the budget specified that old thermal plants will be asked to shut down if their emission is above the pre-set norms.

To incentivize investment by the sovereign wealth fund of foreign governments in the priority sectors, it has been recommended to grant 100% tax exemption to their interest, dividend and capital gains income for the investment made in infrastructure and other notified sectors before March 31, 2024, and with a minimum lock-in period of three years.

The budget does not lay a clear path to reach 100 GW of solar by 2020

To attract investment in the power sector, the concessional corporate tax rate of 15% could be extended to new domestic companies engaged in the generation of electricity.

The finance minister has also proposed a 100% profit deduction for three years out of 10 years for startups with a turnover of up to ₹1 billion (-$13.98 million).

Taking electricity to every household has received a major thrust from the government. However, the distribution sector, particularly the DISCOMs, has been under financial stress.

To this end, the government said it intends to promote smart metering. "I urge all the states and union territories to replace conventional energy meters by prepaid smart meters in the next three years. Also, this would give consumers the freedom to choose the supplier and rate as per their requirements," the finance minister said in her budget speech. Five new smart cities would also be developed in coordination with states on a public-private-partnership model.

On India's plan for expanding electric mobility, she said that customs duty rates are being revised on electric vehicles.

In what could be a significant concern for the industry, the finance minister said that the government is looking at amending safeguard duty provisions to regulate the surge in imports in a systematic way.

To encourage foreign investments, the limit for foreign portfolio investment (FPI) in corporate bonds, which is currently at 9% of outstanding stock, would be increased to 15% of the outstanding stock of corporate bonds.

To promote the listing of bonds at India International Exchange (IFSC), the withholding rate is reduced from 5% to 4% on interest payment for the bonds listed on its exchange.

Addressing the liquidity constraints of the non-banking financial companies (NBFCs), the government had earlier announced the Partial Credit Guarantee

Program for the NBFCs. Providing further push, the government would offer support by guaranteeing securities floated by the NBFCs.

Lastly, the budget also underlined the need to promote electric vehicles. Sitharaman also stated that customs duty rates are being revised on electric vehicles to facilitate electric mobility.

Budget Reactions from Stakeholders

Welcoming the government's decision to reinforce the PM-KUSUM program, Pranav R Mehta, chairman of the National Solar Energy Federation of India (NSEFI), said, "We are very happy that the government has decided to reinforce the program with two million off-grid and 1.5 million on-grid solar pumps. While we always welcome the use of locally made modules in the country, the provision of using only domestically made cells in this program might be a deal-breaker due to the lack of adequate infrastructure".

The focus on bringing down the commercial losses in the distribution companies by mandating prepaid meters, coupled with the consumers having the 'choice of suppliers', may resolve the long-term viability issues of the power sector. The usage of solar in the railways and farming and usage of farmlands for solar projects could open up new entrepreneurial opportunities and help in faster adoption of solar energy across the country.

A simplified return format for GST would be introduced from April 2020

"We urge the government to consider the use of microgrids that can help improve the utilization of solar panels deployed with these pumps as well as ensuring groundwater management. Without such integrated policies, push for just deployment of solar pumps could lead to exploitation of limited groundwater resources and result in unintended consequences during summer months," said Dr. Rahul Walawalkar, president, India Energy Storage Alliance (IESA).

Although the budget emphasized on the expansion of solar, however, the finance minister did leave a grey area regarding custom duties on imports.

Ashish Khanna, the managing director of Tata Power Solar and president, Tata Power (Renewables), opined that the Budget 2020, is set in the right direction. He said that the promotion of smart metering is a good step, "but one step can't be the solution to all problems." Further, he said that the industry awaits the details of the budget.

"The 2020 budget has some aspects to it that could help the renewable energy industry, but there is also added uncertainty by proposing new solar duties without clarity. It is unclear how specific programs will be implemented. Overall, the budget does not lay a clear path to reach the goal of installing 100 GW of solar by 2020," said Raj Prabhu, CEO of Mercom Capital Group.

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ENGIE to Sell 74% Stake in Indian Solar Assets

The transaction is expected to help the French multinational company reduce its net debt by €400 million

By : Nithin Thomas Prasad

French multinational electric utility company ENGIE's portfolio in India crossed 1.5 GW last year. Its strategy in India, as well as many other countries, is to use its resources to design, finance, and build renewable energy production capacity and then partially dispose of its interest in the project and only retain operation and maintenance responsibilities.

In January, it announced its plans to sell a 74% stake in its solar assets in India to Edelweiss Infrastructure Yield Plus (EIYP).

This transaction is a part of a strategic partnership between the two companies. The French power distribution company said it would sell 12 solar assets with a total operating capacity of 813 MW (DC) to EIYP and Sekura Energy Limited, a portfolio company of EIYP.

The company added that the transaction would take place during the first half of 2020 and will help ENGIE reduce its net debt by over €400 million (-₹31.49 billion).

"This transaction allows us to accelerate the implementation of our strategic model in renewables, and to free up capital to keep up investing in the very dynamic Indian solar market," said Paulo Almirante, ENGIE Executive Vice-President, and Chief Operating Officer.

It added that this transaction marked the beginning of a partnership with EIYP that aims to expand a growing solar platform.

In 2018, ENGIE acquired a 90% stake in Simpa Energy from its parent company Simpa Networks, a distributed energy solutions provider with the pay-as-you-go model. Through the ENGIE Ressembleurs d'Energies investment fund, the company also supports community initiatives in India, the primary aim of which is to help the local population have access to clean energy.

Mercom reported ENGIE's total renewable capacity in India crossed 1.5 GW, as of June 2019, after Gujarat Urja Vikas Nigam Limited awarded a 280 MW solar project as part of the state's Raghanesda Solar Park, which is currently under development.

According to Mercom India Research, Engie has large-scale solar projects worth 569 MW (AC) in operation, and around 250 MW (AC) of solar projects are under the development pipeline.

First Loss Protection Can Help Scale Rooftop Solar

The rooftop solar segment in India has been growing at a brisk pace. However, as the 2022 target looms large, innovative instruments like First Loss Protection Program are needed to expand the rooftop market

By : Nithin Thomas Prasad

Rooftop solar in India has lagged large-scale projects for several years now, and the growth in the segment may end up preventing India from reaching its solar installation goals. Rooftop is currently suffering from a lack of financing and liquidity issues among others, preventing it from reaching its full potential.

Because of the liquidity crunch and weak economic conditions, commercial & industrial (C&I), companies cannot finance rooftop projects. Instead, they are looking for OPEX opportunities that do not require an upfront investment. Banks and financial institutions are not funding

First-loss protection instruments protect investors from a pre-defined amount of financial losses

at the same levels as they were earlier. Financial institutions are only looking to lend to companies with good ratings.

Total solar installations in India have crossed the 35 GW mark, according to Mercom's India Solar Project Tracker. Out of the 35.6 GW, ~31.3 GW of large-scale solar projects were in operation as of December 2019, while 4.3 GW of rooftop solar installations were recorded against the government's target to install 40 GW of rooftop solar by 2022.

Earlier this year, Mercom reported how a serious policy push is needed to get India's rooftop solar market back on track.

The penetration of operational expenditure (OPEX) or third party-owned rooftop solar projects in India has been low as only large corporations with healthy balance sheets have been able to garner financing. However, there lies an untapped market for OPEX-based rooftop solar projects in the country, particularly for micro, small, and medium enterprises (MSMEs).

Typically, an investor checks the credit rating of consumers from the industrial, commercial, or retail segments who want to install a rooftop solar system. However, there are millions of MSMEs in India which remain underserved by financiers due to the lack of required grade of credit rating. This lack of creditworthiness or the lack of information about credit ratings also limits the capability of rooftop solar developers to offer their services to these companies.

According to rooftop solar developers, this opens a window for products that can enhance a project's creditworthiness. One such instrument is the 'First Loss Protection Program.'

A first-loss protection mechanism refers to any product designed to insure the amount of capital that has been invested in the case of a financial loss on security, including equity, debt, and derivatives instruments. First-loss protection instruments protect investors from a pre-defined amount of financial losses, enhancing creditworthiness, and improving the financial profile of the investment. Essentially the product is a type of insurance that can help mitigate an estimated amount of losses for the lenders funding these projects.

Mercom reached out to financiers and rooftop project developers to discuss how these instruments would be able to boost rooftop solar penetration in India. However, according to stakeholders, currently, there aren't many options for a first loss protection program available in the country.

Mercom also discussed the scope of first loss protection with rooftop solar developers, such as CleanMax Solar, about how a first loss protection program would increase their universe of serviceable clients.

Nikunj Ghodawat, Chief Financial Officer, CleanMax Solar, said, "The early adopters of rooftop solar have been large C&I customers with good credit ratings, rendering easy financial availability from banks. Rooftop solar developers like CleanMax Solar make the complete capital investment in an OPEX model to set up the solar system, which is paid over 20-25 years.

newer segment of customers.
A more addressable segment would be MSMEs. However, a low to non-existent credit rating makes it daunting for a

agency for MSMEs with a credit rating below 'A,' would open up the rooftop solar market to a multitude of small businesses. This would allow them

India cannot meet its target of 100 GW of solar by 2022 without strong growth of the rooftop segment

We essentially target the top 5-10% of the corporate universe with good credit ratings, but with the deployment of the 'first loss protection' program, it can effectively enhance and broaden our market."

To fast-track the growth and adoption of rooftop solar, the country needs to create avenues to tap into a developer to raise debt from financial institutions to invest in a project with such a long-term payback.

To promote the MSME segment, what is needed is not a subsidy, but someone to take on some of the credit risks of these projects. A first loss protection program, promoted by the government or perhaps a multilateral

to enter into long-term, zero CAPEX rooftop solar contracts.

So, a stable first loss protection policy would be a strong enabler to encourage the adoption of rooftop solar, creating a potentially large market. In addition to benefiting the environment, it would also bring down electricity costs for these companies,

which is a significant impediment in India to accelerate industrial growth and the associated employment.

Speaking to Mercom, an official at State Bank of India (SBI), the public sector bank with the largest portfolio of solar sector lending, both utility-scale and rooftop solar, commented, saying that there is a sizable amount of funds that are unclaimed by the

rooftop solar sector currently. "SBI is the implementing agency for the funds provided by the World Bank to promote rooftop solar in the country. There are various reasons for this, chief of which is a lack of knowledge of such funds and how they operate. Rooftop installers also need to educate and convince MSMEs of the benefits of rooftop solar, and later take the time and effort to lead them through the long process of securing the loans," he said.

He further added, "Banks are not too rigid about the credit rating qualifications, but there are other technical glitches. For example, if an MSME has taken a loan from another bank for its primary business, they need to get a "no objection certificate" from that bank, if another bank has to approve the loan for the rooftop solar system. The MSMEs also need to convince the banks that the rooftop solar systems would reduce the cost of power of the company, which in turn would positively affect the cash flow of the company. These procedures take time; in the process, both the MSME and the developer lose interest. Before asking for other financial assistance programs by the government, the companies should find a way to utilize the existing corpus of funds."

In the past, the SBI and the World Bank announced ₹23.2 billion ($357 million) in credit facilities for seven Indian solar companies to develop grid-connected solar rooftop projects with an aggregate capacity of 575 MW. The companies receiving credit facilities include Adani Group, Hinduja Renewables, JSW Energy, Tata Renewable, Azure Power, Cleantech Solar, and Hero Solar Energy.

The MSME sector is lying untapped due to the credit rating demand by the banks

Ramesh Shivanna, president of Karnataka Renewable Energy Systems Manufacturers Association (KRESMA), said, "We have a sizeable MSME segment who are major power consumers but with small industrial roof space available. Unfortunately, these MSME are not eligible for third-party investments because of the credit rating merits prescribed by the large funds. Private banks do not offer non-recourse debt funding for rooftop solar. Banks should be mandated to offer debt similar to automobile debt funding for rooftop solar to scale up."

Another executive from a rooftop solar company told Mercom that "The MSME sector is lying untapped due to the credit rating demand by the banks. Investors and banks are willing to lend to MSMEs with the credit rating of 'A' and above, which only opens doors to 800-1,000 MSMEs. There are over 8,000-10,000 MSMEs with a credit rating of 'B,' which is a huge opportunity for rooftop solar developers."

A first loss protection program for solar energy projects can also help match investors' risk-adjusted returns and give a step up for funds to be deployed for the adoption of clean energy sources.

Over the last year and a half, debt financing has dried up as banks have scaled back on lending to corporates in India. This cut back has been more pronounced in the NBFC sector ever since the collapse of IL&FS. Further, the companies suffering the most due to the lack of borrowing capability belong to the MSME segment. The growth of MSMEs is crucial for the growth of the Indian economy. For these companies to grow, the government also needs to put in place a mechanism that helps certify their creditworthiness. Not only will this enhance their ability to borrow from lenders for their operations, but it will also help them adopt clean energy sources, which will reduce their carbon footprint and help procure power at lower costs.

"A program like first-loss has multiple benefits. It can open up the dormant SME and MSME markets to rooftop solar; SME's will reduce their power bills, carbon footprint and increase cash flows at a time liquidity is most needed; it will help kick start the rooftop sector, and all of this will help with the steady march to reach the Modi government's 100 GW/2022 goal," said Raj Prabhu, CEO of Mercom Capital Group.

Venture Capital Funding for Battery Energy Storage Soars

There were a few mega deals recorded in 2019 which helped take the overall funding numbers up, clocking in a significant growth

By : Utsav Sinha

In 2019, global VC funding (venture capital, private equity, and corporate venture capital) for battery storage, smart grid, and efficiency companies totaled $2.3 billion compared to $2.8 billion raised in 2018.

These numbers were revealed in the newly released annual and Q4 funding and M&A report by Mercom Capital Group.

The total corporate funding (including venture capital funding, public market, and debt financing) shrunk by 22%, with $3.8 billion raised during the year when compared to $4.9 billion in 2018.

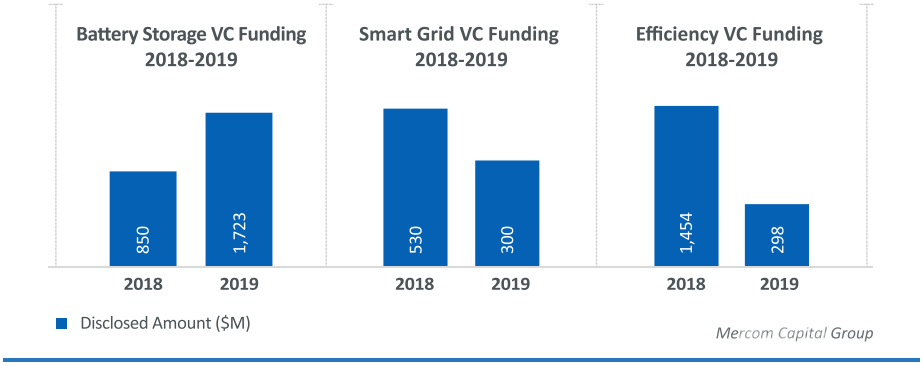
Battery Energy Storage

VC funding into battery energy storage companies in 2019 was up by 103%, with $1.7 billion raised in 32 deals compared to $850 million raised in 49 deals in 2018.

This increase was primarily due to Northvolt's $1 billion deal in Q2 2019.

Total corporate funding, including debt and public market financing, increased to $2.8 billion in 2019 compared to $1.3 billion in 2018.

The top VC funded companies in 2019 were: Northvolt with $1 billion,



Sila Nanotechnologies with $170 million and $45 million in two separate deals, Energy Vault with $110 million, and Romeo Power with $89 million.

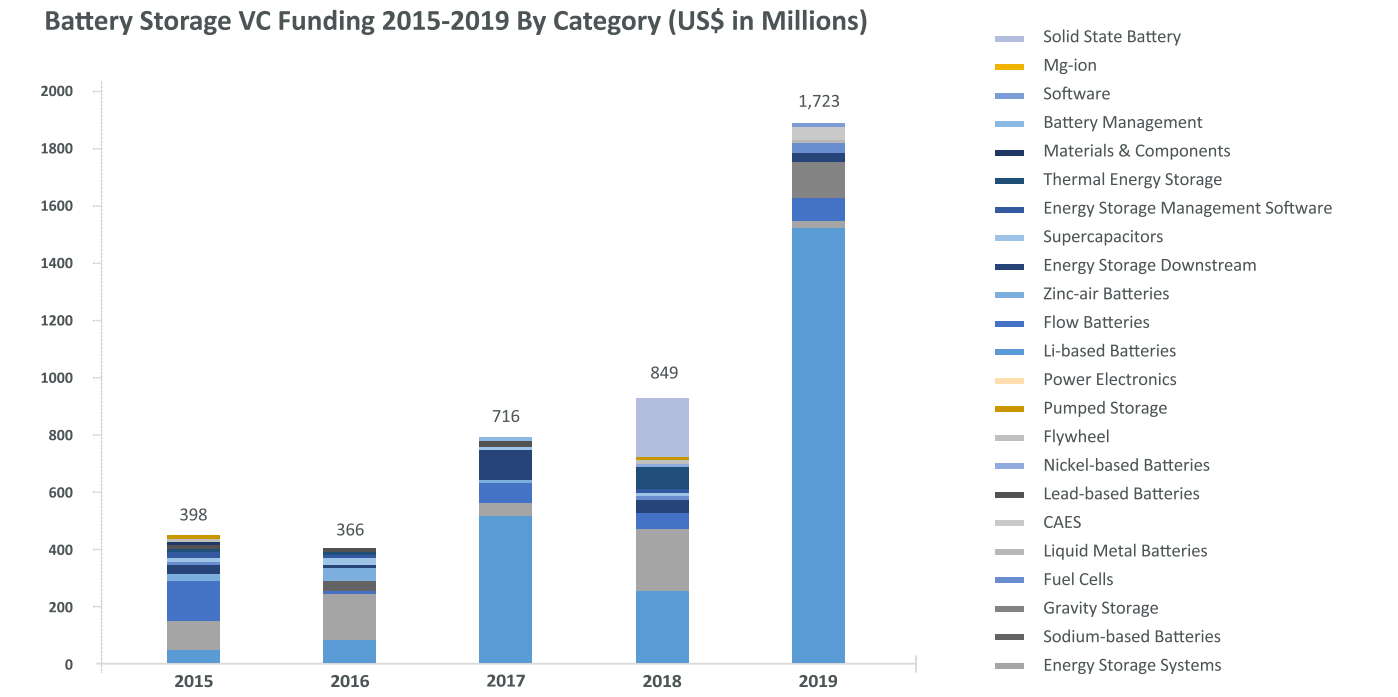
Two Indian battery storage companies, Log 9 Materials and LivGuard Energy Technologies received VC funding in 2019.

A total of 78 VC investors participated in battery storage deals in 2019. Utilities and oil and gas companies were involved in seven battery storage funding deals in 2019.

Announced debt and public market financing in 2019 increased to $1.1 billion in 10 deals compared to $494 million in 12 deals in 2018. Northvolt's $393 million loan was the largest debt financing deal in 2019.

There were 10 M&A (merger and acquisition) transactions in the battery storage category in 2019, of which only two disclosed the transaction amounts. In 2018, there were 16 M&A transactions, three of which disclosed the details.

According to a forecast from BloombergNEF (BNEF), energy storage installations around the world will multiply exponentially, from a modest 9 GW/17 GWh deployed as of 2018 to 1,095 GW/2,850 GWh by 2040. Just ten countries are on course to represent almost three-quarters of the global market in gigawatt terms. South Korea is the lead market in 2019, but will soon cede that position,



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with China and the U.S. far in front by 2040. The remaining significant markets include India, Germany, Latin America, Southeast Asia, France, Australia, and the U.K.

Also, one Indian company, Greenko, received a funding of $495 million for energy storage projects in 2019.

Smart Grid

VC funding in smart grid companies in 2019 was 43% lower, with $300 million raised in 38 deals compared to

Image: Ysc usc [CC BY (https://creativecommons.org/licenses/by/4.0)]

Image: UniEnergy Technologies

the $530 million raised in 29 deals in 2018. Total corporate funding was $372 million in 41 deals, compared to $1.8 billion in 33 deals in 2018.

The top VC funded companies in 2019 were Smart Wires, which brought in $75 million, eSmart Systems, which received $34 million, SmartRent, which secured $32 million, CleanSpark with $20 million, and Volta Charging with $20 million.

There was one Indian smart grid company, Husk Power Systems, that received VC funding in 2019.

Announced debt and public market financing came to $72 million in three deals compared to $1.3 billion in four deals in 2018. There were no IPOs announced for smart grid companies in 2019.

In 2019, there were 29 M&A transactions (one disclosed) recorded in the smart grid sector. In 2018, there were 12 undisclosed transactions.

Energy Efficiency

VC funding for energy efficiency companies fell sharply with $298 million in nine deals in 2019 compared to $1.5 billion in 23 deals in 2018. This was an 80% decrease primarily due to the $1.1 billion deal raised by architectural dynamic glass developer, View, in Q4 2018. Total corporate funding reached more than $670 million in 2019 compared to $1.7 billion in 2018.

The top VC funded companies in 2019 were: Kinestral Technologies, which raised $100 million, followed by Budderfly with $55 million, CIMCON Lighting with $33 million, Carbon Lighthouse with $33 million, and Arcadia Power with $30 million.

Announced debt and public market financing activity in 2019 rose to $371 million in three deals compared to $277 million raised in the same number of deals in 2018.

In 2019, there were a total of nine M&A transactions (two disclosed compared to seven transactions (one disclosed) in 2018.

Energy storage is one of the most crucial components missing in India's energy infrastructure strategy and is critical in sustaining India's transformation from fossil fuels to renewables. Key areas for energy storage applications include integrating renewable energy with distribution and transmission grids, setting rural micro-grids with diversified loads or standalone systems, and developing the storage component of electric mobility plans.

In the first nine months of 2019, VC funding for battery storage, smart grid and energy efficiency totaled $2.3 billion

Battery Storage, Smart Grid, and Efficiency Top Disclosed M&A Transactions in 2019

Company	Terms/Amount ($M)	Acquirer	Country
Cree Lighting	310	IDEAL INDUSTRIES	USA
Maxwell Technologies	218	Tesla	USA
SMRE	77	SolarEdge Technologies	Israel
SmartWatt	37	Centrica	UK

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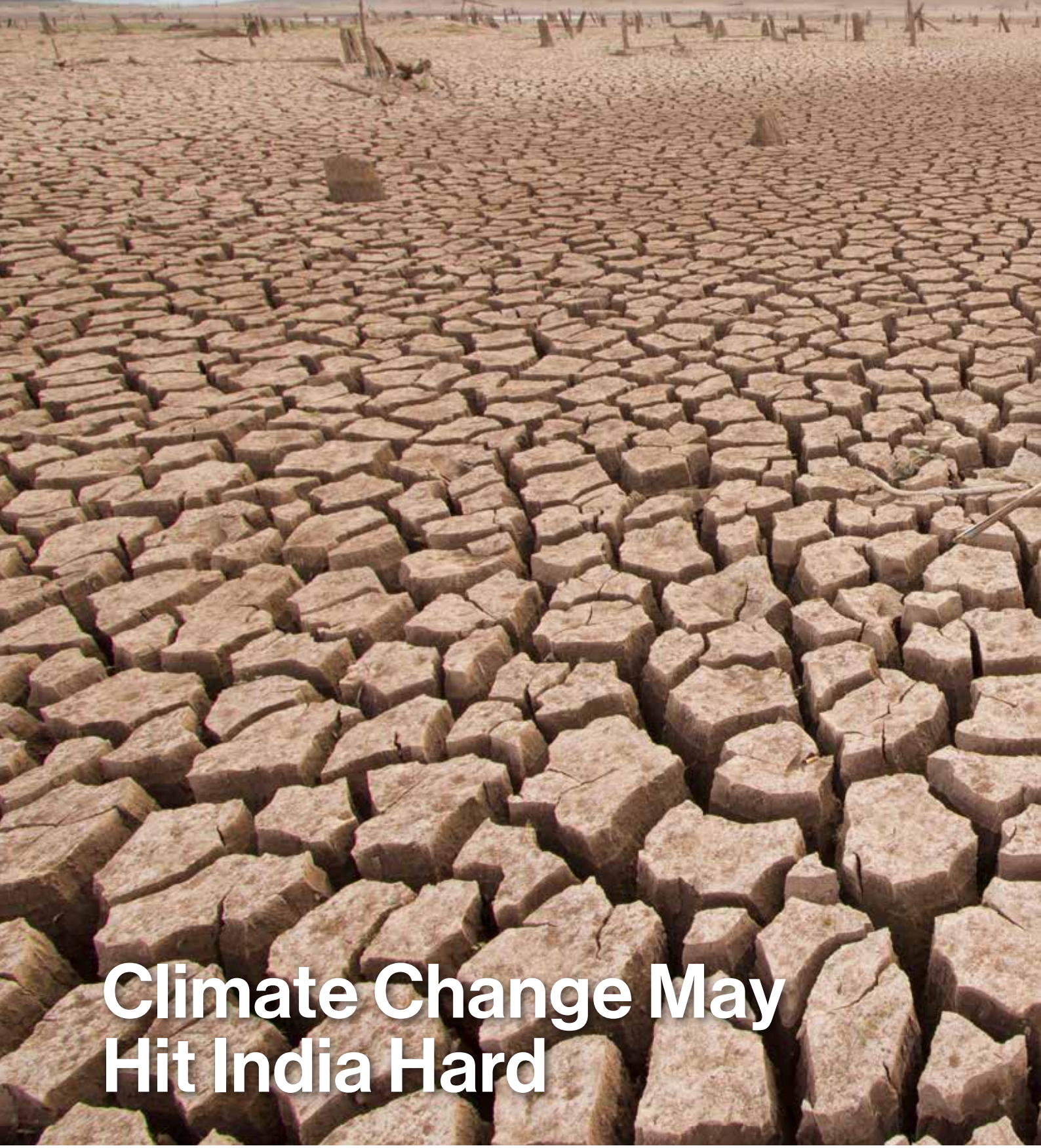

Climate Change May Hit India Hard

The report titled Climate Risk and Response suggested that climate risks should be considered and duly addressed during the process of framing policies

By : Nithin Thomas Prasad

India needs to be more concerned about climate change. It is no longer just an environmental issue but also an economic challenge. The repercussions of climate change for a country with tropical weather and a large chunk of the population dependent on outdoor work could be immense unless action is taken immediately.

The McKinsey Global Institute (MGI) has released a report titled "Climate Risk and Response," which focuses on understanding the nature and extent of physical risk from climate change over the next three decades.

The report focuses on the physical risk, i.e., the risk from the physical effects of climate change, including the potential impact on people, communities, natural and physical capital, economic activity, and the implications for companies,

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governments, financial institutions, and individuals.

The report takes into consideration six indicators to assess potential socioeconomic impact in 105 countries. It identified that climate change already has substantial physical implications at a local level in regions across the world, and the affected areas will continue to grow in number and size.

It looks at the impact of climate change on livability and workability in India and the Mediterranean; disruption of food systems through looking at global breadbaskets and African agriculture; physical asset destruction in residential real estate in Florida and supply chains for semiconductors and heavy rare earth metals; disruption of five types of infrastructure services and, in particular, the threat of flooding in urban areas; and destruction of natural capital through impacts on glaciers, oceans, and forests.

As weather affect food systems, climate change will introduce more volatility to these systems

The report states that the socioeconomic impacts of climate change will likely be nonlinear as system thresholds are breached and have knock-on effects, implying that irreversible damage has been done to some socioeconomic systems like natural capital and that they cannot be fixed.

It also identified that the global socio-economic impacts of climate change could be substantial as climate change affects not only human beings, but also physical and, as previously mentioned, natural capital.

McKinsey suggested that financial markets could bring forward risk recognition in affected regions, with consequences for capital allocation and insurance. This falls in line with its next finding, which stated that countries and regions with lower per capita gross domestic product (GDP) levels are generally more at risk.

Also, it said that addressing physical climate risk will require more systematic risk management, accelerating adaptation, and decarbonization.

The study also shows how climate hazards could affect different socio-economic systems. It emphasized on five systems in particular - livability and workability, food systems, physical assets, infrastructure services, natural capital.

It showed that hazards like heat

stress not only lowers human productivity because workers need to take breaks to avoid heat strokes, but it also could put human lives at risk. This could also cause a shift in the kinds of diseases that affect human health.

The report said that hot and humid countries like India and Pakistan are expected to become significantly hotter and more humid by 2050. It added that India might become one of the first places in the world to experience heat waves that cross the survivability threshold for a healthy human being resting in the shade.

It stated that as heat and humidity increase in India, under an Representative Concentration Pathway (RCP) 8.5 scenario, by 2030, between 160 million and 200 million people (of whom 80 million to 120 million people are estimated not to have air-conditioned homes) could live in regions with an average 5% annual probability of experiencing a heatwave that exceeds the survivability threshold for a healthy human being, absent an adaptation response.

The RCP 8.5 scenario predicts that global average warming of 2.3 degrees Celsius by 2050, compared with 1.8 degrees Celsius for RCP 4.5. Under RCP 4.5, 2.3 degrees Celsius warming would be reached in the year 2080.

Climate change will affect five systems in particular – livability and workability, food systems, physical assets, infrastructure services, natural capital

Changes like these would threaten the lives of millions and make outdoor work, which accounts for about half of the GDP currently, much more challenging.

India is also expected to experience a net-negative agricultural impact from climate change. The country is expected to experience a 7% decrease in projected crop yields by 2050, while the probability of an over 10% decrease in annual yields in a given year would increase from 10% to 40% by 2050, according to the report.

Other countries that are at high risk to this are ones that are near the equator in Africa, Asia, and the Persian Gulf. These countries are characterized by extreme increases in heat and humidity impacts on workability, as well as a decrease in water stress.

Food systems could be disrupted because of drought conditions, extreme temperatures, and floods. Weather conditions play a drastic role in the performance of food systems. Climate change will introduce more volatility to the systems.

Weather volatility also has the potential to wreak havoc on physical assets like buildings. Extreme precipitation, tidal flooding, forest fires, and other havocs can wipe out significant parts of towns and cities. Rural and remote settlements are at higher risk of this.

Infrastructure services are another system that could fall prey to climate volatility. They could either

be destroyed completely, crippled or wholly incapacitated. Power systems, for example, could become less productive in very hot weather conditions.

Natural capital like forests, glaciers, ocean ecosystems that provide essential services to human communities would start deteriorating, in turn directly affecting human and economic activity. Additionally, human mismanagement may also play a role in the loss of these systems.

The report discussed three steps that stakeholders could consider taking to provide an adequate response to the socioeconomic impacts of physical climate risk. It suggested the integration of climate risk into decision-making processes as currently, stakeholders might be underprepared to manage the impact of climate change.

Decision-making processes need to reflect these characteristics. For example, companies will have to take climate considerations into account when looking at capital allocation, development of products or services,

India is expected to experience a 7% decrease in projected crop yields by 2050

supply-chain management, among others. Cities must bring about an element of climate change focus on their urban planning decisions.

The second step suggested was accelerating the pace and scale of adaption. While societies have been adapting to climate change, the speed and scale of adaptation will likely need to increase significantly. These measures should include protecting people and assets, building resilience, reducing exposure, and ensuring that appropriate insurance and financing are in place.

McKinsey added that supporting socioeconomic development in a manner that incorporates recognizing the risk of climate change is also crucial. For example, by shifting the basis of economic development of extreme heat-prone regions from outdoor work to urban indoor environments would be a good start.

The final step was to promote decarbonization at larger scales. While the report did not present an assessment or roadmap for this, it stated that the next decade of human existence on the planet is highly dependent on the cumulative amount of carbon dioxide that is added to the atmosphere.

The report said that decarbonization investments would need to be considered in parallel with adaptation investments, particularly in the transition to renewable energy, which plays a vital role in achieving zero net greenhouse gas emissions.

The report concluded that since physical climate affects everyone, either directly or indirectly, responding to it adequately would require careful translation of climate science into risk assessments at a time when old models of assessing and managing risk are losing relevance.

Gujarat to Change Bidding Guidelines for a Solar Tender

The Gujarat Electricity Regulatory Commission has approved changes in the clauses of the bidding guidelines dealing with unforeseeable events

By : Rakesh Ranjan Parashar

Force Majeure is a French term that means 'greater force' and for which no one can be held accountable. But there's still very little clarity on the events that fit the bill as force majeure events and those which don't. Force majeure events have been the bone of contention between the developers and the governing authorities, leading to lengthy litigations.

In a recent order, the Gujarat Electricity Regulatory Commission (GERC) approved the changes to the Ministry of Power's guidelines relating to force majeure (unforeseen) events, as sought by Gujarat Urja Vikas Nigam Limited (GUVNL).

GUVNL had filed a petition seeking the approval for deviations from the Ministry of Power's tariff-based competitive bidding guidelines to procure power from grid-connected solar PV power projects that were amended in October 2019. The change sought is specifically regarding the force majeure clause in the amended guidelines. GUVNL is planning to issue a tender for a 500 MW solar project in the state.

The Commission has approved the changes sought by the GUVNL.

Background

In August 2017, the Ministry of Power had issued guidelines for the tariff-based competitive bidding

process for grid-connected solar PV power projects under which Clause 5.4 referred to force majeure stating, the PPA would contain provisions about force majeure definitions, exclusions, applicability and available relief on account of force majeure, as per the industry standards.

In place of the simple two-sentence reference to force majeure, the guidelines amended in October 2019, had force majeure elaborately defined and categorized under natural and non-natural force majeure events and also exclusions. Further details of how the notification of force majeure is to be presented, and termination of PPA due to force majeure events were also mentioned.

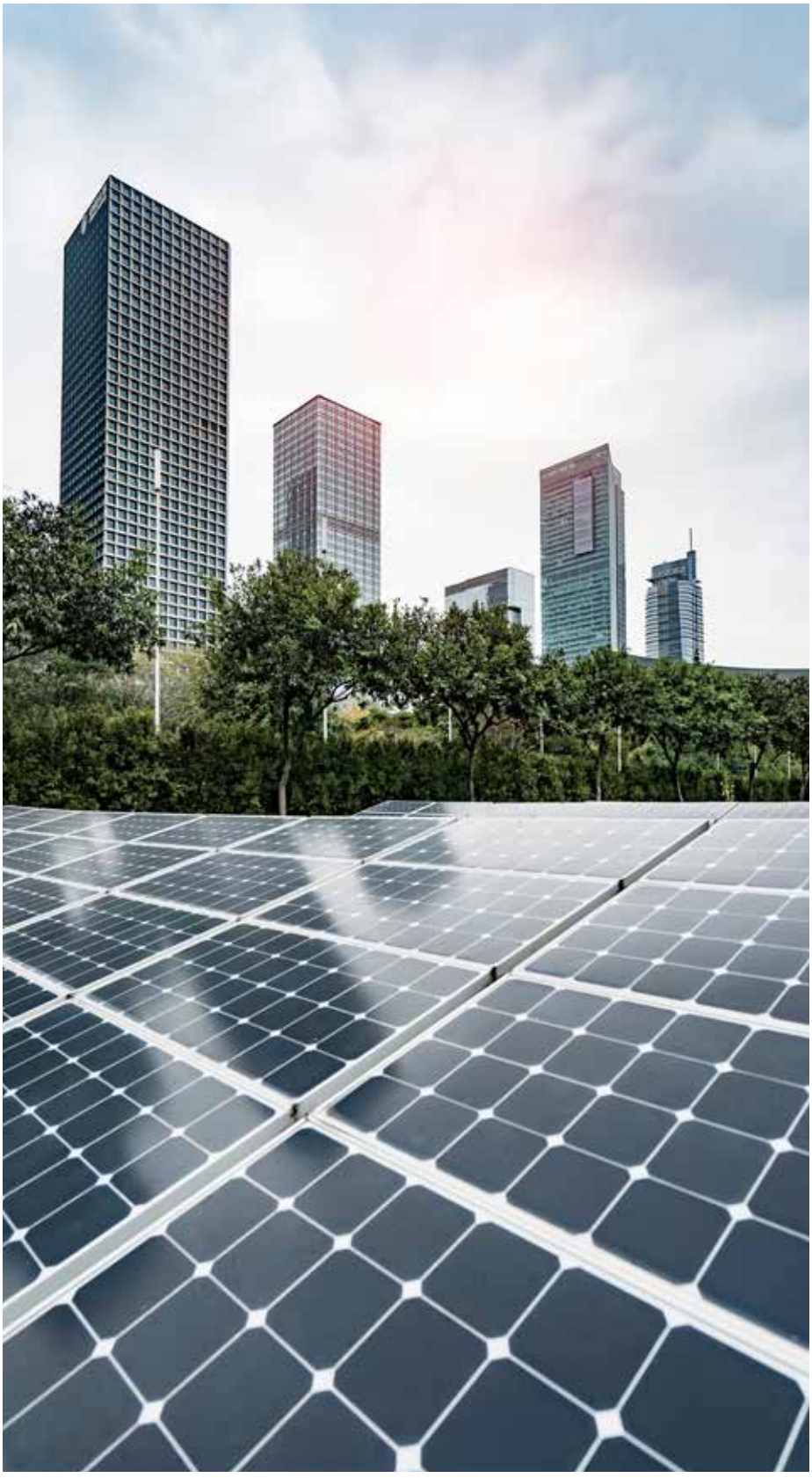
The amended guidelines provide scope for the termination of the PPA in the event of force majeure

The amended guidelines provide scope for the termination of the power purchase agreement (PPA) in the event of force majeure, which was earlier missing.

GUVNL has pointed out to the Commission that in the guidelines, the generator is given the discretion to unilaterally terminate the PPA in case of a non-natural force majeure event in the absence of any default on the part of the procurer (in this case, GUVNL), which would be hard on the distribution licensees. According to GUVNL, the termination of the PPA unilaterally requires the procurer to take over the project assets, providing a potential exit route to the generator by transferring the project risks to the procurers and ultimately to the consumers of the state, which is not fair. GUVNL had also submitted that the generation of power and maintenance of the project is not the

business of the DISCOMs, and it would be inappropriate for the DISCOMs to step into the shoes of the generators by taking over the project.

GUVNL, in its submission, asserted that it wants to continue with the existing provisions of force majeure under Article 8 of the PPA, which allows for relief under force majeure but not termination. This calls for a deviation from the force majeure clause as in the amended guidelines issued in October 2017.



Natural calamities and introduction of new laws come under the purview of force majeure

To reiterate that the requested change could be allowed, the GUVNL pointed out to clause 18 in the guidelines issued in August 2017, which states that in case there is any deviation from the guidelines, it would be subject to approval by the appropriate Commission. The appropriate Commission can approve or ask for modification in the bid documents within a reasonable time, not exceeding 90 days.

The provisions of force majeure under the amended guidelines are extensive and have a vast scope. More particularly, the termination provisions provide a potential exit route to the generator by transferring the project risks to the procurers and ultimately to the consumers of the state. This may also give rise to circumstances where the generator would terminate the PPA for no default on the part of procurers, and in such cases, the interest of procurers and ultimately of electricity consumers of the state would be adversely affected.

Termination or renegotiation of PPAs is a cause of concern for renewable developers in the country, and over the past year, generators have become extremely wary of such moves. That said, PPAs often contain ambiguous clauses, the scope of which is not clear. Under these circumstances, elaborating or clarifying such clauses is in the interest of both parties.

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Robotic Module Cleaning Going Mainstream

Robotic solar cleaning is gaining traction in the country, especially in arid states like Rajasthan where water resources are scarce

By : Rakesh Ranjan Parashar

The use of water in energy generation is a big concern in a country of 1.4 billion people where water tables are fast depleting. Thermal projects not only leave behind pollutants but are also exhausting the precious water resources in their operation and maintenance.

The rise of solar, wind generation has been a significant milestone as these resources not only curb air pollution but also tend to use less water compared to thermal generation.

That said, solar projects do use some water primarily for cleaning panels. Cleaning of solar modules is a big challenge for developers, especially in arid and dry zones where water is scarce, particularly water that is suitable for cleaning solar modules.

The life of solar modules is usually guaranteed for 25 years, and throughout its life span, cleaning is essential for efficient power generation, which ultimately impacts the bottom line.

Typically, 12,800 liters of water per month is saved using a robotic cleaning system

Dust particles, bird droppings, and other particulate materials lead to a decrease in energy generation, highlighting the importance of solar module cleaning. While manual cleaning is one of the options, several robotic technologies have entered the market that provides a cost-effective method to clean solar panels as compared to manual cleaning. Some of the more common types of robotic cleaning systems include module cleaning robots, driving robots, and AI-enabled robots.

Speaking about the latest technologies entering the robotic cleaning market, Aayushman Goyal, senior management, product development at Ganges Internationale, said, “The latest technologies include trolleys that can facilitate movement between two rows in a plant, which will bring down the CAPEX (capital expenditure) significantly. Infusion of thermal imaging cameras with robotic cleaners is another new technology that will shape the future, as it gives plant owners the ability to detect and fix any hotspots that may arise on their modules.”

Authorities have also noticed increased water usage in solar projects. Last year, the Ministry of

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Image: Ecoppia

Ecoppia's E4 is a fully autonomous robot that uses microfiber brushes to clean the dust from the solar panels. It is designed for large rows of solar panels located in arid and sandy zones.

Speaking to Mercom, Ecoppia's Vice President of Marketing, Anet Cohen Segev, said that solar companies are moving towards robotic cleaning as the only way to remain competitive in today's low tariff, low margin times, and to improve O&M practices through automation.

Water is a scarce commodity in most regions where solar power projects are being developed

New and Renewable Energy (MNRE) recommended the efficient utilization of water for cleaning utility-scale solar projects. The ministry said that project developers are currently using too much water to clean solar modules, and they should try and minimize wastage. The ministry also recommended the use of robotic cleaning technology.

Water is a scarce commodity in most regions where solar power projects are being developed, such as locations like Rajasthan. Currently, developers have to seek permission from local authorities to get access to groundwater and canals. The lack of water in these dry, arid zones poses a massive challenge for the developers.

According to a 2018 NITI Aayog report, India is suffering from the worst water crisis in its history, and millions of lives are at risk because of it. Currently, 600 million Indians face high to extreme water stress, and the crisis is only going to get worse. By 2030, the country's water demand is projected to be twice the available supply, implying a severe water scarcity for hundreds of millions of people, which count account for an eventual ~six percent loss to the country's GDP.

The application of robotic cleaning solutions is slowly gaining acceptance, and it becomes more economical when the project sizes increase. The larger the project, the higher the cost of manual labor for panel cleaning, which is driving utility-scale developers and solar park operators to opt for automated cleaning solutions.

Several companies, both domestic and international, have started offering robotic panel cleaning solutions to customers. In November last year, Israeli company Ecoppia was chosen by Fortum to deploy its field-proven cleaning solutions across its solar projects in India. Ecoppia has partnered with Fortum to equip its projects in Pavagada and Bhadla solar parks with Ecoppia's environmentally friendly E4 solution. The Bhadla project is in a water-deficient region and often faces massive dust storms.

Commenting on Ecoppia's role in the evolving Indian solar market, Anet says, "In India alone, Ecoppia has more than 5 GW of awarded projects with the largest developers and independent power producers. Even in India's challenging conditions of low tariffs and low labor costs, Ecoppia has proven to offer a cost-effective solution and a compelling business case."

Generally, the cleaning of solar panels takes place every 15 or 20 days by deploying manual labor and water. While it seems to be a simple process, when the solar panels are cleaned manually during the day, there is a drop in efficiency, which affects the overall power output. As a viable alternative to this problem, developers are now looking towards robotic cleaning, which can clean the panels during the night.

Comparing it with manual cleaning, Segev said, "Unlike manual cleaning, with the robotic solution you have no reliance on labor availability and labor costs, and what's more important is that cleaning itself is consistent day in day out. Clearly, this is not the case with manual cleaning, and cleaning is not consistent as it may cause hot spots, which will drastically impact the modules' production rate. With

Ecoppia robots, the cleaning is not only efficient and consistent but also water-free and sustainable. No manual cleaning can be done without water."

Domestic companies and start-ups are slowly gaining traction, and attracting investments as the demand for robotic solutions has increased. Recently, the Noida-based clean tech start-up Skilancer Solar received funding from Venture Catalysts. Skilancer Solar specializes in providing a robotic cleaning system which is capable of cleaning solar modules without the use of water and manual intervention. In June of last year, Alfa Ventures, a venture capital fund, along with serial entrepreneur Dhianu Das, had announced an undisclosed investment in Skilancer Solar.

According to Mercom India Research, major developers such as SB Energy (SoftBank), Sprng Energy (Actis), Engie, NTPC, ACME Solar, Rattan India, and Fortum have deployed the solar robotic cleaning systems on their projects. Most of the major developers have robotic cleaning systems installed on projects at solar parks such as REWA, Bhadla, Pavagada.

Speaking on the cost-effective nature of robotic cleaning, Manish Kumar Das, director of business at Skilancer, says, "Robotic cleaning system

Solar panels are typically cleaned every 15 or 20 days through manual labor and water

eliminates three major components of cost which result in higher ROI. The three cost components involved are the water cost, manpower cost, and higher electricity generation due to daily cleaning. To sum this up, the ROI will increase by nearly 15-20% from robotic solar panel cleaning."

"Approximately 2 liters of water is required to clean a single panel per cycle, and typically 3200 panels are installed in a 1 MW plant. Now for every cleaning cycle, approximately 6,400 liters of water are required per cleaning cycle. So, typically 12,800 liters of water per month is saved using a robotic cleaning system. Taking the case of 1 MW installation, the developer can save up to ₹700,000 (-$9778.55) annually," he adds.

Robotic cleaning does mean capital investments when most developers are cash strapped. Does investing in these new technologies make sense in the long-term? After all, in India, it is ultimately all about the cost.

"Robotic cleaning is the best and most optimized method of cleaning solar panels. I should not deny that the cost of installation of the robotic cleaning system is more than the traditional cleaning. But if we look at the bigger picture where the plants are to be kept functioning for 25 years and if the tariffs are reduced, it will lead to less ROI for any solar power project owner. On the other hand, there are two additional costs involved in the traditional method; one is the labor cost, and the second is the water cost. With the robotic system installed, the plant owners can save on labor, water, with the added advantage of the higher generation of electricity," comments Das.

India is a vast country with varying climatic conditions, and this makes it imperative for developers to take into account all the factors before opting for robotic cleaning. Das added, "Robotic cleaning is perfect for Indian weather conditions when compared to the Middle East where sand storms can cause a massive load of sand to settle on the solar panels where robots cannot be deployed. In the European colder conditions, snow piles up on the solar panels, making it very difficult to clean the panels using the robotic system. The best validation of Indian is the sudden influx of major robotic cleaning players in the Indian market."

Several semi-automated and automated cleaning methods are gradually replacing manual ones with improved efficiency and reduced costs. With low labor costs in India, it might take a while before robotic cleaning completely replaces manual cleaning, but as the costs of these solutions decrease, more developers are opting for this new technology.

Image: Skilancer Solar

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India Installs 7.3 GW of Solar in 2019

The government has set up a target of achieving 100 GW of solar capacity by 2022, but the prevailing market uncertainties have prevented the pace of installations from soaring high

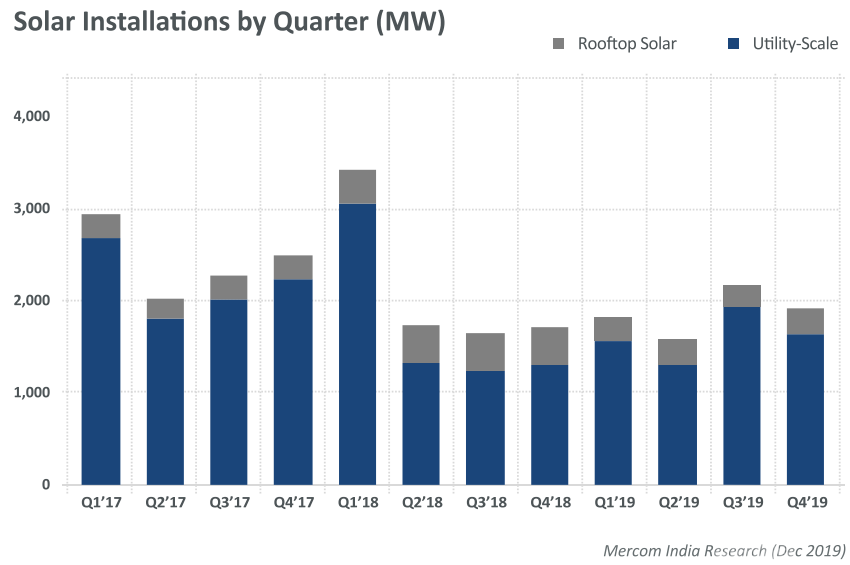
By : Priya Sanjay

India's deadline for achieving 100 GW of solar capacity is fast approaching, but the pace of installations slowed down considerably last year. While the economy has been moving at a sluggish pace, industry-specific problems have remained unaddressed. According to Mercom India Research's latest findings, the country installed 7,346 MW of solar capacity in the calendar year (CY) 2019. This was a 12% decline year-over-year (YoY), compared to 8,338 MW in 2018.

Large-scale solar projects accounted for 85% of installations with 6,242 MW (7% YoY decline) and rooftop solar made up the remaining 15%, adding 1,104 MW (33% YoY decline).

By the end of 2019, the cumulative solar installations reached almost 35.7 GW. Large-scale projects accounted for 31.3 GW (87.6%), whereas rooftop solar installations accounted for 4.4 GW (12.4%).

The report notes that the Indian solar market added 1,897 MW in Q4 2019, a 12.8% decrease from 2,177 MW installed in Q3 2019. However, installations were up by 15.6% from



Mercom India Research (Dec 2019)

1,641 MW installed in the same quarter of 2018. In Q4 2019, the large-scale solar projects came to 1,593 MW, and rooftop solar installations to 304 MW, an increase of 24.1% from 245 MW installed in Q3 2019.

Large-scale solar pipeline stands at 23.7 GW, currently with 31.5 GW of tendered projects awaiting auctions at the end of Q4 2019.

Multiple reasons led to a decline in solar additions in 2019, including elections, a slowing economy, liquidity issues, tariff caps, lack of financing, curtailment, payment delays, and PPA renegotiations in Andhra Pradesh.

The solar industry started slowing from the first quarter of the year when elections made all activity ground to a halt with government agencies stopping approvals of licenses and permits. The slowdown in the economy, followed by a credit crunch, made it tough for projects to get financed all year long.

As of December 2019, the cumulative installations reached nearly 36 GW

The liquidity crisis took hold among India's Non-Bank Financial Companies (NBFC) after Infrastructure Leasing, and Financial Services (IL&FS) admitted to defaulting on several payments to its creditors. Financial institutions became reluctant to lend to solar projects.

Payment delays started cropping up in Andhra Pradesh, Tamil Nadu, Telangana, Madhya Pradesh, and Karnataka, increasing project risks and slowing participation in tenders in the affected states.

The attempt by Andhra Pradesh to renegotiate the previously signed power purchase agreements (PPA) was the low point in 2019, and this issue became the biggest cause of concern for developers and investors. The issue dragged on from state commission to the courts, with the central government issuing several requests to the state to stop creating

an unconducive environment for investors.

After a dismal 2019, the solar industry is a bit more optimistic going into the calendar year 2020. Though the economy is yet to tick upwards and market fundamentals remain nearly the same, the optimistic outlook is primarily due to a stronger large-scale solar project pipeline.

"The demand outlook for 2020 looks better with a stronger project pipeline, and we should see the solar market resume year-over-year growth again. But a lot will depend on the economy and lending situation getting back on track, the impact of Coronavirus, and the outcome of the 20% basic customs duty announced in the recent budget," said Raj Prabhu, CEO of Mercom Capital Group.

Recently, a basic customs duty (BCD) of 20% on the import of solar cells and modules was announced in the Union Budget of 2020-21 in a bid to protect Indian manufacturers from foreign suppliers.

While the exemption on this duty remains in place, the change has raised a lot of concern in the solar sector as this could potentially impact solar tariffs adversely. The move has led to speculation as to what would happen after the expiry of the existing 15% SGD on imports at the end of July 2020.

Tariff caps have single-handedly killed the momentum in the solar sector leading to retenders and cancellations along with undersubscribed auctions. Removing tariff caps could be the single most important action to take at this time to revive the solar sector.

Rooftop installations declined for the first time in five years. The report pointed to the slowdown in the economy in 2019 as a significant factor, along with liquidity issues in the market following the NBFC crisis, which made it extremely difficult for installers to finance rooftop projects in a tough economy.

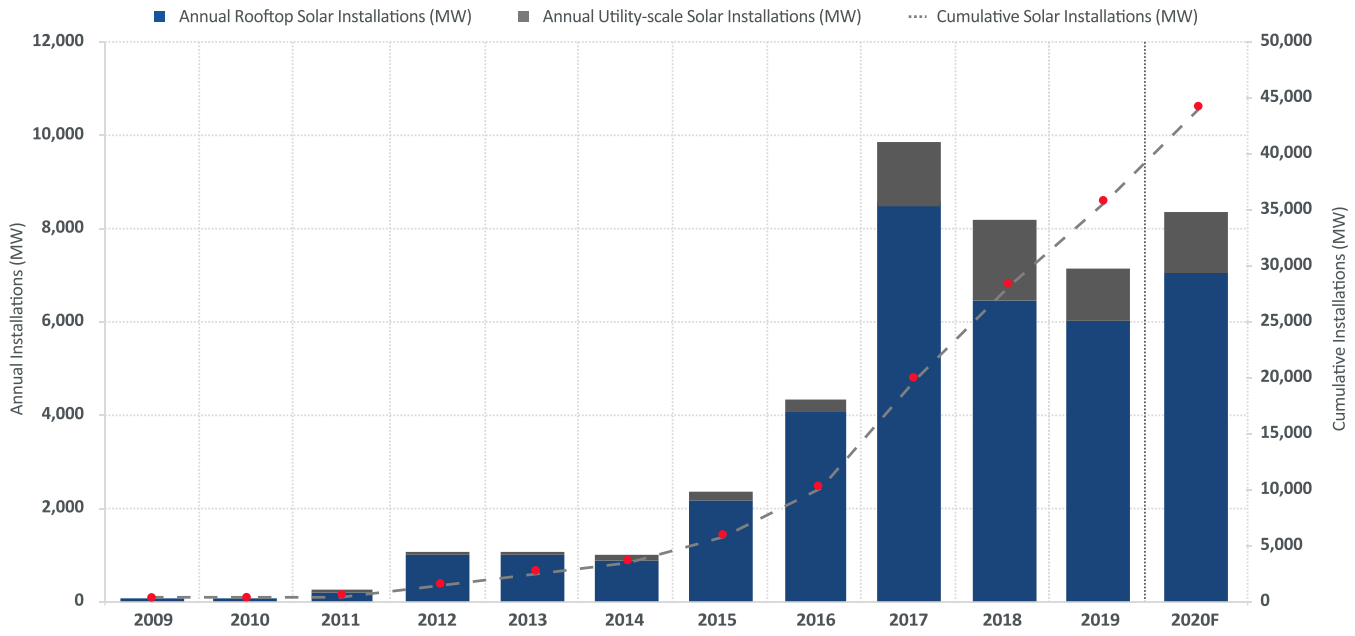
The state of Maharashtra, in particular, has been guilty of trying to discourage net metering and, consequently, the rooftop market. The state has now proposed a grid support charge for net-metered rooftop systems to discourage rooftop solar installations under the pretext of protecting consumers.

In Karnataka, rooftop installers are up in arms against a new rooftop order, which makes the DISCOMs the sole arbiter when it comes to consumers choosing their suppliers. The Karnataka Renewable Energy Systems Manufacturers Association has alleged that the shift from net metering to gross metering will deal a fatal blow to the viability of solar rooftop installations.

In 2019, Karnataka was the top state for solar installations, followed by Rajasthan and Tamil Nadu. Karnataka accounted for 29% of the total installed solar capacity in 2019. Karnataka, Rajasthan, and Tamil Nadu together contributed around 70% of the total solar installations in 2019.

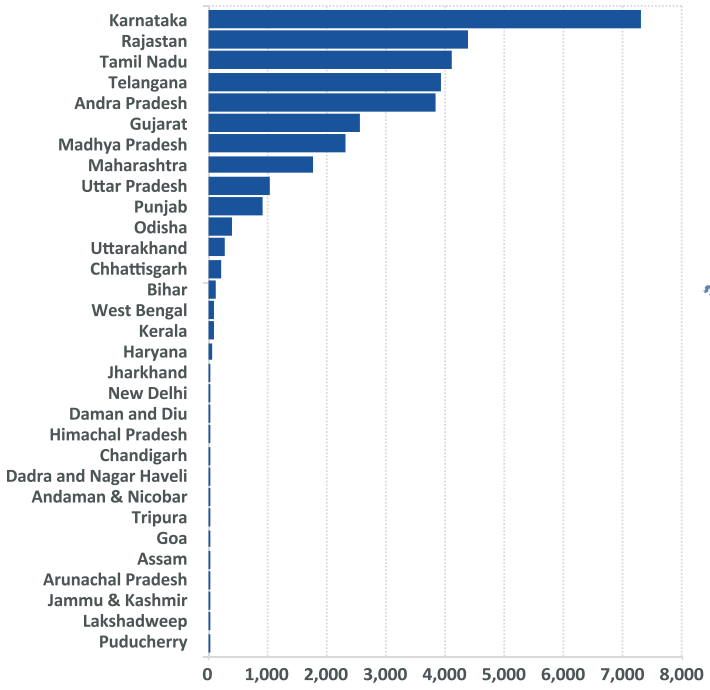
Large-scale solar pipeline stands at 23.7 GW with 31.5 GW of tendered projects awaiting auctions

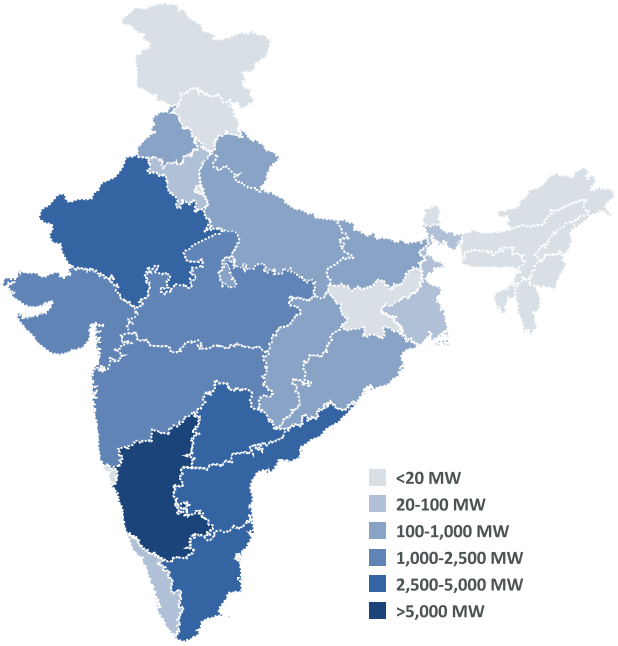
India Solar Demand Forecast (MW)



Mercom India Research (Dec 2019)

India Utility-scale Cumulative Solar Installations by States (MW)





Mercom India Research (Dec 2019)

"There are several challenges facing the industry, but a few fixes that could immediately turnaround the sector would be to remove tariff caps in reverse auctions, getting government agencies to make timely payments and facilitate lending to get the solar market moving in the right direction again," added Prabhu.

After five consecutive years of decline, coal accounted for a majority of the power installations with 7.8 GW and made up 44.1% of the installed capacity, followed by solar with 7.3 GW. Wind accounted for 2.4 GW followed by small hydro and other renewables with 154 MW and 82.5 MW, respectively. Even with coal installations rising, renewables collectively still made up a majority of the installations in 2019.

Mercom estimates solar installations in the 65-70 GW range by 2022 based on current market conditions. The

A stronger pipeline has made the industry hopeful of robust growth in 2020

government has set a solar installation target of 100 GW by 2022. In an optimistic scenario - the economy starts improving in the second half of the year along with lending; component prices continue to go down, and if the government makes a big push to reach the installation goal by announcing a slew of auctions - we could see installations of up to 80 GW by 2022.

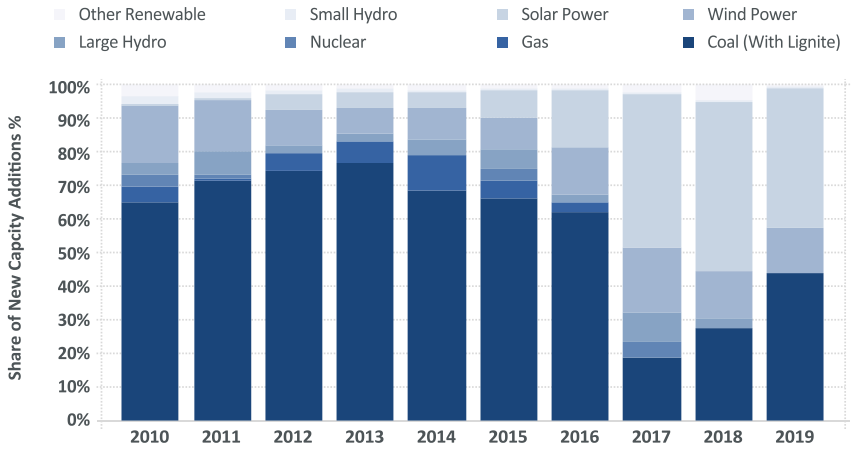
Key Highlights from the report

- India added 7.3 GW of solar in 2019, a 12% decline compared to 8.3 GW installed in 2018
- Large-scale solar installations in 2019 accounted for 85% with 6.2 GW, and rooftop made up the remaining 15% adding 1.1 GW
- Cumulative solar installations reached 35.7 GW as of December 2019
- In 2019, Karnataka was the top state for solar with 1.8 GW followed by Rajasthan and Tamil Nadu
- The top 3 states made up for almost 70% of the solar installations in the year
- Solar accounted for 41% of new power capacity additions in 2019 behind coal which accounted for 44%
- About 35 GW of tenders were announced by various organizations in 2019 (8% decline yoy), with over 15.8 GW of projects auctioned (2% increase yoy)
- In 2019, investments in the Indian solar sector were 16% lower compared to 2018

While 2019 was a lost year for India's solar sector, Mercom India Research expects solar installations to rise by 17% YoY to approximately 8.5 GW by the end of 2020.

Share of New Power Capacity Additions in India (2010- 2019)

Solar and Wind account for 55% of New Power Capacity Additions during CY 2019



MNRE's revised cumulative Bio-Power figures not included
Data from CEA, MNRE, Mercom India Solar Project Tracker

Mercom India Research (Dec 2019)

Component Manufacturers Need More Support

India is a hotspot for all segments of the renewable industry, including inverters. The third-largest solar market in the world, India has seen an influx of foreign players offering a range of products at competitive prices.

Solar inverter manufacturers have not had the easiest of times in the Indian market lately, given an uncertain policy environment and rising competition from foreign players. The ambiguity of the BIS certification process has left the industry in a difficult spot as the "on the ground" realities are starkly different from what has been envisioned in government policies.

With the recent deadline extension for BIS certification of solar inverters through June 30, 2020, industry players remain hopeful and are banking on new policies by the government, a more conducive environment coupled with healthy competition in the market.

Sunil Badesra, Business Head at Sungrow (India) Private Limited, explained to Mercom what the company expects from the Indian solar market this year and his take on BIS certification. Here are some excerpts from the interview:

What are your expectations for the Indian solar inverter market is 2020?

We are expecting upward growth in the solar inverter market, considering the large-scale project pipeline in 2020 and 2021. New programs like KUSUM, SKY, SRISHTI, if successful, will boost the demand in the string inverter market.

How will the extension of BIS standards certification affect the sector?

We appreciate the BIS standards for PV Inverters in the Indian market. In 2019, there were multiple extensions after representation from the industry. We hope it will be extended further since the lead time for the testing process is long, and no series guidelines are yet available for higher capacity inverters. There are several products for different market segments. Hence, the implementation of BIS with a phased timeline for different capacities/voltage levels will give more clarity and help manufacturers, as well as labs, to plan and streamline processes in a better way.

Why are developers switching from central inverters to String inverters for ground-mounted projects?

The choice for products is dependent on a variety of factors, such as project size, location, terrain, the preference of the developer/EPC, etc., for an optimized design. We have the largest 1500V products in both Central (5MW) and string (250kW) for any large-scale utility projects. "Design meets demand" has been our approach to provide the most advanced and best-optimized solution to our customers.

What are some of the biggest issues currently plaguing the Indian solar inverter market, and what can be done to address them? Are there any incentives the government can provide?

Since the supply chain is still evolving in India, more incentives and support to component manufacturers would help the 'Make in India' initiative in a big way and give us a cost advantage. Such steps must be considered in a holistic way, which will also have a significant effect in other upcoming industries like EV and its charging infrastructure, where power electronics is a critical part. We have had a 3 GW manufacturing unit in India since 2018 and are shipping products to the global market from the India factory. So, we don't see any major challenges.

What are your company and product differentiators?

As per a recent report, Sungrow is a 100% bankable inverter brand and the number one supplier in project financed projects. Inverters being the heart of a project, the lenders, investors, have a lot more confidence on Sungrow to reduce project risk, while ensuring long term steady return from the projects. Sungrow has the vision to be a global leader in clean power conversion technology. This vision drives us every day with a very focused approach to bring the most advanced technological solutions for our customers as the industry leader.

Do you expect competition to increase in 2020 in the Indian market?

Despite the competition in India, we are happy to maintain a leadership position with 17%+ market share, thanks to our technologically advanced product portfolio, superior service network, and reliability in harsh environments. Though we welcome competition, a price war is not desirable for any industry, as we have seen in the Indian solar inverter market in recent times.

Any other market insights?

India is one of the largest growing solar markets, so it is an important market for Sungrow. In India, large scale battery energy storage systems (BESS) projects are yet to come online. However, we expect this market to grow in the coming years with increasing penetration of renewable power to the grid.

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Industry News and Policy Briefs

The International Finance Corporation (IFC), the financial arm of the World Bank, announced its plan to lend **$36 million** (-₹2.57 billion) for a **250 MW** solar project by **Mahindra Renewables Private Limited** (MRPL) in Rajasthan. The project is expected to be developed in the district of Jodhpur in the state. It is part of the Solar Energy Corporation of India's (SECI) 2 GW interstate transmission system (ISTS) connected solar project that was auctioned in 2018.

ENGIE, a French multinational electric utility company, has announced that it is selling a **74% stake** in its solar assets in India to **Edelweiss Infrastructure Yield Plus** (EIYP). This transaction is a part of a strategic partnership between the two companies. The French power distribution company said it would sell 12 solar assets with a total operating capacity of 813 MW (DC) to EIYP and Sekura Energy Limited, a portfolio company of EIYP.

Renewable energy company **Suzlon Energy Limited** disclosed an outstanding debt of **₹127.85 billion** (-$1.8 billion), according to the company's Bombay Stock Exchange (BSE) filing. The company filed the disclosure of defaults on payment of interest, repayment of principal amount on loans from banks and financial institutions in the filing. The outstanding debt towards various lenders is inclusive of interest calculated by the company up to December 31, 2019.

The company announced this development through a recent corporate filing at the Bombay Stock Exchange (BSE). With this acquisition, Sherisha Solar has become a "step-down subsidiary" of SunEdison. In the BSE Filing stated that this acquisition has been in effect since January 3, 2020.

The country's total installed power capacity stood at about 371 GW as of December 31, 2019. Of this, renewables (including large hydro) accounted for about 133.2 GW, up from 122.8 GW last year, an 8.5% rise.

It was also reported that **renewable energy** (including large hydro) accounted for almost **36% of India's total power capacity mix** at the end of the calendar year (CY) 2019, according to data from the Central Electricity Authority (CEA), and the Ministry of New and Renewable Energy (MNRE).

The **MNRE** has directed wind power developers in the vicinity of Air Force station at Bhuj to comply with the **no-objection certificate** (NOC) issued by the **Ministry of Defense**. One of the mandatory requirements is the standard obstruction markings and lightings as per IS 5613 notification and International Civil Aviation Organization (ICAO) standards on wind turbines.

The Indian Prime Minister's office has proposed waiving the **Goods and Services Tax** (GST) Compensation Cess, (earlier called the Clean Energy Cess which was India's version of carbon tax) on coal to reduce the financial strain on distribution companies, besides helping the thermal power projects install flue gas desulphurization to curb pollution.

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The government of **Gujarat** has implemented a program for the distribution of battery-operated vehicles (BOVs), especially two-wheelers to the students of grade nine and above. The initiative has been taken to promote eco-friendly vehicles in the state. Those students who opt for such vehicles will get the benefit of state subsidy to the tune of **₹10,000 (-$141) per vehicle**. The program is executed through the dealership network of Gujarat Energy Development Agency (GEDA) authorized manufacturers. High speed (>25 km/hr) battery-operated two-wheelers have also been distributed to those students of grade 12 and above with a valid driving license.

News in Brief

The **Maharashtra Electricity Regulatory Commission** (MERC) has asked the **Maharashtra State Electricity Distribution Company Limited** (MSEDCL) to extend the financial closure and scheduled commissioning dates for a wind power project. The project was developed by **Mytrah Vayu** (Vedavati) Private Limited (MVPL). MVPL had filed a petition with the Commission seeking the extension of the financial closure and scheduled commercial operation date (SCOD) of its 100 MW wind project in the state of Maharashtra.

The **Ministry of New and Renewable Energy** (MNRE) published a **clarification** for the second phase of its rooftop solar program under which distribution companies–or its authorized agencies will invite Expressions of Interest (EoI) for empaneling the agencies to supply, install, test, and commission rooftop solar systems in residential premises. However, to ensure the quality and post-installation services, only manufacturers of solar panels and system integrators who fulfill the pre-determined technical and financial criteria would be eligible to participate in the bidding process.

The **Uttar Pradesh Energy Regulatory Commission** (UPERC) reviewed its regulations for **captive and renewable energy generating projects** (CRE Regulations, 2019) in response to a petition from the **Uttar Pradesh Power Corporation Limited** (UPPCL). The UPPCL had filed an instant petition seeking the inclusion of specific provisions and amendments in the existing CRE Regulations.

In the electric vehicles segment, the **Department of Heavy Industries** (DHI) has so far approved **2,636 electric vehicle charging stations** in 62 cities across 24 states and union territories under the second phase of FAME India (Faster Adoption and Manufacturing of Electric Vehicles in India) program. According to the government's statement, nearly 106 proposals were received from the public and private entities for the deployment of approximately 7,000 EV charging stations. After the evaluation of these proposals, the government has approved 2,636 charging stations for 24 states. Out of these, 1,633 charging stations will be fast-charging stations, and 1,003 will be slow charging stations.

Chennai-based renewable energy company **SunEdison Infrastructure Limited** (formerly YKM Industries Limited) informed that its subsidiary **SIL Rooftop Solar Power Private Limited** (SIL), has acquired 100% fully **paid-up equity share capital** along with voting rights of **Sherisha Solar Private Limited (SSPL)**.

The **National Institute of Transforming India (NITI) Aayog's** sustainable development goals (SDG) index showed that **Kerala, Himachal Pradesh, Andhra Pradesh, Tamil Nadu, and Telangana** held the top spots in terms of progress towards sustainable development targets. The SDGs are a collection of 17 global goals intending to end poverty, fight inequality, and address the urgency of climate change. The SDGs, set in 2015 by the United Nations General Assembly and intended to be achieved by the year 2030, is part of UN Resolution.

The **Chhattisgarh State Electricity Regulatory Commission** (CSERC) issued a **draft order** announcing generic levelized tariffs for the fiscal year (FY) 2019-20 and 2020-21 for renewable energy sources. The generic tariff would be set on a levelized basis for the tariff period from the commercial operation date (COD) of the projects up to the useful life of the projects. The useful life of a small hydro project is considered to be 35 years and 25 years for solar.

The **MNRE** has asked for feedback from various stakeholders, including the **Ministry of Power,** renewable energy associations, and state governments and their power distribution companies, among others. The first phase of JNNSM provided for the **'bundling' facility,** where solar power could be bundled with the comparatively cheap thermal power from the unallocated quota generated at **National Thermal Power Corporation** (NTPC) coal-based stations.

The **MNRE** released a draft plan to supply **round-the-clock** (RTC) power from renewable (solar, wind, and hydro) projects, which will be complemented with power from thermal projects.

The Ministry of Power announced the release of its **'State Energy Efficiency Index 2019'** report, which keeps tabs on the progress made by the Indian states and union territories regarding energy efficiency initiatives. The report covers energy efficiency initiates in 36 states and union territories (UT) based on 97 indicators. The index was developed by the Bureau of Energy Efficiency (BEE) and the Alliance for an Energy-Efficient Economy (AEEE). According to the latest report, there are no front runner states. The top-performing states - **Haryana, Karnataka, and Kerala** - fell under the 'Achiever' category. Nagpur, Manipur and Jammu and Kashmir scored the lowest and fell under the 'Aspirants' category.

Jinko Solar, a China-based solar module manufacturer, announced that it had broken the world record for maximum conversion efficiency for its bifacial solar modules, hitting **22.49%**. With this, the company says it has set a new industry standard for the efficiency of mass-produced solar cells.

The month of January also saw the **Himachal Pradesh Electricity Regulatory Commission** (HPERC) announce the **generic levelized tariffs** for solar PV projects for the last six months of the financial year 2019-20. In December 2019, the Commission had requested the major stakeholders to send their suggestions on the proposal. The proposed tariff will be applicable only for small capacities up to 5 MW. The Commission prefers that distribution licensees purchase power from higher capacity projects through **Solar Energy Corporation of India** (SECI) or competitive bidding route.

Wind, solar, wind-solar hybrid, and hydro projects must be treated as **'must-run'** power projects, suggested a panel reviewing the Indian Electricity Grid Code (IEGC) 2020. The draft report also suggests that such projects should not be subjected to curtailment on account of merit order dispatch or any other commercial consideration.

The **Ministry of Power** (MoP) asked the state and union territory governments to request the state electricity regulatory commissions (SERC) to consider reducing the **retail power tariff** to consumers who purchase power through prepaid meters. It also stated that the necessary changes in the relevant regulations, orders, or mechanism to reduce the power tariff in case of advance payments or prepayments by the consumers, should be implemented six months from the time of issuance of the letter.

The **Ministry of Environment,** Forest and Climate Change (MoEF & CC) notified that the issue of license for the import of **hydrochlorofluorocarbon (HCFC)-141b** would be prohibited from January 1, 2020. This move comes after the ministry amended a set of regulations and renamed it as 'Ozone Depleting Substances' (Regulation and Control) Amendment Rules, 2019.

Bengaluru-based startup **Numocity Technologies** has raised an undisclosed amount of funding from **Ideaspring Capital, Rebright Partners, and ABB Technology Ventures** (ATV). The early-stage startup is focused on providing end-to-end solutions for the electric mobility infrastructure in the country.

ReNew Power Private Limited, a domestic renewable project developer, has raised **$450 million** (-₹31.96 billion) through a dollar bond issuance. The bonds were priced at a coupon rate of 5.875% and will be issued in two tranches with an average maturity of five-and-a-half years.

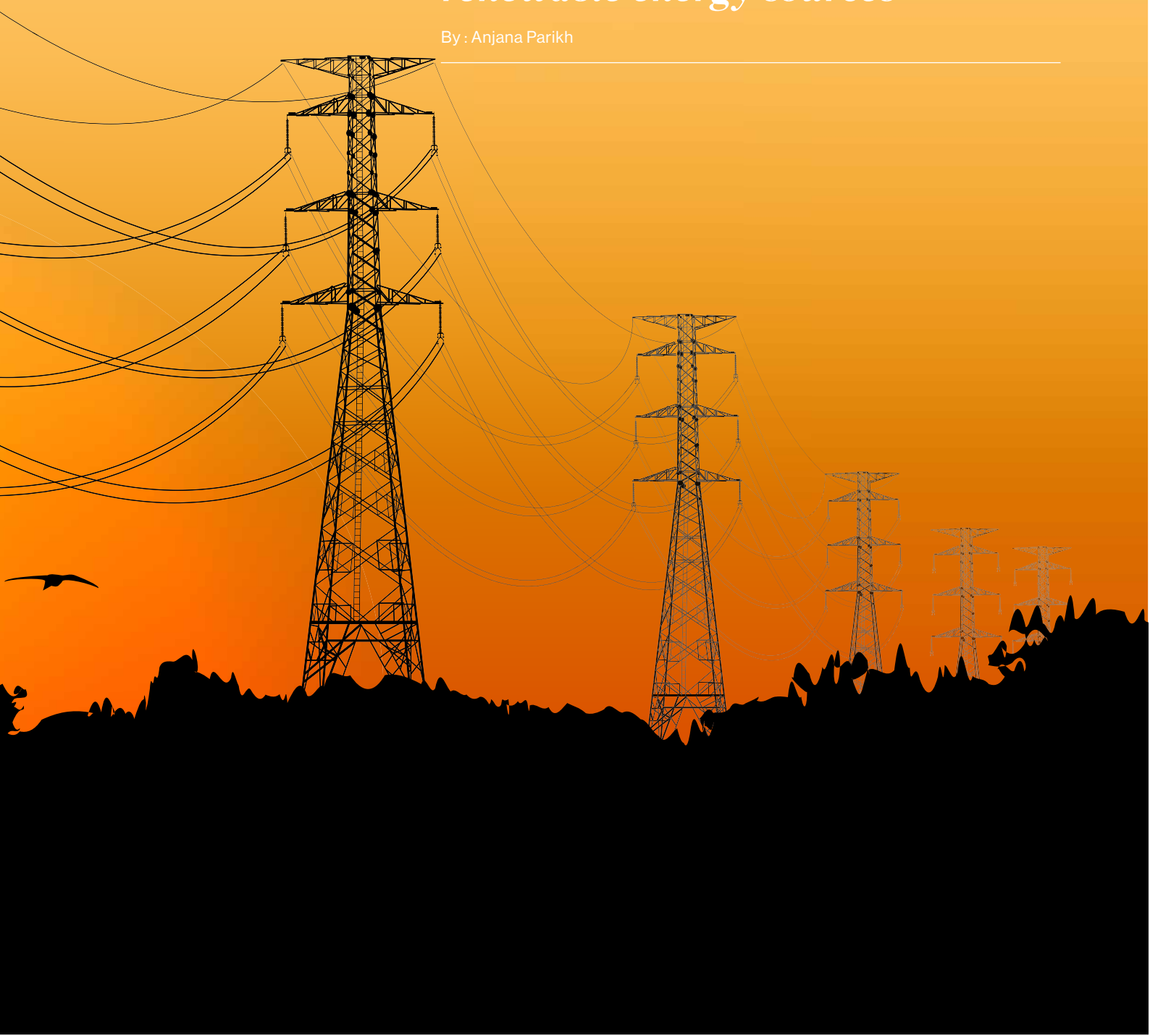
The **Central Electricity Regulatory Commission** (CERC) has directed the **National Thermal Power Corporation** (NTPC) to pay the dues claimed by **ACME Solar** along with late payment surcharge within 30 days of the order. The payment is for reimbursing the sum that was incurred as additional capital expenditure after the introduction of GST Law. Last year, ACME Solar Holding Ltd had issued a letter to NTPC for the payment of dues totaling **₹226.8 million** (-$3.179 million) for solar projects in Karnataka and **₹99.2 million** (-$1.39 million) for projects in Telangana.

The **MNRE** issued a circular stating it has held talks with the **Department of Financial Services, Ministry of Finance,** and the Insurance Regulatory and **Development Authority of India** (IRDAI) regarding the availability of insurance products for domestic solar modules. The insurance of solar products is a crucial component for developers in the solar ecosystem, and currently, there are not many players in this business.

Energy Banking - Not for All in Madhya Pradesh

The state has amended the regulations for co-generation and generation of electricity from renewable energy sources

By : Anjana Parikh



India's power sector is going through a transitional phase, with the paradigm-shifting from long-term generation contracts to short-term contracts.

The transition is occurring due to the changes in industry structure; growing interest by distribution companies in shorter-term contracts; rapid declines in solar projects and wind costs; aggressive national renewable energy targets and renewable purchase obligations; concerns over coal project utilization; greater flexibility in coal fuel allocation; and ongoing efforts to improve the financial health of DISCOMs, according to a report prepared by the United States Agency for International Development's (USAID) GTG program, a joint initiative of the Ministry of Power (MoP), National Association of Regulatory Utility Commissioners, and Ethree (Energy + Environmental Economics).

Recently, Madhya Pradesh Electricity Regulatory Commission (MPERC) has amended regulations for co-generation and generation of electricity from renewable energy sources. This is its eighth amendment to the regulations issued in 2010.

As part of the amendment, the MPERC has defined "captive renewable energy generation source" as a project set up by any person to generate electricity primarily for his own use and includes a project set up by any co-operative society or association of persons for generating electricity primarily for use of members of such co-operative society or association.

Previously the sub-regulation 12.1 in clause (iv) stated that, if a portion of banked power remains unadjusted at the end of the financial year (FY), then such power would be considered as power purchased and the MP Power Trading Company (now MP Power Management Company Ltd (MPPMCL)) would pay for it at the rate determined by the Commission from time to time for inadvertent flow of energy from non-conventional source.

The current amendment now states that such power will be purchased at the rate equal to the lowest rate discovered in that year in the state in solar or wind auctions, as the case may be. In case there are no auctions

Captive projects registered under the rule with DISCOMs will not be eligible for banking facility

in that year, then the lowest tariff discovered in the previous year's bidding will be considered. In the case of the renewable energy-based captive generating projects other than wind or solar, the average power purchase cost (APPC), as determined by the Commission for the year in its retail supply tariff order for distribution licensees, will be applicable.

A major amendment in the regulation is related to energy banking. The earlier regulation said that the entire power generated from non-conventional sources of energy during a financial year might be allowed for banking.

While the new sub-regulation states that renewable energy-based captive generating projects registered under this regulation with the distribution licensee will not be eligible to avail of the banking facility. But the renewable energy-based captive generating projects that are not registered under this regulation will be eligible to avail of the banking facility.

The Commission has added new points in the amendment regulations for the renewable-based captive generating projects, installed within and outside the premises of its captive users. Now, they will be eligible to sell the surplus power to the distribution licensee under the following conditions:

1. The captive user of such renewable energy project must mandatorily be a consumer of any distribution licensee in the state
2. The expenses incurred on the infrastructure development for the evacuation of power has to borne by the owner of the project
3. The captive consumer is not availing the facility of net metering in its premises
4. The project would be eligible to sell its surplus power to any third-party

The amendment has also added a clause about forecasting, scheduling, energy accounting, and settlement. MPERC had published the first amendment of its 2018 regulations for forecasting, scheduling, and deviation settlement mechanism for wind and solar projects in October 2019. The

Captive consumer will not be liable to pay cross-subsidy surcharge, wheeling, and additional surcharges

accounting and settlement of energy supplied to the consumers by the captive generating projects have to be done within 15 minutes time-block for the entire billing period. Also, the surplus power injected by a solar and wind captive project will be metered for each 15 minutes time-block. The settlement of the surplus power will be made at the end of every billing period at the rate equal to the lowest tariff rate discovered in the solar or wind bidding.

The regulations also mention that the captive consumer will not be liable to pay cross-subsidy surcharge, wheeling, and additional surcharges. That said, they will be liable to bear the losses for carrying the generated electricity from its project to the destination. In case the power is supplied to a consumer other than a captive user, such consumers will pay all open access charges, including cross-subsidy surcharge, wheeling, and additional surcharges as determined by the Commission and has to bear the losses. The surplus electricity purchased by the distribution licensee will qualify for the compliance of renewable purchase obligation (RPO) of the distribution licensee.

Last year, the state published the first amendment of its 2018 regulations for forecasting, scheduling, and deviation settlement mechanism for wind and solar projects. The regulations mandated that if wind and solar generators fail to appoint a common qualified coordinating agency (QCA) within two months from the date of issue of notice by the state load despatch center (SLDC), then the concerned licensee will be asked to disconnect the defaulting generators. Previously, the regulations stated that the wind and solar generators must appoint a common QCA within one month.

These measures can go a long way in instilling grid discipline and help tighten the processes involved in the groundwork to help India achieve its renewable energy targets.

Major Tender and Auction Announcements in January 2020

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

Top Large-Scale Solar Tenders

The Solar Energy Corporation of India **(SECI)** issued a detailed request for selection documents to set up **1,200 MW** of interstate transmission system (ISTS) connected solar projects under tranche VIII of the ISTS program. A tariff cap of ₹2.78 (-$0.03)/kWh has been set for the tender.

SECI also issued a request for selection for setting up **1,200 MW** of interstate transmission-connected **wind-solar hybrid** power projects in the country under Tranche III of the ISTS program. SECI has set a ceiling tariff of ₹2.88 ($0.04)/kWh for this tender.

SECI announced a notice inviting tender (NIT) for the procurement of **5 GW** of power on a round-the-clock basis from **renewable energy** sources complemented with **thermal power** projects on a build-own-operate (BOO) basis. The request for selection (RfS) document with all the necessary details are expected to be issued soon.

Retenders

The Rewa Ultra Mega Solar Limited **(RUMSL)** reissued tenders inviting bids to develop three solar parks with an aggregate capacity of **1,500 MW** in the state of Madhya Pradesh. The first tender was floated for 450 MW of grid-connected solar PV projects at Shajapur Solar Park. RUMS also retendered 550 MW of solar projects at the Agar Solar Park of the state and 500 MW of solar projects at the Neemuch Solar Park.

The Maharashtra State Electricity Distribution Company Limited **(MSEDCL)** has reissued a tender for **1,350 MW** of solar projects to be developed across 30 districts. The ceiling tariff has been raised to ₹3.30 (-$0.04)/kWh, up from ₹3.15 ($0.044) /kWh previously.

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Top Rooftop Solar Tenders

The Jharkhand Bijli Vitran Nigam Limited **(JBVNL)** floated a tender for the empanelment of agencies to install grid-connected rooftop solar PV power projects of various capacities anywhere in the state. The total capacity of the rooftop solar PV projects will be **10 MW** for residential consumers only.

The South Bihar Power Distribution Company Limited **(SBPDCL)** announced a tender for **5 MW** of grid-connected rooftop solar projects across the state for the residential sector.

Major Auctions

The National Thermal Power Corporation **(NTPC)** concluded the auction process for **1,000 MW** of solar projects under the Develop Build Demonstrate (DBDT) program. Only **560 MW** was auctioned as the tender was undersubscribed, receiving bids for only 700 MW. **Tata Power Solar** was the lowest bidder with an EPC quote of ₹19.2 million (-$271,089) for 300 MW. Second in the list of winners was **Jakson** with an EPC quote of ₹19.96 million (-$281,820) to develop a capacity of 110 MW. **L&T** had quoted the price of ₹19.98 million (-$282,102) for 300 MW but was allotted capacity of 150 MW in line with the bucket filling method followed in the auction.

Meanwhile, **Greenko Group** and **ReNew Power** won the auction conducted by **SECI** for **1.2 GW of solar,** wind, and energy storage projects with guaranteed peak power supply. While Greenko has been awarded 900 MW, ReNew Power has won 300 MW of projects. Greenko Group won the bid at a peak power tariff rate of ₹6.12 (-$0.086)/ kWh, and ReNew Power won at ₹6.85 (-$0.096)/ kWh.

Separately, **Adani Green Energy** and **Azure Power** won a first of its kind manufacturing-linked solar tender floated by SECI for **7 GW** of solar capacity. Both companies won the bid to develop 2,000 MW of projects with 500 MW of manufacturing capacity. The winning tariff quoted by both the companies was ₹2.92 (-$0.04)/kWh. The ceiling tariff for this tender was ₹2.93 (-$0.041)/kWh.

SECI conducted the auction for 1,500 MW of solar projects under the second phase of the Central Public Sector Undertaking **(CPSU)** program (Tranche-II). The projects have been allocated through the viability gap funding (VGF) route. Out of the 1,500 MW capacity, **1,104 MW** have been auctioned. The tender was undersubscribed, receiving financial bids only for 1,381 MW. Capacities have been awarded to **Singareni Collieries** Company Limited (81 MW), which quoted the lowest VGF amount of ₹6.8 million ($95,492)/MW and **Indore Municipal Corporation** (100 MW) quoted -₹6.9 million (-$96,616)/MW. The National Thermal Power Corporation Limited **(NTPC)** which quoted the highest VGF of ₹7 million ($98,301) was successful in winning 923 MW out of 1,104 MW it had bid for. The highest VGF of ₹7 million (-$98,301)/MW for these projects is the maximum permissible limit.

The Kerala State Electricity Board Limited **(KSEBL)** awarded **46.5 MW** of **rooftop solar** capacity in a recently conducted auction to **Tata Power**, Waaree Group, and Inkel. Tata Power bagged a total capacity of 35 MW in all categories, which includes projects less than 10 kW, 11-100 kW, or more than 100 kW. **Waaree** was awarded 6.5 MW while Kochi-based developer **Inkel Energy** won 5 MW.

SECI also announced the list of successful bidders selected for its **97.5 MW rooftop solar** tender. Under Zone 1, the lowest price discovered during the bidding for the CAPEX A model was ₹29,490 (-$416)/kWp. The lowest price discovered under the RESCO model was ₹3.250 (-0.045)/kWh. The lowest price discovered under the CAPEX C model was ₹37,989 (-$536)/kWp. The tender results were announced for total of four zones.

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