**Kashish Shah, Research Analyst**
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Institute for Energy Economics and Financial Analysis
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# India's Utility-Scale Solar Parks – A Global Success Story

## *India Is Home to the World's Largest Utility-Scale Solar Installations*

## Executive Summary

Renewable energy in India has taken centre stage when it comes to the significant development of energy infrastructure required to achieve India's economic goals.

In 2016, the Indian government set a target of 175 gigawatts (GW) of renewable energy by financial year (FY) 2021/22 and 275GW by FY2026/27 to transform the power sector from an expensive, unreliable, and polluting fossil fuels-based system into a low-cost, reliable, and low-emission system. In February 2019, the Central Electricity Authority increased the target to 450GW of renewable energy by 2030'.[1]

So far, India's electricity sector transition has had a promising start, assisted by lower costs for solar and wind energy generation equipment, cheaper financing, and a favourable policy environment.

In March 2020, India's on-grid renewable energy capacity stood at 87GW. Of the 30GW of renewable energy capacity installed since the beginning of FY2017/18, coupled with an additional 50GW awarded to date, more than 90% has been contracted at tariffs ranging between Rs2.43-2.80/kilowatt hour (kWh) (~US$35-40/MWh) with zero indexation for 25 years. This is 60% to70% less than the first-year tariff set for proposed new non-mine mouth coal-fired power plants in India.

## Solar Park Pioneers

India's renewable energy sector has been facing policy headwinds for more than 18 months.[2]

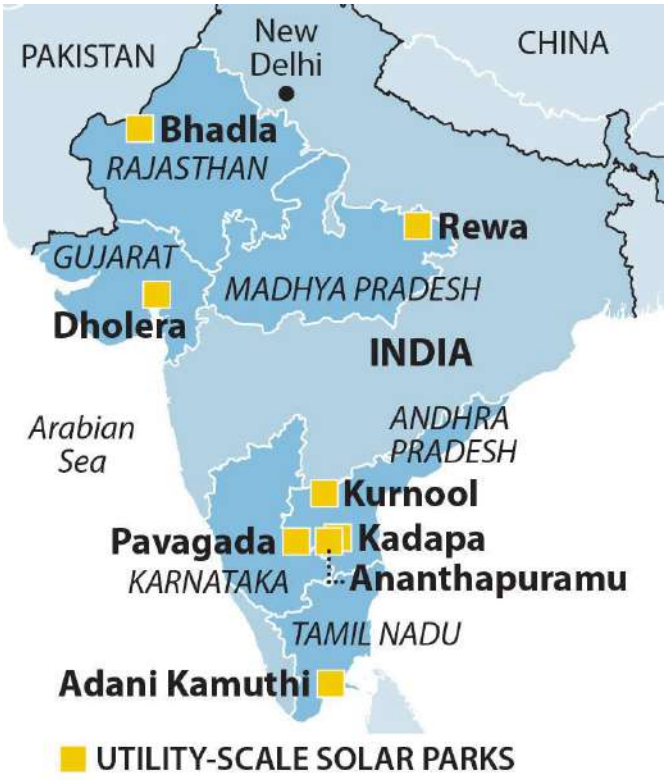
After adding an average of 13GW of renewable energy capacity in FY2016/17 and FY2017/18, India's renewable capacity was expected to grow on average at 20-25GW in line with the target of 175GW by FY2021/22. However, less than 10GW of on-grid renewable capacity was added in FY2018/19. This was expected to grow to 12-13GW in FY2019/20, but has only managed to reach 9.4GW, thanks to global lockdowns caused by the COVID-19 pandemic. (An additional estimated 2GW of behind-the-meter rooftop solar capacity was added in FY2019/20.)

Amid myriad policy and project execution issues, India's utility-scale solar park model has firmly stood its ground. India now houses multiple ultra-mega solar

[1] CEA. Draft report on optimal generation capacity mix for 2030. February 2019.
[2] IEEFA. India's renewable energy policy headwinds. February 2020.

parks with capacity of more than 1GW, including two that are the largest commissioned in the world to date. The solar parks in India continue to attract global capital and some of the most renowned domestic and international renewable energy developers.

India pioneered the concept of the ultra-mega power plant (UMPP) in a single solar industrial park. In 2016, India's Ministry of New and Renewable Energy (MNRE) set a target for 40 industrial solar parks with a combined capacity of 20GW, and in 2017 doubled this target to 40GW by 2022.




The UMPP concept involves a state government or local distribution company facilitating a single central grid connection and taking on the procurement and time-delay risks relating to land acquisition. This approach has been instrumental in driving economies of scale and attracting global capital into India's renewable energy over the last five years, with an immediate boon in the form of a halving of solar tariffs to a record low of Rs2.44/kWh (at the exchange of that time, this was US$39/MWh) achieved in mid-2017.

Utility-sale solar parks in India have successfully overcome the three major risks associated with renewable energy development in India: namely, project execution risk, off-taker risk and operation and maintenance risk.

## Project Execution Risk

India's land acquisition process is one of the most critical roadblocks to infrastructure projects. But state government renewable development energy agencies have helped in acquiring large-scale government and privately-owned land for the solar parks. The solar parks also have saved developers the bother of arranging the connection of generation units to the nearest substation.

## Off-taker Risk

The financial stress of state government-owned power distribution companies (discoms) continues to be a major concern for the Indian power sector, with overdue payments of more than Rs88,765 crore (~US$12 billion) owed to generation companies in the 12 months to January 2020. The discoms' weak financial position magnifies the counter-party risk in new power projects.

The Solar Energy Corporation of India (SECI) and NTPC Ltd, both government-backed power companies, were brought in to underwrite power supply agreements (PSA) with the new solar parks.

SECI and NTPC further signed power purchase agreements (PPA) with state-owned discoms, which improved the quality of the contracts as SECI and NTPC took the risk on their own balance sheets that were much more robust than those of most state-owned discoms.

### Operation and Maintenance Risk

The solar parks are required to build and maintain roads to make project sites accessible. The requirement supports the projects' construction and promotes maintenance of the project for a 25-year lifespan.

## *Reverse Bidding Auctions*

The introduction of reverse bidding auctions has helped bring renewable energy prices down. In reverse bidding auctions, developers bid for the lowest attainable tariff at which to supply power. The auction mechanism has driven prices down by promoting competition, but also has introduced transparency and efficiency in the process of contracting new renewable energy capacity.

Ultra-mega solar parks have attracted extremely low tariffs all across the globe. In a recent tender in the United Arab Emirates (UAE), 1.5GW of solar capacity was awarded at a world-record low solar tariff of AED0.0497/kWh ($US13.5MWh) to a consortium led by EDF of France and Jinko Solar of China.[3]

# India Solar Park Update 2020

In May 2018, IEEFA's report, 'Solar is Driving a Shift in Global Electricity Markets' analysed more than 80 global solar projects' execution models, technology, financing, and top developers.[4] In this note, we update the Indian utility-scale solar parks discussed in the earlier report.

[3] PV Magazine. Abu Dhabi's 1.5 GW tender draws world record low solar bid of $0.0135/kWh. 28 April 2020.
[4] IEEFA. Solar is driving a global shift in electricity markets. May 2018.

**Figure 1: India's Ultra Mega Solar Power Parks**

| No | Project Name | Capacity (MW) | Status | State | Sponsors |
|---|---|---|---|---|---|
| 1 | Bhadla Industrial Solar Park | 2,245 | Operational | Rajasthan | Rajasthan Solar Park Development Company ltd, ESSEL, IL&FS, Adani RE power Ltd |
| 2 | Pavagada Solar Park | 2,050 | Operational | Karnataka | Karnataka Solar Power Development Corporation Pvt Ltd |
| 3 | Kurnool Ultra Mega Solar Park | 1,000 | Operational | Andhra Pradesh | Andhra Pradesh Solar Power Corporation Pvt Ltd |
| 4 | Rewa Solar Park | 750 | Operational | Madhya Pradesh | Rewa Ultra Mega Solar Ltd |
| 5 | Adani Kamuthi Solar Plant | 648 | Operational | Tamil Nadu | Adani Green |
| 6 | Ananthapuramu - I Solar Park | 1,500 | Partially operational | Andhra Pradesh | Andhra Pradesh Solar Power Corporation Pvt Ltd |
| 7 | Kadapa Solar Park | 1,000 | Partially operational | Andhra Pradesh | Andhra Pradesh Solar Power Corporation Pvt Ltd |
| 8 | Ananthapuramu - II Solar Park | 500 | Partially operational | Andhra Pradesh | Andhra Pradesh Solar Power Corporation Pvt Ltd |
| 9 | Dholera Solar Park (Gulf of Khambhat) | 5,000 | Under development | Gujarat | Gujarat State Government |
| | **Total** | **14,693** | | | |

*Source: MNRE, IEEFA.*

## *Bhadla Industrial Solar Park, Rajasthan (2,245MW)*

The Bhadla solar park in Rajasthan is world's largest solar park to date, with total capacity of 2,245MW.[5]

The Bhadla park is located at Bhadla village in the Jodhpur district in Rajasthan, covering more than 14,000 acres. It was developed by several entities. Rajasthan Renewable Energy Corporation Limited, through its subsidiary, Rajasthan Solar Park Development Company Ltd., has constructed 745MW of capacity. Saurya Urja Company of Rajasthan, a joint venture company of the government of Rajasthan and IL&FS Energy Development Company, has developed infrastructure for 1,000 MW of solar projects. Adani Renewable Energy Park Rajasthan, a joint venture between the government of Rajasthan and Adani Renewable Energy Park, (a subsidiary of Adani Enterprises) has developed 500MW of solar capacity.

**The headline tariff gave India's renewable energy mission a profound impetus.**

The Solar Energy Corporation of India's auction bid for 500MW in May 2017 saw a record-low tariff of Rs2.44/kWh, which has not yet been beaten. ACME quoted Rs2.44/kWh to win 200MW, and SB Energy (SoftBank) quoted Rs2.45/kWh to develop 300MW. In IEEFA's view, the headline tariff turned global industry's heads towards India and gave India's renewable energy mission a profound impetus.

[5] Mercom India. With 2,245 MW of Commissioned Solar Projects, World's Largest Solar Park is Now at Bhadla. 19 March 2020.

Bhadla has attracted record low solar tariffs in India in the range of Rs2.44-2.62/kWh (US$35-37/MWh) which remain among the lowest tariffs in India to date.

**Figure 2: List of Developers of Bhadla Solar Park**

| Developer | Capacity (MW) |
|---|---|
| SB Energy SoftBank | 600 |
| Hero Future Energies | 300 |
| NTPC | 260 |
| ACME Solar | 200 |
| Azure Power | 200 |
| Sunseap Energy | 140 |
| Engie | 140 |
| Avaada Power | 100 |
| Fortum Solar | 70 |
| Vector Green | 70 |
| Renew Power | 60 |
| Phelan Energy | 50 |
| Electrotherm | 5 |
| Aditya Birla | 20 |
| LNB Group | 5 |
| Roha Dyechem | 25 |
| **Total** | **2,245** |

*Source: Mercom India.*

## *Pavagada Solar Park, Karnataka (2,050MW)*

Pavagada Solar Park in Karnataka, which has 2,050MW of operational capacity, is the second largest industrial solar park in the world.[6]

The project, also called Shakti Sthala, is spread across 13,000 acres in Karnataka's Tumkur district. Land for the solar park is being leased for Rs21,000/acre annually (US$300).[7]

The facility has been developed by the Karnataka Solar Power Development Corporation Ltd. (KSPDCL), a joint venture between Karnataka Renewable Energy Development Ltd. (KREDL) and SECI. KSPDCL acquired all the land and the required approvals and then awarded contracts for the solar power capacity, a simplified 'plug and play' model. This facility illustrates how quickly renewable energy infrastructure can be planned, financed, and built when a suitable energy policy framework is in place.

[6] Mercom India, World's largest solar park at Karnataka's Pavagada is now fully operational. 27 December 2019.
[7] World Bank Blogs. Solar energy to bring jobs and prosperity back to parched villages. 22 December 2015.

Of the total 2,050MW capacity, NTPC installed 600MW of solar PV capacity, SECI constructed 200MW and KREDL implemented 1,250MW.

As of January 2018, 600MW was already operational (priced back in 2016 at Rs4.79/kWh, or US$73/MWh).[8] An additional 550MW was successfully tendered in March 2018 at prices of Rs2.91-2.93/kWh (US$42/MWh) — 39% lower than the first tender just two years earlier.[9]

**This facility illustrates how quickly renewable energy infrastructure can be planned, financed and built when a suitable energy policy framework is in place.**

Leading Indian domestic renewable energy developers to win this round were Renew Power (300MW), Avaada Energy (150MW) and Azure Energy (100MW). In May 2018, SB Energy, the joint venture of Japan's SoftBank, Taiwan's Foxconn, and Bharti Airtel won 200MW of solar park generation at an even lower tariff of Rs2.82/kWh,[10] taking the total tendered capacity of the solar park up to 1,250MW. The remaining 650MW was tendered in May 2018.

**Figure 3: List of Developers of Pavagada Solar Park**

| 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 |
| KREDL | 50 |
| **Total** | **2,050** |

*Source: Mercom India.*

## *Kurnool Ultra Mega Solar Park, Andhra Pradesh (1,000MW)*

The 1,000MW Kurnool solar facility is India's third-largest operational solar project and one of the earliest completed ultra-mega solar parks.

The project, located in Andhra Pradesh's Kurnool district has attracted international capital from firms such as SoftBank of Japan in partnership with Foxconn of Taiwan

[8] Live Mint. How the world's largest solar park is shaping up in Karnataka. 6 March 2017.
[9] Mercom India. Lowest tariff of Rs2.91/kWh quoted in KREDL's 550MW Pavagada Solar Auction. 23 March 2018.
[10] ET Energy World. SB Energy wins SECI's 200MW auction in Karnataka. 18 May 2018.

and BHEL (trading as SBG Cleantech), as well as Indian investors such as Adani Green Power and Azure Power.[11]

Andhra Pradesh Solar Power Corporation (APSPCL), a joint venture of the government of Andhra Pradesh and the government of India, led the development effort, first by acquiring nine square miles of land for the project and then working to secure funding of Rs500,000 ($7,700) per MW to improve roads, drinking water and training facilities in surrounding villages. Local skilled and semi-skilled workers were also given preference for jobs in the solar park.[12]

Under the UMPP scheme, the national government provided a subsidy of Rs200,000 (US$3,000) per megawatt to APSPCL to develop the solar park.

The first 500MW was awarded to Sun Edison at Rs4.63/kWh in January 2016 (this asset was later acquired by Greenko),[13] and 350MW was awarded to SBG Cleantech at Rs4.63/kWh, 100 MW to Azure Power of India at Rs5.12/kWh and 50MW to Adani Green at Rs5.13/kWh. Just a year later, solar tariffs were set as much as 50% lower,[14] highlighting the price deflation sweeping through the Indian market.

**A year later, solar tariffs were set as much as 50% lower, highlighting the price deflation sweeping through the Indian market.**

**Figure 4: List of Developers of Kurnool Solar Park**

| Developer | Capacity (MW) |
|---|---|
| SunEdison | 500 |
| SBG Cleantech | 350 |
| Azure Power | 100 |
| Prayatna Developers (Adani Green) | 50 |
| **Total** | **1,000** |

*Source: APSPCL.*

## *Ananthapuramu – I & II Solar Park, Andhra Pradesh (2000MW)*

Ananthapuramu-I Solar Park is the largest under construction in Andhra Pradesh; it is spread across two villages in the district of Ananthapuramu and Kadapa.

[11] The Hindu Business Line. AP makes rapid strides: 1GW ultra mega solar park nearing completion in Kurnool. 28 April 2017.
[12] NRDC. The world's largest solar park – Kurnool India. 31 October 2017.
[13] Business Standard. Greenko buys SunEdison's Indian assets for $392mn. 4 October 2016.
[14] APSPCL. Kurnool Ultra Mega Solar Park.

The 1,500MW project will be the largest solar power facility to be built from domestically manufactured solar cells and modules, aligning with the Indian government's 'Make in India' program.

NTPC is developing 1,000MW of the 1,500MW total. The first phase of 250MW was commissioned by NTPC in 2015 with a power purchase agreement (PPA with the Andhra Pradesh state-owned electricity distribution company at Rs5.96/kWh (US$91/MWh).[15] In May 2018, NTPC completed a tender for the remaining 750MW at Rs2.71-2.72/kWh, just 45% of the tariff just three years earlier.[16] Commissioning can be expected within 24 months as per 18 to 24 months of commissioning due date.

Ananthapuramu–II, totalling 500MW, will be built near four villages of the same district.

## *Kadapa Solar Park, Andhra Pradesh (1,000MW)*

The 5,928 acre, 1,000MW Kadapa facility is being developed by the Andhra Pradesh Solar Power Corporation. The Solar Energy Corporation of India (SECI) awarded 750MW, the bulk of the facility's capacity, in April 2017 at what was then a competitive price of Rs3.15/kWh, with zero indexation for 25 years, as is standard for Indian renewable tenders.[17] But with the continuing sharp price deflation that characterised 2017, whereby solar tariffs dropped to a record low of Rs2.44/kWh, the distribution companies involved declined to honour the proposed contracts.

While clearly an issue for the solar sector, this price deflation has been a much graver threat for the country's financially troubled thermal power generators with tariffs often ranging from Rs3-5/kWh, raising serious concerns about massive stranded asset risks in that sector.

**The solar price deflation has been a much graver threat for the country's already financially troubled thermal power generators.**

The remaining 250MW was won by ENGIE of France's SolaireDirect under a bundling strategy (tying at-the-time more expensive solar with lower-cost coal-fired power that can be supplied when solar electricity is not being generated).[18]

[15] PSPCL. NP Kunta Ultra Mega Solar Park.
[16] ET Energy World. Strong response, drop in tariffs at NTPC solar auction. 10 May 2018.
[17] APSPCL. Kadapa Ultra Mega Solar Park.
[18] The Economic Times. NTPC searches for buyer for Kadapa Solar Park. 24 October 2017.

## *Rewa Solar Park, Madhya Pradesh (750MW)*

Rewa Solar Park with 750MW capacity spreads over an area of 1,590 acres in the Gurh Tehsil of Rewa district of Madhya Pradesh (MP). The project was commissioned in December 2019 with a capacity of 750MW.

Rewa Ultra Mega Solar Limited (RUMSL), the implementing agency of the project, is a joint venture between the Madhya Pradesh Urja Vikash Nigam Limited (MPUVNL) — Madhya Pradesh's discom and SECI.

In February 2017, in the auction for 750MW, Rewa Solar Park bids had reached a new record low of Rs2.97/kWh (US$42/MWh), falling 30% from the previous low of Rs4.34/kWh (US$62/MWh) which was recorded in Rajasthan in January 2016. The tariffs have an escalation of Rs0.05/kWh over 15 years, which brings the levelised tariff to roughly Rs3.30/kWh (US$47/MWh) over the 25-year period. [19]

ACME Solar Holdings, Solengeri Power, and Mahindra Renewables were the winners for three project units at tariffs of Rs2.970/kWh, Rs2.974/kWh and Rs2.979/kWh for the first year.

**Figure 5: List of Developers of Rewa Solar Park**

| Developer | Capacity (MW) |
|---|---|
| ACME Solar | 250 |
| Solengiri Power | 250 |
| Mahindra Renewables | 250 |
| **Total** | **750** |

*Source: RUMS.*

Rewa Solar Park's off-taker's profile make it a unique project. The generation from Rewa is shared between Madhya Pradesh Power Management Company Ltd. (MPPMCL) (76%) — the holding company for Madhya Pradesh's three discoms — and Delhi Metro Rail Corporation (24%). This provides 90% of Delhi Metro's current daily power requirement.[20]

The Rewa project illustrates that ultra-mega solar parks could enable trade between renewable energy rich zones to other states and cities of the country. This eradicates the need for states to build costly and polluting thermal power projects in their own states as cheaper and cleaner power

**Ultra-mega solar parks could enable trade between renewable energy rich zones to other states and cities.**

[19] Mercom India. New record low solar tariff of Rs3.30/kWh logged at Rewa solar park auction in Madhya Pradesh. 10 February 2017.
[20] RUMS. Rewa Ultra Mega Solar park.

could be sourced from ultra-mega solar parks from anywhere in the country.

Additionally, Rewa boasts various payment security measures. A three-tier security guarantee was provided to developers to ensure payment in the event of a delay or even natural disaster.[21]

### *Adani Kamuthi Solar Plant, Tamil Nadu (648MW)*

Adani Green Power's Kamuthi facility in Ramanathapuram district was the world's largest solar plant when it was commissioned in September 2016. The plant was planned and built in two years with an investment of US$679m and covers 2,500 acres.[22]

It was built without securing the necessary water licences for module maintenance and washing, forcing developers to look for other solutions. They solved this issue by incorporating a then-new self-charging, remotely operated, waterless robotic cleaning system developed by Israel's Ecoppia and manufactured in India, a cost-effective and efficient technique that optimises the cleaning process, guaranteeing long-term high performance.[23] [24]

**The plant was planned and built in two years.**

## World's Largest Announced Solar Park

### *Dholera Solar Park, Gujarat (5,000MW)*

On April 11, 2018, Gujarat announced the approval of the world's largest solar park, with a capacity of 5GW capacity, to be built in the Dholera Special Investment Region (DSIR) of Ahmedabad district.[25] Chief Minister Vijay Rupani said the solar park would be spread across 11,000 hectares of land along the Gulf of Khambhat, and would attract investment of Rs250bn (US$4bn). The region also aims to be a global manufacturing and trading hub.

Dholera Solar Park's first auction awarded 300MW of capacity to Tata Power and Gujarat Industries Power Company Ltd at a tariff of Rs2.75/kWh. However, the tender originally invited 1GW of capacity and was undersubscribed by 700MW amidst multiple cancellations of auctioned capacities, tariff renegotiations and

[21] RUMS. Rewa Ultra Mega Solar park.
[22] Indian Express. World's largest solar park unveiled in Tamil Nadu. 30 November 2016.
[23] GTM. India holds the crown for world's largest solar PV project— for now. 02 December 2016.
[24] Ecoppia. Robotic Cleaning, Clients.
[25] PV Tech. India's Gujarat approves 5GW solar park. 11 April 2018.

aggressive tariff caps from Gujarat Urja Vikas Nigam Limited (GUVNL), the state power company.

The 700MW was retendered with the same tariff cap of Rs2.75/kWh in June 2019.[26] However, it still failed to attract any interest from developers. The capacity is now once again retendered with an improved ceiling tariff of Rs2.92/kWh.[27]

Additionally, NTPC announced a plan for another 5GW of solar park in Kutch, Gujarat during its annual analyst and investor meeting for FY2018/19.[28] Gurdeep Singh, Managing Director of NTPC, talked about using Kutch's excellent wind and solar energy resources to implement hybrid wind-solar generation to improve efficiency of generation infrastructure as well as to maximise the utilisation of transmission infrastructure. This announcement puts Gujarat ahead in the race for building renewable energy capacity between states such as Tamil Nadu, Karnataka, Maharashtra, Andhra Pradesh, and Rajasthan with similar renewable energy potential.

The Power Ministry has approved 6.2GW of solar park capacity for Gujarat, the highest share of the total 26.5GW approved all across India.[29]

## Issues With Ultra Mega Solar Parks

As much as the scale and execution of a large-scale solar park exemplifies India's technological ingenuity to mobilise capital at scale and at the least cost, it must be acknowledged that it comes with its own set of negative externalities.

### Land

Solar parks are land-intensive, and they pose a resource availability challenge for a densely populated country. However, we note the total land required for solar parks is equivalent to the total land required for coal-fired power plants and associated coal mines.

The government should carefully study all options before making plans for new solar parks in future. Wastelands, low-utility non-agricultural land, or reclaimed coal mines should ideally be used for large-scale solar projects.

### Labour

The Indian solar construction industry is highly dependent on low-skilled interstate migrant labour and informal employment most of the time. The government could progressively look to execute industry-specific labour reforms for the renewable

[26] Mercom India. Gujarat Invites Bids for 950 MW of Projects to be Developed Across Two of its Solar Parks. 25 June 2019.
[27] Mercom India, Gujarat Reissues 700 MW from its 1 GW Solar Tender for Dholera Solar Park, 18 March 2020.
[28] ET EnergyWorld, NTPC plans 5,000MW ultra-mega solar plant in Kucth worth Rs20,000 crore investment, 20 August 2019.
[29] ET EnergyWorld, Gujarat leads India in approved capacity of solar parks, 7 August 2018.

energy industry to reap long-term benefits from the growth industry of the decade.

### Grid Stability

Large-scale solar parks are not as easy to operate as decentralised solar systems for grid operators. Large-scale input of power from utility-scale generators is harder for grid stability management from the perspective of the grid operator as it must deal with large voltage and frequency fluctuations because of the intermittent nature of renewables. India's rooftop solar market has been slower to reach scale in the Indian market, but is finding its feet with more than 5GW of total installed capacity to date.

India has actively looked into various solution to expand its decentralised solar capacity. There have been gigawatt-scale planning and some small installations of floating solar. In addition, government-owned buildings such as offices, hospitals and education facilities are being used to accommodate rooftop solar projects.

India has been growing its grid capacity roughly in step with new generation capacity. India's grid network successfully managed reduction and consequent increase of 31GW demand within a period of 9 minutes during the recent 'lights off' event on 5th April 2020.[30] [31] This demonstration of grid management supports the argument that with the right planning and additional investment in firming capacity, India's robust national electricity grid could be further developed to handle large-scale renewable integration.

## Conclusion

It is worth looking back over the last four years to see just how far the Indian renewable energy industry has advanced. Indian utility-scale solar parks have been effective in kickstarting India's energy sector transition. The ultra-mega solar parks have attracted foreign capital as well as top global developers to India, and in return have provided investors with an opportunity to join a US$500-700bn renewable energy and grid infrastructure investment boom in the coming decade.

**India should rightly take pride in being able to execute world-leading renewable energy projects.**

India's power industry and the government should make good use of the coronavirus lockdown period to resolve long-standing problems and to be fully prepared for a green infrastructure investment stimulus as India comes out of this pandemic. India should rightly take pride in being able to execute world-leading

[30] Prime Minister Narendra Modi called on fellow citizens to switch off lights on 5 April evening at 9pm for nine minutes to express solidarity on the 9th day of the national lockdown by lighting earthen lamps or torch lights and switching off lights in their houses.
[31] IEEFA. Power system operator demonstrates the fine art of grid management. April 2020.

renewable energy projects and continue to work to resolve short-term policy impediments to achieving its long-term renewable energy aspirations.

The government must also address development-related negative social and economic externalities. It must avoid the mistakes made in the past with large-scale coal mine and thermal power plant development, particularly in terms of development on key agricultural lands and critical forestry reserves.

# About IEEFA

The Institute for Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. www.ieefa.org

# About the Author

## Kashish Shah

Kashish Shah, a Research Associate at IEEFA, has a master's degree in economics from the University of Sydney and an engineering degree from NMIMS University in Mumbai. He has worked in the Global Analytics Division of the Royal Bank of Scotland with a focus on regulatory policies. Kashish has research experience in India's public sector from his work for a member of the Indian Parliament and a University of Sydney-based research group.