

# Energy Access Monitor

May-June 2016

## Trending topics

### Rural Electrification



- 112 more villages electrified, total now 7,766
- 'Make in India', rural electrification to push up power demand: Piyush Goyal
- Government to spend 73cr for rural electrification
- Government decides to electrify 5.98 crore un-electrified households by December 2018
- Agreement on rural electrification signed
- Orissa biggest beneficiary under DDUGJY

### RE Technology for energy access



- India's 1st Solar Irrigators Cooperative in Gujarat
- IIT Delhi Team Create A Machine That Converts Waste Cooking Oil Into Biodiesel

### Cooking energy access



- Cooking with kerosene, dried dung ups cataract risk in women by 50%

### Financing energy access



- World Bank Approves \$625 Million to Support Grid Connected Rooftop Solar Program in India
- India-U.S. Partner to Mobilize a Billion Dollars for Clean Energy Access

### Women and energy access



- Tribal women turn entrepreneurs of green energy

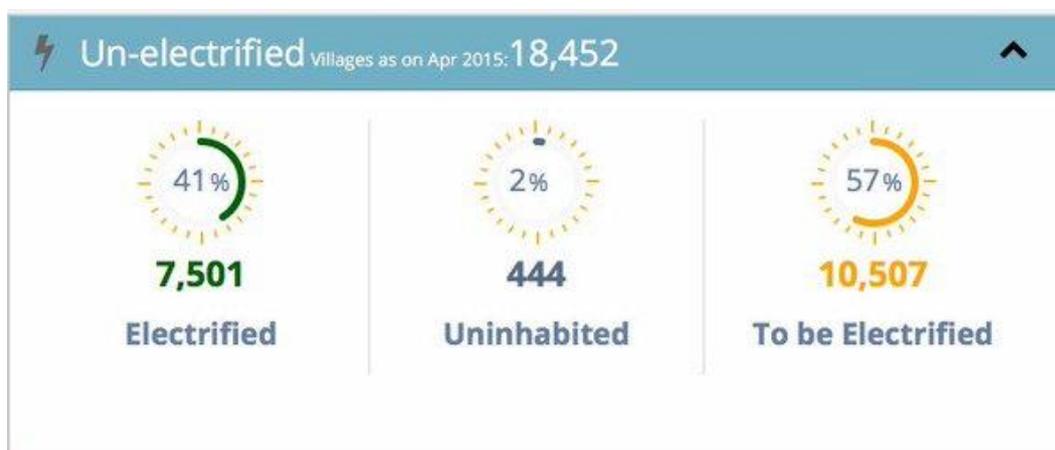


**112 more villages electrified, total now 7,766.** As many as 112 villages were electrified across the country last week, taking the total tally to 7,766, the government said today. “112 villages have been electrified across the country during last week (from 9th to 15th May 2016) under Deen Dayal Upadhyaya Gram Jyoti Yojna (DDUGJY),” the Power Ministry said in a statement.

Out of these electrified villages, two belong to Arunachal Pradesh, 42 in Assam, 24 in Jharkhand, 16 in Madhya Pradesh, 11 in Bihar, 6 in Chhattisgarh, 3 in Himachal Pradesh, 3 in Rajasthan, 2 in Odisha, 2 in Uttar Pradesh and 1 in Manipur.

Number of Villages Electrified during 9 <sup>th</sup> May 2016 to 15 <sup>th</sup> May 2016	
States	Number of Villages
Arunachal Pradesh	2
Assam	42
Jharkhand	24
Madhya Pradesh	16
Bihar	11
Chhattisgarh	6
Himachal Pradesh	3
Rajasthan	3
Odisha	2
Uttar Pradesh	2
Manipur	1
<b>Total</b>	<b>112</b>

**Data Source:** 112 more villages electrified, total now 7,766; The Indian Express, 16<sup>th</sup> May 2016



**Figure 1: Status of the electrified villages in India as on April 2016**

**Source:** [https://twitter.com/PiyushGoyal/status/726401648453541889/photo/1?ref\\_src=twsrc%5Etfw](https://twitter.com/PiyushGoyal/status/726401648453541889/photo/1?ref_src=twsrc%5Etfw)

In view of the Prime Minister Narendra Modi's address to the nation on the Independence Day, the government has decided to electrify the remaining 18,452 un-electrified villages within 1,000 days.

**‘Make in India’, rural electrification to push up power demand: Piyush Goyal.** Demand for electricity will increase manifold with implementation of central schemes like 'Make in India' and rural electrification, Power Minister Piyush Goyal said on Friday.

According to him, the power sector in India is focusing on environmental sustainability and NTPC has taken a lead by preserving the flora and fauna in and around its power stations and the government aims to increase use of clean technologies and renewable energy for power generation.

**Government to spend 73cr for rural electrification.** The Union government has sanctioned Rs 72.71 crore for electrification of all villages in Gautam Budh Nagar district. The work, to be implemented under Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY) and Integrated Power Development Scheme (IPDS), aims to provide electricity to all villages in the district by mid-2018. The government has sanctioned Rs. 47.71 crore for DDUGJY and Rs. 25.01 crore for IPDS programme.

On Saturday, MP Mahesh Sharma held a meeting with district magistrate N P Singh and elaborated the plans. According to Mr. Mahesh Sharma, the scheme focuses on feeder separation and strengthening of sub-transmission and distribution infrastructure including metering at all levels in rural

areas. "This will help in providing round-the-clock power to rural households and adequate power to agricultural consumers," he said. He also stated that the government will provide electricity connections to all the villages by mid-2018. "The houses under BPL categories will also be taken care of in this scheme. N P Singh, district magistrate, said that the electrification of the villages will immensely improve the living standards of people in those areas.

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- The scheme focuses on feeder separation and strengthening of sub-transmission and distribution infrastructure including metering at all levels in rural areas.
- The scheme will provide electrification to all villages, feeder separation to ensure sufficient power to farmers and regular supply to other consumers, improvement of sub-transmission and distribution network to improve the quality and reliability of the supply and metering to reduce the losses.

**Government decides to electrify 5.98 crore un-electrified households by December 2018.** India has scaled up its electrification drive to target every household and shed the tag of being a nation with surplus supply to distribution companies but having one-third of its population without access to energy. The government's shift of focus from village electrification to last mile connectivity will be helped by fiscal sops to states and launch of an interactive web platform that will connect consumers with the brass of distribution companies, officials said.

The government has decided to electrify 5.98 crore un-electrified households by December 2018 and has offered finance to states from Power Finance Corporation (PFC) and Rural Electrification Corporation (REC) on no profit, no loss basis. This is a shift from the present Rural Electrification

programme where a

village is declared electrified if 10% of households and all public places have electricity access. According to Mr. Dinesh Arora, executive director of REC, an interactive web application will be

- The target to electrify 18,452 villages, barring Maoist-infested areas and difficult terrains, has been advanced by at least five months to December 2016.
- The Centre will soon launch an extension of its existing dashboard and mobile app 'Garv' on rural electrification to provide real-time data on progress of all households.
- The GIS-enabled web application will have extensive information on infrastructure availability that can be later used to promote other government programmes including LPG distribution. It will help consumers interact with distribution companies for getting connections and for restoration of supply.

launched in July to track the progress of electrification of these six-crore households. And the Power, coal and renewable energy minister Piyush Goyal has announced that by December 2018 all Indian citizens will have access to electricity connections, while by March 2019, power will be available 24\*7 to all, ahead of the earlier target of March 2022.

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## Let There Be Light

**Govt's focus** on last mile connectivity will be helped by fiscal sops to states and launch of an interactive web platform that will connect consumers with the brass of discoms

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**Agreement on rural electrification signed.** A tripartite agreement was signed here on June 24 under the Government of India’s flagship scheme Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY), among the State government, the Assam Power Distribution Company Ltd (APDCL) and the Rural Electrification Corporation Ltd to boost the rural electrification infrastructure in Assam. The scheme will facilitate electrification of 1,423 un-electrified villages, intensive electrification of already electrified villages for connecting un-connected households, improvement of system infrastructure to cater to the demand of enhanced electrical load and system load and system metering to achieve 24x7 power supply in the State.

- ✓ The Government of India has sanctioned Rs 1,540.81 crore under the DDUGJY scheme for rural electrification works, for which the Rural Electrification Corporation Ltd is appointed as the nodal agency.
- ✓ The Indian Institute of Technology, Madras will electrify 305 un-electrified remote off-grid villages through their own invented 48 volts inverter-less solar DC system.

**Orissa biggest beneficiary under DDUGJY.** Orissa has become the largest beneficiary of getting assistance from the Centre under Deen Dayal Upadhyaya Gram Jyoti Yojna (DDUGJY) meant for electrification of rural areas in the country.

A state-wise data from the Ministry of Power suggests that out of the target list of 18,452 villages of 19 states where DDUGJY is being implemented, 3,474 villages are from Orissa – the highest among the beneficiary states. Similarly, Assam secures the second position with 2,892 of its villages to be electrified under DDUGJY. Likewise, Bihar is the third largest beneficiary with 2,747 of its villages being covered under DDUGJY, according to the data.

Officials associated with the project claimed that there are many areas which are yet uninhabited either due to difficult terrains or due to their inaccessibility where electricity facility could be a reality. “Out of the 3,474 un-electrified villages in Orissa, about 433 are uninhabited where electrification is not possible. But our team is toiling hard to provide electricity to the remaining 1,675 villages. Our team is now visiting many such un-electrified villages in the state to get them covered under the project”.

- ✓ According to a state-wise progress report uploaded on the government website, 1,366 villages of Orissa have been electrified under DDUGJY while work on many villages is underway. The department officials however claimed that in some areas the team has been facing hurdles due to lack of physical connectivity.
- ✓ The government of India has decided to electrify the remaining 18,452 villages by May 2018. The project has been taken up on a mission mode and strategy for electrification consists of squeezing the implementation schedule to 12 months and also dividing village electrification process in 12 stage milestones with defined timelines for monitoring.

RE Technology for  
 energy access

**India's 1st Solar Irrigators Cooperative in Gujarat.** The agricultural sector contributes to nearly 23% of India's electricity consumption. This power supplied to this sector is nearly free – again thanks to political pandering to garner agrarian vote banks. States like Gujarat have successfully separated rural feeders into agricultural feeders and household feeders. The household feeders largely have access to uninterrupted power throughout the day. The agricultural feeders receive power only during

specific times – mostly during the night when excess power is available. This creates a problem for farmers who have to stay awake to irrigate their fields. Most farmers circumvent this problem by leaving their pump sets switched on throughout the night. This method of flood irrigation is wasteful and is responsible for the rapid depletion of India's underground aquifers.



Figure 3: Solar Pumps

✓ Solar pumps are a boon to farmers, as they provide high-quality power that is available throughout the day. Solar pumps have been rapidly deployed in many states across India, such as Uttar Pradesh, Rajasthan, Gujarat, and Karnataka.

✓ As per official estimates from the Ministry of New and Renewable Energy (MNRE), India has installed over 23,000 pumps for irrigation as of April 30, 2016.

While solar pumps can bring significant benefits to the farmers, one major drawback is the impact of these pumps on the groundwater.

- ✓ Solar pumps provide farmers with free and unlimited access to energy during the daytime. This means that the farmers have no incentive to conserve ground water. One major change is the move towards water-intensive crops such as rice and sugarcane.
- ✓ Second, the informal, yet highly organized water-markets in rural areas thrive due to unlimited access to groundwater. Farmers with deep borewells extract and supply water to smaller farmers who cannot afford a borewell.
- ✓ The water is transported through extensive water pipelines laid down by the farmers themselves. It is an attractive business, with farmers charging nearly 100–200 rupees for an hour of water. Solar pumps help farmers exploit this market throughout the day.

So, to overcome the issue of groundwater exploitation, one possible solution is to connect the solar pumps to the grid. These systems function very similar to net-metered solar homes. Farmers now have a choice between using daytime solar energy to pump water or to use these systems to generate energy and sell it to the grid. Farmers are remunerated for every unit of power that is recorded by meters and sold to the local distribution utility. This choice that farmers have to make will depend on several factors:

- The power purchase price for solar energy.
- The demand (and price) for water from the informal water distribution network.
- The cropping patterns and irrigation need for the crops.

The premise is that if the power purchase price for solar energy is high enough, then farmers will make adequate money that in turn will prevent them from exploiting ground water.



**Figure 4: Dhundi Village – The World’s First Cooperative Solar Enterprise**

So, to test this hypothesis a village of Gujarat was selected. The village is called Dhundi in Central Gujarat, India. The village did not have access to the agricultural grid. This meant that the farmers here used expensive, noisy, and polluting diesel pumps to pump water out of the ground to irrigate their crops. Diesel pumps were replaced with grid connected solar pumps, installed meters to record the energy, entered into an agreement with the local distribution utility (MGVCL) to buy back any excess power at the rate of INR 4.63/kWh. Six farmers opted into the scheme – three farmers with 5 HP pumps sets and three farmers with 7.5 HP pump sets. The farmers paid roughly 20% of the price of the pump, while the remaining capital came from the research grant.

While states like Karnataka have announced similar, the difference in our pilot project is that we brought together farmers in the form of a cooperative. Farmers now pool their excess power and sell this to the utility, instead of each farmer having an independent agreement with the discom. This helps in two ways:

- The discom has lesser transactional costs and overheads in managing and recording each agreement with every farmer.
- A community-based approach reduces the chance of any one farmer stealing power from his neighbor’s grid. Cooperatives are self-regulatory in nature.

The pilot at Dhundi, Gujarat, presents a feasible solution to reduce the agricultural electricity consumption from the grid, thus eliminating power subsidies that are inherent to India’s power sectors. Every unit of electricity that is evacuated onto the grid will mean that groundwater remains under the ground. The key challenge would be to arrive at the right number for the buyback of power – a number that is acceptable to both the farmer and the utility. In a scenario of rapidly falling solar

tariffs, this is indeed a challenge. Nevertheless, Dhundi demonstrates that small yet simple solutions can go a long way in solving India's power and water problems.

**IIT Delhi Team Create A Machine That Converts Waste Cooking Oil Into Biodiesel.** Three IIT students



have developed a prototype device that can convert waste cooking oil from our kitchens into biodiesel, which can power engines. The washing machine sized device is designed to be eco-friendly and affordable, and can be set up in an hour, in rural agricultural settings oil seeds can be the input for abundant access to diesel.

India generates the highest amount of waste cooking oil and due to this reason they decided to create a technology that could actually compensate for more than 30% of the country's energy deficit.

✓ Testing has confirmed that the device can be used for big hotels, which generate a substantial amount of waste cooking oil as by-product.

**Figure 5: Machine made by IIT students that converts Waste cooking oil to Bio-fuels**

[Clean Technica](#), 9 June 2016 | [India Times News](#), 15 June 2016



**Cooking with kerosene, dried dung ups cataract risk in women by 50%.**

Women in India who cook using fuels such as wood, crop residues, kerosene and dried dung are nearly 50% more likely to have cataracts than those who use clean fuels such as gas, new research warns. The study, believed to be the largest such, was conducted by the All India Institute for Medical Sciences (AIIMS), Aravind Eye Hospitals and London School of Hygiene & Tropical Medicine.

- ✓ The population-based study involved nearly 6,000 people aged 60 and over from randomly chosen rural villages and small towns in India.
- ✓ Participants were interviewed at home on their use of cooking fuel over their adult life, and on a range of socioeconomic and lifestyle factors.
- ✓ After taking into account other risk factors including indicators of poor nutrition, sun exposure, smoking and chewing tobacco, the researchers found that women who cooked with biomass fuels were 46% more likely to have nuclear cataracts compared to those who used gas.
- ✓ Furthermore, the researchers found that cataracts were more likely with increasing length of time the women had used biomass fuels - from 50% more likely for 20 years use rising to 90% after 30 years.

Biomass cooking fuels are particularly common in India, especially in poorer communities, as they are generally cheap and easily accessible. Recent estimates suggest that 83% of rural households and 19% of urban households in India use them. However, they are typically burnt in open stoves exposing households to high levels of health damaging pollutants including small respirable particulates. It is thought these may impair the eye's defence system, accelerating the clouding of the lens leading to cataract.

Business Standard, 26 May 2016



**World Bank Approves \$625 Million to Support Grid Connected Rooftop Solar Program in India.**

The World Bank Board has approved a \$625 million loan to support the Government of India's program to generate electricity from widespread installation of rooftop solar photo-voltaic (PV). The Board also approved a co-financing loan of \$120 million on concessional terms and a \$5 million grant from Climate Investment Fund's (CIF) Clean Technology Fund. The project will finance the installation of at least 400 MW of Grid Connected Rooftop Solar Photovoltaic (GRPV)

across India. These solar PV installations will provide clean, renewable energy, and reduce greenhouse gas emissions by displacing thermal generation. The project will also strengthen the capacity of key institutions, and support the development of the overall solar PV market.

- ✓ The project will be implemented by the State Bank of India (SBI). SBI will on-lend funds to solar PV developers/aggregators and end-users, who wish to invest in mainly commercial and industrial rooftop PV systems.
- ✓ Financing will be provided to those with sound technical capacity, relevant experience, and creditworthiness as per SBI standards.

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India is one of the lowest per capita consumers of electricity in the world. Over 200 million people remain unconnected to the electricity grid, and those who are, continue to face frequent disruptions. Power shortages also affect industrial output with many industries and manufacturers relying on expensive and polluting diesel-based back-up power supplies.

Despite energy shortages, and the high cost of backup supply, rooftop solar PV systems have not yet become widespread in India. This is primarily due to the lack of adequate financing, unfamiliar technology and low consumer awareness. Until now, those that wanted to install solar rooftop PV systems had to pay the full cost up-front. The total capacity of rooftop solar, therefore, remains low.

This IBRD-CIF loan has been designed to tackle a number of these barriers, develop the market for rooftop solar PV systems, and ensure that their use becomes much more widespread.

- ✓ Aided by government policy and declining costs, rooftop solar has the potential to transform the energy sector. The overall potential demand for rooftop solar is estimated at about 124,000 MW.
- ✓ The IBRD-CIF loan will support a number of solar PV business models, to expand the reach of rooftop PV systems to a variety of customer groups. Some customers can afford to develop and own their rooftop systems, whereas others prefer the pay-to-use model, without outright ownership.

The loan, from the International Bank for Reconstruction and Development (IBRD), has a 19.5 year grace period, and a maturity of 20 years. Loan from CIF's Clean Technology Fund, has a 10 year grace period, and a maturity of 40 years.

**India-U.S. Partner to Mobilize a Billion Dollars for Clean Energy Access.** President Obama and Prime Minister Modi announced new initiatives that can catalyze investment in the renewable energy space and potentially have a transformative impact on the lives of hundreds of millions of people, living in energy poverty, in India and across the world. The [joint statement](#) by the two leaders, signaled serious intent to bring modern energy to people living far from the electric grid by launching two initiatives aimed to spur investment in clean energy organizations that often have the drive and the technology, but struggle to raise equity capital. Launched as a part of the International Solar Alliance (ISA), which the US intends pursuing membership to, the two countries will equally support establishing the following facilities:

- A \$20-million U.S.-India Clean Energy Finance (USICEF) initiative, which will help mobilize up to \$400 million to provide clean and renewable electricity to up to 1 million households by 2020. The USICEF seeks to provide funding for early stage projects helping entrepreneurs develop their project ideas into bankable proposals. This can potentially include funding for technology assessment, environment impact studies and project design.
- The U.S.-India Catalytic Solar Finance Program: which will set up a \$40-million fund provide financing for small-scale renewable energy investment, "particularly in poorer, rural villages that are not connected to the grid." This program aims to make equity investment in clean energy organizations and thus help bring more US and Indian private investors on board.



**Tribal women turn entrepreneurs of green energy.** Their skills and efficiency can amuse anybody. One may be surprised to see how tactfully these 'lady engineers' check the circuit of a voltmeter or their cautious handling of soldering machines to fix LED bulbs to solar panels. It is even surprising when one comes to know that these women have never read science and a majority of them have not even seen schools all their lives.

The task of solar lamp making has transformed these tribal uneducated women into engineers and they are determined to manufacture 60,000 lamps within three months. This army of over 200 women of different self-help groups (SHGs) in four clusters of Dungarpur are working under the Rajasthan Gramin Aajeevika Vikas Parishad (Rajeevika). Rajeevika has entered into an MoU with IIT-Mumbai for making solar lanterns. Experts from the IIT imparted technical training to 80 women from Punali, Jhonthari, Biladi and Aantri who in turn are training their peers to make solar lamps at their respective clusters



**Figure 6: Women making solar lamps in  
Dungarpur district**

[The Times of India](#), 6 June 2016