

# Renewable Energy Monitor

## May 2016

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**Tough challenges ahead for renewable energy sector.** Beyond the headlines that the renewable energy sector made since the National Democratic Alliance came to power, there are lofty targets to be met and several unfinished tasks to be accomplished. While India saw record capacity addition in both solar and wind power, almost all states have defaulted on their renewable purchase obligations (RPO) again, for the fourth year in a row.

Currently, at an average of eight per cent of the total procured power, no state is even close to its mandated RPO. In FY16, even renewable energy-rich states like Gujarat, Rajasthan and Andhra Pradesh defaulted on their targets. The ambitious green corridor project, an alternative transmission network for renewable energy, has been revised and re-revised since 2013. Lack of transmission could leave renewable projects at the same crossroads where conventional projects are - no takers and congested grid, say sector experts. Due to unavailability of proper guidelines and on ground local issues land and power evacuation continue to pose problem. Mr Sunil Jain, Managing Director, Hero Future Energies said the evacuation infra did not grow in the same pace as generation infra in the past few years, leading to such bottlenecks.

There is no fresh equity flowing in the solar and wind market. Close to 10,000 megawatt (Mw) projects, both solar and wind, are on the block scouting for equity of \$2-3 billion. These include independent wind power projects, solar projects bid under the Centre's flagship National Solar Mission and state programmes. Ambiguity in the tariff of solar projects across the country is also something that's baffling investors. Aggressive bidding has brought down the price of solar power, but investors are not lured. The tariffs are falling but the project size is sub-500 Mw. Industry experts say that leading project developers are putting aggressive bids for 50-200 Mw projects to be relevant in the market. The likes of ReNew Power, Hero Future Energies, Azure Power and ACME are putting close to Rs 5 a unit bid for small projects.

**Karnataka to modify solar policy to target 6,000 MW.** Karnataka is planning to modify its solar power policy to achieve the 6,000 MW target set by Centre before 2020. State Energy Minister Mr DK Shivakumar, addressing Bangalore Chamber of Industry and Commerce's (BCIC) meet on solar energy, sought the active participation of the industry to achieve the target. On the Rs 8,000-crore subsidy that the State government incurs annually on energy/power and other related doles, Mr Shivakumar said the government is actively contemplating phasing out or drastically reducing the subsidy burden on the government by bringing in efficiency. The Minister admitted that the State is facing a severe power crisis. However, he said that despite the difficulties, the State government is able to manage the power crisis by sourcing energy from outside without incurring huge costs. He said that in the next few months the crisis would be eased as more capacities to the tune of 1,700 MW are being added to the existing grids which are more efficient.

**Indian Railways to meet 10% of energy needs via renewables by 2020.** Indian Railways, which has envisioned a plan to generate 1000 MW of solar energy by 2020, claims to be on track to become the largest harvester of rooftop solar plants. As part of its 'Solar Mission', the transporter plans to generate 500 MW (megawatt) of solar energy through rooftop solar panels and the rest 500 MW through land-mounted solar panels. It also aims at generating 312 MW of energy through windmill plants with the help of [Railway Energy Management Corporation Limited](#). The ministry said Indian

Railways has already tied up with Solar Energy Corporation of India to generate 100 MW of solar energy through land-mounted solar plants and production is estimated to commence from December, 2017, at an average rate of Rs 4.50/unit. The transporter has also tied up with Rewa Ultra Mega Solar (RUMS) to generate 50MW of solar energy through land-mounted solar plants at an average rate of Rs 4.50 per unit and the production is estimated to commence from December, 2017.

The transporter last year floated tenders for 50 MW for rooftop-based solar panels across its various zones. Sources in the railways ministry said the tenders will be finalised by June, 2016, and the ministry is expecting the per unit cost to come below Rs 5.50/unit. The railways is also going to float an additional tender for 100 MW by the end of May this year and expects the bids to be awarded by the end of 2016.

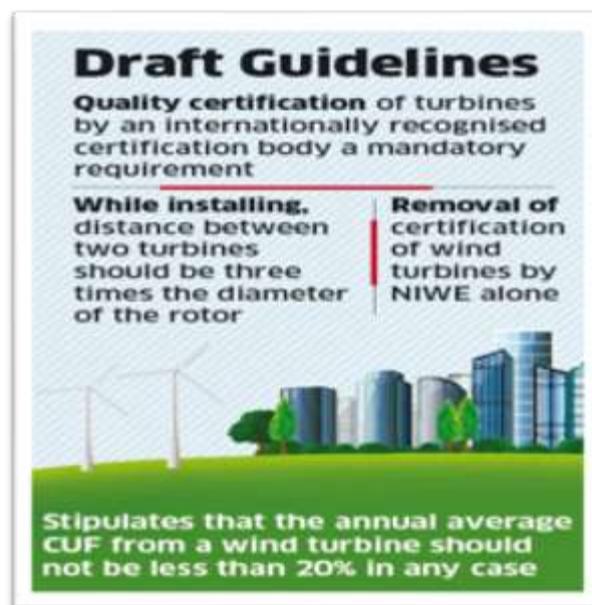
**States shifting gears to catch up with new green power regime.** The setting of stringent renewable purchase obligation (RPO) targets in the revised national tariff policy will push states towards lending back-end support for evacuation and financing of green power. The existing solar RPO fixed by the regulators for the states are in the range of 0.10 per cent to 0.50 per cent of their total power procurement. The RPO provision has been raised to eight per cent for solar in the revised National Tariff Policy. The RPO for solar power set by the regulators for the states is in the range of 0.10-0.50 per cent of their total power procurement. The RPO provision has been increased to eight per cent for solar power in the revised national tariff policy.

#### PLACE IN THE SUN

- The government has increased the targets for setting up solar capacity five times to 1,00,000 Mw by 2022
- The existing solar RPO fixed by the regulators for the states are in the range of 0.10 per cent to 0.50 per cent of their total power procurement
- The RPO provision has been raised to eight per cent for solar in the revised National Tariff Policy.

*(Source: Business Standard, 14 May 2016)*

**Green energy min issues fresh draft norms for onshore wind power projects.** The Ministry of New and Renewable Energy (MNRE) has issued fresh draft guidelines for onshore wind power projects, specifying how sites for wind farms should be chosen, the standards wind turbines should conform to and how they should be installed, the average annual plant load factor they need to achieve, and more. The last such guidelines were issued in June 1996, when wind power in India was in its infancy. Since then the country has installed 26,736 MW of wind power, the fourth highest in the world after China, the US and Germany. It has set itself a target of 60,000 MW of wind power by 2022.



(Source: *The Economic Times*, 16 May 2016)

Most importantly, as the guidelines point out, “over the last 20 years...wind turbine technology has evolved from low capacity, less efficient turbines of 225 kW to efficient turbines of 3 MW being manufactured in India”. The guidelines, for instance, make “quality certification of turbines by an internationally recognized certification body “a mandatory requirement. They also insist that, while installing, the distance between two turbines should be “three times the diameter of the rotor”.

**Policy to promote integrated solar manufacturing units on cards.** The Centre will soon release a policy to provide subsidy support and business assurance to attract companies for setting up integrated solar manufacturing units in the country. Integrated solar manufacturing units make everything from ingots, wafers, solar cells and solar photovoltaic modules. Power Minister Mr Piyush Goyal said the subsidy support will be given on the basis of a reverse bidding process so those interested in setting up such plants can bid for the least amount of subsidy required to be competitive in the market. He added that there will also be a ‘reasonable’ business assurance for five to seven years and it will be given on the basis of a ‘formula pricing’ which will be a part of the policy. Meanwhile, the government has also started working on reviving the wind power and hydro-energy sectors.

**India global 5th in green energy jobs, China on top.** India ranks fifth in the world in renewable energy (RE) job creation, with 416,000 employed in the sector during 2015. In the world, 8.1 million persons are employed in the clean energy space. China tops the list with 3.5 million, followed by Brazil with 918,000. According to the [International Renewable Energy Agency’s \(Irena\)](#) Annual Review 2016, there was a five per cent increase over a year before in the sector, with new jobs being created even as employment in the broader energy sector falls. “This increase is being driven by declining RE technology costs and enabling policy frameworks. We expect this trend to continue as the business case for renewables strengthens and as countries move to achieve their climate targets agreed in (the) Paris (agreement),” said Mr Adnan Z Amin, director-general of Irena.

The [report, titled Renewable Energy & Jobs](#), also provides a global estimate of the number of jobs supported by large hydropower, with a conservative estimate of an additional 1.3 million direct jobs worldwide. RE jobs in America increased six per cent, while employment in oil and gas decreased 18 per cent. RE in China employed 3.5 million people, while oil and gas employed 2.6 million. “As in the

previous years, enabling policy frameworks remained a key driver of employment. National and state auctions in India and Brazil, tax credits in the United States and favourable policies in Asia have all contributed to employment increases.”

### Key Facts Annual Review 2016

- IRENA estimates that global renewable energy employment increased by 5% in 2015 to reach 8.1 million. An additional 1.3 million people are employed in large hydropower.
- While the growth in jobs slowed down compared to previous years, the total number of jobs in renewables worldwide continued to rise, in stark contrast with depressed labour markets in the broader energy sector.
- Countries with the highest number of renewable energy jobs were China, Brazil, the United States, India, Japan and Germany. Jobs continued to shift towards Asia and the share of the continent in global employment increased to 60%.
- Solar PV was the largest renewable energy employer with 2.8 million jobs worldwide, an 11% increase over 2014. Solar PV employment grew in Japan and the United States, stabilised in China, and continued decreasing in the European Union.
- Wind power witnessed a record growth year. Strong installation rates in China, the United States and Germany resulted in a 5% increase in global employment, to reach 1.1 million jobs.
- Bioenergy is a key employer, with liquid biofuels accounting for 1.7 million, biomass 822,000 and biogas 382,000 jobs. Biofuel employment declined by 6% due to mechanisation in some countries and low biofuel production in others.
- Jobs in solar water heating and cooling declined to reach 940,000, as markets in China, Brazil and the European Union contracted.
- Direct jobs in large hydropower fell to 1.3 million due to a drop in new installations. Most of the jobs were in operation and maintenance, and China, Brazil and India were key employers.
- IRENA’s early research indicates that the renewable energy features more gender parity than the broader energy sector.

*(Source: IRENA\_RE\_Jobs\_Annual\_Review\_2016 pages 2-3)*

[Business Standard](#), 9 May 2016 | [The Hindu Business Line](#), 10 May 2016 | [The Financial Express](#), 12 May 2016 | [Business Standard](#), 14 May 2016 | [The Economic Times](#), 16 May 2016 | [The Hindu Business Line](#), 20 May 2016 | [Business Standard](#), 27 May 2016



#### **Tata power set to buy Welspun's wind, solar assets.**

Tata Power, the country's largest integrated power utilities company, looks set to acquire the renewable energy assets of the diversified Welspun Group, valuing the 1,152 mw portfolio of operational and almost ready solar and wind farms at close to \$1.45 billion inclusive of debt.

**Green Drive**

**WELSPUN RENEWABLES**

PORTFOLIO: 1.15 gw of solar & wind power

FOOTPRINT: 10 states including Gujarat, MP, Rajasthan, AP & Maharashtra

OPERATIONAL: 685 mw

PIPELINE: 200 mw (by June) +257 mw (by Oct-Nov '16)

**Welspun Renewables Is 100% subsidiary of Welspun Energy**

LIKELY EV ₹9,600 cr, INCLUSIVE OF ₹3,700 cr EQUITY VALUE

OTHER CONTENDERS IDFC PE-Fortum; Greenko, Sembcorp, Iberdola

**TATA POWER RENEWABLE**

PORTFOLIO: 1,674 mw (18% of total capacity) of hydro, wind, solar, geothermal

Tata Power created a 100% arm Tata Power Renewable Energy

**RECENT DEALS IN SECTOR**

Sembcorp Utilities acquired 60% in Green Infra for ₹1,051 crore

ENEL Green bought a majority of BLP Energy for ₹220 crore

ADIA Invested \$200 m in Goldman-backed ReNew Power

**THE ONE THAT DIDN'T CLICK**

Sun Edison agreed to acquire Continuum Wind for \$650 m but deal fell through

Negotiations are in the final stages and a definitive sharesale agreement is expected in the next two-three weeks, concluding what will be the largest buyout in the sector if it goes through. The Tata offer has trumped the closest competing proposal from a consortium of IDFC Private Equity and Finnish clean energy multinational Fortum by at least 15-20%, said the people cited above. The other serious contender in the fray was Greenko Group Plc, a Hyderabad-based renewable energy company controlled by GIC, the sovereign wealth fund of Singapore.

Welspun Renewables is a 100 per cent subsidiary of Welspun Energy which in turn is co-owned by the listed Welspun Enterprises. BalKrishna Goenka, chairman Welspun Group and serial entrepreneur Vineet Mittal who is also the Managing Director of the business are the other key shareholders along with a clutch of foreign financial investors.

Welspun valuations also translate to a per megawatt cost of Rs 8.33 crore as against the prevalent replacement cost including finance costs that ranges from Rs 6.5-Rs 7 crore per MW, argues some analysts tracking the sector.

(Source: The Economic Times, 2 May 2016)

**SECI plans to set up more solar plants.** The Solar Energy Corporation of India (SECI), set up primarily to facilitate the growth of solar power, is going ahead with plans to become a renewable energy developer itself. After having set up a solar project in Rajasthan, it will soon embark on two projects: a 300MW hybrid project, comprising both solar and wind energy in Andhra Pradesh, and floating solar plants across Kerala (10 MW), Andhra Pradesh (10 MW) and Lakshadweep Islands (5MW). There are few hybrid and floating solar projects in the country. Both are innovations intended to save on land use since every megawatt of installed photovoltaic solar requires about 5-6 acres. In hybrid projects, solar panels are mounted in the space between wind turbines, while in floating projects, solar plants are set up on lakes or tanks. In India's first floating plant, a pilot effort of 10 kW (0.01 MW) built by Arka-Ignou Community College of Renewable Energy, has already been commissioned at Rajarhat New Town near Kolkata. Another 100 kW being built is one in Loktak Lake, Manipur.

**Solar auction: Cos seeking lowest state support win.** With solar power developers unable to bid below the reserve price of ₹ 4.43 per unit at the latest auction, contracts were awarded on the basis of the amount of state support they asked for. Companies that sought the lowest viability gap funding - state support on capital costs - won projects in the auction by the Solar Energy Corporation of India in Andhra Pradesh. FRV Solar Holdings XI, a newcomer to India, put in a winning bid for 100 MW seeking funding of Rs 44.5 lakh per MW installed, the lowest subsidy amount, SECI said. FRV, originally a Spanish company, was acquired by the Saudi Arabia headquartered Abdul Latif Jameel Group in April 2015. Its US business had been sold off earlier to SunEdison. FRV has 532 MW of renewable energy projects commissioned so far in five continents. Acme Solar Holdings won its bid to set up 150 MW seeking funding of ₹ 55 lakh per MW, Tata Power Renewable Energy got 100 MW asking for ₹ 74 lakh

per MW and Azure Power won 50 MW with a funding requirement of ₹ 74.5 lakh per MW. Viability gap funding is provided in instalments over five years. All the developers offered tariffs of ₹ 4.43 per unit. SECI had originally floated a tender for 500 MW at Anantapur Solar Park in January, with 100 MW to be built with equipment sourced from local manufacturers. However, only 400 MW was auctioned and the portion to be set up with local equipment was postponed as SECI was not satisfied with the land made available for it.

**Will protect local solar firms ‘come what may’.** Mr Piyush Goyal, Minister of State (Independent Charge) for New & Renewable Energy, Power and Coal, is confident that India is on a “strong footing” as it defends its solar programme at the World Trade Organization. Mr Goyal’s confidence stems from the fact that even the US, which had challenged India’s programme of mandating domestic content, has 16 domestic content procurement requirements in place in various states. Earlier this year, the WTO’s dispute settlement panel ruled that the domestic content requirement in India’s [Jawaharlal Nehru National Solar Mission](#) flouted multilateral trade rules as it discriminated against foreign manufacturers. This was on the basis of a case filed by the US against India three years ago, which India is contesting.

**Only solar energy can fight pollution.** Adoption of solar power over fossil fuels would be the only solution to India’s increasing pollution, the head of a Supreme Court-appointed panel on environmental protection said. Mr Bhure Lal, the chairperson of the [Environment Pollution Control Authority](#) (EPCA), said that India should intensify efforts to develop adequate solar energy for mass consumption as it would improve air quality. Mr. Lal said that a focus on solar energy at the policymaking level as well as a close partnership between the government and the industry would help in tackling air pollution. He was speaking at the inauguration of a workshop on air pollution in Delhi organised by the PHD Chamber of Commerce and Industry. He said that all fuels derived of hydrocarbons could not be pollution-free, with diesel being the worst.

**Delhi looks to Gujarat to tap solar energy.** The Delhi government sent a three-member team of engineers to Gandhinagar, Gujarat to gain technical expertise on its “canal-top” solar projects. The Delhi government is preparing a proposal wherein it plans to install solar power plants atop major canals in the capital. A pilot project for the same is being chalked out for installation of solar panels on the Supplementary Drain which is maintained by the Flood and Irrigation Department. The 35-kilometre long Supplementary Drain which is the second major drain after the Najafgarh Drain is being considered for the pilot project. If the pilot project is successful, the government plans to expand it to other drains in the Capital. The team which is being sent for two-days is also going to take a look at the roof-top solar power plants in Gujarat.

**Solar lighting for 17 railway stations on Kalka-Shimla link.** To save energy consumption, all 17 railway stations on the world heritage Kalka-Shimla rail track will soon have the solar lighting system. Divisional Railways Manager, Ambala, Mr Dinesh Kumar said the engineering staff was in the process. The solar power can also be used to light up coaches, helping in saving power and making all stations on the track green in the second phase. It will also help the Railways earn some carbon footprints for reducing the use of energy. Some public sector companies like the Container Corporation of India are helping the Railways to bear the cost of introducing the solar energy-based system in its stations as part of their corporate social responsibility. As it is a world heritage rail track, the railway authorities are compelled to retain the track’s ancient architecture, but transformations are not permissible. The introduction of the solar lighting system will help conserve energy consumption.

**CSIR develops 'solar tree' that can light 5 houses.** A CSIR laboratory in West Bengal has designed a 'solar power tree' that takes up only four square feet of space and produces about three kilowatts (kW) of power, enough to power about five households. Dr Sibnath Maity, chief scientist at the Central Mechanical Engineering Research Institute (CMERI) in Durgapur, which developed the "tree" said the challenge was to come up with a design so as to generate more solar power in less land space. For one mW of power, one needs five acres of land. To generate 10,000 mW we would need 50,000 acres. Now this poses a dilemma in states like West Bengal and Bihar.



(Source: The Hindu, 21 May 2016)

The "solar tree" was inaugurated on by Union Science and Technology Minister Dr Harsh Vardhan during his maiden visit to the CMERI, which is a constituent of the Council of Scientific and Industrial Research (CSIR). Dr Maity said one conventional solar photovoltaic system of five kW requires 400 square feet of area. The three kW solar power tree resembles a tree with branches at different tiers and could be squeezed on rooftops and highways with a space requirement of around four square feet. The branches hold up the 30 photovoltaic panels and the system costs around Rs.3 lakh with battery back-up.

**India to use International alliance to push solar water pumps.** India plans to use International Solar Alliance to popularise indigenously developed solar water pumps across the world, especially in emerging markets. Mr Upendra Tripathy, secretary, ministry of new and renewable energy (MNRE) said many countries are not even aware of solar pumps, and are planning to launch pilot programmes in 15-20 countries, explaining their benefits and exporting about 100 pumps to each of them. India is a world leader in solar water pump use for both irrigation and drinking water, with about 62,000 pumps in operation across the country. Slightly more than half of the total were added last year. Of the total, 13,964 pumps were sold under MNRE's programme **Solar Pumping Programme for Irrigation and Drinking Water**. Solar pumps mostly substitute for diesel and electric pumps used by farmers.

**CLP plans \$1 bn investment in solar sector.** [CLP India Pvt. Ltd](#), one of the largest foreign investors in India's power sector, is looking to enter the solar energy sector as part of the parent's push to increase the share of renewables in its portfolio. The local unit of Hong Kong listed CLP Holdings Ltd is planning to invest about \$1 billion for setting up over 1 gigawatt (GW) of solar power capacity over the next 3-5 years, Mr Mahesh Makhija, director-business development (renewables), said. CLP India will bid for solar projects under **Jawaharlal Nehru National Solar Mission (JNNSM)** and invest in projects won by others. India needs as much as \$200 billion to meet its target to install 100 GW of solar power and 60,000 megawatts (MW) of wind power by 2022. This has seen global investors, including the renewable energy companies and pension funds, make a beeline for the country. Among the companies CLP India is talking to is Suzlon Energy Ltd, for buying an initial stake of up to 49% in a 100 MW project the latter won at a tariff of ` 5.59 per kilowatt hour (kWh) in Telangana under the JNNSM in August 2015. The project has a cost of over \$110 million (about ` 740 crore).

[The Economic Times](#), 2 May 2016, [The Economic Times](#), 3 May 2016, [The Economic Times](#), 6 May 2016 | [The Hindu Business Line](#), 6 May 2016, [The Hindu](#), 7 May 2016, [The Hindu](#), 12 May 2016 | [The Tribune](#), 19 May 2016 | [The Hindu](#), 21 May 2016 | [The Economic Times](#), 30 May 2016



**Wind energy picks up steam.** FY16 saw the highest wind energy installation in a year at 3,472 megawatt (Mw), up 50 per cent from the previous year. The last time the wind energy sector witnessed such frenzied activity was in FY12. Around 4,500 Mw is expected to be added in 2016-17 across the country, as the 'accelerated depreciation' (AD) is coming to an end in March 2017. AD is a tax benefit scheme that can be availed by anyone who sets up or invests in a wind farm irrespective of the power generated.

About 80 per cent of the project cost is paid back if the plant is commissioned before September 30 of the financial year concerned or 40 per cent of the cost if commissioned before March 31. The challenge continues to be the delay in payments, signing of power purchase agreements by state electricity boards. Mr D V Giri, secretary-general of [Indian Wind Turbine Manufacturers' Association](#) (IWTMA) said that wind installation hit a high of 3,197 Mw in FY12 as generation-based incentive and AD came to a close in March 2012. It dropped to 1,700.30 Mw in FY13 and thereafter started growing slowly.



(Source: *The Business Standard*, 6 May 2016)

**IWTMA installing devices which will reveal how much wind power is available every 15 minutes.**

Wind energy producers in India are stepping up efforts to provide buyers with a way to measure the quantity of power received in real time in an attempt to make the renewable source of energy more attractive and help utilities prepare despatch schedules. The [Indian Wind Turbine Manufacturers Association](#) is installing devices across 20 substations in Rajasthan, which will reveal how much wind power is available every 15 minutes, making the task of state load dispatch centres (SLDCs) easier. The association is putting up availability-based tariff (ABT) meters and remote terminal units (RTUs) at these substations.

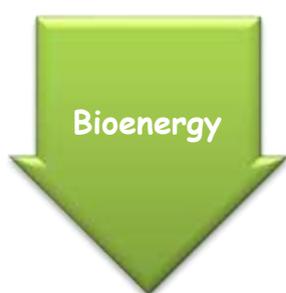
The step may help to ease the reluctance of power distribution companies to buy wind energy because of its unpredictable nature, which makes output a variable of wind speeds. Although developers provide SLDCs a daily estimate of power availability 24 hours in advance, limitations on

verifying the actual quantity received in real time created problems in scheduling dispatches. The 20 substations have a capacity of 3,144 MW of the total 4,006.85 MW installed in Rajasthan. The cost of putting up the meters and the monthly maintenance charges will be borne by the wind energy developers of the state.

**Wind energy developers must secure power grid connectivity.** The Renewable Energy Ministry's [draft guidelines](#) for the development of onshore wind power projects lays the onus of securing grid connectivity and transportation on the developers, which experts say could dampen investor interest in the sector. The draft guidelines lay down the rules for setting up onshore wind projects ranging from land use permissions to metering and real-time monitoring to eventual decommissioning. India's wind potential is pegged at 302 GW, according to Niti Aayog, with the sector expected to contribute 60 GW to the target of 175 GW of renewable energy by 2022. While the rules are comprehensive in their scope, experts argue that they could also be over-prescriptive. In some cases, the minutiae of the rules also render them redundant or too binding in the face of climatic factors that could affect the flow of wind.

**Higher wind generation powers electricity output.** The increase in wind power generation capacity by 3,000 MW over the last one year has helped raise electricity generation from renewable energy source to new highs in 2016-17. Data from the National Load Dispatch Centre show that on May 24, 2016 almost 21 per cent or 650 million units of the country's total electricity demand of 3,127 million units was met through wind and hydro energy. Between April – May 25, 2016, wind and hydro power plants generated 23,066 million units across the country while the nationwide electricity demand met was at 1,83,143 million units. Wind power capacity has increased to 26,866.66 MW as on April 30, compared with 23,444 MW last year. However, falling hydro power generation has meant that the share of wind and hydro in the country's total electricity mix has remained at 12.5 per cent between April-May 25, 2016. Data from the previous two years indicates that towards the last week of May, contribution of hydro power and wind power to the total electricity demand typically spikes to around 19-20 per cent.

[The Business Standard](#), 6 May 2016 | [The Economic Times](#), 11 May 2016 | [The Hindu](#), 13 May 2016 | [The Hindu Business Line](#), 27 May 2016



**Women using biomass fuels at higher risk of having cataract: Study.** Women in India who cook using fuels such as wood, crop residue and dried dung instead of cleaner fuels are more likely to have cataract, according to a [new study](#) published in the [Journal Environmental Health Perspectives](#). The study, the largest of its kind, was conducted by the [London School of Hygiene and Tropical Medicine](#), [Aravind Eye Hospital](#) and the [All India Institute for Medical Sciences](#).

The study, funded by the [Wellcome Trust](#), involved nearly 6,000 people aged 60 and above from randomly chosen villages and small towns in north and south India. Participants were interviewed on their use of cooking fuel and on a range of socio-economic and lifestyle factors. Then they underwent an eye examination. More than 40 per cent were found to have nuclear cataract.

It found that Indian women who cook with biomass fuels were nearly 50 per cent more likely to have nuclear cataract (clouding of the lens in the nucleus leading to visual impairment) than those who use clean fuels such as gas. The associations were not observed for men, probably because cooking was almost exclusively done by women.

**Researchers Engineer Bacteria to Streamline Biofuel Production Process.** Researchers, including an Indian American scientist from the Department of Energy's Berkeley lab, have engineered a strain of bacteria that enables a "one-pot" method for producing advanced biofuels from a slurry of pre-treated plant material. The Escherichia coli is able to tolerate the liquid salt used to break apart plant biomass into sugary polymers. Developing ionic-liquid-tolerant bacteria eliminates the need to wash away the residual ionic liquid.

The achievement is a critical step in making biofuels a viable competitor to fossil fuels, because it helps streamline the production process. Being able to put everything together at one point, walk away, come back and then get your fuel is a necessary step in moving forward with a biofuel economy," said principal investigator Ms Aindrila Mukhopadhyay, vice president of the fuels synthesis division at the [Joint BioEnergy Institute's Berkeley lab](#).

[The Indian Express](#), 22 April 2016 | [India West](#), 11 May 2016