

Newsletter on the JICA-IREDA initiative to promote renewable energy (RE) development in India



648 MW Adani Solar Park in Tamil Nadu (Source: PwC)

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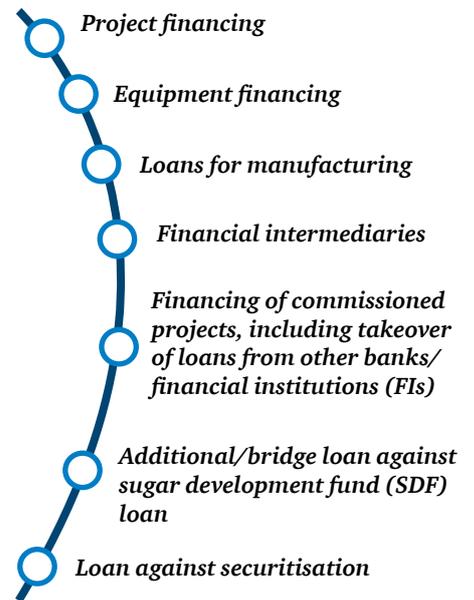
1. IREDA

The Indian Renewable Energy Development Agency (IREDA) is a non-banking financial company (NBFC) under the administrative control of the Ministry of New and Renewable Energy (MNRE). It is a public limited government company and is classified as a 'Miniratna Category I' organisation by the Government of India.

The organisation has been active in promoting, developing and extending

financial assistance for renewable energy (RE) and energy efficiency (EE) projects through innovative financial mechanisms. It is currently the biggest financial contributor of India's RE sector. Headquartered in Delhi, IREDA has its branches and camp offices in Chennai, Hyderabad and Ahmedabad. It caters to the wind, hydro, solar, biomass, cogeneration, waste to energy, EE, biofuel, new and emerging energy and hybrid sectors.

IREDA's financing schemes



New fund and non-fund based financing schemes

- Line of credit to NBFCs for on-lending to RE/EE projects
- Short-term loan assistance to RE developers/suppliers/contractors
- Bridge loan assistance to RE developers against capital subsidies/viability gap fund (VGF)/GBIs available under various state/central government schemes
- Policy on underwriting of debt/loan syndication
- Guarantee assistance scheme to RE suppliers/promoters

2. Japan International Cooperation Agency (JICA)

JICA is the world's largest bilateral development organisation, operating in around 150 countries to help some of the globe's most vulnerable people. It coordinates official development assistance (ODA) for the Government of Japan and is globally the largest provider of ODA. Its work spans a broad spectrum of issues—education, information communication and technology, healthcare, climate change, agriculture, energy, etc.

JICA has been supporting the development of India's RE sector since 2011 by supplying two lines of credit of 30 billion JPY to IREDA. This concessional credit, coupled with technical expertise, has supported the growth of India's RE sector by almost 70% to around 42.75 GW in the last five years. The first line of credit was awarded for the years 2011–14 and the second line of credit (2014–2022) is now under implementation.



- Updation of CPDMS

- India leading the renewable energy capacity installations globally
- Renewable Energy sector achievements in 2016
- RE share rose to 7.5 %
- India to launch largest solar PV rooftop tender
- Policy round-up
- Energy storage tenders

- Impact of GST on renewable energy installations
- Corporates on low carbon path
- World largest solar plant in Tamil Nadu
- Role of energy storage crucial for uptake of RE installations in India

- Investments in solar sector dropped by 40 percent in Q2 16
- Government to setup \$2 billion equity funds for renewables

- Solar PV tariff hits all time low
- MNRE releases draft policy on solar and wind hybrid power projects

3. Project Updates

Updation in CPDMS

A workshop was arranged to provide an overview of Centralized Project Data Management System (CPDMS) system and its functioning and to make it successful, the workshop was focused on necessary updations in the system and added few reporting screens related to solar projects. The workshop also provided a hand-on training to understand the dashboard of the CPDMS and its applications to understand the different data patterns.

Data fetching from solar project location:

Solar developers will share unit wise generation data with IREDA in JSON format (a light weight technology used for data exchange across network). The updated CPDMS has a standard API/module for reading the above information and storing in relational database for further analysis and reporting purpose. The diagrammatic representation of entire process is presented below:

Challenges met through CPDMS

- Collection of generation data from all the developers - at present generation data is being collected through multiple log-ins from developer website connected to their SCADA system
- Effort in report preparation by linking Generation data and Loan repayment information
- Requirement of analytic tools for carrying out multi-dimensional analysis; generation of trend and analytic reports on current and historical data
- Getting regular generation data from all the developers in this manual process, need significant amount of time and effort by IREDA staff

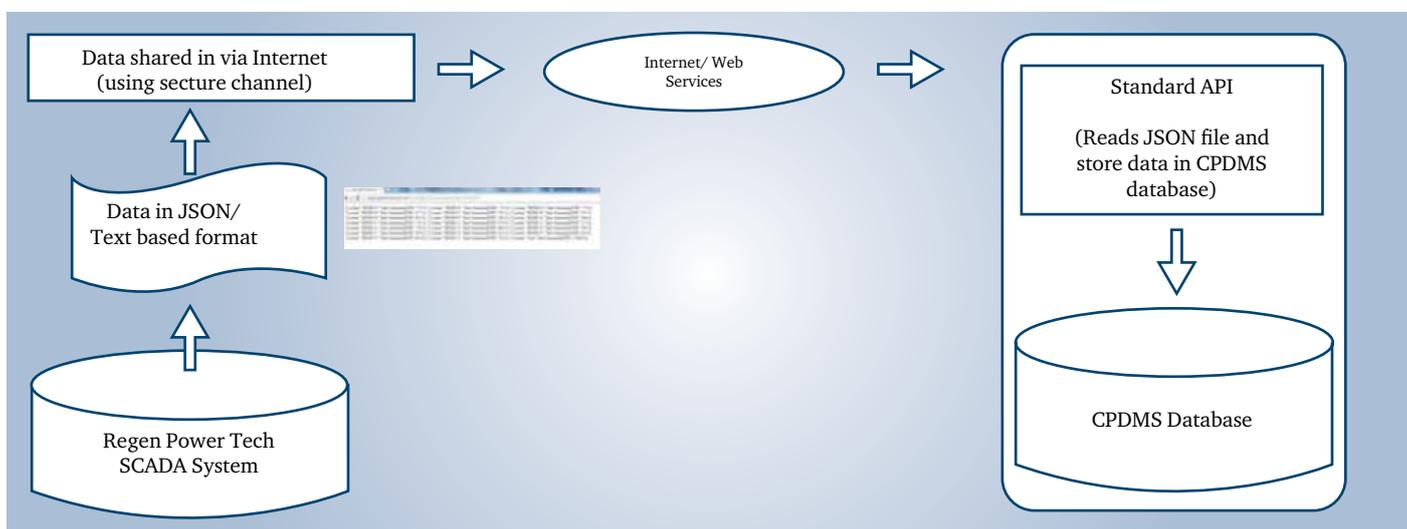


Figure 1: Data processing in CPDMS software

Once the data is processed through the software, user can have access to the pictorial representation of the generated energy throughout the year. The Monitoring Daily/ Monthly Generation

data profile of Solar Generating Station/Developer is shown in the figure below:

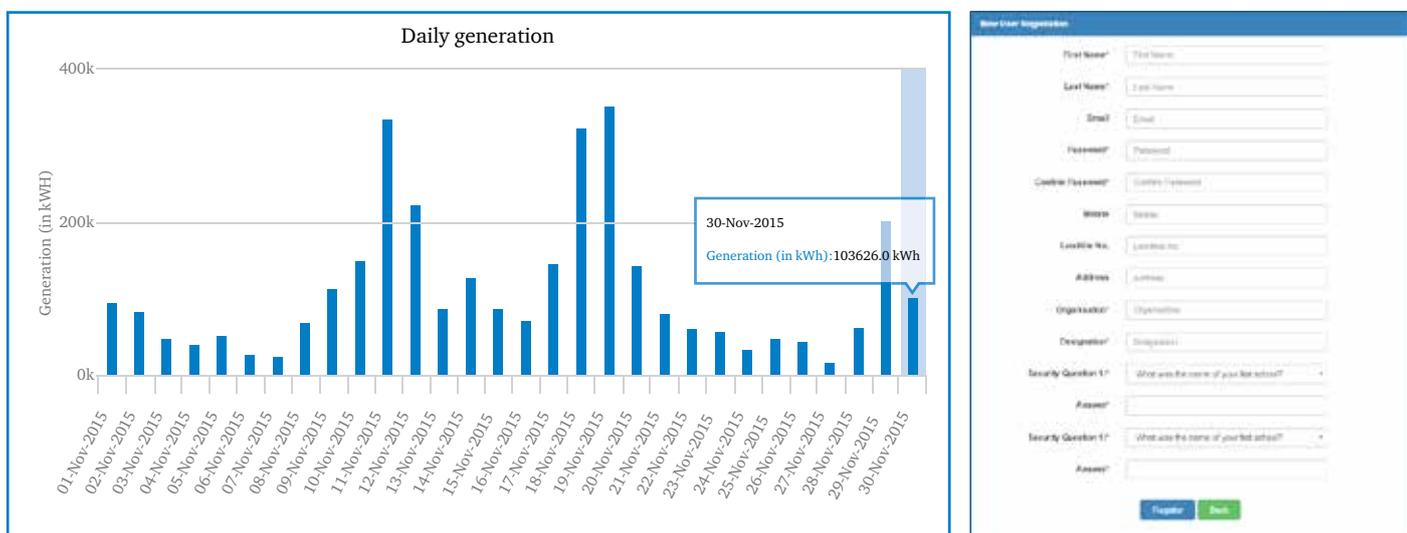


Figure 2: Daily solar generation profile and input dashboard

Clean Tech Sector Roundup

India among the top five frontrunners in clean energy installations and investments

In union budget 2015, the Government of India revised the target to 175 GW of renewable energy by 2022, an ambitious plan to increase the share of renewable energy in the country's energy mix and transform to low carbon path. This includes 100 GW of solar power, 60 GW of wind power, 10 GW of waste-to-energy power and 5 GW of small hydropower by 2022. With this backdrop

Government of India introduced slew of initiatives to foster renewable energy and attract investments and single window clearances. Even state governments took the initiatives to participate in adopting clean energy via conducive policies providing incentives and shovel ready infrastructure to kick start

clean energy projects. India stood at fourth position in 2016 in terms of RE capacity addition and attracted investments of USD 9.7 billion by the end of 2016. Investments will rise exponentially in the coming months, the state and central agencies are planning to implement large scale solar Parks and the respective nodal agencies are developing a framework for implementing GW scale solar parks via competitive biddings.

In order to meet this target of 175 GW by 2022, the renewable energy sector in India will require \$189 billion in additional investment. The USD \$189 billion requirement includes \$57 billion in equity, and \$132 billion in debt. The estimations have been calculated from the capital expenditure forecasting for renewable energy projects (including solar power, onshore wind power, small hydropower, and waste-to-energy power) between 2016 and 2022.

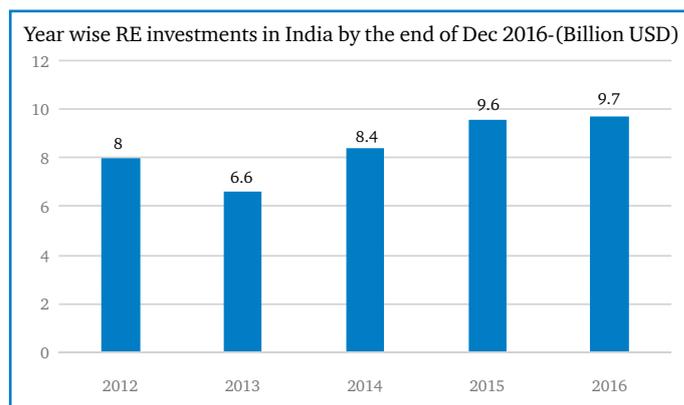
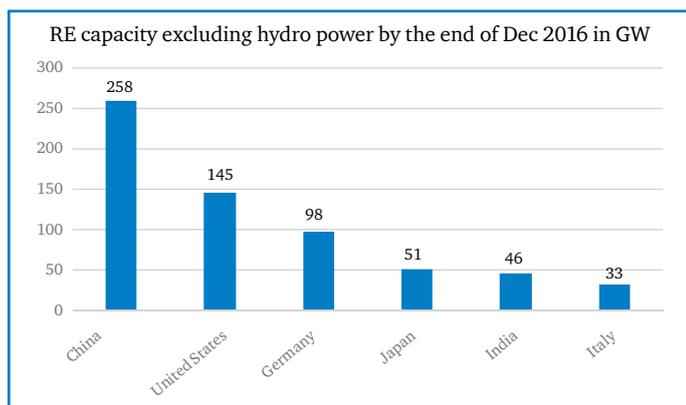


Figure 3: RE capacity additions in 2016 and investments

Renewable energy sector achievements in 2016

The details of year round initiatives and achievements are as follows:

- Largest ever wind power capacity addition of 3423 MW in 2015-16 exceeding target by 43%. During 2016-17, a total 1502 MW capacity has been added till 31.10.2016, making cumulative achievement 28,279 MW. Now, in terms of wind power installed capacity India is globally placed at 4th position after China, USA and Germany.
- Biggest ever solar power capacity addition of 3,019 MW in 2015-16 exceeding target by 116%. During 2016-17, a total 1750 MW capacity has been added till 31.10.2016, making cumulative achievement of 8728 MW.
- 31,472 Solar Pumps installed in 2015-16, higher than total number of pumps installed during last 24 years i.e. since beginning of the programme in 1991. So far, 92305 Solar Pumps have been installed in the Country as on 31.10.2016.
- Solar projects of capacity 20,904 MW were tendered in 2015-16. Of these, 11,209 MW capacity already awarded.
- Biomass power includes installations from biomass combustion, biomass gasification and bagasse co-generation. During 2016-17, against a target of 400 MW, a total of 51 MW installations of biomass power plants has been achieved making a cumulative achievement to 4882 MW.
- Family Type Biogas Plants mainly for rural and semi-urban households are set up under the National Biogas and Manure Management Programme (NBMMP). During 2016-17, against a target of 1.00 lakh biogas plants, 0.26 lakh biogas plant installations have been achieved making a cumulative achievement to 49.35 lakh biogas plants as on 31.10.2016.
- A total sanction of 1300 million dollars has been received to support renewable energy project financing from World Bank, KFW, ADB and NDB through which the SBI, PNB, Canara Bank and IREDA will be in the position to fund at the rate of less than 10%.

GST to push costs by 10-15 percent for solar and wind energy companies

Multiple Indirect taxes are currently levied on transactions in India. Some of the taxes are levied and collected by the Central Government, while other taxes are collected by the State Governments. Accordingly, the current Indirect tax regime

is beset by myriad problems such as complexity, tax on tax and lack of credit fungibility. India is gearing up to introduce a comprehensive Indirect tax regime under GST. All existing Indirect taxes, barring a select few, would be subsumed into the new GST.

Once GST comes into force, renewable energy firms, which are currently exempted from any duties on the import of equipment, will have to pay a special additional duty and countervailing duty while importing solar modules under the GST slab of either 18% or more, or below 12%, whichever is applicable. Renewable

Source of Renewable Energy	% range of increase in Levelised Tariff/ cost of setting up and operations (as applicable)
Solar PV- GRID	12-16%
Solar - Off-grid	16-20%
Wind energy projects	11-15%
Wind Solar hybrid projects	11-17%
Bio-mass projects	11-14%
Bio-mass gasifier projects	11-14%
Small hydro projects	1-11%

Renewable energy share rose to 7.5 percent in overall energy mix by the end of Nov 2016

India's overall energy mix is shifting towards clean and renewable day-by-day on the back of governments push to achieve 100 GW of solar PV installations by 2022. The recent data published by ministry of power indicates that the clean energy share rose to 7.5 percent in the month of Nov 2016.

During the second half of the 2016, out of total energy generation of 630 billion units (BU), 47 BU were generated from clean energy sources like solar PV and Wind energy. The share of renewable energy power generation was 5.6 percent in 2014-15. The total installed capacity from various forms of renewable energy sources as on October 2016 is 28.8 GW from Wind, 8.7 GW from solar PV, 4.9 MW from bio-mass and 4.3 MW from small hydro.

The reason for this sharp jump in July was the large wind capacity exposed to high-speed monsoon winds. Of the 10.1 BU of

Government of India announces largest solar PV rooftop tender

India is all set to launch its largest solar rooftop tender for 1,000 Megawatt capacity. The mega tender will be launched by the Solar Energy Corporation of India (SECI), a state-owned firm, in what will give a major boost to government's renewable energy capacity addition plans.

It is the largest such tender in India's fledgling rooftop solar market. 700 MW of capacity is proposed to be allocated under the RESCO route, in which project developers shall fund and own the solar systems and sell power to the respective government departments under a 25-year power purchase agreement. Balance 300 MW is proposed to be set up under the capital expenditure route where the government department would set up the units.

Buildings under the Ministry of Human Resources and Development (MHRD) account for over 70% of the identified capacity. This means that most of the systems are likely to be installed on educational and training institutes.

This tender is expected to bring down tariffs to record lows since they would expand the market and would also receive capital subsidies of up to 35-90%

A study by the ministry of new and renewable energy on the implications of GST on the delivered cost of renewable energy estimates a cost increase of about 12-16% for grid-connected solar photovoltaic projects and 16-20% increase in costs for off-grid solar projects. It estimates an increase of 11-15% in wind energy project costs.

energy is one sector that has so far benefited from multiple tax exemptions such as full exemption from value-added tax and excise duty in some states and continues to lobby for an exemption from GST.

MNRE has analyzed the impact of GST on renewable energy industry and suggested recommendations and releases a report on implications of GST on renewable energy and its delivered cost of energy.

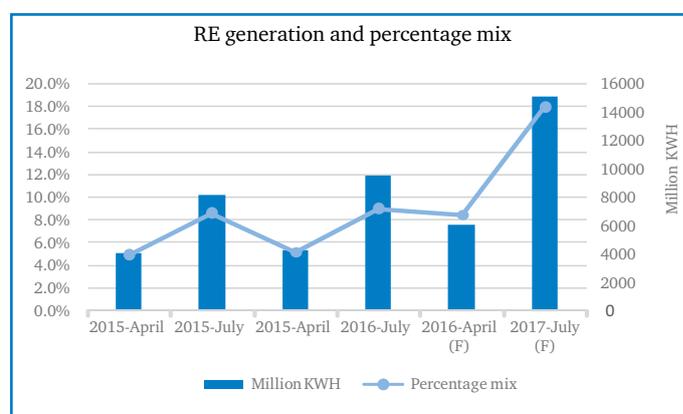


Figure 4: RE generation and share in India

renewable energy generation in July, 76.2% (or 7.56 BU) were generated by wind energy projects, again the highest ever.

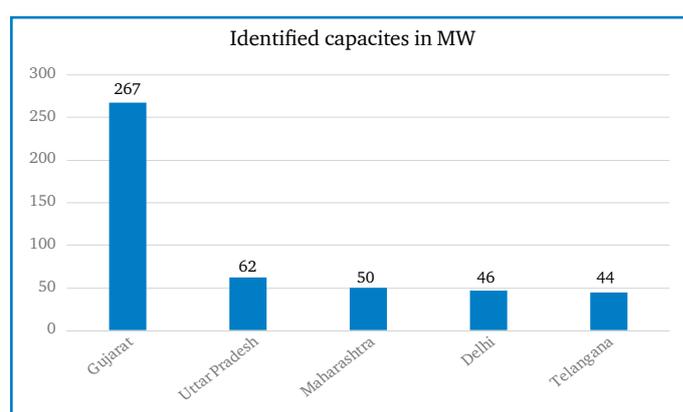


Figure 5: Identified Capacity (MW)

SECI expects enthusiastic response to the tender both from rooftop solar specialists and utility solar players. In the previous 500 MW rooftop solar tender by SECI, tariffs dropped to an all-time low of Rs 3 (US\$ 4.4)/ per unit for special category states on the back of a significant capital subsidy and the highest was Rs. 6.17 (USD0.0909) per kWh for non-special category. The expectations for tariffs under this tender to fall even lower for special category states as buildings have already been identified and government off-take is more bankable than private sector off-take.

RE Investments roundup

Investments in Solar sector dropped by 40 percent in second half of 2016

Total corporate funding, including venture capital funding, public market and debt financing into the solar sector in Q2 2016 fell to \$1.7 billion this quarter, a 41 percent drop compared to the \$2.8 billion raised in Q1 2016. Year-over-year total corporate funding was down significantly compared to \$5.9 billion in the second quarter of last year. Funding levels bounced back in Q3' 16 compared to Q2' 16. The solar industry continues to experience weakness in terms of financing activity, and corporate funding in Q2 2016 was at its lowest level in three years.

Renewable energy investments will rise in 2017

The Indian government has forecast that it will exceed the renewable energy targets set in Paris last year by nearly half and three years ahead of schedule. A draft 10-year energy blueprint published by CERC predicts that 57% of India's total electricity capacity will come from non-fossil fuel sources by 2027. The Paris climate accord target was 40% by 2030. The forecast reflects an increase in private sector investment in Indian renewable energy projects over the past year, according to analysts.

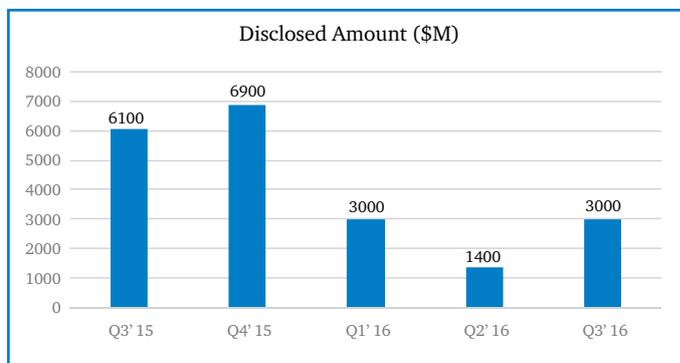


Figure 6: Solar Investments in India in million USD

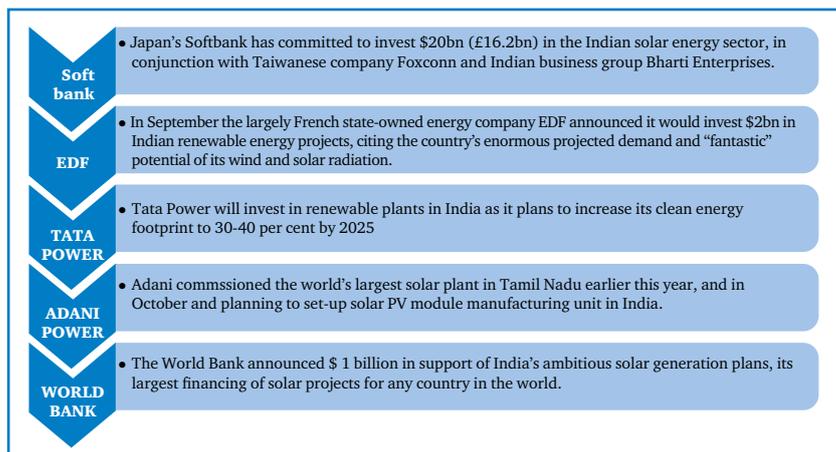


Figure 7: Slew of investments proposed by different organizations

India to invest \$ 1.8 billion in solar power transmission infrastructure

India will invest Rs127 billion on lines to transmit power from solar parks to enable the goal of boosting clean energy capacity to 175 gigawatts by 2022. The dedicated transmission lines, part of the so-called green corridor project, will transmit 20 gigawatts of power capacity from 34 solar parks across 21 states, the government announced in a series of reports commissioned by minister for power, coal and mines.

The green-energy corridor is part of the country's plans to boost transmission capacity to enable a seamless flow of electricity from clean electricity producing states to consuming states that face power shortages. New lines will also help manage intermittency challenges of renewable energy, especially as clean sources increase their share of power generation to almost 50% in some states.

Indian Corporates aiming to increase their clean energy share

A plethora of enablers and incentives by the government, together with the improving cost economics and rising awareness of renewables, has led to a substantial increase in the deployment of renewables. The corporate sector is becoming a key player in this increase, with an increasing number of corporates establishing targets for the procurement of energy from renewable sources. Additionally, multiple initiatives have emerged that seek to promote the uptake of renewable energy by corporates by providing support, such as RE100 and GPMDG offering membership to initiatives, promoting a greener image, etc.

Technology companies have come under increasing scrutiny over the carbon footprint of their operations, which have grown so fast they now account for about 2% of global greenhouse gas emissions, rivalling the aviation industry.

- The inter-state portion of the transmission investments will cost Rs80 billion, while intra-state lines will require another Rs47.45 billion, according to the government.
- India will receive a soft loan of about €1billion for the corridor's development from the German development bank KfW.
- Intra-state transmission under the plan will be funded through a 20% equity state held by the state government, 40% in the form of a grant from the National Clean Energy Fund and the soft loan accounting for the remaining 40%. The inter-state transmission schemes are to be funded as 30% equity by Power Grid Corp. and 70% as a soft loan

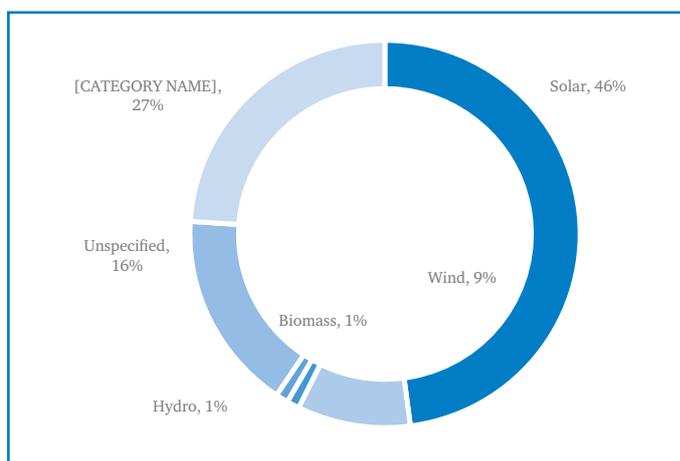


Figure 8: Technology preference by corporates (PwC research)

4. News & Analysis

World's largest solar power plant installed in Tamil Nadu

A big achievement in India's solar mission, the country had installed the world's largest single location solar power plant in Tamil Nadu, which will produce 648MW of electricity. The plant is built at Kamuthi in Ramanathapuram district at a cost of around INR 4,550 crore. The plant has been connected to a 400 KV substation

of Tamil Nadu Transmission Corp. The plant was built in a record time of eight months with equipment and machinery from around the world. Around 8,500 personnel worked on the project, installing an average of 11MW a day.

The vast, 10 sq km project in

Ramanathapuram, in the southern state of Tamil Nadu, is the world's largest solar power station in a single location, according to the developer Adani Group. It has the capacity to power 1,50,000 homes - and it is one sign of how serious India is becoming about meeting its renewable energy targets.

Energy storage will play a dominant role in renewable energy capacity additions

Intermittency and unpredictability are the key issues in dispatching renewable energy optimally to meet the energy demand. India is adding renewable capacities at GW scale year on year to reach the ambitious target of 175 GW by 2022, which requires transformation in grid infrastructure and adoption of ancillary services to support the intermittent nature of renewable energy.

The typical strategy adopted by grid operators in India is to simply discard the unstable power and maintain the grid stability with the available transmission infrastructure.

- The ESS market for India in 2016 was around 5GW/10GWh from the data released by IESA
- The overall projection for ESS potential in India between 2016-22 is around 57GW/ 116GWh
- ESS for solar integration will witness a few projects driven by SECI, NLC, NTPC, GEL and others
- Solar rooftop market will be significant post 2019-20 when the ESS costs are expected to be comparable to grid tariffs and the tariff incentives for grid connected projects would be minimal

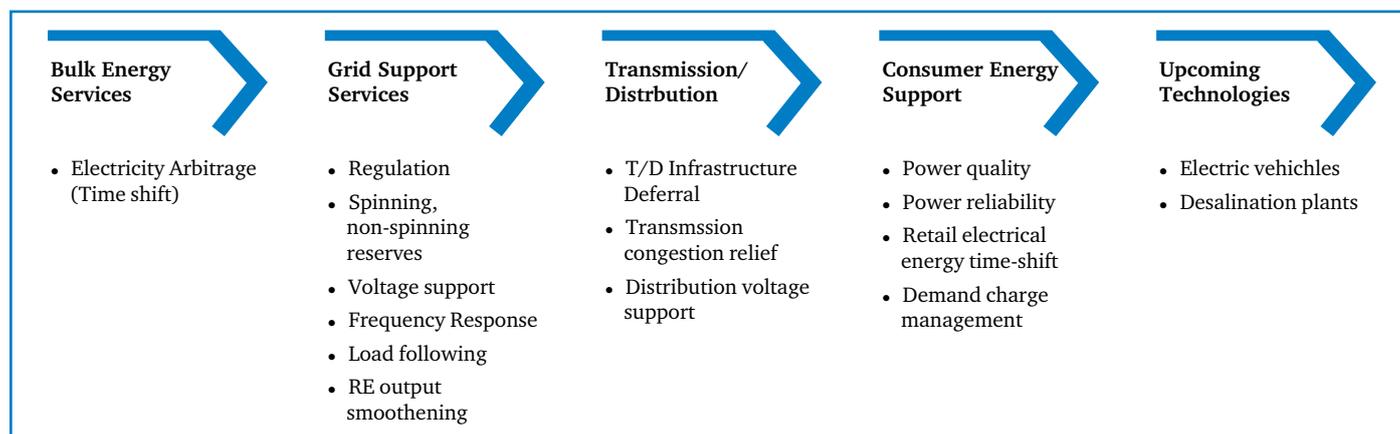


Figure 9 Applications of energy storage

India issues tender for 200 MW solar plus storage facility

India has issued its second solar energy storage tender as it looks to expand its capabilities to efficiently absorb the rapidly increasing solar capacity into the existing grid. The Solar Energy Corporation of India (SECI) issued a tender to set up 200 MW of solar capacity along with a storage facility. The power generation capacity will come up in

Karnataka's Pavagada solar power park. Projects will be auctioned in the size of 50 MW each, with each project having a storage capacity of 2.5 MWh.

Pavagada solar power park is among around 34 solar parks approved by the Ministry of New & Renewable Energy. The planned capacity of the solar park is 2 GW,

which would make it among the largest power projects in India.

This new tender comes only days after SECI issued the first solar power storage tender of 100 MW capacity for the 1 GW Kadapa solar power park in Andhra Pradesh.

Solar PV tariff slumps to all time new low at INR 4 per unit

The National Thermal Power Corporation (NTPC), a state owned utility in India, has announced the winners of a tender in the state of Rajasthan for 130 MW solar power capacity projects in July 2016. The lowest tariff range was 4.35 INR per kWh (\$0.06), while the highest went up to 4.36 INR per kWh (\$0.06).

Earlier in January 2016, the auction conducted by NTPC for 420 MW solar in Rajasthan have seen the record low of INR 4.34 per unit under 'batch II, tranche-I of the second phase of the National Solar Mission', in six blocks of

70 MW each.

In the state of Rajasthan, 750 MW of solar has been tendered by the Solar Energy Corporation of India (SECI) at a low benchmark price of Rs.3.93 (~\$0.0590)/kWh compared to the previous benchmark price of Rs.4.43 (~0.0665)/kWh. The developers will be bidding for additional viability gap funding (VGF) in addition to the tariff and can also use other available incentives like accelerated depreciation (AD), concessional customs and excise duties. However, developers cannot claim VGF and AD simultaneously.

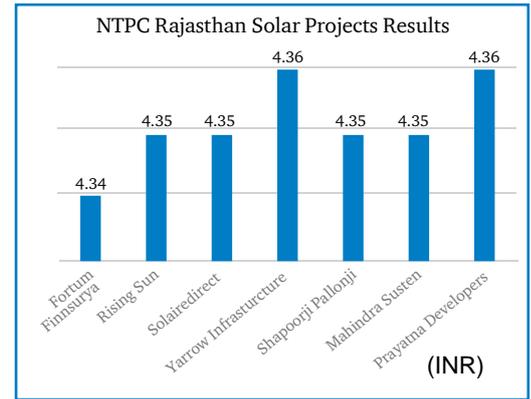


Figure 10: Solar PV tariff trends

MNRE targets 10 GW of Solar and Wind Hybrid projects by 2022

There is growing trend of solar PV and Wind hybrid system globally to compliment both the technologies and utilize the resources at their fullest capacity. In India, the potential for solar

and wind is mammoth and the country is blessed with solar rich and windy sites at one place. With the view of stabilizing the grids with optimal sizing of solar PV and Wind, the ministry of new and renewable

energy had come with draft policy and requested for comments from different stakeholders across the clean energy sector. Few highlights from the draft policy are enlisted in the picture below:

The policy aims to reach wind and solar hybrid capacity of 10 GW by 2022



Integration Process

- Design should be in such a way that it should utilize the transmission infrastructure
- For wind rich sites solar component should be minimal and solar rich sites, wind component should be at minimal.
- The detailed technical regulations are yet to be released



Implementation Process

- Injection of hybrid power should not exceed transmission capacity/sanctioned grid capacity
- No additional transmission charges will be levied by utilities
- RECs and FiT are allowed



Tariff Guidelines and Incentives

- CERC shall lay the guidelines for the mechanism for determination of tariff and forecasting and scheduling mechanisms
- All fiscal incentives for wind and solar will be in place
- Low cost financing for hybrid projects will be available through IREDA

Other Updates

- Madhya Pradesh announces Solar Rooftop Policy for net metering with capital subsidy for domestic consumers and aims to install 265 MW in the 2016-17 fiscal and cumulative capacity of 2.2 GW by 2022.
- Jammu & Kashmir Energy Development Agency (JAKEDA) announces solar policy on net-metering for grid connected rooftop solar PV projects with a target of 450 MW by 2022.

Assignment Update

The meetings with solar developers, have been carried out at IREDA, IHC office for Central Project Data Monitoring System (CPDMS) integration. They are ready with the format and have agreed to share the CPDMS data arrangements through web link. A four day domestic study tour of solar and wind projects in Rajasthan has been carried out for 18 employees of IREDA. The aim of the visit is to help them gain exposure to actual plant operations, which in turn will help them during project appraisals.

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