Achiever:
Shyam Patra helps in lighting villages
Pg 42

ENERGY EFFICIENCY
in electronics and mobility Pg 33

Interview:
SR Mohanty on MP's RE growth
Pg 49

₹100 $5 €3

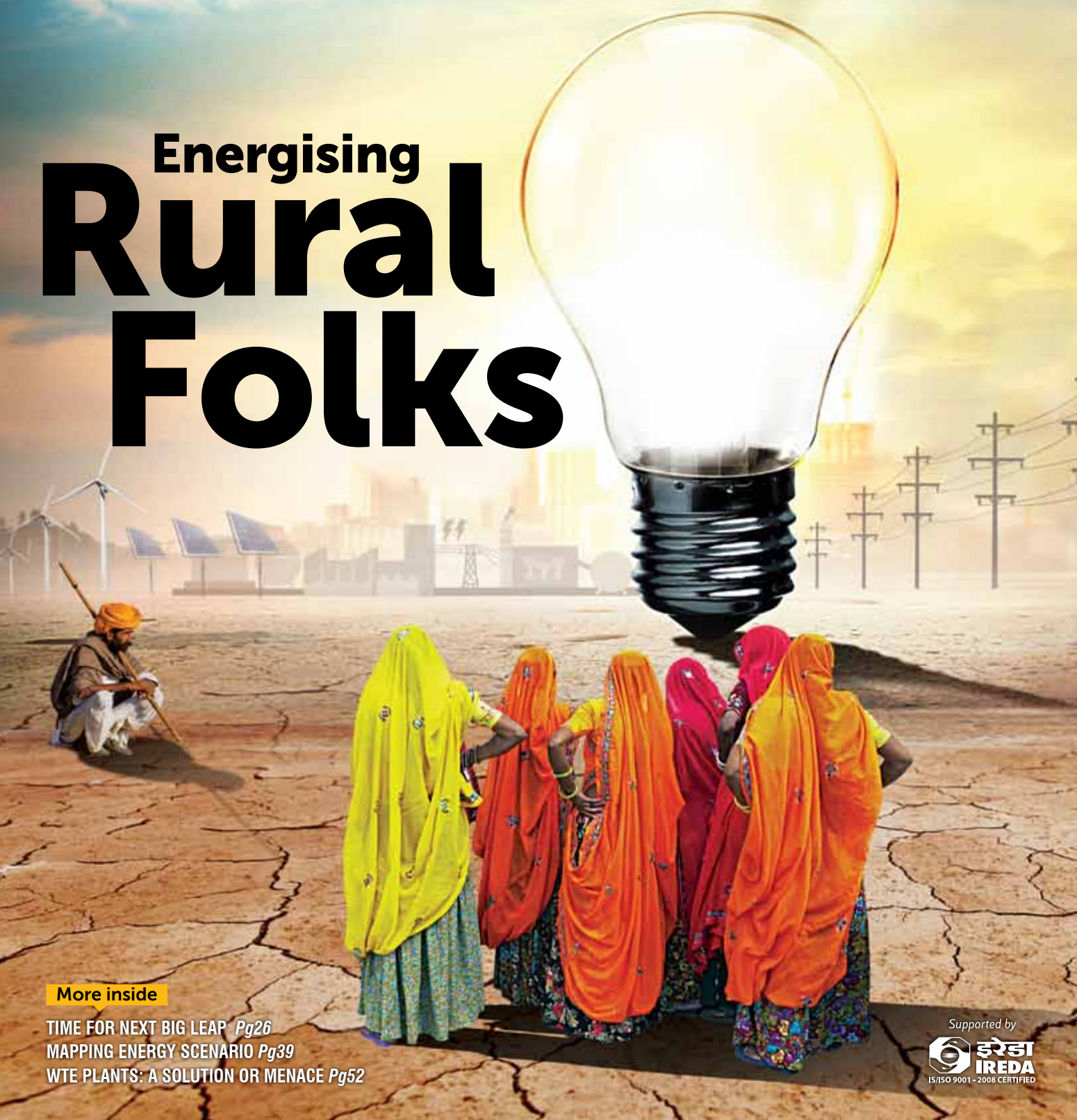
www.energynext.in

Energy Next

Volume 4 Issue 6 April 2014 Hyderabad

Your guide to Renewable Energy

Energising Rural Folks



More inside

Supported by
इरेडा IREDA
IS/ISO 9001 - 2008 CERTIFIED

IN THIS ISSUE

VOLUME 4 | ISSUE 6 | APRIL 2014
www.energynext.in

On road to Recovery

While it is hailed as one of the fastest growing economies in the world, India still continues to struggle on the energy front. People living in the countryside are still starved for adequate power. Unstable and erratic power network in villages and long hours of power outages have forced the government to initiate steps for rural electrification based on distributed generation technology. The objective is to increase energy access and energy security of rural population.

The government has drafted an action plan for effective network infrastructure for the generation and transmission of power to the rural households. So far, the attempt has achieved 50 percent of the target.

By 2022, the Ministry of New and Renewable Energy (MNRE) proposes to cover about 10,000 villages with biomass-based systems and thousands of other villages across the country with solar power. However, substantial funds would be required to meet the initial capital cost. This is apart from the target of coverage of 20 million households to be covered with solar lights.

The Jawaharlal Nehru National Solar Mission (JNNSM), which was launched in 2010, had not only brought about a solar revolution in the country, it had also put India on the global solar map. The credit for the successful completion of the first phase of the Mission can be attributed to investor-friendly policies of the government and active private sector participation.

Despite the slight delay in the second phase, the response by the private players is definitely a good sign for the Indian solar industry. In all likelihood the efforts of the government, financial institutions, project developers and other stake holders will help in realising the goals set under the Mission.

With the Government also focusing on ICT (Information and Communications Technology) as the backbone for rural development, scientists have designed and developed a Solar PV-AC mains hybrid DDG solution for rural applications. This technology is aimed at ensuring 4 to 5 hours of reliable power supply to rural ICT-based service centres.

The Centre is also promoting the concept of solar technology platform and solar mini utility with a view to provide reliable and quality energy services for different rural applications (such as lantern and battery charging, ICT enabled services, water purification, health services and more).

The nineties was known for bringing about telecom revolution in India. In wake of the high cost and fast depleting conventional sources of energy, this decade belongs to the renewable. A comparison with Chinese experience will throw up a lot of learning for India, as the former has boosted the rate of electrification in the last six decades to over 90 per cent, with rural areas achieving 99 per cent electrification. China has given importance to local participation and strengthening of institutional framework for successful rural electrification.

In the developed world reliance on renewables is increasing day by day. In Germany and Italy, solar PV for self-consumption showcases a viable, cost-effective, and sustainable power generation alternative.

Japan too is striving hard to generate more power from the renewables post Fukushima nuclear power plant disaster in 2011 and is looking forward to increasing its share in the country's electricity mix to 20 per cent by 2030.

Despite the global economic slowdown, the renewable energy sector seems to be getting back on track, as a number of recent studies and surveys have pointed towards modest to robust growth especially in the solar energy segment.

In India too, the renewable energy sector is treading on the path of recovery. Availability of low cost funds from the National Clean Energy Funds to reduce the capital cost of renewable energy projects is likely to provide substantial impetus to investment and growth of the renewable energy sector in the country.

KS Popli
Chairman & Managing Director, IREDA

Wind Mission instils confidence

The proposal to execute the national Wind Energy Mission will surely give much needed impetus to the wind sector. It is heartening to see that the cumulative installed capacity of the wind power industry had crossed 20,000 MW. The initiative taken by the MNRE to implement the wind mission in the coming months indicates the seriousness on the part of the government to develop the sector in wake of the depletion of the conventional sources of energy and the rising price of petrol.

●● ***Anchal Khandelwal,*** *New Delhi*

CEO Roundtable – commendable event

After going through the stories and the photo feature of the round table conference organised by ***Energy Next***, I could figure that it brought to the fore the problems faced by the developers before the policy makers. The issue of tariff needs to be addressed at the earliest so that the small hydro-power projects can get the much needed kick-start.

●● ***Shruti Joshi,*** *Haldwani*

Energy Efficient products are important

The star labelling story is extremely informative as it helps one to know the importance of buying star labelled products. It is interesting to know that a little higher investment in the initial stage truly yields good results in the future as it helps to save not only power but also reduces the electricity bill.

●● ***Deepshikha,*** *Bangalore*

EN to go a long way

I am a regular reader of ***Energy Next*** and it is good to see that it carries stories on the young guns who are striving hard to provide power in the rural areas through the renewables. More so, it is good to know that these young entrepreneurs do not give up easily when the chips are down.

●● ***Manisha Prasad,*** *Kolkata*

MNRE Sector taking new strides

It is good to see that more and more countries are collaborating with India in the renewable energy sector. The collaboration with Argentina, and the signing of the memorandum of understanding with Netherlands, as well as the workshop with Portugal showcases that the nations are understanding the importance of renewables in wake of the gradual depletion of the conventional sources of energy.

●● ***Pankaj Chowdhary,*** *Patna*

Feedback: Please send your feedback and comments to
editor@energynext.in

Energy Next
Enabling Investment Environment

Editor-in-Chief	K S Popli
Publications Director	R Ramprasad
Assistant Editor	Upendra Singh
Assistant Editor	Richa Kapoor
Head - Business & Events	Anupam Daftuar
Design	Flying Tusker Media
Marketing Manager	Abhinav Dutta
Manager - Research	Anup Kumar

For the latest Renewable Energy news. log on to ***www.energynext.in***

Energy Next is printed by R Ramprasad and published by R Ramprasad on behalf of Focal Point Media Services Pvt Ltd #407, Fifth Floor, Pavani Plaza, Khairatabad, Hyderabad - 500 004 AP, India. Focal Point Media Services Pvt. Ltd. is a joint venture of Gateway Media Pvt. Ltd, and Invision Communications & Research Pvt. Ltd, and printed at M/s. Kala Jyothi Process Pvt. Ltd. 1-1-60/5, RTC Cross Roads, Musheerabad Hyderabad - 500 020, and Published at Focal Point Media Services Pvt. Ltd. #407, Fifth Floor Pavani Plaza Khairatabad, Hyderabad - 500 004 AP. India. Tel: +91 40 233 000 61, 233 006 26 Fax: +91 40 233 006 65

Editor-in-Chief: K S Popli
Subscribe: Phone: +91 11 2642 4071/72
e-mail : subscribe@energynext.in
Write to: Focal Point Media Services Pvt. Ltd. #409, Mansarovar Building, 90 Nehru Place, New Delhi-110 019, INDIA
Phone: +91 11-26424071/73
Fax : + 91 11-46507580

Supported by
IREDA
IS/ISO 9001 - 2008 CERTIFIED

Energiser

The Indian government is planning to launch a separate scheme to help public sector undertakings (PSUs) to invest in renewable energy projects. Many PSUs have expressed their interests for investing in larger RE projects

Upendra Tripathy is new MNRE secretary

Dr Upendra Tripathy, a 1980 batch IAS officer from the Karnataka cadre, has been appointed as the new Secretary for the Ministry of New and Renewable Energy (MNRE). He has taken over the reins from the outgoing secretary, Dr Satish Balram Agnihotri, currently appointed as the secretary, Coordination, Government of India.

An alumnus of Jawaharlal Nehru University, Delhi and Carleton University, Ottawa, Canada, Dr Tripathy has a rich history of administrative experience spanning over three decades working with state and union governments.

He has been conferred with several awards during his illustrative career – including the coveted Prime Minister's Award for the year 2007-08 for Excellence in Public Administration for his work in Bangalore Metropolitan Transport Corporation on Financial Sustainability.

Environmental Policy Formulation and Project Implementation are Dr Tripathy's areas of expertise. The renewable energy industry has great expectations from him, and is looking forward for him to take the sector to new heights.

CERC withdraws wind forecast directive

The directive asking the wind farms to predict output or be penalised has been temporarily withdrawn by the Central Electricity Regulatory Commission (CERC). Last year the CERC had said that it would take action against the wind farms if they failed to predict their day-ahead generation within a 30 percent band. The decision was taken by the regulators as it was considered the most appropriate way to ensure stability of the grid, after more than half the nation plunged into darkness in 2012.

The industry players provided their feedbacks to the CERC making it known that the directive was not in the interest of the project developers, as the fines would eradicate the profits in an industry which has drawn about $10 billion in investment since 2011.

Sunil Jain, the president of the Wind Independent Power Producers Association informed that the wind industry has urged the regulator to change the rules so that a centralized, state-level load dispatcher can compile more accurate, region-wide predictions.

According to sources, not a single project has been able to produce data within the margins. On receiving feedback from the industry, CERC has taken the decision to review the mechanism and suspended the commercial portion.

Moniz bats for off-grid energy access

Clean energy is an essential pillar of the Indo-US relationship and there is a need for promoting off-grid energy access for betterment of rural India, according to Dr Ernest Moniz- the Energy Secretary of US. He said this at a round-table held in New Delhi during his recent visit to India.

Speaking at the round-table- 'Scaling Decentralised Clean Energy in India'- hosted by Council on Energy, Environment and Water (CEEW), Dr Moniz said, "Clean energy is an essential pillar of the US-India relationship. In September 2013, we launched a new program in our clean energy partnership, PEACE, with the transformational goal of off grid energy access to drive economic growth and improve lives across rural India."

The event highlighted the energy situation in rural India, where still around 45 per cent of rural households do not have access to electricity and less than a third have access to clean cooking fuels.

The dialogue with Dr Moniz included practitioners in the decentralised energy sector, financiers and government officials. It focused on potential areas of joint cooperation, such as technology, reducing information barriers and increasing access to finance.

RE firms await Govt subsidy

The renewable energy project developers in India are looking towards the Ministry of New and Renewable energy (MNRE) for disbursement of subsidies that are due for some time.

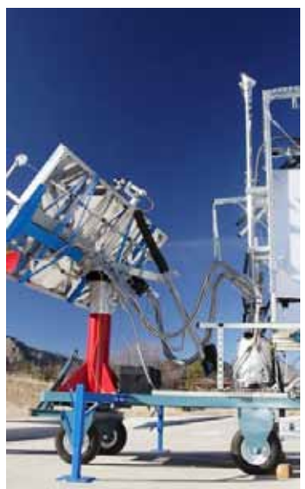
The MNRE has been unable to pay the subsidies amounting to ₹ 1,000 crore in wake of reduced budgetary allocations. The solar and wind project developers who had launched projects in anticipation of subsidies from the government are now finding it tough to make their projects viable.

The government offers generation based incentives (GBI) to wind power projects and small solar projects of 100 kW to 2 MW in order to make them viable and competitive with the conventional power. The wind power developers received the last disbursement of incentives in August 2013 for the period April-September 2012, and the total backlog has reached around ₹ 600 crore. In case of solar projects, the pending amount is close to ₹ 550 crore.

According to Tarun Kapoor, joint secretary at the MNRE, the delay in disbursement of incentives is due to speedy growth of the renewable market, and with limited resources it is becoming difficult for the ministry to meet the targets.

Solar powered toilet unveiled

In order to provide safe and sustainable sanitation, a waterless toilet powered by solar energy has been unveiled in India. The toilet has been designed and built by using monetary aid worth $ 7, 700 from the Bill & Melinda Gates Foundation.



The innovative technology used in the making of this toilet will help convert human waste to biochar, which is a highly porous charcoal. The toilet has the potential to heat the human waste to a high enough temperature, sterilising it and creating a highly porous charcoal.

The project, which was part of the Gates Foundation's 'Reinvent the Toilet Challenge,' is aimed at the development of the next-generation toilet, which can be used to disinfect liquid and solid waste and at the same time generate useful end products.

The unit has been designed for use by four to six people a day, and the work is on for developing larger versions to meet the requirements of several households. It is illuminated by concentrated sunlight and heated to temperatures between 200°C and 600°C.

NALCO office to go solar

नालको NALCO
National Aluminium Company Limited

The state-run National Aluminum Company Limited (NALCO) is planning to set up a solar power plant at its corporate office in Bhubaneswar as part of its green initiative.

The electricity generated at the solar photovoltaic (PV) power plant with a capacity of 160 kW will be utilised to meet the power requirements of the building and help in bringing down the power bills.

Launched by its CMD, Ansuman Das, the plant will generate about 2.10 lakh units per annum of clean energy. The power plant will be entitled for 30 per cent subsidy of the capital cost through the Solar Energy Corporation of India Ltd (SECI).

This is not the first initiative by NALCO in the renewable energy space, as the Navratna company already has two wind farms to its credit. The first wind farm of 50.4 MW capacity was commissioned at Gandikota in Andhra Pradesh while the other wind farm of 47.6 MW capacity is at Ludarva in Rajasthan.

Energiser

IIT-Kanpur is planning to install 1,7500 kW capacity of solar rooftop plant in its campus. In the first phase it will build 350 kW capacity while the remaining capacity will come up in the second phase

Energiser

Surat, popularly known as the diamond city, is all set to become one of the first solar cities in the country, as it will start generation of at least 3.35 lakh units of solar power per annum from April 2014

GIS tool to map rooftop solar

The first-ever cloud based open-source Web-GIS Tool for estimating rooftop solar power potential for Indian solar cities was recently launched at an event in New Delhi by The Energy and Resources Institute (TERI).

The primary objective of this initiative is to accurately map the rooftop solar power potential of Indian cities that could be developed into solar cities. Chandigarh will be the first city in the country where the tool will be launched, followed by similar tools for other cities.

This initiative is being supported by Shakti Sustainable Energy Foundation, with strategic support from Chandigarh Renewable Energy Science and Technology Promotion Society (CREST), Ministry of New and Renewable Energy (MNRE), Solar Energy Corporation of India (SECI), and the Confederation of Indian Industry (CII).

At the time of the launch of the tool, Shivraj V Patil, Governor of Punjab & Administrator, UT Chandigarh, said that solar energy was revolutionizing the world. He urged that the private sector should take a leaf from solar initiatives in China, Europe and Japan and invest in solar devices.

World's largest linear Fresnel CSP plant

India will soon see the commissioning world's largest linear Fresnel concentrated solar power (CSP) plant, which is among the cheapest internationally. With locally manufactured components making up 61-71 per cent of the plant, this technology could help in meeting another of the Indian government's goals- creating a CSP industry.

According to Climate Policy Initiative's new case study – 'The Role of Public Finance in CSP: Rajasthan Sun Technique- there is need for policy adjustment to replicate such kinds of technologies on large scale in order to deliver wider goals.

The 100-MW Rajasthan Sun Technique CSP plant will soon be commissioned, developed by Reliance Power. CPI's case study finds that while the plant looks set to deliver some of the cheapest CSP power worldwide, India's CSP policy as a whole has fallen short of its goals.

Tendered under phase I of Jawaharlal National Solar Mission (JNNSM), this CSP plant costs 43 per cent less than other linear Fresnel plants and up to 67 per cent less than other large CSP plants worldwide. These investment costs translated into an electricity price of ₹ 11.97 /kWh, which is around 22 per cent lower than the government's CSP reference tariff set before the bidding.

Bombay House gets green certificate

Bombay House, the headquarters of the Tata group, has become the first heritage site in India to be awarded the prestigious IGBC Green Existing Building GOLD rating by the Indian Green Building Council (IGBC).Built in 1923 in Mumbai, the Bombay House has been honoured for executing measurable strategies and solutions in five categories, namely site and facility management, energy efficiency, water efficiency, health and comfort, and innovation.

The building is following several sustainability benchmarks,

which include a green policy for all future building retrofits and renovation, energy saving of at least 20 per cent, water saving of over 50 per cent, installation of energy efficient chillers and cooling towers for air conditioning, installation of CO2 sensors to regulate air quality inside the building, fitting of LED lights, smart metering, etc.

Bombay House is also promoting the use of renewable energy by purchasing the renewable energy certificates (REC). It has purchased RECs which account for more than 75 per cent of the total power consumption in a year.

India to add 1GW solar capacity in 2014

The solar power installations in India will be around 1,000 MW in 2014 which is similar to what was installed in 2013, says a new analysis by Mercom Capital Group.

Mercom says that the slow pace of installation in the year could be attributed to the economic slowdown in the country and delay in allocation of projects for Phase-II of Jawaharlal Nahru National Mission (JNNSM).

It also talks about various state policies and non compliance of renewable purchase obligation (RPO) as other factors for the sluggish capacity addition. The trade dispute between India and the US on domestic content requirement clause is another thaw that has led to the slowdown of solar project development in the country.

In 2012, the solar installations in the country were 986 MW which marginally rose to 1004 MW in 2013, and the scenario is not going to change much this year as well. Now, since national elections are under way, India's solar market will continue to witness slowdown in large-scale solar project installations.

MPs demand more budget for RE

Despite positive provisions for solar energy development in the interim budget for the year 2014-15, the Climate Parliament, a cross party network of MPs working to promote renewable energy in India, feels that overall renewable energy promotion in the country is not impressive.

The group states that the interim budget has allocated a much lower Gross Budgetary Support (GBS) to the Ministry of New and Renewable Energy (MNRE) as compared to the previous year's budget estimates. This year, it received an allocation of only ₹ 441 crore which is substantially less than last year's ₹ 1521 crore. However, irrespective of the high allocation in the budget, last year the MNRE in actual just received around ₹ 426.5 crore as GBS.

Climate Parliament has been asking the government to implement the recommendation of the 'Thirteenth Report of Committee on Estimates (Fifteenth Lok Sabha) on the subject 'Power Generation – Demand and Supply' pertaining to the Ministries of Power; Coal and New & Renewable Energy.' The report recommended that the budget of the MNRE needs to be increased to at least 1 per cent of the Union Budget.

Financing policies need change: Study

India needs to make certain changes in its policies to achieve the target of 55,000 MW of renewable energy capacity by 2017, according to a joint study by Climate Policy Initiative and Indian School of Business.

The study, titled- 'Solving India's Renewable Energy Financing Challenge: Which Federal Policies can be Most Effective'- states that the existing policies are not as cost-effective as they ought to be, and accordingly there has to be some reassessment.

The study stresses that long-term, debt-related policies are more cost-effective than the existing policies. A loan at 5.9 per cent interest with a tenor extension of 10 years for wind energy projects can help in cutting down the total government subsidies by up to 78 per cent.

On the other hand, subsidies for solar energy projects, which are more capital-intensive, can also be cut by 28 per cent by reducing debt cost to 1.2 per cent and extending the loan tenor by 10 years.

The high interest rates, short tenor and variable rate of interest lead to escalation in the cost of renewable power by 24-32 per cent in India compared to similar projects in the US.

Energiser

A group of third-year mechanical engineering students from Don Bosco Institute of Technology, Kurla have made a single-seater solar-powered vehicle- Trike- that runs at a speed of 40 km per hour and covers 50 km in a single charge

Energiser

The Kerala State Electricity Board is planning to set up wind turbines on its vacant lands in Kanjikode, Madakkathara, Pothencode and Idukki to generate 106 MW of electricity in three years

J&K to set up 7.5 GW of solar projects

The Jammu & Kashmir (J&K) government is planning to harness the huge solar power potential in the state and plans are afloat to set up solar projects worth 7,500 MW capacity.

Recently, the state government signed an agreement with the Ministry of New and Renewable Energy (MNRE) for setting up projects in the Ladakh and Kargil regions. These regions have very good solar radiation power potential for most part of the year. Plans are in the offing to develop 5,000 MW of solar projects in Ladakh and 2,500 MW worth capacity in Kargil.

MNRE minister, Dr Farooq Abdullah, said that the potential of solar power in Ladakh region is around 30,000 MW, and the MoU between MNRE and the state government was a positive step towards harnessing that huge potential. He informed that MNRE has initiated several other programmes to harness the renewable energy potential that is available in this northern state.

Currently, the state is among the laggards in harnessing renewable energy, except small hydro power. Against an installed capacity of over 2,200 MW of solar power capacity in the country, the contribution of J&K is just 308 kW.

Karnataka milk cooperatives to go solar

Solar power is turning out to be a boon for 522 milk cooperatives in Karnataka which are using solar power to run electronic weighing and testing machines.

The initiative undertaken by SELCO Foundation has helped the Karnataka Milk Federation (KMF), which is the country's second largest milk producer in reducing the power consumption, avoiding delay in the process of milk weighing and testing as well as its delivery to processing and pasteurization units.

The KMF has more than 12,900 Milk Producers' Cooperative Societies (MPCS) in the state, out of which 3,200 are Women Milk Producers' Cooperative Societies (WMCPS), mostly in the rural areas.

The solar panels are set up on the roofs of milk cooperative societies, while the batteries provide back up for at least four hours and are charged through these panels. The power generated from these batteries is used to illuminate two lights as well as to run electronic milk weighing and testing machines. The testing of the milk helps to measure fat as well as the water content.

Goa CM backs green buildings

To promote renewable energy and energy efficiency in Goa, the state government is initiating various schemes to encourage investment in the sector.

Recently, Manohar Parrikar, chief minister of the state announced that they would soon execute a scheme for providing financial benefits to those shifting towards green buildings. Speaking at a workshop on Demystifying green buildings & GRIHA (Green Rating for Integrated Habitat Assessment) for developers, the chief minister announced that the government would refund up to 25 per cent of Infrastructure Tax paid for buildings which are certified Green by The Energy and Resources Institute.

The workshop was organised to promote the concept of sustainable green buildings in Goa. This scheme will be made effective from September 2014, and is likely to trigger efficient construction in the state. ST Puttaraju, the chief town planner, Town & Country Planning Department, Goa informed that they would take all possible steps to ensure more green buildings in the state.

APGCL to build solar plant on 140-hectare land

The Assam Power Generation Corporation Limited (APGCL) plans to develop a grid-connected solar power plant on a 140-hectare site that it owns, and has released a request for qualification (RFQ).

The specified site can accommodate around 60 MW capacity of solar panels. However, the exact capacity can be calculated on the outcome of a detailed feasibility study. APGCL proposes to build three 20-MW power plants on the specified land area.

The criteria laid down for the prospective bidders are quite stringent, as the company doesn't want to compromise on the quality

of work for such an ambitious project. The successful bidder will be chosen on the basis of the lowest levellised tariff achieved over 25 years, the life of the project.

APGCL also proposes to form a joint venture company to build the project of such a magnitude, in which it will hold a share of 26 per cent and after 25 year the assets will be turned over to it.

Kerala schools to have bio-gas plants for mid-day meal

The schools in the south Indian state of Karnataka will serve mid-day meals cooked on cheap fuel generated by bio-gas plants. The state government has allocated Rs 5.55 crore for the installation of biogas plants in the schools that will not only ensure clean fuel but food self-sufficiency as well.

As per the order of the Agriculture Department, a total of 3,825 bio-gas plants will be installed in primary, upper primary, and high schools across the state, giving students a chance to access organically grown vegetables for mid-day meal.

This initiative follows an earlier order by the Agriculture Department in December 2013 which said that besides providing cheap and safe cooking gas for preparing mid-day meals, the project was also meant to provide effective bio-waste management and enriched organic manure for vegetable gardens in the schools.

A total of 625 units would be installed in primary schools, 1,200 in upper primary schools & 2,000 in high schools. In order to make this initiative a success, the experts and academics feel that there should be an unconditional societal involvement which ensures that this food security project doesn't lose focus.

Odisha plans for rooftop solar project

In line with Odisha Solar Policy 2013, the state is gearing up to install solar rooftop systems to generate 5 MW of power.

The Green Energy Development Company Ltd (Gedcol), the nodal agency of the state government to develop on grid solar power, has received positive feedbacks from various companies in response to the request for qualification (RFQ) tender floated by it. The last date for applying to the RFQ proposal is April 29.

The rooftop solar project is estimated to cost around ₹ 50 crore, where Gedcol will be providing the money from loan assistance financed by International Finance Corporation (IFC). Major companies like Tata Power and L&T have shown keen interest in developing solar rooftop projects in the state.

Initially, the rooftop solar systems will be installed on selected government buildings in the cities of Bhubaneswar and Cuttack to bring down their ever-increasing power bills. In the later phases, the projects would be expanded to other cities. With close to 300 sunny days every year, almost all the districts in Odisha receive good solar radiation to generate solar power.

Energiser

The Tamil Nadu rooftop solar plan has witnessed warm response from the residents as it has received around 1,050 applications for setting up rooftop systems in the first five months after announcement of the subsidy scheme

Energiser

Renewable energy in Scotland achieved record levels of generation meeting around 46 per cent of country's total energy needs. It produced more than 17,000 GW of energy in 2013 from renewables including wind and hydro

Global solar PV capacity to rise significantly

The global solar PV capacity is poised to witness a rapid growth with close to 300 GW of new capacity addition over the next five years, according to the latest edition of NPD Solarbuzz Marketbuzz.

The report forecasts around 100 GW of annual deployment in the year 2018. It says that this end-market growth will lead to significant increase in revenue of solar PV modules that may reach close to $50 billion in 2018.

The solar PV industry fared well in the last two years despite the market being severely hampered by overcapacity and declining operating margins. The industry registered a growth of 34 per cent over the last two-year period.

In 2013, the global solar PV market grew more than 37 per cent of end-market demand, and it is on its way towards attaining the milestone of installing a cumulative capacity of 500 GW in 2018. This spurt in PV installation will also have a positive impact on the revenue of equipment manufacturers, with more than $200 billion in the time period from 2014-18.

Vestas regains top spot

Vestas Wind Systems (Vestas), the Danish wind turbine manufacturer, regained its top position as world-leading wind turbine installer in 2013, replacing GE Power & Water from the top position, according to industry survey.

Vestas regained its top position following its high number of wind turbine installations in the US and other countries. The company came through troubled times by cutting a third of jobs, outsourcing production and entering a joint venture in offshore turbines.

On the other hand, GE not only lost its supreme position but it also slipped from the list of top five original equipment manufacturers (OEMs) in the year with an installation of just 980.2 MW. Enercon, the German manufacturer, made a gain of two places to be placed at second position.

Chinese manufacturer, Goldwind made significant advances reaching third position from seventh in 2012. Siemens slipped one step to fourth position following its decline in the US, UK and Romanian wind markets. Suzlon Group, entered the top wind turbine installers and ranked as the fifth largest OEM for 2013, advancing from its sixth position in 2012.

Japan to set renewable targets

Japan plans to take forward its renewable energy march and increase its share in the country's electricity mix to 20 per cent by 2030. The country is all set to fix its renewable energy targets in a basic energy framework that is being devised by the government.

According to reports, the energy plan envisions the generation of power from renewable energy sources such as hydro, solar, wind and geothermal of more than 13.5 per cent by the end of this decade and gradually increase it to 20 per cent by 2030.

Post Fukushima nuclear power plant disaster in 2011, the Japanese government embarked upon an aggressive plan to harness renewable energy potential, and the country has performed well over the last two years in solar and wind energy.

The closure of nuclear fleet in Japan led to increase in imports of fossil fuels like coal and gas, which triggered a shift in the government's approach towards renewable energy. The government came out with a renewable energy law in 2012 that provided conducive environment and generous subsidies for development of renewable energy projects.

RE fund for Sub-Saharan Africa

The African Development Bank (AfDB) and the African Biofuel and Renewable Energy Company (Lomé, Togo) have initiated a renewable energy fund to provide a much needed boost to the renewable energy projects in the Sub-Saharan Africa.

The African Renewable Energy Fund (AREF), which will be headquartered in Kenya's capital Nairobi, closed an initial investment of US$ 100 million. This fund will be used to support small- to medium-sized independent power producers (IPPs) in developing solar, wind, biomass, geothermal and waste gas projects in the region.

AREF will be managed by Berkeley Energy Africa Limited, which is a fund manager focused on developing and investing in renewable energy projects in emerging markets. The fund is targeting a final close of $ 200 million over the next 12 months.

The AREF will target IPPs developing renewable projects from 5 to 50 MW, with a commitment of $ 10–30 million per project. Further funding can be sourced from co-investors for larger projects.

Global CPV market to reach 1GW by 2020

The global concentrated photovoltaic (CPV) market is likely to take a significant leap in the next five years and the cumulative capacity may reach 1,043.96 MW by 2020 as compared to 357.9 MW in 2014.

According to a new report from research and consulting firm GlobalData, the CPV market is poised to undergo a major growth spurt in the coming years. It says that China and the US dominated the global CPV market in 2013, with their cumulative installed capacity reaching shares of 35.4 per cent and 33.3 per cent, respectively. Spain stood third after the US with 12.2 per cent.

The CPV market is at a nascent stage, and the companies that have been successful in operating CPV prototype systems in pilot sites are now progressing towards multi-MW CPV projects.

The report says that despite recent developments, the market growth forecast is conservative. From 2009, many small and large companies in the CPV industry , both small and large, eeither had to close down their businesses due to bankruptcy, or were acquired by other companies.

Solar reaches grid parity

Solar energy is fast approaching grid parity in various parts of the world, and it is almost on par with conventional energy in countries like Germany, Italy and Spain, according to an analysis by consulting firm Eclareon.

The analysis, carried out on behalf of an international group of sustainable energy interests, reveals that other countries could also attain grid parity in the near future. H, however, high installation cost is the major obstacle towards that objective.

The analysis talks about the growth of the solar energy and asserts that high cost of solar energy is the thing of the past, now and is competitive with conventional power. David Pérez, partner at Eclareon in charge of the study, states that in countries like Germany and Italy, solar PV for self-consumption represents a viable, cost-effective, and sustainable power generation alternative.

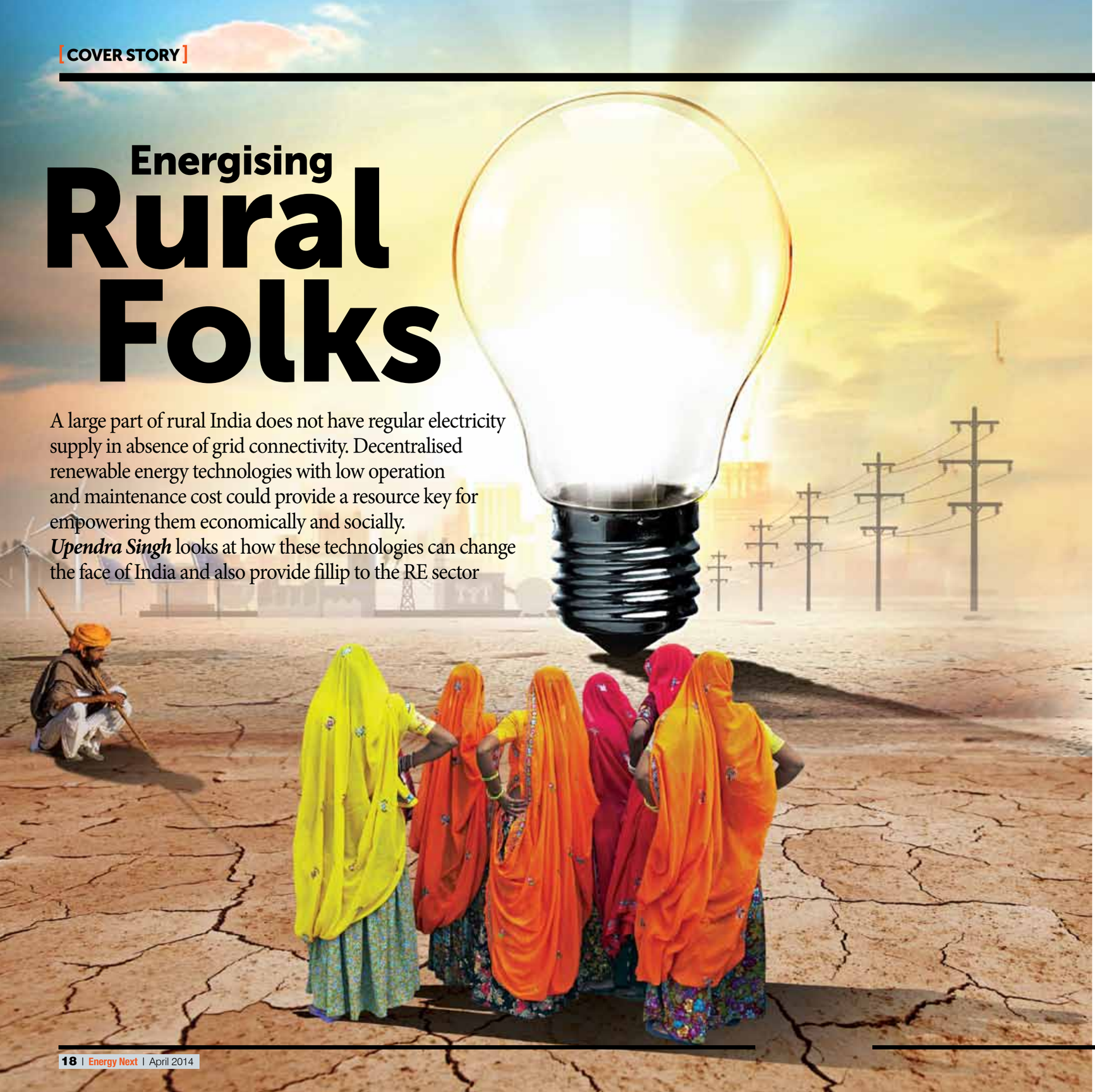
The analysis also points fingers at changes in policy and regulations, especially in case of Spain. It states that though Spain has performed well in solar energy, but the poor regulations may act as a barrier in the sector's progress.

Energiser

The global cumulative solar PV capacity will overtake wind energy by 2021, according to a new report by Clean Edge. The annual PV installations narrowly edged out wind capacity addition for the first time in 2013

Energising Rural Folks

A large part of rural India does not have regular electricity supply in absence of grid connectivity. Decentralised renewable energy technologies with low operation and maintenance cost could provide a resource key for empowering them economically and socially. ***Upendra Singh*** looks at how these technologies can change the face of India and also provide fillip to the RE sector



Energy lights up lives. But today, half of rural India is devoid of this vital resource. For them, even after 66 years of India's Independence, power remains a distant dream. They turn to the sun, and solar power, for an instant solution. And thankfully, the change is coming, though the pace remains slower than rural Indian would like.

Even today, highly polluting biomass sources are a major source of energy, especially for cooking in rural India. This results in women becoming the biggest sufferer; indoor pollution a leading cause of many illnesses they face. According to the Indian National Census (2001), more than 80 per cent of the rural population relies on solid fuels, which primarily include firewood and cow dung. An estimated 135,672 deaths each year occur in children below five years due to acute lower respiratory infection. Women exposed to indoor pollution suffer chronic obstructive pulmonary disease, and an estimated 35,000 die due to it.

In the recent past there has been a lot of talk on this issue. In 2002, during the Durban Summit on World Sustainable Development, energy access was termed as the most important component in achieving Millennium Development Goals (MDGs). The importance of energy in life could be understood by the fact that United Nations Secretary-General, Ban Ki-moon, declared the year 2012 as the 'International Year of Sustainable Energy for All.' Going a step ahead, the United Nations General has declared the years from 2014 to 2024 as the 'Decade of Sustainable Energy for All.'

According to International Energy Agency (IEA), more than 75 per cent of the population that is devoid of electricity resides in rural regions. For a country like India, where a majority of its population resides in rural areas, the agenda of rural electrification warrants a priority status. As per the census of 2011, more than 45 per cent of population in the rural areas lack basic access to electricity, and around 77 million households still use kerosene for lighting purposes.

Commenting on the precarious energy situation, Dr Arunabaha Ghosh, CEO, Council on Energy, Environment and Water (CEEW), states, "In rural India, even with rising incomes, up to 85 per cent of households are using traditional biomass as cooking fuel and almost half the population does not have access to electricity. Thus, even with the ability and willingness to pay for modern sources of energy, the supply is not available. Programmes to extend the grid are still short of targets and electrified villages, which do not mean all households, receive intermittent supply."

The absence of modern energy services acts as a barrier in achieving bare minimum living standards, which include gross deterioration in fruitful activities, health, education, income and employment opportunities in rural areas. "There are upward of 500 million people in the country who have never escaped poverty of energy supply. The growth of electricity has bypassed the poor so far," remarks K Subramanya, solar expert and former CEO of Tata BP Solar.

FEASIBLE ALTERNATIVE

The ever-increasing energy demand coupled with the failure of traditional delivery mechanisms is putting a lot of pressure on the policy makers to address the issue of energy poverty. Heavy reliance on kerosene for lighting, diesel for irrigation and cow dung and firewood for cooking are not only costly but also unhealthy for both environment and mankind. Amid depleting reserves of fossil fuel and issues of climate change, the rising demand for electricity and energy warrants an innovative approach that is not only affordable, but environment-friendly as well.

Renewable energy in its decentralised form could be the best alternative, and it is already playing a significant role in providing access to energy in some parts of rural India. "I personally believe that RE should be the cornerstone of India's policy to address the energy needs of the poor in rural India," notes Hari Natarajan, Senior Technical Expert, Renewable Energy Component, Indo German Energy Programme (IGEN-RE), GIZ. He goes on to say that the decentralised nature of

renewable sources of energy means that local communities have greater control of such sources and can make better choices on the utilization of the same.

Seconding Natarajan's opinion, Dr Akanksha Chaurey, CEO, IT Power Consulting Private Limited, states, "Renewable energy can be the provider of the first level of electricity services to rural folks having virtually no electricity access for their basic and other needs; it can also provide additional and more reliable electricity services to those that are poorly served by sources such as grid or diesel. The renewable energy sources can complement, supplement and in some cases, even replace conventional electricity supply systems in providing access to rural population in India.

India, with huge renewable energy potential spread across its length and breadth, is perfectly placed to take a quantum leap towards attaining the goal of providing energy to all in a sustainable manner. Dr Ghosh feels that the decentralised renewable energy can fill that energy gap if appropriate policies, investment and ecosystem support are in place.

The decentralised form of renewable energy is not only a feasible alternative for lighting, but it is of great use in agriculture, health, education, vocational activities and heating purposes as well. "Among all the forms of renewables, solar is perhaps the most appropriate form of renewable energy for providing electricity to off grid homes in rural India because it can be done at a very small and very large scale and because sunshine is available country wide," reasons Nikhil Jaisinghani, co-founder of Mera Gao Power that is involved in setting up of solar micro-grids in Rajasthan.

INITIATIVES

The Ministry of Power launched an ambitious programme, Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY), in 2005 for electrifying over one lakh un-electrified villages. This government initiative aimed at attaining national common minimum programme to provide energy access to all in five years. This programme was later brought under the ambit of Bharat Nirman. Despite all the efforts and planning, though, it couldn't address the objective in totality. "Bharat Nirman has miserably failed and woefully missed targets," says Subramanya.

Similarly, the Ministry of New and Renewable Energy (MNRE) is working towards electrifying villages where either grid is not feasible or cost-effective and also not covered under RGGVY. The Ministry is implementing this programme by providing financial support, and the villages are provided basic facilities for creation of infrastructure to generate power from solar PV, micro Hydel, biomass gasification, etc. The villages can adopt distributed generation systems by availing subsidies and easy loans from the National Bank for Agriculture and Rural Development (NABARD).

A number of social entrepreneurs, small companies and non-government organisations (NGOs) have entered into the rural fray with the concept of decentralised micro-grids and other renewable products such as solar lights, solar chargers, and solar street lights. In the recent times, it has been observed that several companies are investing in setting up renewable energy generation systems under their corporate social responsibility (CSR) schemes. These companies are investing to install solar street lights, solar power packs, solar rooftops in schools, hospitals, etc.

ACHIEVEMENTS

In the recent years, decentralised solar applications have witnessed considerable installations . These applications are largely propelled by the subsidy scheme of the central government and aided by some incentives at the state level. By the end of 2013, the total number

PROGRESS REPORT OF VILLAGE ELECTRIFICATION AS ON 31-01-2014

Total inhabited villages as per 2001 census	Villages electrified as on March 31, 2013 as per new definition (Provisional)		Cumulative achievement as on Jan 31, 2014 as per new definition	Percentage of villages electrified as on Jan 31, 2014	Unelectrified villages as on Jan 31, 2014
	Numbers	Percentage			
593732	560552	94.4	563238	94.9	30494

Source: CEA

In rural India, even with rising incomes, up to 85 per cent of households are using traditional biomass as cooking fuel and almost half the population does not have access to electricity. Even with the ability and willingness to pay for modern sources of energy, the supply is not available

Dr Arunabaha Ghosh, CEEW

Renewable energy can be the provider of the first level of electricity services to rural folks having virtually no electricity access for their basic and other needs; it can also provide additional and more reliable electricity services to those that are poorly served by sources such as grid or diesel

Dr Akanksha Chaurey, IT Power

of solar installations rose to 20 lakh. In comparison to 17.59 MW a year ago, the total installed off-grid solar capacity rose to 35.09 MW in 2013-14.

The state of Chhattisgarh has done a commendable job by installing solar mini-grids and electrifying more than 1,400 villages. Many villages and remote regions of Ladakh in Jammu & Kashmir and Uttrakhand have also been electrified with solar power packs. Several other states like Uttar Pradesh, Bihar, Jharkhand, Madhya Pradesh, Himachal Pradesh, Rajasthan, Maharashtra and Odisha have programmes for implementing decentralised renewable energy systems to address the issue of rural electrification.

The response to the MNRE's subsidy scheme for off-grid solar applications such as irrigation pumps, home lights and solar lanterns received significant response from the rural communities. Of late, the government is reviewing the subsidy scheme in wake of huge rise in installations. A sum of ₹ 350 crore for off-grid solar projects has been allocated by the Ministry out of the total budget outlay of 1,500 crore per financial year. However, it is said that the amount is proving to be inadequate in view of the success of the programme. According to Tarun Kapoor, Joint Secretary at MNRE, the ministry is in the process of getting money released from the National Clean Energy Fund (NCEF) to provide subsidy to the tune of ₹ 1,000 crore. The ministry is also contributing its share in the subsidy amount.

CHALLENGES

Looking at the current energy scenario in rural India, a greater emphasis on deployment of renewable energy technologies (RETs) for cooking, lighting, heating, agriculture and vocational activities is the need of the hour. The major successes in India have been in grid-tied projects and rural product delivery. However, the real opportunity is in providing energy services to the poor communities in the far flung and remote locations.

"Firstly, the policies have to support decentralised energy firms rather than distort markets in a manner that customers would be unwilling to pay. Secondly, early stage investments are needed along with risk guarantees, asset financing and aggregation of small projects into larger portfolios," suggests Dr Ghosh.

Despite all the efforts and monetary benefits, the market for decentralised renewable applications in rural areas have not attained momentum as expected. Some experts point out that the complex government specifications and service models as the major reasons for the slow pace of investment. A number of key policy constraints hinder operation of rural micro grids. Some even believe that the market should be left to grow on its own, without government subsidies and involvement.

"Government's involvement has limited private sector participation. Because the government has designed subsidy and contract schemes, companies are not willing to get involved on their own. They instead wait for the government to expand its subsidy programs or tender contracts for rural electrification. For this reason, the private sector has stayed away from rural service delivery," claims Jaisinghani.

Besides technical and implementation aspects, the absence of trained manpower and technical expertise has to be addressed to increase the proliferation of renewable energy technology in the rural landscape. Dr Ghosh states that the technological innovation is needed to make micro-grids smarter, prevent tampering of pre-paid meters, and to develop appliances that can use AC and DC electricity. "A network of training centres is needed to build up the skill base of village-level entrepreneurs, managers and technicians to help scale up interventions. Several more technology testing centres are needed to test and certify products, and a dynamic information base is needed so that firms and other stakeholders can quickly overcome information barriers, find partners in the supply chain and explore ways to expand to other districts and states," he notes.

On the contrary, Chaurey doesn't see any major bottlenecks for the growth of the off-grid rural application in India for rural electrification except the mindset in implementing these projects. She states that challenges of using renewable energy systems related to quality, appropriate designs, service network, policies, etc are not insurmountable and can be addressed easily once the mindset issues are dealt with.

ROAD AHEAD

Major investments are required in off-grid renewable energy to bring down the dependence on fossil fuels for energy needs. There is need to create a mechanism where the renewable energy systems turn out to be a win-win situation for both the investors as well as the beneficiaries.

Chaurey stresses that the need of the hour is to focus on compatibility of renewable energy systems with grid in achieving the goals of rural electrification and do an integrated planning with optimisation of resources, including the manpower. "We also have to integrate the planning and implementation of rural development schemes with those of renewable energy based rural electrification to maximise the impacts of both," she remarks.

Natarajan calls for integration of delivery of decentralised renewable solutions with other government programmes targeted at rural development, to achieve greater impact. "Need of the hour is to create an environment that promotes entrepreneur driven models for delivery of such solutions to ensure long term sustainability. There are several social enterprises/MSMEs active in this space and it is important to understand and address their needs in order to help them scale up their operations," he suggests.

Till date, the renewable energy has played second fiddle to the fossil fuel based power generation. Now, is the time to scale up the deployment of renewable energy and make it the primary source of energy in areas where grid-connectivity is not possible. "We have always chased big projects and big budgets. We have an opportunity in decentralised renewable energy, especially solar, to change this and change for benefit of humanity," concludes Subramanya.

DECENTRALISED RE TECHNOLOGIES IN RURAL AREAS

- Solar powered street lights
- Solar lanterns / solar home lighting systems
- Solar water heaters
- Solar cookers
- Solar power packs
- Biomass based power generators
- Family-size biogas plants
- Wind pumps
- Micro-Hydel systems

Because the government has designed subsidy and contract schemes, companies are not willing to get involved on their own. They instead wait for the government to expand its subsidy programs or tender contracts for rural electrification

Nikhil Jaisinghani, Mera Gao Power

Biomass lights up villages

Access to quality, reliable and affordable energy is the need of the hour and biomass is being used to generate power in Saran district of Bihar. ***Energy Next*** details how the lives of people have changed after the district was electrified by Saran Renewable Energy (SRE)

Saran is one of the poorest villages in India, where power outages are both common and frequent and the people reside in darkness for days. However, during the monsoons there is abundance of water, leading to the area becoming flooded. On the other hand, farmers in the area are unable to use irrigation pumps during the dry season, due to lack of adequate power supply.

With an aim to light up the village, SRE took upon itself the task of building a biomass gasification plant, where power would be generated and would be sold to small and local traders.

The biomass, which is supplied locally, is used as a fuel. It is fed into the gasifier and heated at a very high temperature till the time emission of flammable gases, like hydrogen and carbon monoxide commences. This in turn is used in an engine to produce power.

The power, which is supplied to the customers, is metered and consumers are supposed to pay every day.

A large number of customers are no longer using power supplied through grid. The cost of setting up the plant was ₹ 8.3 million and power is supplied to the customers at ₹ 7.5) per kW. Though the state electricity price is merely ₹ 6, customers are willing to pay more in wake of the reliability of the power supplied through the gasifier.

At the time of the inception of the plant an average of about 300 kWh/day of electricity was generated.The production has more than doubled by now. The local population has benefited tremendously, with the gasification plant operating for almost 11 hours a day.

The generator which is connected to a low voltage line (240 V, 3-phase) is placed close to the plant. Since the demand is limited, a transformer is used to step up the voltage to 3 kV, for transmission via two 3 kV lines for the consumers who reside 1.25 km away. At the other end of these lines, another transformer steps down the voltage, and power is taken to a distribution room with a meter for each customer.

One of the biggest advantages of the plant is the decline in the use of diesel and reduction in the emission of CO2. The gasifier plant does not create any kind of noise pollution and there is minimal emission of other pollutants such as nitrous oxide, sulphur dioxide and particulates.

The biggest social advantage of the gasifier plant is that it is providing power to a nursing station, which uses electricity for services such as analysing blood samples. Free power is provided at a study centre so that children can study in the evening and power to the computer training centre is provided at a subsidised rate.

Meanwhile, the plant is maintained by technicians who are trained in Bangalore and the maintenance is undertaken by an engineering company in Haryana.

The success of the plant has prompted the makers to set up more such plants in areas that have clusters of small businesses and are in the vicinity of places where biomass can be supplied.

Solar Pumps powering farmers

Solar water pumps have proved to be a boon for the farmers in different parts of India as they faced the brunt of erratic power supply and high cost of diesel. ***Energy Next*** analyses how solar water pumps have addressed the irrigation woes of the farmers and also provides drinking water for the rural population

The rural population of Uttar Pradesh and Bihar have something to cheer as Claro Energy Private Limited have developed customized solar irrigation pump, which are manufactured according to the level of the local groundwater table, irrigation and water discharge conditions.

The Department of Minor Water Resources, Bihar had launched a programme in 2012 to power 34 existing tube wells with solar energy in 20 villages of five blocks in Nalanda district of Bihar.

The systems were installed by the company with a five-year annual maintenance contract. The systems had 7.5 HP pumps with a discharge capacity of 70,000 litres per hour and a solar panel capacity of 8.5 kW (six arrays with six panels of 235 watt capacity).

Speaking about the programme, the Co-founder & Director of Claro Energy, Soumitra Mishra said that the challenges faced by them included high initial cost of the systems, lack of consumer financing available to farmers for solar pumps, last mile sales and service difficulties, and unintended consequences of the subsidy programs.

Meanwhile, different community owned approaches are adopted with regards to the setting up of the solar pumps. If there is a cluster of farm in an area where the maximum power rating of the pump to be used is 2 HP then multiple farmers are using leased trolley based Mobile Solar Pumping System. Thus the burden of high initial investment is being shared among the farmers and thus the payback period increases.

CHALLENGES

The biggest challenge faced by Claro Energy was to create awareness in the government with regards to spreading information about the importance of the feasibility of the solar power to run the water pumps, which could be used extensively in the agricultural sector. In order to overcome these challenges, Claro showcased the functioning of a 7.5 HP pump, which would be run on solar power.

SOCIAL AND ENVIRONMENT IMPACT

The programme will help in reducing 511 tonnes of carbon dioxide emissions annually, while providing water supply to 1, 600 acres of land. At least 45 direct and 80 indirect jobs were created and has proved to be a boon for more than 3, 000 families in the Nalanda district.

The increased usage of solar powered irrigation pump-sets help in keeping the environment clean as it prevents air pollution due to diesel combustion and emissions of greenhouse gases.

As the farmers are now working during daytime, they are saved random risks such as snake bites or tripping in the dark.

STATE PERSPECTIVE

State	State Nodal Agency	Total Nos of Systems executed by Agency	Application	Funding Pattern
Punjab	Punjab Energy Development Agency	100 Nos 2hp submersible (dc) spv water pumping systems	For drip irrigation in horticulture sector	The Project was been funded by MNRE, GOI, Punjab Govt. and beneficiaries by providing 30%, 40% and 30% funds respectively.
Tamil Nadu	Tamil Nadu Energy Development Agency	530 Nos. Solar PV Pumping Systems of 4800 Wp (5 HP) capacity at various places in Tamil Nadu	For irrigation in agriculture	20 % Contribution by farmers 80% by Government
Bihar	Bihar Renewable Energy Development Agency	1560 Nos, 2HP	For irrigation in agriculture	10% Contribution by farmers 90 % by Gov.
Bihar	Bihar Fishery	216 Nos, 3 HP	For filling pond for pisciculture	10% Contribution by farmers 90 % by Gov.
Chhattisgarh	Chhattisgarh Renewable Energy Development Agency(CREDA)	around 900 Nos 1 HP Solar Dual Pump	For Community Drinking Water	Fully funded by Public Health Engineering Department under Rashtriya Gramin Peyjal Yojana
Orissa	Orissa Renewable Energy Development Agency	413 pump	For Community Drinking Water	Fully funded by Govt.

New hydro turbine- a milestone

UK's University of Southampton has developed a new marine current turbine generator, installed in the tailrace of the Tata Power owned 150 megawatt (MW) Bhira hydropower station in Maharashtra. ***Energy Next*** analyses how the newly developed hydro turbine will go a long way in promoting clean technology and sustainable development in the country

The newly developed hydro turbine is a new, more efficient, lighter and cheaper version of its predecessor. The 2.1 metre diameter turbine utilises the existing water flow in the tailrace to generate 10 kilowatt (kW) of additional clean energy, which is fed directly into the 415 volt network.

The blades of the novel horizontal axis turbine attached to the outer rotor of a direct drive magnet generator helps in saving the complexity and cost of a gearbox.

Speaking about the efficiency of the micro-hydro turbine, Dr Suleiman Sharkh, Head of Electro-Mechanical Engineering Research Group, University of Southampton (UK), who headed the project and designed the generator, said: "The electric machine efficiency is 93 per cent, and the overall efficiency of the turbine is 35 per cent; the theoretical limit (Betz limit) of 59.3 per cent."

Sharkh hailed the project and had described it as a significant step towards the development of a low-cost clean energy solution based on simplicity, functionality and versatility of design.

Another unique feature of the turbine is the bi-directionality, which permits it to function in tidal currents as well. The generator works most effectively in fast-flowing water, and an array of these devices in tidal marine currents and rivers can provide a locally generated and sustainable energy source for riverside and coastal communities, and for the national electricity network.

The project is a significant step towards the development of a low-cost clean energy solution based on simplicity, functionality and versatility of design

Highlighting the usage of the turbines, Sharkh added that it could be used to harvest energy from tidal currents, rivers, and discharge from hydropower stations. He said "it could be used for both small scale generation for local communities as well as deployed in arrays to generate large amounts of power from say tidal currents, which can be fed into the national grid."

Meanwhile, the Casmir Group which customised and indigenously manufactured the micro turbine was also studying additional sites where similar kinds of micro hydro sets could be set up. The company had sponsored the research undertaken by University of Southampton and is looking forward to tapping innovative clean technologies in its hydro turbine generators.

Expressing the future course of action, Ruta Samant, from Casmir Group, said that they are eager to commercialise the scalable and frugally developed technology.

Mahesh Paranjpe, Head-Hydros Tata Power lauded the installation and commissioning of the micro hydro turbine, calling it a vital milestone at Bihra.

A statement issued by Tata Power said that the low-head micro-hydro turbine utilised the existing flow rate, which was available to generate supplementary clean energy to manage its auxiliary loads. The micro unit was effectively synchronised to the grid.

The monetary assistance for the project was provided by Casmir Group Ltd, which had exclusively licensed the patented technology from the University.

Time for next big leap

Phase-II of the Jawaharlal Nehru National Solar Mission is all set to take forward India's solar ambition. The projects have been allocated and developers are gearing up for the task. ***Upendra Singh*** tries to analyse the present scenario of the Indian solar industry and what lies ahead for the sector

India's ambitious solar energy programme- Jawaharlal Nehru National Solar Mission (JNNSM)- has acted as an engine of growth since its launch in 2010. This has not only triggered a solar revolution in the country, but it has also put India on the global solar map in considerably quick time. A lot of credit for the successful completion of the first phase of the Mission could be attributed to investor-friendly government policies and the active participation of private companies and entrepreneurs who took timely decisions to lap up the opportunity.

Banking on the success of Phase-I, it was expected that Phase-II would leapfrog the sector to new heights. However, due to several reasons, the second phase was delayed by almost a year and a lot of concerns were raised about the Mission's target. Now, since the bidding process for the Batch-I of the second phase is complete, it is believed that things will fall in place.

HOPE AMID UNCERTAINTY

The India solar sector saw a slowdown in the second half of 2013 attributed primarily to a sluggish economy and volatility in the foreign exchange market. The delay in the bidding process for the Phase-II projects also led to further depression in the minds of the investors. Amid such uncertainties, the successful bidding for Batch-I, Phase–II has reconfirmed the interest of investors in the sector.

The state-run Solar Energy Corporation of India (SECI), the Nodal l agency for Phase-II, received bids worth 2,170 MW for around 120 projects from 68 project developers. The companies that got the major chunk of the projects include SEI, Azure Power and ACME Power, who got projects worth 100 MW capacities each. Other prominent players to bag projects include IL&FS Energy Development that bagged 40 MW capacity, Today Homes and Infrastructure which got 40 MW, while Tata Power Renewable Energy secured 35 MW.

The 750 MW capacity has been split into two parts of 375 MW each - projects under 'domestic content requirement' (DCR) mechanism and the 'open category'. The government has introduced financial assistance in the form of a viability gap funding (VGF) mechanism, wherein project developers will seek financial assistance to make their projects viable. The second phase will see disbursement of around ₹ 800 crore in the DCR category, while the amount for the open category could be around ₹ 400 crore.

In the DCR category, the VGF sought by the project developers is in the range of ₹ 1.35 crore to ₹ 2.456 crore per MW, and for open category, it ranges from ₹ 0.175 crore to ₹ 0.135 crore per MW. Consequently, the second phase has seen tariff plummeting to as low as ₹ 5.5 per unit.

Industry insiders and experts feel that the impressive response from the industry for Phase-II has instilled life into the sector that was struggling in latter part of 2013. They urge that this positive energy needs to be sustained through enabling long-term policies and investment opportunities.

"Solar power has become more competitive beyond anyone's imagination when JNNSM started. The capital cost per MW has come down from nearly ₹ 12 to 13 crore when the program started to ₹ 6 to7 crore currently. With the cost of solar power reducing to around Rs 6 to 7 per KWh, it is necessary to provide more support," avers K Subramanya, Solar Consultant and former CEO, Tata BP Solar.

CHALLENGES AHEAD

The Indian solar power industry is ready to take its next step towards the big goal. Commenting over the success of the Indian solar industry, KN Subramaniam, CEO, Moser Baer Solar, states that the country is seeing tremendous growth in the grid connected solar farms aided by JNNSM on one side and state specific solar power projects on the other. "Approximately, 12 GW of solar capacity is set to get commissioned apart from the JNNSM goals, which means the Indian solar sector should grow beyond its earlier goals of 20 GW by 2022."

Going by the current trend, it can be said that the future seems bright; however, the industry players need to be aware of some near-term as well as long-term challenges that would come in their way. These hiccups would require appropriate diligence, flexibility and vision on the part of the investors to steer past those challenges. The foremost challenge is the timely commissioning of the Phase-II projects. Due to delay of one year in allocation of projects, the project developers have their task cut out to complete their projects on time. The industry insiders are of the opinion that a delay of one year can have an impact on the overall target achievement under this phase.

The cost of solar project development has fallen tremendously over the last few years as a result of oversupply of solar modules by China, US, Taiwan and Malaysia. Currently, the solar project cost is almost half as it was in 2008. Due to overcapacity of PV modules, solar cell manufacturers were forced to sell off their inventory at reduced prices and profit margins. "The rock bottom project cost has already been achieved and now the focus of the developers should be towards optimisation of other significant parameters," remarks Manoj Kumar Upadhyay, Chairman, ACME Power, one of the biggest players in the Phase-II bidding. He stresses the need for optimisation of project funding to meet the future demands of the industry.

A recent report by GTM Research claims that the global solar power industry will see a significant increase in installation in 2014 that could lead to a shortage in PV supply. It is believed that the global solar market is on its way towards stabilization and the new installations in 2014 may surpass 40 GW. According to market research firm IHS, the selling prices of crystalline silicon PV modules are rising due to a number of factors that include increasing demand in China and Japan.

Going by these projections, reduction in the cost of solar projects will halt and prices may start rising. In India, the price of solar panels has already started increasing, though marginally, due to the depreciating rupee over the last year and an easing of the global supply glut. Upadhyay states that the cost of

> **The capital cost per MW has come down from nearly ₹ 12 to 13 crore when the program started to ₹ 6 to 7 crore currently**

The rock bottom project cost has been achieved and now the focus of the developers should be towards optimisation of other parameters

solar modules, which contribute around 50 to 55 per cent of the total cost, has witnessed an increase of around 12 to 15 per cent over the last six months.

Likewise, the cost of power per unit from solar has gone down to one-third of what it was in 2008. Hence, it becomes imperative to have a focused approach to negate any such measures that may lead to projects becoming unviable. Subramanya agrees that any further reduction in cost or price of solar power can be only through a technological revolution, which is not yet on the horizon. "For some time to come, we need some semblance of stability and consolidation in solar equipment costs," he asserts.

Financing of solar projects is another aspect that needs to be streamlined. It has been seen during the Phase-I projects that the project developers struggled to get funds, as domestic banks and financial institutions showed their apprehension towards solar power. Subramanya calls for significantly higher funding and much lower interest costs so that the projects are commissioned on time and are viable. Also, in wake of weakening rupee against the US dollar, there has to be a more focused and innovative approach towards hedging of US dollars. This is required to bring down the cost and mitigation of risk posed due to such volatility in the exchange rate.

MANUFACTURING

When the JNNSM was launched in 2010, its aim was to create favourable conditions for solar project development as well as enhance the domestic solar manufacturing industry. The government had plans to make India a global solar PV manufacturing giant with a manufacturing capacity of 5 GW per annum by 2020. While project development has performed as per expectations on the one hand, the same cannot be held true on the manufacturing front. Despite various policies, the indigenous manufacturing industry is finding it tough to find its place amid cheap imports from China, Taiwan, Malaysia, US and other foreign companies.

The DCR clause during Phase-I turned out to be a bane for domestic manufacturers, as the project developers imported thin films from foreign companies rather than the polysilicon modules produced in the country. Taking a cue from the past, the government has earmarked half of the projects under the DCR mechanism, which includes both thin film and polysilicon. Though termed as a policy to safeguard the interests of domestic manufacturers, a row has erupted between India and the US that alleges this approach is against WTO norms.

It is not only the foreign nations that are pointing fingers at this approach, but a certain section of project developers also feel that this may hamper their viability prospects. Commenting on the DCR for Phase-II projects, Upadhyay says, "DCR is very challenging situation for independent power producers like us. As a country, we do not have enough capacity of integrated cell and module manufacturers on whom solar developers can have a very confident view."

The project developers would ensure the quality of the modules to last the envisaged 25 years, and a number of developers feel that domestic manufacturers need to upgrade their facility to meet desired global standards. Most experts feel that DCR is a short-term measure, and in order to sustain for longer duration, local manufacturers will have to raise their standards efficiently. Upadhyay suggests for a one-time subsidy to Indian manufacturers to upgrade their manufacturing facilities that would enable them to compete not only for Indian tenders but also on global platforms.

CONCLUSION

Today, the Indian solar power industry is very competitive as far cost of solar modules and costs of power generation are concerned. This was possible due to global oversupply of modules and the competitive bidding process adopted by the Indian government. However, in the backdrop of recent hiccups and the projections of several studies, the Indian solar industry needs to keep a close tab on the short-term developments.

"Today, the solar prices in India are pretty competitive. In order to make solar more cost-friendly and competitive, there is need for creating better infrastructure and efficient power evacuation, lesser hassles in land procurement, lesser bureaucracy and speedier approvals," remarks Subramanya. This has to be supported by implementing solar mandates and obligations at the state level and wholeheartedly supporting renewable energy certificate (REC) mechanism.

"As the business sentiments turn positive, attracting investments and reducing costs will drive grid parity across segments. We are confident that India will be the solar hub to the world in the coming years," claims Subramaniam. Therefore, to sustain momentum, it is important to look at ways that is sustainable for the solar industry. In place of just momentary gain, the focus should be on sustained growth of the sector in the long run.

India, US lock horns

Indo-US relations on renewable energy seems to have hit a new roadblock after the latter's complaint at the World Trade Organisation against India for imposing restrictions on foreign solar sales and modules to the country's solar market. ***Energy Next*** elucidates why both New Delhi and Washington are unwilling to relent from their current stand

A spanner has been thrown in Indo-US relations with regard to the renewable energy sector. The US decided to take India to the World Trade Organsiation (WTO) for unfair trade practice by having a domestic content requirement (DCR) clause in the Jawaharlal Nehru National Solar Mission (JNNSM). India has hit back saying the claim is unfair as every country in the world protected its domestic industries.

The decision of the Indian government, which earmarked 50 per cent of the projects out of the total 750MW in batch one, phase II of the Mission under DCR has the US. The DCR mandates solar energy producers in the country to source indigenously manufactured solar cells and modules. Expressing dissatisfaction over New Delhi's decision, the US administration decided to file a second case at the WTO.

India's Solar Mission was launched in 2010 with an aim of deploying 20,000 MW of grid connected solar power by 2022 while also decreasing the cost of solar power generation in the country. The objective was to adopt a long-term policy that included large scale deployment goals and aggressive research and development into the domestic production of essential products and equipments.

After the launch of the JNNSM, the country's power capacity increased to more than 2,200 MW from almost 10 MW.

In order to provide boost to the domestic solar manufacturing industry, the government had introduced the DCR in phase one of the mission. However, it did not deliver the expected results on the ground that the clause was only meant for polycrystalline cells and was not binding for thin films. Consequently, the government decided to implement DCR for half of the project capacities irrespective of technology.

US alleged in a statement that the restriction on the import of manufactured solar cells and modules in India was against international trade laws and it would result in an increase in the cost of solar energy. The US had filed a complaint in the trade body last year as well which related to the initial phase of the Indian programme and dialogue

The US administration has decided to file a second case at the WTO over the domestic content requirements in India's massive solar program

between the two countries had failed to resolve the deadlock.

Washington has claimed that solar energy sales in India would grow in the near future and US solar producers were eager to participate in the Phase-II of the JNNSM, under which the government is looking to add 750 MW out of a total 20,000 MW. The Americans reiterated that they were committed to the promotion of clean energy as well as to ensure the security of millions of jobs of American workers as well as manufacturers.

In order to resolve contentious issues, consultations take place at the WTO. In case the matter is not resolved within 60 days, the US may urge for the setting up of a WTO dispute settlement panel. India, on the other hand, is also probing the claims of domestic solar manufacturers who alleged that competitors from the US, China, Malaysia, Europe and Japan had dumped solar cells or sold them at a lesser price.

New Delhi lashed out at the US, demanding that Washington clearly outline its stand over providing incentives to US companies that use local labour and products in renewable energy and water projects. In response to the allegation levelled by the US, India has said that its solar policies were in consonance with the WTO government procurement rules, which allow nations to let off projects from non-discrimination obligations.

Speaking on the issue, KN Subramaniam, CEO, Moser Baer Solar said, Government of India is doing the absolutely right thing by protecting its domestic industry. Domestic content in solar/renewable industry exists in at least 15 countries across the globe including Canada, France, Italy, China, USA, Belgium, South Africa, USA etc, we are doing nothing unique. Industry thanks Government for taking a strong and unambiguous stand against the move by the US, which is pushing its agenda to protect its domestic industry. Domestic manufacturing industry has been going through tough times for last 2.5 years, beyond doubt driven by huge overcapacities. ADD will not only help provide a level playing field, but will also address building local capacities by global players driving FDI, scale, employment and above all keeping India tax payers money in India. It will help achieve one of the two goals of JNNSM- have thriving local manufacturing industry to the tune of 4-5 GW p a by 2017."

The DCR requirement in Phase-II itself is not bad since it is important for India to help build and strengthen its own manufacturing capacities for long term energy security. However, several experts are of the opinion that such support should not continue in perpetuity and it should have a clear end date beyond which the Indian industry must be ready to compete in the market. This will also ensure that the end beneficiary gets the advantage of the lowest tariff arising from the least cost of energy generation.

However, the US said that India's national solar policy was against its obligations under the WTO agreement. Prominent among these obligations are Article III of the General Agreement on Tariffs and Trade, 1994 (GATT 1994), which normally prohibits measures which discriminate in favour of domestically produced goods versus imports. According to the provisions of Article 2 of the WTO Agreement on Trade-Related Investment Measures, produced goods which are not in accordance with the GATT Article III are prohibited. Article 3 of the WTO Agreement on Subsidies and Countervailing Measures (SCM Agreement) forbids the conditioning a subsidy on the use of domestic over imported goods, while Article 5 of the SCM Agreement states that there would be adverse effects on other WTO members if subsidies discriminated against imported goods.

Since India is not party to the WTO's Government Procurement Agreement, it is not mandatory for it to adhere to multilateral rules that are mentioned for government procurement. Justifying its allegation, the US claimed that since the local sourcing condition had applied on purchase of power equipment and not power (which will be bought by the Indian government), it cannot be considered as part of government procurement.

It seems that the US is not going to let India off easily with the WTO website recording the former having brought to the fore at least half a dozen cases against India since 1996, most of them related to agriculture.

On the contrary, American environmental groups have asked President Barack Obama to retract from taking any WTO action as the growth in India's solar power industry will help cut down greenhouse gas emissions. Pressure, however, is being exerted by US lawmakers as well as big business groups towards taking stringent action against the supposedly protectionist stance of the Indian government.

Investing in RE can revive economy

Industry leaders are buoyant about the future of India's solar power sector despite the recent slowdown due to the sluggish economy and delay in allocation of project under Phase-II of the Jawaharlal Nehru National Solar Mission (JNNSM). ***Ratul Puri***, Chairman of Hindustan Power Projects Ltd, speaks to ***Richa Kapoor*** about the prevailing energy scenario and the role solar energy and other forms of renewable energy will play in providing complete electrification by the end of the 12th plan

Q The total solar energy potential in India is huge and this may contribute significantly to bridging the gap between supply and demand. Do you think that the efforts taken in harnessing that potential are in the right direction?

India is endowed with huge solar potential, with most parts of the country receiving energy in range of 4 – 7 kWh/ sq m / day. It is worth-while noting that our country has more than 300 sunny days and also that the Solar irradiance is approximately 160per cent higher than that of Italy/ Japan. The above translates to annual Solar energy incident on India as 5000 trillion kWh !! Considering the fact that power deficit in country from April 2013 – February 2014 was only 39,335 million kWh, hence it is evident that the solar truly has huge potential to bridge this deficit.

The efforts taken to harness the potential are in the right direction but the intensity of efforts have to be multiplied many times, especially with regard to strict enforcement of renewable purchase obligation (RPO); strengthening of renewable energy certificate (REC) framework by putting in place Guarantee fund using National Clean Energy Fund(NCEF) and government backed power purchase agreements (PPAs) similar to NTPC - Plan fund diversion. There is also a need to arrange for land bank and undertake regular revision of Discom tariffs on annual basis to reflect the true cost of power supply. The transmission grid and local distribution grid have to be strengthened in order to evacuate power generated at the solar energy sites.

Solar projects under Batch I, Phase II of Jawaharlal Nehru National Solar Mission (JNNSM) have been allotted to project developers, however, it got delayed by almost a year. Do you think that the targets of the second phase will be achieved on time?

The cumulative JNNSM Phase II (2013-17) target for Utility Grid Power projects (including roof-top) is 10 GW, out of which target of Central Sector of 1650 MW was planned to be allotted in 2013-14 and 1950 MW in 2014-15. We are very positive that there will be no further delay and JNNSM targets of phase II will be met.

What strategy will India need to adopt to provide the much needed boost to the solar sector in wake of economic slowdown?

Except for land and balance of system (BOS), generally the costs of solar module, inverters, etc. have shown a downward trend. In this economic downturn one should promote investments in renewable energy projects. Though these demand high initial investments, they have almost zero recurring expenditure on fuel in the years to come. Similar to USA, wherein in post 2008 era, they made huge investments in building solar and wind assets, which not only brought back the momentum in USA economy but also created jobs in manufacturing, this without creating any long term recurring burden of fossil fuel costs, India should also push investments in Renewable Energy.

In order to further increase the solar installed capacity Government needs to focus on reducing the cost of borrowing for the project. National Clean Energy Fund(NCEF) is a good way to tax polluting industry and use that pool for investing in renewable assets. Also special exposure should be maintained with banks to provide funds to solar sector.

The efforts taken to harness the potential are in right direction but the intensity of efforts have to be multiplied many times, especially with regard to strict enforcement of renewable purchase obligation

Similar to financial institutions like Green Banks in countries like U.K. and U.S.A, there should be a separate framework for funding solar projects.

Since the power generation company has a 10 year tax exemption from the block of 15 years, the Government should make relevant amendments in MAT credit so as to give the company true advantage of tax benefit and increase it to 15 years.

What do you think about the 20,000 MW grid-connected solar power target set under JNNSM? Will India be able to achieve that target?

Definitely, India should be able to achieve the numbers well beyond the targets. Globally the Solar capacity added last year (2013) was approx. 37 GW, reflecting one of the key strengths of Solar which is scale and speed. In this capacity addition of 37 GW, there was dominance of China (12 GW); US (5 GW) and Japan (7 GW). Seeing the capacity addition achieved, we believe that India can also achieve its annual JNNSM target of approx. 2000-2500 MW with adequate policy support and planned execution.

New technology helps save energy

Recognised as among the most energy efficient measures, standby power consumption is being increasingly used by the electronics industry. ***Sandeep Garg*** proposes measures which need to be taken to meet rising energy demands and suggests reducing standby levels on new products

Standby power consumption, which is the power used by appliances when they are not performing their primary function, has been recognised as one of the most cost-effective potential end-use energy efficiency measures. While the amount of standby power varies markedly between countries, the global energy consumption from standby power has been estimated by the International Energy Agency (IEA) to be between 200 TWh and 400 TWh per year. In the 1990s, the IEA encouraged the development of a notional 1W standby consumption target culminating in a call to action in the coming decades.

Standby power is now used by a myriad of electronic products. Most people will be familiar with a television and the remote control. When the remote control is used to turn the television off, the television continues to use some power to keep the remote control circuit active so that the remote control can be used to turn the TV on again. This is one form of standby power.

Now, "standby power" is present in a huge range of products and used to power a wide range of modes and functions. Many small lights emanating from appliances seen at night is a demonstration of the pervasiveness of standby power. It can deliver a range of functions desired by the end-user (clocks, remote controls, communications, sensors, controllers), but it can also be due to poor design and through the use of inefficient components.

While global understanding of standby power is growing rapidly within governments and efficiency advocates' circles, there is still little comparative data available which indicates the range of standby levels found in typical products and whether these power levels are in fact improving or deteriorating over time. Various studies have estimated that global standby power levels could be reduced to less than 30 per cent of current levels using existing technology with little additional manufacturing cost.

POWER CRISIS AND STANDBY POWER

The integrated energy policy (IEP) which was adopted by the Indian government in 2008, projects an increase in energy demand by about 5 to 6 times in 2030 as compared to 2005. This increase is largely driven by sustained economic growth between now and 2030. The rapid growth in electricity demand in India will be largely driven by increased penetration of appliances in households and commercial buildings, new building constructions, apart from growth in the industrial sector. There is growing appreciation of the fact that improvements in energy efficiency have a very important role in bridging the gap between energy supply and demand. A reduction in energy consumption can be brought about, not only by an improvement in efficiency through the process of making informed choices on products which are energy efficient, but also by making use of technology which can enable reduced energy consumption in products. With an increase in the consumption of electricity, particularly, in the residential sector with

Standby power can deliver a range of functions desired by the end-user (clocks, remote controls, communications, sensors, controllers), but it can also be of poor design and through the use of inefficient components

multi-use of the products used in computing and IT products, more and more devices are getting connected to uninterrupted power supply sources. This increase gives rise to the power crisis in India and there is a particular need for an Uninterrupted Power Supply (UPS). In lay terms, the inverter, as the UPS is called, has a huge market base in India with costs going up every year due to high demand and a low production of electricity.

PROBLEM STATEMENT

The UPS is generally attached to the mains of the dwelling and is designed to take up the slack in case of a power outage. However, more often than not, due to the large number of equipments running on electricity, this results in the UPS reaching it's 'trip point ', thus causing the need to work in darkness, to switch off electrical components and then again flip on the circuit breakers of the inverter. This is murderous to inverter batteries and may result in damaging the UPS system itself.

Some alternate solutions proposed included incorporation of the load monitor onto the mains itself and incorporating a device on the inverter which detects the load on line.

The problem with these suggestions is that to incorporate a monitor on the mains or the inverter, one would first need to have a tie-up with a manufacturer who is willing to take the additional step and increase the production cost of their UPS system. Secondly, this would be possible only in new inverters, severely decreasing the potential and market base for such a system, as the large section of the population would not want to buy a new UPS system just for this one feature.

THE PROPOSED SOLUTION

Bearing this phenomenon in mind, one can use a "smart plug" device, which can be attached to higher-rated electrical equipments, such as TV's and electric heaters , so that they are automatically turned off or on upon detecting a change in the output from the mains to the back-up batteries.

This project combines existing technology incorporated in a device which can be designed as per the following specifications: First, the product detects when the power output changes from the mains to the back-up UPS system and disconnects (or not) the power to the attached device as programmed by the use. Then, programmable power output is used to switch the device on or off as required by the user, by wireless operation of a connected device using a remote or one single remote/pad device to control all smart plugs, the inbuilt meter to check power consumption of the device which also provides real time load-on-line.

ADVANTAGES

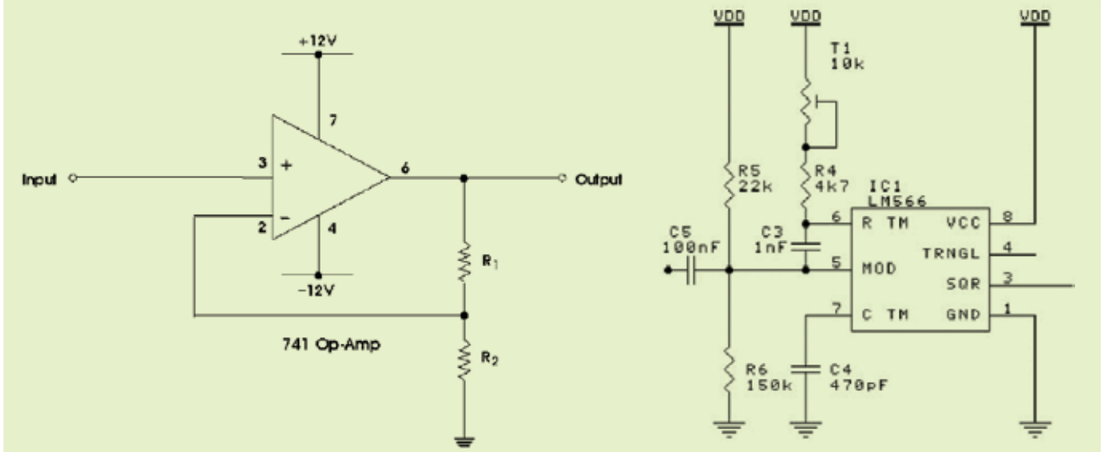
The advantage of such a system is that it incorporates all the necessary information about a particular device. As it also incorporates a wireless remote, you are free to sit in one corner of the room and take care of all devices without the need to get up. According to the first concept, the problem can be tackled by detecting when the mains are on or off, checking power line transmission, differentiating between the sine wave from the UPS output and the output from the Mains, and checking when the device is to be on or off on the RF module circuit.

CONCEPT 1

There is a basic problem of detecting when the inverter is on or off, more so when the power output from the UPS system is a pure sine wave, as with many of the newer power back-up systems. Therefore, our first task is to detect when the power system is on and when it is off. The most foolproof way to detect when an inverter is on is when there is current being drawn from the batteries. Current will be drawn only in the case of NO mains power and the power system being on.

We can use a sensor on the input to the inverter which will tell the device when a system is on or off. This sensor can communicate to the smart plug device via two methods; firstly, by using an RF communication system for wireless transmission and, secondly, by using power line communication to modulate the output signal which can be detected by the smart plug device.

A SAMPLE TRANSMITTER CIRCUIT



Using the RF system is costlier and is inconvenient because of two basic reasons; first, in case of multiple devices, each plug would need a separate RF device which would increase production costs and, secondly, RF communication has a lot of data that can be lost in transmission and one would need confirmation before the device is switched on or off.

On the other hand, modulating the output signal and creating a filter which would detect that particular signal is more convenient, as the signal would be transmitted to all the devices simultaneously, which in turn would reduce power requirements and cost.

This particular approach reduces the necessity of an in-built design in the back-up system hardware, thus reducing required innovation and cost and can be accomplished using existing technology.

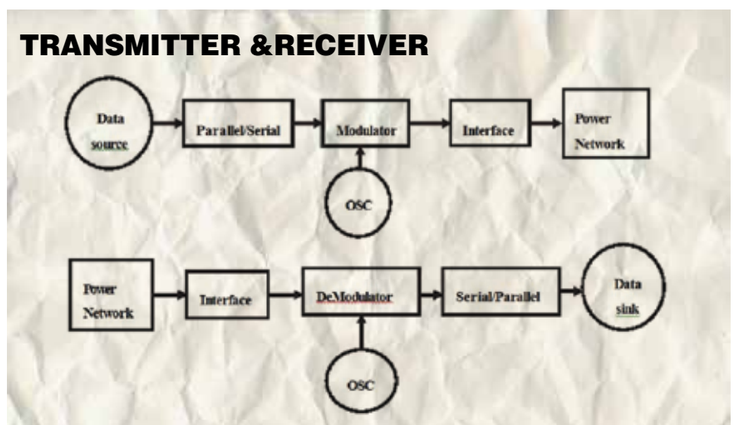
This concept accomplishes the following tasks: it differentiates when the mains are ON or OFF, thus, informing the device when it has to be switched on or off. This also saves the trouble of differentiating between the sine waves produced by the mains voltage or by inverters.

USING POWER LINE COMMUNICATION

The principle to the transmission in this case is same as that of the home automation system.

The transmitter contains of four basic parts: A data source, signal modulation (frequency oscillator and digital modulator), signal amplification and an interfacing circuit (isolating circuit).

TRANSMITTER &RECEIVER



SIGNAL MODULATION

We can use the LM566CN Voltage Controlled Oscillator to modulate the input signal. The LM566CN is a general purpose voltage controlled oscillator which is capable of generating both square and triangular waveforms.

AMPLIFICATION

We need to amplify the signal due to the simple reason that the power cable noise is so high and the output so small that the data shall be lost in the noise and would not be detected at the receiver's end. To combat this, we use a small amplification circuit using an LM 741 op amp.

INTERFACING CIRCUIT

This is a basic isolating circuit designed to prevent the 220V, 50Hz wave from passing through, and allow the information to move through it. As we connect the transmitter to a 220V, 50Hz line, parts of the circuit can burn very easily. Therefore to prevent this, an isolating circuit is required.

The concept development is a work in progress and will include the receiver amplifier, demodulator, basic circuit of the device, RF modules etc, which will make a device that can be wirelessly controlled in being switched on and off and will automatically shut down when the UPS systems kicks-in. As above, the device design is in progress.

The author is head of the Energy Efficiency division, Energy Efficiency Services Limited

(Views expressed by the author are personal)

Cost-effective driving

The automobile industry will face the brunt of the mandatory fuel efficiency norms, which were recently announced by the Bureau of Energy and Efficiency (BEE) as it would inflate the production costs. ***Richa Kapoor*** details the impact on the industry as well as the environment

Owing to the global economic slowdown, there was a steady rise in the price of oil, mainly due to rapid motorisation in developing countries, like Brazil, China, India and others. The rise in the demand of oil is primarily driven by the increase in the number of vehicles, especially private passenger vehicles, as well as total vehicle distance travelled.

The other challenges, which are faced by India are the steps that need to be taken to curb the energy demand and greenhouse gas (GHG) emissions from personal vehicles.

In order to combat this rising menace, the Central Government in consultation with the Bureau of Energy Efficiency (BEE) issued a directive under the powers conferred by clause (a) and (b) of section 14 and section 18 of the Energy Conservation Act, 2001 (52 of 2001), thereby specifying energy consumption standard for the motor vehicle of petrol or diesel or liquefied petroleum gas or compressed natural gas, used for the carriage of passengers and their luggage and comprising not more than nine seats including driver's seat, and of Gross Vehicle Weight not exceeding 3,500 kilogram tested on chassis dynamometer (hereinafter referred to as the said motor vehicle) for the purpose of manufacturing or importing for sale of the said category of motor vehicles.

The introduction of the new norms, will pave way for increasing the mileage of the passenger vehicles by at least 14 per cent from 2016-17.

CONVERSION TABLE

Fuel Type	Conversion Factor to Petrol equivalent
Diesel	1.1340
LPG	0.6878
CNG	0.7581

On being asked about the impact of the new fuel efficiency norms, on the automobile sector, Dr Ajay Mathur, Director General of the BEE said, "the objective of the new norm for fuel efficiency is not merely aimed at increasing the efficiency of the vehicles but also at reducing the carbon dioxide emission by the vehicles. In the long run, this would prove beneficial for the consumer. "

According to the fuel efficiency gazette, each manufacturer of the said motor vehicles shall comply with energy consumption standard in terms of Average Fuel Consumption Standards as provided below:—

(i) "The Average Fuel Consumption Standard = a x (W-b) + c

Where, a = Constant Multiplier

Average Fuel Consumption Standard = Average Fuel Consumption Standard of manufacturer in petrol equivalent liter per 100 kilometer;

b = Fixed Constant;

c = Fixed Constant;

W = Weighted average of unladen mass in kilogram (kg) of all new said motor vehicle, manufactured or imported for sale by the manufacturer;

The gazette also stated that the actual fuel consumption in petrol equivalent for diesel, LPG and CNG motor vehicles shall be obtained by multiplying the actual fuel consumption referred to in (a) above with the conversion factors specified below:—

The fiscal year, beginning from1st April, 2016 onwards, the Average of Actual Fuel Consumption as specified in sub-para (2) of para 2 shall be less than or equal to Average Fuel Consumption Standard as specified in sub-para (1) of para 2 of the respective fiscal year.

The introduction of the new norms, will pave way in increasing the mileage of the passenger vehicles by at least 14 per cent from 2016-17

After notifying the standards for the fuel efficiency in the vehicles, in the near future, BEE would also undertake star labelling of the vehicles, the way they had done for the electronic appliances.

Fuel consumption will be calculated based on the vehicle's weight and the ministry will create 8 different weight categories in order to accommodate all vehicles.

Meanwhile, stringent action would be taken against the violators of the newly introduced fuel norms as the Ministry of Road Transport and Highways will impose harsh penalties for violations.

There has been a drastic change in the automotive industry from the perspective of technology, deployment and innovation and execution of governmental standards and regulations. Speaking about the new fuel efficiency norms, Vishnu Mathur, director general of Siam said, ...

WORLD VIEW OF FUEL EFFICIENCY NORMS

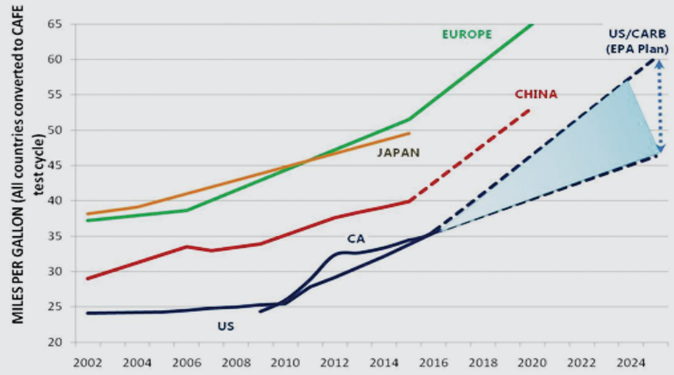
In different parts of the world, fuel economy

FUEL ECONOMY AND GHG EMISSION STANDARDS FOR VEHICLES AROUND THE WORLD

Country/ Region	Type	Measure	Structure	Test Method	Implementation
United States	Fuel	mpg	Footprint-based value curve	US CAFE	Mandatory
European Union	CO2	g/km	Weight-based limit value curve	EU NEDC	Voluntary for now, Mandatory by 2012
Japan	Fuel	Km/L	Weight-bin based	Japan 10-15/JC08	Mandatory
China	Fuel	L/100-km	Weight-bin based	EU NEDC	Mandatory
Australia	Fuel	L/100-km	Overall light-duty fleet	EU NEDC	Voluntary

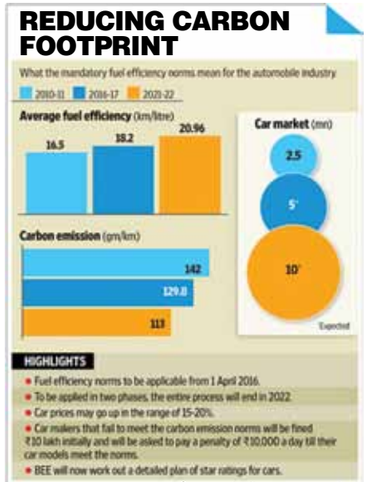
Source: indiaenergy.gov.in

STANDARDISED COMPARISON OF INTERNATIONAL FUEL ECONOMY STANDARDS (MPG)



Source: An and Sauer (2004), Feng An et al

REDUCING CARBON FOOTPRINT

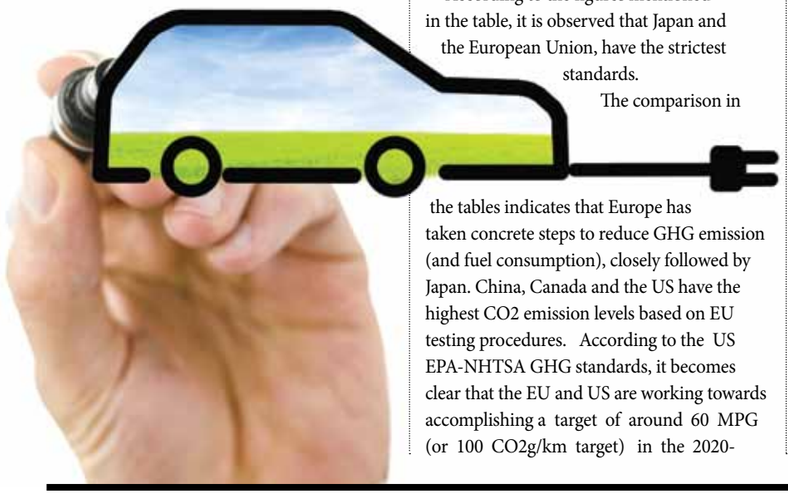


Source: indiaenergy.gov.in

programmes include both numeric standards and fiscal incentives, which aim to improve the energy efficiency of individual vehicle s per unit of distance travelled.

Presently, it is observed that new technologies help in bringing about drastic improvement in the vehicle fuel economy, thereby showcasing that technology development also responds to price and the hike in oil prices has paved the way for the manufactures and consumers to build and buy small and more fuel efficient cars.

Various countries in the world have adopted different approach to promote fuel-efficient vehicles.There have been drastic changes in China, the EU, Japan and the US who had overhauled vehicle fuel economy regulations.



In Japan and China, it is imperative for the vehicles to adhere to the standard for their weight class as the fuel economy standards are based on a weight classification system. Meanwhile, in Republic of Korea, the fuel economy standards are based on an engine size classification system. China is following the New European Driving Cycle (NEDC) testing procedures developed by the EU. However, Japan follows its own test procedures.

In the tables given, a comparison is given between fuel economy and GHG emission standards for the US, EU, Japan and China. The US/CARB suggested fuel economy target range, with annual fuel economy improvement by 6 per cent for upper boundary and 3 per cent for lower boundary, from 2017 to 2025.

According to the figures mentioned in the table, it is observed that Japan and the European Union, have the strictest standards.

The comparison in the tables indicates that Europe has taken concrete steps to reduce GHG emission (and fuel consumption), closely followed by Japan. China, Canada and the US have the highest CO2 emission levels based on EU testing procedures. According to the US EPA-NHTSA GHG standards, it becomes clear that the EU and US are working towards accomplishing a target of around 60 MPG (or 100 CO2g/km target) in the 2020-2025 timeframe.

The tables also point that both the US and the EU are moving towards mandatory, attribute-based (either a weight-based or size-based) approaches, while moving away from fleet-average or corporate average approaches.

Developing country like India face problems as it does not have sufficient capability to formulate targets for individual manufacturers, or to monitor the compliance of individual manufacturers to a sales- weighted fleet average standard owing to the absence of sophisticated data reporting systems about vehicle sales.

In the near future, it is important to provide all kinds of assistance to the developing nations so that they can device regulatory systems in phases by first limiting the emissions or consumption of individual vehicles. After an adequate measurement and reporting system is in place, the next step would be to develop corporate average fuel economy/emission standards which will allow for more variety in automotive products in the longer term.

CONCLUSION

The power ministry had formulated the guidelines, keeping in mind fuels such as CNG, LPG and diesel, which provide better mileage and wanted to make it equivalent to the petrol proportionately. Despite the BEE being buoyant about the new fuel efficiency norms, experts from the industry have expressed their apprehensions about them. en

Mapping energy scenario

India is struggling to bridge the gap between the demand for power and its supply. Keeping the energy requirements of the country over the next three decades in view, the Planning Commission has launched a web tool to assess various energy scenarios with respect to different levels of demand and supply in the mid-term. ***Energy Next*** reports

As per the Planning Commission's estimates, India will have to import 84.4 per cent of its total energy requirements in 2047 against 31 per cent as of now, if the government doesn't come out with policies to reduce consumption as well as reliance on overseas supplies. A web tool recently launched by the Planning Commission emphasises that the government, consumers and industries alike should bring down their energy usage through best practices and switch to more environment friendly and sustainable power generation. The web-based statistical tool --- 'The India Energy Security Scenario, 2047 (IESS, 2047)' --- takes into consideration various energy pathways in assessing the demand versus supply of energy in the country from now till 2047.

According to Montek Singh Ahluwalia, the Planning Commission deputy chairman, the country currently imports about 31 per cent of its total primary energy requirement and this import dependence looks set to increase under any business-as-usual policy. Globally, India is the fourth-largest energy consuming nation and has to import 80 per cent of its crude oil and 18 per cent of its natural gas. The rising energy demand and greater dependence on foreign imports warrants a long-term energy plan for the country. The IESS, 2047 is an attempt on the part of the Planning Commission panel to derive projections of energy requirements and supply leading up to 2047.

THE TOOL

It has been developed by the Commission in consultation with key stakeholders including the UK Department of Energy and Climate Change, TERI, C-Step and Prayas Energy. It has been developed in the Excel format, which allows graphic representations of the chosen energy demands and supply levels' outputs leading up to the chosen terminal year, i.e. 2047. The tool is open to the adoption of other outputs going

The tool has been developed in a consultative manner and is an attempt to facilitate more objective and informed debate about India's energy future. The tool is transparent, with all assumptions and constraints available in the public domain

OBJECTIVES OF IESS, 2047

- A platform to facilitate academic and policy discourse on possible future pathways for the Indian energy sector
- Enable prioritising some potential policy interventions for deeper analysis
- Help in understanding of wide realm of possible energy pathways available to the country from highly pessimistic to highly optimistic scenarios
- To provide indicative numbers for demand and supply, and potential implications on issues such as import dependence, cost and land requirement.

forward. In the current form, the tool would integrate energy security, land, cost and CO2 emissions as its output, while the future versions could incorporate other implications like water, energy, labour, energy intensity, etc as outputs.

The tool deals with broad estimates of the likely long term prices of different fuel technologies. Inputs from multiple agencies have been sought on the basis of which assumptions have been made with regard to reduction in the cost of technologies, as well as a point estimate between the high cost and the likely lower cost till 2047. The tool also provides land use estimates, emission levels and derives example pathways ranging from the least efficient scenario to the most efficient.

Commenting over the tool, Ashwin Gambhir, Senior Research Associate at Prayas Energy Group, says, "The tool has been developed in a consultative manner and is an attempt to facilitate more objective and informed debate about India's energy future. The tool is transparent, with all assumptions and constraints available in the public domain and it also allows users to create their own energy future pathways. The tool allows users to choose a combination of supply and demand trajectories, lying within a broad spectrum ranging from a highly pessimistic "least effort" scenario to an extremely optimistic "heroic effort" scenario, and understand the implications of the chosen trajectory on energy imports, land requirements, CO2 emissions etc."

The tool segregates the demand for energy by sectors and the supply numbers by sources.

It also generates energy import numbers by sources, and aggregates the same to offer total energy imports under different scenarios. It presents scenarios for different sectors in a linear format, either rising or falling, which is easy to comprehend.

LEVELS

The IESS, 2047 web tool talks about various levels of assessment for demand and supply of energy for the given time period. There are four levels of assumptions, Level 1 to Level 4, on the basis of which calculations are made both for the demand and supply sides.

Demand side: Level 1 is the 'Least Effort' scenario, wherein projections assume that past trends will continue. Level 2 is the 'Determined Effort' scenario which talks about the level of effort which is deemed most achievable by the implementation of current government policies and programmes. Level 3, the 'Aggressive Effort' scenario, describes the level of effort needing significant change which is hard but deliverable, and finally, Level 4, the 'Heroic Effort' scenario that indicates heightened efficiency numbers leading to the best possible result in due course.

Supply side: For the supply sectors, the 'Least Effort' scenario means poor domestic output of energy, and is likely to follow past trends. In Level 2, it is assumed that the capacity addition would follow the prescribed projections should there not be any major policy announcement, or any other trigger in generating energy supply. In level 3, the capacity addition in various supply sectors will be greater than the projected targets due to significant efforts at various stages. The 'Heroic Effort' scenario of Level 4 presents the best possible limits, thereby guiding the growth of the particular energy supply up to the year 2047.

DEMAND OVERVIEW

The IESS, 2047 has included 6 demand sectors, namely --- Industry, Transport, Cooking, Buildings, Agriculture and Telecom. Each of the six sectors are further broken down into subsectors to offer 16 different sectors, each offering variable levels of effort. Once the user chooses a demand pathway, the levels of supply to meet this demand also needs to be chosen.

RANGE OF OPTIONS AVAILABLE ON THE DEMAND SIDE

(UNITS IN TERA WATT HOURS)

Sector	Baseline (2012)	Least Effort Scenario (2047)	Heroic Effort Scenario (2047)
Lighting & Appliances	239.5	3,174.6	1,805.9
Industry	2,278.8	11,326.4	7,960.7
Transport	847.9	6,085.3	3,035.0
Green Building Design & Envelope Savings	(0.0)	(0.4)	(77.1)
Agriculture	237.2	1,047.8	533.1
Telecom	82.7	237.0	101.0
Cooking	1,218.5	1,808.2	1,296.5
Total	4,905	23,679	14,732

Source: indiaenergy.gov.in

RANGE OF OPTIONS AVAILABLE ON THE SUPPLY SIDE

(UNITS IN TERA WATT HOURS)

Sector	Baseline (2012)	Least Effort' Scenario (2047)	Heroic Effort Scenario (2047)
Nuclear fission	94	168	990
Solar	2	107	1,663
Wind	19	161	1,462
Hydro	156	207	641
Bio-energy	959	993	3045
Coal reserves	2,704	2,878	7,306
Oil reserves	443	401	907
Gas reserves	449	769	2,115

Source: indiaenergy.gov.in

SUPPLY OVERVIEW

The major supply sectors that are taken into account in the IESS, 2047 include gas, coal, oil, renewable energy, hydroelectric power stations, nuclear power stations, carbon capture and storage, electricity imports, energy from municipal waste, and bio-energy. These 10 sectors are further broken down into subsectors to offer 21 different sectors, each offering variable levels of effort.

SUSTAINABILITY

There has been increased emphasis on renewable energy generation across the world in the wake of depleting fossil fuel reserves and the need to bring down carbon emissions. It, therefore, becomes pertinent to adopt energy efficient products and appliances and rely more on generating power from renewable sources of energy. The web tool presents ample scope of power generation from renewable sources of energy in the country through solar PV, solar thermal, small hydro power, wind energy and bio-energy. A number of permutations and combinations of the power scenario through renewable sources up to the terminal year have been presented in the tool. It also talks about the concept of green buildings and the use of energy efficient products and appliances in various sectors like industries, agriculture, lighting, etc.

"Given the huge potential of energy in India, these sources need to be optimally exploited in order to address the country's energy security. Demand side management, particularly improved energy efficiency across all end uses, would be another key element of India's efforts at improving its energy security. Heroic efforts at improving energy efficiency and shifting to renewables can reduce India's energy imports by over 22 per cent in 2047 in comparison to the "determined effort" pathway," remarks Gambhir.

IMPLICATIONS

The increased deployment of renewable energy projects over recent times have led to debates over the implications on land, as renewable projects such as solar, wind and biofuel require huge stretches of it. The tool has, therefore, incorporated the land use numbers for different energy supply sectors and aggregates the implications therein, one of which being the land area footprint of the chosen pathway.

While India is striving to achieve energy security, proper attention is being given to the environment friendly and sustainable pathways. With the help of this tool, the cumulative impact of various energy pathways on emissions can be determined by combining different mixes of energy efficiency interventions on the Demand side, and fuel mix on the Supply side, in the medium term. As of now, only CO2 emissions have been included for examination and green house gases (GHGs) can be taken up in later versions.

On the basis of detailed examination of the tool, it could be ascertained as to which policy interventions can be more effective to meet the desired energy goals. As the tool offers fuel-wise data, suitable policy measures can influence specific demand sectors to curb consumption of such fuels that are largely imported in the country. Overall, the guiding principle of the IESS, 2047 is energy security, viewed as reduced import dependency for India from now till 2047. The tool is unique in providing information on energy security in the overall context of all supply sources. On one hand, there is an integrated exercise between energy demand and supply sectors, while on the other it is about energy security, balancing, energy flows, emissions, land, etc. It, however, does not propose any one scenario or pathway over the others, but only presents the possible energy scenarios and their implications.

Illuminating **lives**

A number of villages in the Unnao and Sitapur districts of Uttar Pradesh were either forced to embrace darkness post sunset or would rely on costly and polluting kerosene lamps to light up their homes. ***Shyam Patra***, a social entrepreneur, came to their rescue with offerings of cheap solar energy through innovative solar micro-grids. ***Upendra Singh*** explores the journey of this young entrepreneur, taking a look at his accomplishments and their impact on the lives of rural communities

An electrical engineer from NIT-Jaipur and MBA from IIPM- New Delhi, Shyam Patra could have continued his job in the corporate world, but decided to take the road less travelled, embracing the role of a social entrepreneur. Having worked in various capacities with companies like IPCL, Capital Fortunes Ltd, Gujarat Gas, GMR, Lanco and Usha Martin, today Patra is seen standing shoulder to shoulder with poor villagers in Uttar Pradesh (UP) and Bihar. Using his smart solar micro-grids, and providing smoke-free clean cooking alternative with flexi-biogas systems, Patra is trying to bring light into the lives of the villagers who are devoid of electricity.

Having worked in the power sector for almost a decade, Patra realised that the whole purpose of indulging in plethora of activities to commission a power project was to bring light in the lives of the citizens. However, he was amazed to realise that the local population, which goes through all the noise, air/water pollution, damaged roads after the project, etc., does not get electricity in the end. "Over all these years in power sector, I saw the highs (competitive bidding for handing over 4,000 MW ultra mega power projects) and challenges that the power sector was witnessing with regard to land acquisition, risks of fuel availability, uncertainty in fuel prices, challenges in securing water allocation and environment clearances. And the irony is that when the project finally generates electricity, it is not meant for the local people," remarks Patra.

SHIFT TO RE

The shocking reality of the power business in the country made him look for an alternative in securing electricity, one that would bring light to the millions of rural households that still spend their evening hours in dimming kerosene lamps, inhaling toxic fumes. "The black patches left on the walls due to smokes from kerosene lamps remind you the unfulfilled promises of inclusive growth even in 21st century," he notes.This led to Patra turning towards renewable energy, and as a first step, he incorporated Naturetech Infrastructure Pvt. Ltd. in October 2009. He decided to explore all possibilities and come up with a sustainable business model before resigning from the post of Assistant Vice President at Usha Martin in March 2011. It was in May 2011 that he installed the first solar micro-grid in Bhagalpur district of Bihar. Explaining the foray into off-grid renewable sector, Patra says, "I wanted to set up a business with triple bottom line motive-

creating value while being profitable, being Environment friendly and creating lasting social impact."

Currently, Patra's company is offering cheap solar energy to rural population through its ultra-low cost smart solar AC Microgrids. Patra claims it to be one of its kind in the entire world, electrifying villages in rural areas providing 24x7 electricity for all their household needs through theft-free distribution network and tamper-proof prepaid metering. The consumers pay approximately ₹ 150 a month, which is almost half the amount that they spend on kerosene or diesel. In cooking segment, it is offering family size Flexi Bio-gas plants which cost about 40 per cent less than the conventional dome-shaped biogas plants and are very easy to install and maintain. They have also been promoting battery operated cycles in Lucknow for the last 2 years

CHALLENGES

Patra had to face a number of challenges to realise his dreams. The biggest challenge was securing fund for setting up projects in the rural space. The non availability of fund as well as the delay in securing them proved to be a major obstacle. Also, the lack of awareness among the villagers for the renewable applications was something that had to be addressed through example.

"In the initial years, we had to struggle at both winning customers, managing the nuances and serving remote locations, as well as reconciling with the low capital available. However, need is the mother of all inventions, and we were determined to roll out the renewable solutions for the deprived communities," Patra says.

ACHIEVEMENTS

Naturetech's smart AC solar micro-grid model of village electrification has been getting very good acceptance in India as well as abroad. NABARD, Lucknow has sanctioned a soft loan and grant to showcase this model as a bankable model so that other rural and commercial banks come forward to help the cause.

Recently, the company has been awarded a grant of US$ 30,000 from a UK charity through an all-India level Rural Electrification Challenge Competition for Innovation, Viability & Scalability. It is also bringing in corporate partners to replicate this sustainable model of village electrification under their corporate social responsibility (CSR) program.

Naturetech has already secured work order from a leading cement factory in UP. Patra has also been praised in the electronic and print media for his business model that involves the development of rural communities with the help of renewable energy. Patra expresses gratitude to the media for its continuous encouragement through positive reviews and coverage.

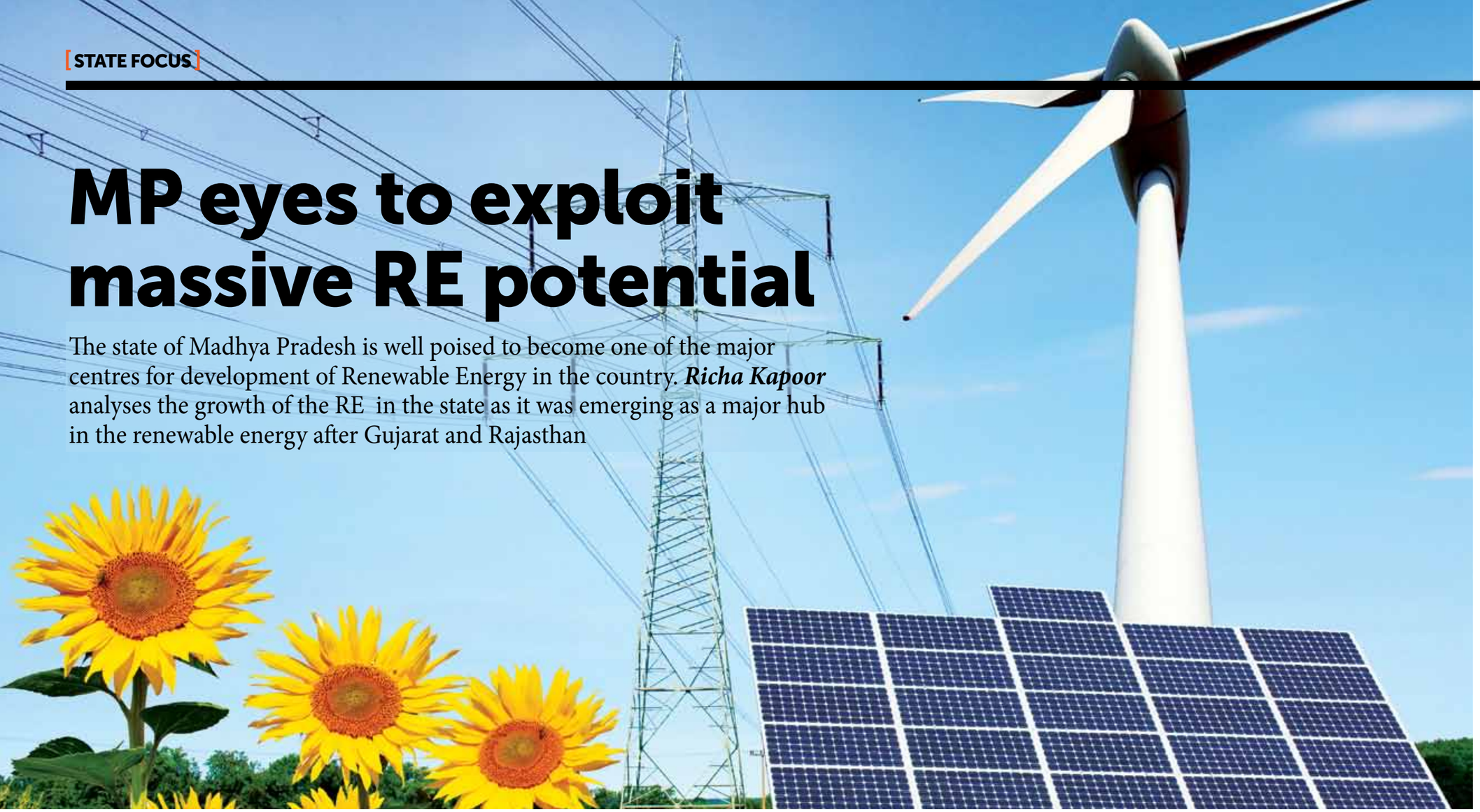
Showering praise on Patra for his good work, Sushil, a shop owner in the Digiah village of Sitapur district in UP, says, "Because of our sir (referring to Patra), everything has been possible. In our village there was no electricity no road. After the solar power plant, there is happiness over here. Till late night the shop remains open. Kids study in the evening. To see this plant, the district magistrate visited our village. And because of that visit, a clay road was built for this village!"

FUTURE PLANS

Patra wants to carry forward this business model so that more and more people living in the rural regions of the country are benefited. Talking about future plans, Patra says, "We are now engaging with NGOs and entrepreneurs in UP to create a franchisee network for promoting solar micro-grids for electrifying shops and households in rural areas. A few investors have taken great interest in our business model and we are in discussion with them to raise our first round of funding to expand our business. If all goes well, then we should be able to electrify about 100,000 households in 5 years."

MP eyes to exploit massive RE potential

The state of Madhya Pradesh is well poised to become one of the major centres for development of Renewable Energy in the country. ***Richa Kapoor*** analyses the growth of the RE in the state as it was emerging as a major hub in the renewable energy after Gujarat and Rajasthan



The efforts of the last few years under the able guidance and support of Honorable Chief Minister, Shivraj Singh Chauhan, is expected to increase the contribution of Renewable Power to the total grid power of the state from 4.61 per cent at the beginning of 2012-13 to about 21 per cent by December, 2015.

The state has a potential of more than 5000 MW of wind, 1200 MW biomass, 750 MW of small hydro and 5000 MW of solar power.

The installed capacity as on 1st April 2012, however, remained only 438 MW which was only 3.65 per cent of the available potential and only 4.61 per cent of total installed capacity of the state. Private investors were also not forthcoming to invest in Madhya Pradesh in solar and wind Power.

SEPARATION OF RE DEPARTMENT

In order to kick-start the process of exploiting the potential of renewable energy in MP, the state government separated the department of Renewable Energy from the Energy Department in 2011-12. In an effort to increase investor confidence in the state, separate policies were formulated after extensive consultation with all stakeholders including investors, manufacturers, financial institutions and consultancy organisations.

DEPARTURE FROM TRADITIONAL POLICIES

The drafting of the policy marked a departure from the traditional practice of maintaining secrecy and confidentiality in the formulation of government policies. In the proposed draft that was shared with the aforementioned stakeholders, several critical points were incorporated that one had not foreseen in preparing the base draft.

All the players concerned enthusiastically received the policies, which not only incorporated all the benefits that the experience of different states had provided, but also aimed to remove various irritants like inspections by government officials, plurality of permissions for constructions and the setting up of units while also simplifying the allocation of land from the government pool.

SOLAR POWER

Madhya Pradesh has at least 300 days of sunshine with the solar fall of 5.6 - 6.2 kWh/sq.m/day in Neemuch, Mandsaur, Mandsaur, Sheopur, Rajgarh, Guna, Shajapur, Ratlam, Cumu. The state also has a huge bank of barren land that can be utilised solely for solar power. The land is also dust free. Even with these favourable factors, the solar power potential remained unexploited till March 2012 when the grid connected solar capacity was a mere 2 MW.

In wake of rising concerns regarding the depletion of conventional energy sources, and in order to combat the issue of climate change, the Madhya Pradesh Renewable Energy Department is taking all possible steps to attract investment in the solar energy sector so as to generate power using clean energy.

SR Mohanty, Principal Secretary, Madhya Pradesh Renewable Energy Department, said, "During the second quarter of 2013,191 MW of solar capacity was added in India, of which 145 MW was added in Madhya Pradesh."

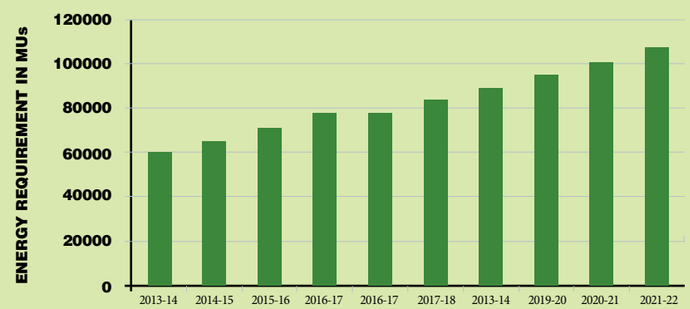
MP has grown tremendously in the sphere solar energy and has become is among the top three states in the country along with Gujarat and Rajasthan in the overall installed capacity for solar power. The contribution of the state is 60per cent of India's capacity addition of 312 MW in the second half of FY 2013-14, a tremendous feat by any yardstick.

DEVELOPMENT OF SOLAR PARKS

As a step towards upgrading investment through participation of large players, the department formulated a Solar Park development policy to generate more than 100 MW from dedicated locations. This, in addition to providing an platform for large investment, also provides small investors with an opportunity for plug and play within the developed solar parks.

The policy has been notified on January 23,

MADHYA PRADESH FUTURE ENERGY REQUIREMENT



Source: 18th EPS

Wind potential, which remained stagnant till March 2012 with meagre addition of 323 MW over the last 20 years, has seen a spurt in investment commitment from developers

2013. Government land for 5 such solar parks has been identified in Neemuch, Mandsaur, Rewa, Rajgarh and Sheopur. Solar parks have been identified on private land as well for capacities ranging from 100 MW to 250 MW to be implemented under a PPP model.

SOLAR REC PROJECTS IN MP

MP is one of the first states in India to allow Third Party Sale for Solar Project developers willing to set up their solar projects under the Renewable Energy Certificate (REC) scheme.

Till December 2, 2013 a total of 51 Solar REC projects of cumulative capacity close to 80.5 MW were registered in MP. A detail list of solar projects in MP registered under the REC is as follows.

OFF-GRID

Along with production of solar power for the grid, the state has taken initiatives for universal application of solar power by providing off-grid solutions not only for the population living in the interior but also for the use of solar power by the general populace to reduce their dependence on grid connected power.

Speaking about off-grid solutions, Mohanty said, "This would go a long way to ensure energy conservation and long term energy sustainability. The Solar PV off-grid power plant capacity in the state has risen to 6MW in 2013-14 from 1 MW in 2012-13."

Presently, there are about 15,000 solar streetlights installed in MP and a further 3000 lights are being installed this year. There were no solar pumps till two years ago but almost 700 will be installed this year.

NEEMUCH PROJECT

The state also proudly announced the completion of the largest solar project in the country and third largest in world in Neemuch district that has a capacity of 130 MW AC (151 MW DC). The 900 acre project was commissioned 8 months ahead of schedule by Welspun Renewables Ltd. The early commissioning bears testimony to the enabling environment created by the policy initiatives of the state govt.

Gujarat Chief Minister Narendra Modi recently inaugurated the solar plant and had stressed on optimum utilization of natural resources of energy. With the plant at Neemuch becoming operational, it is expected that 6,24,000 houses will utilise the solar generated power.

WIND DEVELOPMENT

It is estimated that at least 48,500 MW of grid-interactive wind power projects exist in India. There are sites that have a wind power density of more than 200 W/sq. m at a 50m hub-height with 1 per cent land availability in potential areas for building wind farms at the rate of 12 ha/MW. It has been observed that the Indian RE market has been dominated by wind projects that form 60 per cent of the total installed RE capacity.

The C-WET data suggests that at 80m and 50m hub-heights, an estimated potential of 2,931 MW and 920 MW exists in MP. The state government has put forth an investor

SOLAR POWER PROJECT COMMISSIONED APPLIED UNDER CATEGORY III (PRIVATE LAND) /& CATE. I

Name of Developer	Capacity Applied (MW)	District	Village	Land	Commissioned Date
Shiv Vani Urja ltd.	2	Rajgarh	Ganeshpura	Rev. Land	6/16/2012
Adora Energy Pvt. Ltd.	2	Rajgarh	Ganeshpura	Rev. Land	6/18/2012
JSR Devlopers Pvt. Ltd.	1.25	Rajgarh	Ganeshpura	Rev. Land	6/12/2012
M&B Switch gear Ltd.	2	Rajgarh	Gagorni	Pvt. Land	Jul-12
Deepak Spinners Ltd.	1	Rajgarh	Gagorni	Pvt. Land	11/8/2012
Star Delta Transrormers Ltd.	0.5	Rajgarh	Gagorni	Pvt. Land	10/12/2012
Saboo Industries Ltd.	0.5	Rajgarh	Gaagorni	Pvt. Land	12/22/2012
Saboo Sodium Chloro Ltd.	1	Rajgarh	Gagorni	Pvt. Land	2/8/2013
Agarwal Jewellers	0.5	Rajgarh	Gagorni	Pvt. Land	2/23/2013
Tuhina Enterprises	1	Rajgarh	Gagorni	Pvt. Land	2/23/2013
KRBL Ltd.	2.5	Rajgarh	Gagorni	Pvt. Land	3/28/2013
Friends Salt Works & Allied Industries	2.5	Rajgarh	Gagorni	Pvt. Land	3/28/2013
Gautam Freight Pvt. Ltd.	1.25	Rajgarh	Gagorni	Pvt. Land	3/28/2013
Gupta Sons	1.25	Rajgarh	Gagorni	Pvt. Land	3/28/2013
R Square Shri Sai baba Hospitality Pvt. Ltd.	0.5	Rajgarh	Gagorni	Pvt. Land	3/28/2013
Systematic Enterprises Pvt. Ltd.	0.63	Shajapur	Dhabla Sondhiya, Jaisinghpura	Pvt. Land	3/30/2013
Hindustan Platinum Pvt. Ltd.	1.25	Shajapur	Dhabla Sondhiya, Jaisinghpura	Pvt. Land	3/30/2013
Active Solar LLP	1.25	Shajapur	Dhabla Sondhiya, Jaisinghpura	Pvt. Land	4/26/2013
Aditya Marine Limited	0.63	Shajapur	Dhabla Sondhiya, Jaisinghpura	Pvt. Land	3/30/2013
Bonaterra Greenhouses LLP	0.63	Shajapur	Dhabla Sondhiya, Jaisinghpura	Pvt. Land	4/26/2013
SRS Engineers	0.63	Shajapur	Dhabla Sondhiya, Jaisinghpura	Pvt. Land	3/30/2013
Friends Salt Works & Allied Industries	2.5	Shajapur	Dhabla Sondhiya, Jaisinghpura	Pvt. Land	3/30/2013
Eastman International	2	Shajapur	Dhabla Sondhiya, Jaisinghpura	Pvt. Land	3/30/2013
Centex Fabrics – Export Unit	1.25	Shajapur	Dhabla Sondhiya, Jaisinghpura	Pvt. Land	3/30/2013
Atul Sharma	1	Shajapur	Dhabla Sondhiya, Jaisinghpura	Pvt. Land	3/30/2013
Friends Salt Works & Allied Industries	5	Shajapur	Bid Pipalya	Pvt. Land	4/9/2013
Omega Renk Bearings Pvt. Ltd.	0.695	Bhopal	Bilkheria Kalan	Pvt. Land	4/8/2013
Bansal & Co.	1	Ujjain	Kododiya	Pvt. Land	5/17/2013
Pearl Green Energy Pvt. Ltd.	1	Ujjain	Kododiya	Pvt. Land	5/17/2013
Banco Construction Pvt. Ltd.	1	Ujjain	Kododiya	Pvt. Land	5/17/2013
Bhadresh Trading Corporation Ltd.	5	Shajapur	Bid Pipalya	Pvt. Land	8/8/2013
Omega Renk Bearings Pvt. Ltd.	0.655	Bhopal	Bilkheria Kalan	Pvt. Land	5/4/2013
Birla Corporation Ltd. Unit : Satna Cement Work.	1.5	Satna	Ghurdang, Kolgawa and Badkhar	Pvt. Land	7/23/2013
M and B switchgears Ltd.	5	Shajapur/ Agar	Dhabla Sondhiya	Pvt. Land	9/30/2013
Ranjanben P. Chovtia	0.63	Shajapur/ Agar	Dhabla Sondhiya	Pvt. Land	9/30/2013
Avon Cycles Ltd.	1.25	Shajapur/ Agar	Dhabla Sondhiya	Pvt. Land	9/30/2013
Flow Devices Systems	0.63	Shajapur/ Agar	Rojhani/Rojhana	Pvt. Land	9/30/2013
Indra Vidhya Power	0.63	Shajapur/ Agar	Rojhani/Rojhana	Pvt. Land	9/30/2013
Suryashakti Enterprises	0.5	Shajapur/ Agar	Rojhani/Rojhana	Pvt. Land	9/30/2013
Sharma Industries.	0.63	Shajapur/ Agar	Rojhani/Rojhana	Pvt. Land	9/30/2013
Gujarat Apollo Industries Limited	1	Shajapur/ Agar	Rojhani/Rojhana	Pvt. Land	9/30/2013
Shri Balaji Enterprises.	2	Shajapur/ Agar	Rojhani/Rojhana	Pvt. Land	9/30/2013
IPF- Vikram India Limited-Unit-I	1.25	Shajapur/ Agar	Rojhani/Rojhana	Pvt. Land	9/30/2013
Deepak Industries Limited	5	Shajapur/ Agar	Rojhani/Rojhana	Pvt. Land	9/30/2013
Sanpower Solar LLP.	0.63	Shajapur/ Agar	Rojhani/Rojhana	Pvt. Land	9/30/2013
Hindustan Platinum Pvt. Ltd.	2.5	Shajapur/ Agar	Rojhani/Rojhana/Chipya	Pvt. Land	9/30/2013
Ankit Gems Pvt. Ltd.	1.25	Shajapur/ Agar	Jaminiya	Pvt. Land	9/30/2013
GTC Power Pvt. Ltd.	0.63	Shajapur/ Agar	Jaminiya	Pvt. Land	9/30/2013
Neevya Solar LLP	0.63	Shajapur/ Agar	Jaminiya	Pvt. Land	9/30/2013
KRBL Limited	6.63	Shajapur/ Agar	Jaminiya	Pvt. Land	9/30/2013
Sai Saburi urja Pvt. Ltd.	1	Ujjain	Kadodiya	Pvt. Land	17/12/13
Alpha Infra Pvt. Ltd. (Under RPO)	20	Dhar	Kanheri Bhtyari	Rev. Land	Aug-13
Welspun Solar Madhya Pradesh Pvt. Ltd.	130	Neemuch	Ganeshpura	Rev. Land	Nov-13
Acme Tele Power Ltd.	25	Rajgarh	Rampurya, Orpur, Baghali	Rev. Land	Dec-13
Installed Capacity during 2013-14 up to September 13	**254.16**				

In an effort to increase investor confidence in MP, separate policies were formulated, after extensive consultation with all stakeholders

friendly policy to provide some much needed boost to wind power and develop it as an alternate source of energy.

Wind potential, which had remained stagnant till March 2012 with a meagre addition of 323 MW in the last 20 years, has seen a spurt in investment commitment from developers. The state now has 85 projects of a total capacity of 3280 MW under construction. All these projects were started over the last six months. The state will have 400 MW by March 2014 (against its present target of 346 MW) and more than 1900 MW by December 2015. Wind power based projects with a cumulative capacity of around 323.89 MW have been commissioned in the state.

Numerous reputed and committed developers like Hero Renewables, Inox Renewables, Gamesha Power, Renew Power, ReGen Power, NSL, Suzlon, Wind World are now implementing wind projects in MP. The latest developer set to partake in the execution of the wind projects is Surajbari Windfarm Development (SWD), which is mulling over making an investment of at least $194 million with an aim to set up wind farms in Madhya Pradesh, with the International Finance Corporation (IFC) backing the proposed investment.

SMALL HYDEL PROJECTS

Hydropower is recognized as one of the most non-polluting, economical and environmentally benign sources of energy. In India, the probable potential is about 15,000 MW for small hydropower projects, while Madhya Pradesh alone has an estimated potential of about 15,000 MW.

Despite the presence of large rivers like the Narmada, Chambal and Sone, along with a large network of canals, the hydro potential in the state could not be exploited earlier as there was no focus on these projects.

Mohanty said, "All pending applications and clearances were accorded in a time bound & transparent manner." The state government's effort resulted in nearly 60 projects of more than 276 MW that are now under execution. About 12 projects of an aggregate capacity of 137 MW will be commissioned by December 2015.

BIOMASS-BASED POWER PROJECTS

Although developed nations use biomass minimally, it is widely used in rural India to meet cooking needs as well as industrial use. Biomass is a natural substance that is carbon neutral and aids in the creation of employment. At least 32 per cent of the primary energy use in the country is derived from biomass and more than 70 per cent is dependent on it.

MP has achieved more than 15 per cent growth for three years in a row in agriculture. The state is also blessed with a vast forest cover that contains Lantana Mexicana in abundance. Hence, biomass projects have a huge potential for development in the future. The state has 30 projects of 280 MW under execution and will have more than 200 MW of biomass power by December 2015.

Furthermore, the 'Biomass Resource Atlas of India" projected that the gross potential for energy generation from agricultural sources in MP will be 1386.2 MW. The districts that have been identified to have a high biomass potential in the state are Khandwa, Dhar, Khargone, Barwani, Dewas and Jhabua. The cumulative biomass installed capacity is 40 MW and the additional cumulative project capacity is likely to be 336 MW by June 2014, with an investment of Rs 1500 crore.

REGULATORY SUPPORT

The growth in the sector has been well supported by the State Regulatory Commission. The Commission has mandated Renewable Purchase Obligations as 1per cent solar and 6per cent non-solar for the year 2014. With the ongoing projects, the state is well poised to meet its RPO. This has and will continue to provide a big boost to investor confidence in the state. EN

MP scaling new **heights in RE**

To combat twin challenges of climate change and continuous decline in conventional energy sources, Madhya Pradesh government has devised an ambitious plan to meet the rising demand of power through renewables. ***SR Mohanty***, MP's Principal Secretary – Renewable energy, talks about the plan to ***Energy Next.***

Q Consequent to the Union Government giving a serious thought to non-conventional modes of energy and setting up a separate ministry with ample outlay, what has been the downstream 'action plan' of Madhya Pradesh?

Madhya Pradesh focused on the speedy exploitation of RE resources for state's sustainable energy mix. The aim set in 2012 was to make RE contributions from the level of about 4 per cent to more than 20 per cent in capacity mix by December 2015. In order to achieve the target, MP created separate ministry for focused growth. The new policies for each renewable energy technology were floated after extensive consultations with the investors and all possible steps were being taken to accomplish the goal.

What has been the rating by the Union Ministry of New & Renewable Energy to this 'action plan' mooted by your department?

All the stakeholders have taken the state commitment positively. The responses are emphatic. State has achieved solar installed capacity from meagre 2 MW on 1st April 2012 to now at 330mw, the largest capacity addition growth. State has 1,448 MW of solar Projects ongoing, with 260 MW JNNSM response, state will reach 2 GW by December 2015. Wind which now has 2774 MW projects under construction & would add 700 MW in 2014-15 and would achieve 2 GW by December 2015. The state currently has 60 hydro projects of 276 MW under construction.

Has your department been constantly monitoring the functioning of the renewable energy power plants for periodical review with innovative suggestions?

The department is proactive in all space in not only facilitation but also towards future requirements. State has proposed 100 MW energy storage project to enable grid stability issues, largest wind repowering wind project, solar farms with epc ready for small investors etc.

How effective has been the recovery of cost of services and targeted subsidies as per your 'action plan'? As such what are your views on the commercial viability of renewable power generation?

The grid connected projects are found to be viable at regulated tariff.

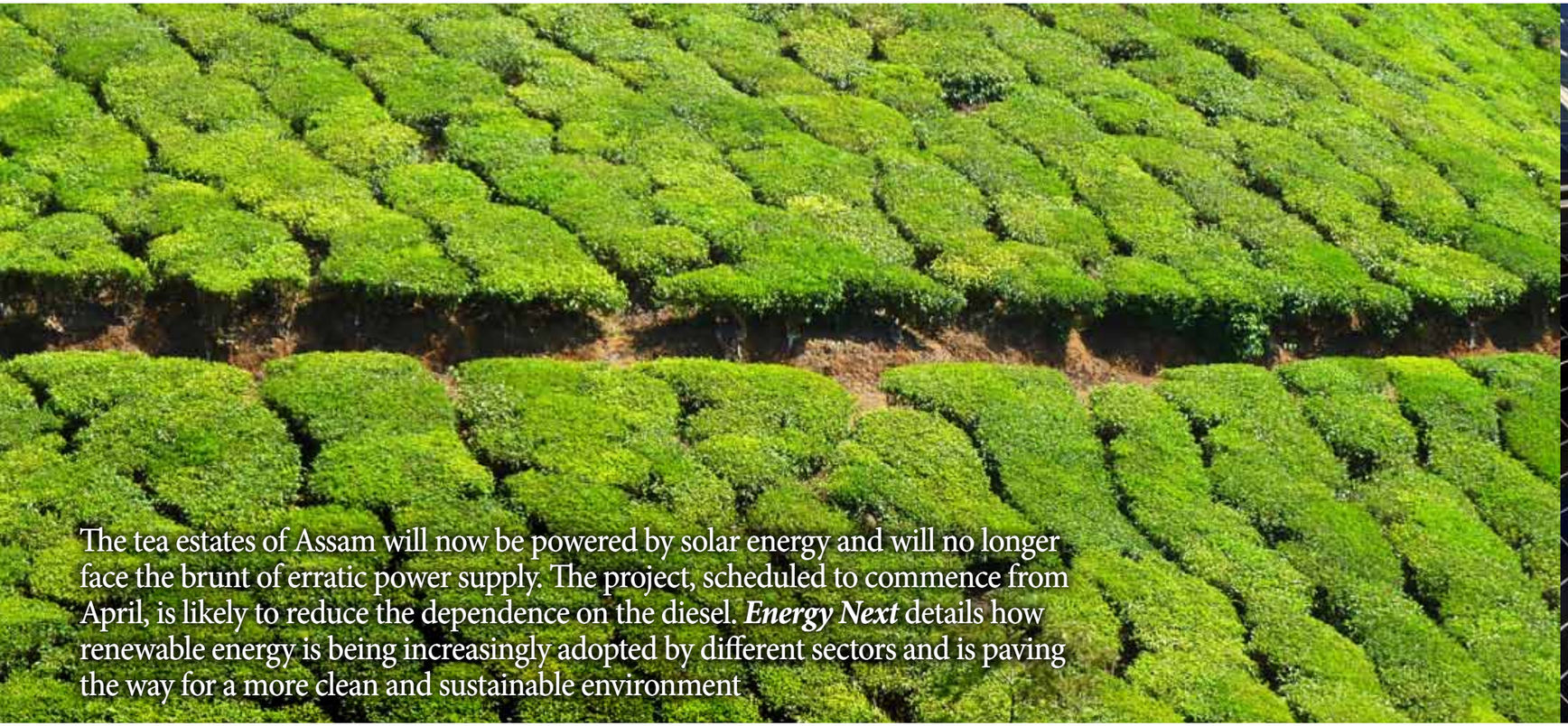
As on date, how has been the response from the private enterprises in setting up new and renewable energy plants and also the level of quality services provided by them alongside keeping the consumers' interests? Is there any nodal agency to address these issues.

As mentioned the response has been emphatic. At present 294 renewable energy projects of capacity 5265 MW are under construction.

What is the future course of action for the development of the renewable energy sector?

In wake of the renewables holding the key to future, our main objective is to provide positive facilitation to the investors so that we can accomplish our goals. EN

Solar solace to Assam tea Estates



The tea estates of Assam will now be powered by solar energy and will no longer face the brunt of erratic power supply. The project, scheduled to commence from April, is likely to reduce the dependence on the diesel. *Energy Next* details how renewable energy is being increasingly adopted by different sectors and is paving the way for a more clean and sustainable environment

In a first in its kind of initiative, Vikram Solar, the Kolkata headquartered global specialist in manufacturing photovoltaic (PV) solar modules has ventured into the tea estate of Assam with an aim to provide alternative source of stable power supply.

The company has partnered with McLeod Russel India Limited for the implementation of 100 Kw Off-Grid Solar Power Project at Attareekhat Tea Estate, Tangla, Assam.

The solar system at the tea estate would have a battery backup and the Ministry of New and Renewable Energy (MNRE) has given 30 per cent subsidy.

The state run power sector merely supplies 60 per cent of the total electricity required by the tea estates and for the remaining 40 per cent they have to rely on diesel gen sets. Ten paise duty is levied on the electricity generated from the gensets in the tea estates.

Speaking about the energy saved by using solar power, Gyanesh Chaudhary, Managing Director & CEO, Vikram Solar said that "though it is difficult to quantify, but without doubt implementation of solar plant in place of using diesel generator sets for power generation will decrease the dependence on inorganic fuel & result in reduction of carbon emission & air pollution and the same would be reflected in a positive way in the balance sheet of the company".

The amount of energy and money saved would be assessed after few months of the commissioning of the plant. The setting of the project in Assam has rooted out the myth that solar power is not suitable for the northeastern region.

The biggest hurdle faced by the tea estates of Assam and other nearby states is the irregular power supply to the grid. Despite high capital investment, solar power is an economical and eco-friendly alternative for conventional energy.

According to experts, Assam Power Distribution Company supplies electricity at the rate of ₹ 5.70 per unit for the tea growers, while the per unit cost of power generated by diesel gensets comes to ₹ 17.

Generation of power from solar energy has therefore emerged as a logical and feasible option for tea growers of Assam

In all probability, the solar radiation would work efficiently in the north eastern region of India despite the belief that the solar system would not work to its full potential during the monsoon season. However, the available solar radiation is quite adequate for the generation of solar power.

In the tea rich north eastern state of Assam, there are at least 800 big tea estates and approximately one lakh small tea growers involved in producing at least 618 million kilogrammes of tea every year. It is likely that the execution of the solar project in the tea estate would be successful as Assam falls in the medium radiation zone, where solar units function in an appropriate manner.

On being asked what would be the approximate savings if the same model was to be replicated in other states, Chaudhary opined, "Obviously it will be a major breakthrough in increasing the scope of implementing Solar Energy in till date unexplored sectors & areas'. But the estimate on savings & save on inorganic fuel will ultimately depend upon how many tea estates it is implemented in & in what scale. There will be a huge reduction in carbon emission & thus reduction in pollution."

The initiative of Vikram Solar and McLeod Russel India has opened new doors for the tea growers of Assam.A The move would also help in the marginalisation and eventual fading away of the diesel gensets as they are costly and highly polluting. Presently, the objective of the project is to maintain continuity of production & quality of the products, as the pooled cost of electricity is on the higher side.

In the near future, similar kind of projects would be set up in other states of India. Chaudhary said that they are holding talks with other north eastern states as well as West Bengal.While a number of other companies have shown their willingness to use solar power, the success of the first installation will be crucial for providing the much needed boost to solar energy in north eastern India.

WTE Plants: A solution or menace ?

The issue of the viability of the waste-to-energy plants continues to haunt the activists as well as the neighbourhood residents, while the government is still buoyant on these projects. It contends that such plants facilitate effective management of waste besides generating safe and eco-friendly power. ***Richa Kapoor*** reviews the modus operandi of these projects from waste collection and separation to the objective of minimising toxic emissions in a sustainable manner

The waste-to energy (WTE) projects in Delhi and nearby areas address the twin needs of garbage disposal in an eco-friendly method alongside generating electricity. The World Health Organisation(WHO) highlighted that the open dumping of garbage in the barren lands poses the danger of methane being formed by the decomposition of the organic matter and has 24 times more potential of global warming than carbondioxide (CO2).

With the population rising, the policy makers face the challenge of the steps that need to be taken to reduce waste owing to the paucity of space. However, the prominent WTE projects which have hit roadblocks include the one at Ghazipur and also Okhla.

It is important to understand that there is a dire need to manage waste. The alternative would result in the degradation of environment due to harmful emission of gases from the heaps of garbage that pile up each passing day.

In wake of the depletion of conventional energy sources, a large number of countries are also setting up facilities for generating power from civic waste after due treatment.

Meanwhile, those who are opposed to the concept of WTE call for adherence to the strict emission standards including those on nitrogen oxides, heavy metals, sulphur dioxide, methane, etc.

When asked whether the waste-to-energy power plants is an apt solution of two birds with one stone in tackling the issues of waste management and generation of power, Gopal Krishna of ToxicsWatch Alliance (TWA) responded in the negative. In his view, the WTE is adverse to human and environmental factors since such projects are aimed solely to generate energy.

Further, he noted that there is a dearth of progressive resource management plans vis-à-vis waste as a vision for the future. Such a plan demands prevention of waste at the very outset besides reuse, repair, recycling, and composting, he said.

As such the need of the hour is to identify the wide range of materials for segregation to enable sustenance of quality and enhance cost-effective diversion levels like keeping organics out of landfills.

According to Gopal Krishna, economic incentives have to be spelt out for those engaged in the recycling of civic waste and effective garbage disposal.

He also sought enactment of rigid policies to ban products that cannot be recycled, including those single-use products like plastic-based razors. These steps would be the pointers to the envisaged resource management plan, he added.

This plan will also include programmes of mass awareness, along with rendering technical know to residents and commercial establishments, thus showcasing the environmental and economic benefits of preventing, reusing, and recycling discards.

In the long run, this action plan will manifest in an environmental health sensitive public, Gopal Krishna observed.

Schedule II of the Municipal Solid Waste (Management and Handling) Rules, 2000, which provides parameters and compliance criteria of management of solid wastes, should be retained in the Draft Rules. It has very good provisions like "waste (garbage, dry leaves) shall not be burnt."

So far, the MNRE has turned a blind eye to these contentions and has been blindly promoting waste burning technologies, Gopal Krishna said.

The Union Ministry of Environment and Forests had come out with a White Paper on Pollution in Delhi with an Action Plan. The relevant part of the paper reads:"The experience of the incineration plant at Timarpur, Delhi and the briquette plant at Bombay support the fact that thermal treatment of municipal solid waste is not feasible, in situations

where the waste has a low calorific value."

Citing this, in June 2005, Gurudas Kamat, the then Chairman of the Parliamentary Standing Committee on Energy had written to the Ministry of New and Renewable Energy (MNRE) for a review of its WTE programme. In this letter, he referred to two projects in Andhra Pradesh and assorted problems of incineration.

But for completion of those projects where already 30% of capital cost had already been

With the rising population, the policy makers face the challenge of the steps that need to be taken to reduce waste owing to the paucity of space

invested, Kamath's letter sought a halt to the government aiding WTE plants in fugure.

In contrast, those backing the concept of WTE claim that the usage of advance technology, like incineration and biomethanation, pyrolysis and gasification has proved to be advantageous in recent times.

Incidentally, the Timarpur plant was shut down merely a week after the commencement of the operations when it was discovered that the city's waste did not have the calorific value to function well with the technology.

STATUS OF WTE PROJECTS

The waste-to-energy plant at Okhla in the national capital is under clout as it is being tested by the country's environmental and zoning laws. The plant which was expected to become operational by October 2009 ran behind schedule due to environment related objections from the neighbourhood residents.

The delay in the project is attributed to the interference by the Ministry of Environment and the Central Pollution Control Board, thus adding to the woes of the company that undertook this project and the state government alike. The Ghazipur WTE is facing the wrath of the residents of the area since it is located merely 800 metres from the dairy farms.

Another reason for the plant running into rough weather is that it has left hundreds of rag-pickers jobless.

In 2001, Lucknow Nagar Nigam (LNN), the civic body of the capital of Uttar Pradesh state too came up with a project that focussed on converting the city's waste into energy and also organic manure.

Reportedly, out of the 1500 tonnes of garbage created daily, the municipal workers collect 1100 tonnes for disposal.

Prior to the planning of this project, this municipal solid waste (MSW) was dumped at various open sites in a reckless manner, posing grave hazards to the citizens.

This power generation-cum- bio-fertilizer project is executed in collaboration with Enkem India Limited through a Special Purpose Vehicle named Asia Bio Energy (India) Limited (ABIL) on a Build-Own-Operate (BOO) basis.

As per initial proposal, this plant was to generate 5.1 megawatts (MW) of power per day (after captive consumption of 0.5 MW) and about 75 tons per day (TPD) of organic manure by treating 300 TPD of MSW. The power is transmitted into the grid of the Uttar Pradesh State Electricity Board (UPSEB).

Enkem had sought technical assistance from ENTEC (an Australian based firm) to provide the digester to produce methane, and a performance guarantee for it. Jurong Engineers (a Singapore based consortium) was also roped in to execute the engineering and procurement contract while C.G.E.A Asia holding Private Limited (a wholly-owned subsidiary of Vivendi) was assigned the task of operations and maintenance of the new facility, executed under the National Programme on Energy Recovery from Urban, Municipal and Industrial Waste.

Amid this scenario Gopal Krishna justified the opposition to WTE plants by terming them as futile endeavours. He mentioned about an incineration based waste to energy plant in the suburban Jiading district of China that exploded on 5 December, 2013 claiming one life and injuring at least five others. Interestingly, it was the same day when the National Green Tribunal (NGT) heard the case against the Chinese incinerator based WTE plant at Okhla, he added. In a lighter vein, he opined that the citizens have become guinea pigs for experiments of the government in toying with failed polluting technologies.

The report of the IMTF had clearly observed that the soil across the country lacks carbon and thus, isn't in favour of WTE plants which burden the cash-starved civic bodies

He reckoned the claim made in page no. 102 of Rapid Environment Impact Assessment report of the Jindal's Okhla plant that "....no likely adverse impact on people's health is predicted" (i.e. during the operation phase) as totally incorrect. Above all, he said that the government ought to have viewed the White Paper prepared by the Environment Ministry in the proper perspective.

It has failed to underline that energy generated from waste incineration cannot be deemed renewable energy. It is does not reveal that waste incineration is a green house gas emitter as per Kyoto Protocol, he added.

Elaborating this Gopal Krishna recalled that the former President Dr. A P J Kalam had aptly summed up the need for integrated zero waste management by depicting how the Panchayat of a tiny village named Gandhi Nagar in Vellore district of Tamil Nadu has implemented a successful plan of garbage disposal.

The civic waste in this village totalling around 48 tonnes annually, is converted into manure and recyclable waste generating revenue to the tune of rupees three lakhs besides providing employment to scores of families.

To supplement his views, Gopal Krishna also cited the recommendations of Inter-Ministerial Task Force (IMTF) on Integrated Plant Nutrient Management that mooted 1000 compost plants all over the country in 2005 at a cost of ₹ 800 crore.

The report of the IMTF had clearly observed that the soil across the country lacks carbon and was not in favour of WTE plants which burden the cash-starved civic bodies, he added.

He said that the Supreme Court had been apprised of this report that has strongly advocated composting of MSW while it was hearing the civil writ petition of Almitra Patel challenging the Indian government.

The Supreme Court Committee on Solid Waste Management headed by Asim Barman had kept in view the characteristics of Indian municipal solid waste -- low calorific value, high moisture content, high proportion of organic matter, and considerable inerts like earth, sand and grit. Accordingly, it had suggested simple technologies and easily achievable standards with liberal timeframe, keeping in mind the limitations of urban local bodies and their institutional capabilities

In totality, the WTE projects are technologically incompatible with reducing dioxins emissions, Gopal Krishna argued by quoting the observations of Mark Radka, Chief of Energy Branch in Division Technology of Industry and Economics for the United Nations Environment Programme (UNEP).

In Radka's words, municipal solid waste is not considered to be a renewable energy source since it tends to be a mixture of fuels that can be traced back to renewable and non-renewable sources.

Thus, the alternative waste disposal methods include waste reduction, waste segregation at source, extended use and refuse, recycling, biomethanation technology and composting, reiterated Gopal Krishna.

By and large, Delhiites expressed happiness with the electoral defeat of Sheila Dikshit-led Congress party government in December, 2013 since it had vociferously supported the waste incinerator based power plant in Okhla, Narela, Bawana and Ghazipur.

However, a few examples have proved that if properly executed, the WTE plants can be turned into a fruitful proposition. Kanpur, for example, has successfully managed to deal extremely well with waste, say experts. Pune Municipal Corporation (PMC) through its Rochem Green project and few other projects has also shown the way. PMC had undertaken aggressive awareness campaigns with an aim to make the citizens aware about the need of the system and accordingly started setting up these projects in different parts of the city in a phased manner.

National Implementation Plan

The 254 page National Implementation Plan (NIP) prepared by Government of India in order to meet its obligation under Article 7 of the UN"s Stockholm Convention on POPs dated April 2011. On page 16 the NIP reads: "The major contribution of PCDD/DF emission is from waste incineration and ferrous and non-ferrous metal production categories followed by heat and power generation sector. Waste incineration has 66.75% share of the total annual releases." It further states, "The highest amount of PCDD/DF is released into residues 63.12%, followed by air emission which accounts for 32.66% of the total releases" The main source categories include waste incineration." On page 96 of the NIP, it is stated, "There is no municipal solid waste incinerator operating in India." It means the municipal waste plant at Okhla, Delhi is the first of its kind. The NIP admits, "India has limited experience in the environmentally sound disposal of POPs."

Preserving in sun

Renewable energy is making inroads into various aspects of life, and solar thermal application in Fisheries sector is seen as an effective and efficient technology to preserve the fish in a hygienic way. ***Veena Sinha*** provides the details

The growing emphasis on solar energy utilisation to achieve energy security as well as to combat the menace of climate change and global warming resulted in the formulation of ambitious Jawaharlal Nehru National Solar Mission (JNNSM). While the larger focus of the Mission is on grid-connected projects, there are great opportunities to deploy solar energy technologies for various off-grid industrial applications as well. This demands the initiation of awareness generation to identify suitable applications for solar energy technologies and estimate their replication potential across residential and industrial sectors across all states.

HEATING IN FOOD INDUSTRY

Drying is the oldest and cheapest method of processing food items like fruits, vegetables, fish, mushroom, spices, etc without contamination by bacteria and fungus. Drying or process heat is crucial in any food processing industry. Open sun drying was the conventional method adopted for this. Dried items have a long shelf life without the requirement of sealed packing, canning or cold storage.

SOLAR AIR HEATING

Solar air heating (SAH) has evolved as an efficient means of preserving food items. SAH systems use air as the working fluid for absorbing and transferring solar energy. This technique involves solar thermal applications, and the heat produced from solar energy can be used for various residential and industrial applications like process heating, drying, distillation/desalination, water heating, space heating and refrigeration. As solar drying is fairly new in this segment, energy savings figures as compared to the use of fossil fuels are not readily available. However, there are several installations of solar driers in industries such as fish drying, leather tanneries, spice drying, drying of fruit pulp and paint shops.

SOLAR DRYING IN FISHERIES

Fisheries sector contributes significantly to the country's economy while providing livelihood to approximately 16 million people in the country. India is the second largest producer of fish in the world after China, contributing to about 5.43 per cent of global fish production. According to annual report of Department of Animal Husbandry, Dairying & Fisheries for 2012-13, one of the main challenges facing fisheries development in the area of yield optimization is the development of infrastructure for harvest and post-harvest operations.

Since fish is perishable and gets spoilt quickly, it must be chilled or dried in order to extend its shelf life. Currently in India only 6 per cent of fish is dried and cured conservatively assuming that all of this is dried using solar FPCs, this would imply that 520 million kg of fish could be dried hygienically, while also improving its marketability. Also, 78 million m2of FPC area or, alternatively, 124.8 million kg of firewood, would be required to dry this quantity of fish. Fishing can be carried on for about ten months a year barring spawning season. The coastline receives bountiful solar energy except for the monsoon months; hence, solar drying is possible for most of the year.

The total fish production in India in the year 2012-13 was about 8.5million tons. In the current scenario, only about one lakh tonnes of fish are dried and preserved. Even though the drying is the cheapest method of preservation and with additional advantages of avoiding expensive storage at low temperature, dry fish business is only marginal compared to the high energy consuming freezing methods.

Dried fish is considered a cheaper food mainly because of the unhygienic method of open drying. Artificial mechanical drying indoors will bring out a remarkable change in the acceptability of dried fish, because of hygiene, color, appearance and flexibility in the shelf life. Obviously, developing energy efficient, hygienic drying equipment is essential for the fishing industry. Value addition in fish products will change the coastal economy.

Solar drying is most economical method of drying and solar energy is available at its peak in our coastal belt. It should be noted that out of the total catch from the sea, the low cost small fishes are thrown back into the sea because of inadequate processing facility, which can be utilised and preserved with solar drying technique. The state government of Kerala has set up community-based fish drying units that are a hybrid of FPCs and firewood.

Expenses for drying Fish/ kg through solar dryer

Investment on 250 m2 Air Heating Collectors + Blowers +Ducting + Backup Heaters	₹ 13,50,000
Investment on 200m2 Water Heating Collectors Storage Tank+ Backup heater + Blowers.	₹ 15,00,000
Subsidy available from MNRE	30 per cent
Investment to be done (approx)	₹ 10,00,000
Total fish to be dried in 3 years(payback time) = 250 kg x 900 days	2,25,000 kg
The cost of drying / kg	₹ 4.40 / kg
Total drying cost of Fish/Kg using Solar Energy/Kg (₹ 4.40 + ₹ 8.00 +₹ 0.79)	₹ 13.19 / kg

ECONOMIES OF SAH

Removing about 750 kilograms (kg) of moisture from 1,000 kg of wet fish requires around 5, 00,000 Kcal of heat, and also about 32 units of electricity to run the fans. The expense of drying 1 kg of fish by diesel costs around ₹ 21.29, while that from electric heater costs ₹ 29.96 and firewood costs ₹ 13.71. The expenses include cost of fuel for heating, cost of electricity for fans and cost of establishment and labour charges.

On the other hand, if the solar collectors are used for tapping solar energy, 5,00,000 Kcal of heat is made available by 250m2of air heating collectors or 200 m2 of water heating collectors.

After three years payback period for solar equipment, the cost of drying will come around ₹ 8.79 per kg. The solar heating system which will have an active life of 15 years, with the above investment; if the cost of drying is spread over 15 years, it can be as low as ₹ 0.88 per kg, thereby bringing down the total drying cost to ₹ 9.67 per kg. Also the solar drying time can be extended to a few hours in the night by storing the heat in water in the water heating models.

SOLAR DRIER VS TRADITIONAL SUN DRIED FISH

A test conducted by Murugappa Chettiar Research Centre inferred that the solar dried fish takes 56 hours as compared to traditional method which takes 27 hours more for the same amount of fish. The report proved scientifically that solar dryers are faster in operation and preserve nutritional value much more as compared to traditional drying. Solar dryer units, therefore, give back handsome profits as the quality and hygiene of solar dried fish makes it a product that can be stored for a longer time. Despite higher installation charges the good quality and better hygiene of the products coupled with reduced processing time is making solar dryers a popular choice among farmers and food processing companies.

The author is director, MNRE

(Views expressed by the author are personal)

Solar dryers launched in Odisha

The Integrated Coastal Zone Management Project (ICZMP) has launched hybrid solar dryers for hygienic solar drying of fish and their preservation in the state of Odisha.

This initiative on the part of ICZMP will ensure livelihood generation during the lean period when fishing is banned under Odisha Marine Fisheries Regulation (OMFRA) Act from April 15 to May 31. In the meantime, it will also create avenues for alternative revenue generation activities, especially among women.

In the pilot phase, ICZMP will provide solar dryers to about 115 self help groups (SHGs) in the districts of Puri, Ganjam and Kendrapara, which will cover major fishing belts from Gopalpur to Chilika and Paradip to Dhamra. The fishermen will also be provided essential infrastructure like fish drying platform and storage rooms.

IFC to aid Surajbari Windfarm

Morgan Stanley and Continuum Energy backed Surajbari Windfarm Development Private Limited (SWDPL) will be receiving financial assistance from IFC to set up wind farms in Madhya Pradesh.

Under the proposed project, IFC would provide at least $48 million in loans and possible syndication of up to $96 million for setting up two wind farms with a combined capacity of 170 MW through its wholly owned subsidiaries, DJ Energy Private Limited (DJEPL) and Uttar Urja Projects Private Limited (UUPPL).

It is estimated that the project would cost $194 million. MP Power Management Company Limited, a state-owned utility company, will be the off taker of the project and would be set up around the villages of Mamathekheda and Pingrala of district Ratlam and Mandsaur in MP.

Meanwhile, DJEPL and UUPPL owned and operated wind power projects of 98.7 megawatt and 80 megawatt respectively. The companies are based in Delhi and Dehradun.

DJEPL and UUPPL are mulling to sign the supply, erection and commissioning, and turbine operations and maintenance agreements for the Project with Inox Wind Limited and Inox Wind Infrastructure Services Limited.

Presently, SWDPL has about 127 MW capacity under operation in Gujarat and Maharashtra. Another project of 115MW is under construction in Maharashtra.

The other wind power projects supported by IFC are NSL Renewable's power project in Maharashtra, Bhilwara Energy, Jath Wind Energy, Inox Renewables, etc.

Cooperation and Development. Last year, social Enterprise, Invest India Micro Pension Services Private Limited raised PE funding from German development bank for 30 per cent stake. EN

KfW to provide fund to REC

The German Development Bank, Kreditanstalt fur Wiederaufbau (KfW), which is a leading lender for power projects in the country, is likely to provide financial assistance to Rural Electrification Corporation (REC)Limited.

REC, which is a fully-owned government of India Public Sector Enterprise, funds and promotes rural electrification projects in different parts of the country and also provides aid for generation projects, transmission and distribution projects. Initially, REC had received at least 100 Million Euros as loan from KfW.

It was in 2012 that REC was mulling to acquire at least 16 per cent stake in Universal Commodity for Rs16 crore valuing UCX at Rs 1000 crore.

Meanwhile, REC's gross non-performing assets as a percentage of total outstanding loans are expected to rise to 1 per cent next fiscal year and 2 per cent a year after that (2015-16).

In the December quarter, the ratio stood at 0.3 per cent, while the company reported a 19.5 per cent growth y-o-y in net profit for the October-December quarter due to strong revenues.

KfW Bankengruppe's leading promotional banks, KfW is devoted to the sustainable improvement of economic, social and ecological living conditions. Its main client is the Federal Ministry for Economic. EN

India to assist Sudan in RE

India has offered its assistance to Sudan in harnessing its renewable energy potential. Dr Abdullah, the Minister of New and Renewable Energy (MNRE), expressed India's desire to work with the African nation at a meeting held in New Delhi.

Dr Abdullah met a delegation from Sudan led by Al Simah Al Siddiq Al Nour, the Industry Minister. Also accompanying him to the meeting was Magdi Hassan Yasin, state minister of Finance and National Economy. Both nations agreed to work together for the development of renewable energy sector.

Dr Abdullah offered India's expertise to tap renewable energy potential such as wind energy, solar energy, biomass and small hydro resources in the African nation. He discussed ways of enhancing cooperation between the two countries in the renewable energy space.

The Centre for Wind Energy Technology (C-WET) and the National Institute of Solar Energy (NISE), under the aegis of MNRE will help Sudan in resource assessment and training in wind and solar energy.

Dr Farooq Abdullah with Al Simah Al Siddiq Al Nour, Minister of Industry, Sudan

Knowledge and technical appraisal assistance will be provided by the Indian Renewable Energy Development Agency (IREDA), which will help in development of renewable energy projects in the country on commercial basis.

India will soon be sending a team of officials from the MNRE, IREDA, C-WET and NISE to Sudan to discuss various parameters and the areas of cooperation between the two countries. EN

MoU for RE investments by oil, gas PSUs

With an aim to push oil and gas PSUs in India towards investments in renewable energy sector, a memorandum of understanding (MoU) was signed between the Ministry of New and Renewable Energy (MNRE) and Ministry of Petroleum and Natural Gas (MoP&NG).

Recently, a number of oil and gas PSUs such as the Oil and Natural Gas Corporation (ONGC), Oil India Limited (OIL), Indian Oil Corporation Limited (IOCL), Bharat Petroleum Corporation Limited (BPCL), Hindustan Petroleum Corporation Limited (HPCL), GAIL (India) Limited and Engineers India Limited (EIL) have desired to invest in the solar, wind and other renewable energy projects.

As per the agreement, two special purpose vehicles (SPVs) will be set up to give boost to large scale grid connected renewable energy projects and implementing off-grid applications. The first SPV is for installation of large scale grid-connected renewable energy deployment in leadership of the ONGC, and supported by equity participation from OIL, GAIL (India), EIL, Solar Energy Corporation of India (SECI) and Indian Renewable Energy Development Agency (IREDA).

The second SPV aims to provide energy access to the energy deficient population by installing off-grid renewable projects using advanced technologies and market based business solutions. In this initiative, the lead partner will be IOCL, with equity support from BPCL and HPCL, and also represented by SECI and IREDA. EN

Stakeholders hail IREDA, air concerns

The 27th foundation day of Indian Renewable Energy Development Agency Ltd(IREDA), the non-banking financial institution under the aegis of the Ministry of New and Renewable Energy (MNRE) on March 11, 2014, saw the convergence of the stakeholders at a roundtable headed by Secretary of MNRE, Dr Satish Balram Agnihotri. He urged the gathering to air their concerns as well as propose suggestions for better functioning of the organisation.

Stakeholders from various sectors of the renewable such as small hydro power, solar, wind and geothermal lauded the organisation for timely monetary assistance in setting up the projects and providing assistance and adequate guidance at every stage of the project.

Apart from lauding IREDA for the commendable job it had done in the growth of renewable energy, stakeholders also expressed their concerns. One of the issues that found resonance with all the stakeholders was the need to reduce the interest rate at which the loan is given to project developers, while the other issue that was also highlighted at the round table was the need to allow partnership and proprietorship for the young entrepreneurs and promote small borrowings.

The other view that was put across at the meeting was that IREDA should swiftly issue the letter of approval for the funding of the project. It was felt that in order to speed up the work on the projects, sub-committees should be set up and everything should not be taken up in the board.

The stakeholders also pressed for the rating of any project by IREDA rather than from any outside agency such as CRISIL.

Addressing the concerns of the stakeholders, the newly appointed CMD of IREDA, KS Popli said that steps are being taken to restructure the cash flow and added that they would try to place the document management system in place. He did not rule out the idea of having a look at the suggestion on proprietorship and partnership for projects worth ₹ 10 crore. He added that ballooning was taking place in a lot of projects and guildelines would be set, with perhaps some deviations. Popli added that they would follow IREDA's credit rating of the project.

The roundtable conference ended on an optimistic note where the new CMD assured the stakeholders that IREDA would look into their problems and find a solution, ensuring that the organisation treads the path of growth. .

As part of the foundation day celebrations, a play was also organised for the employees of IREDA and their family members, which was followed by dinner.

Foundation day celebrations

The celebrations of the 27th foundation day on March 11, 2014, witnessed the presence of Secretary MNRE, Dr Satish Balram Agnihotri, CMD IREDA, K S Popli, officials from MNRE, IREDA and other stakeholders accompanied with their family members.

KS Popli, took the opportunity to welcome the gathering and expressed his gratitude to all the employees of IREDA, who with their dedication and commitment helped the renewable energy sector in scaling new heights.He hoped that the next decade belongs to the renewables.

The gathering was treated with a humorous and a satirical play staged by Asmita Theatre Group, which left the audience in splits as they applauded each and every aspect of it.

The play was followed by dinner which was relished by all.

IREDA signs MoU with MNRE for FY 2014-15

The Indian Renewable Energy Development Agency (IREDA) entered into a Memorandum of Understanding (MoU) with the Ministry of New and Renewable Energy (MNRE) for the financial year 2014-15.

Dr Satish Balram Agnihotri, Secretary, MNRE and KS Popli, Chairman and Managing Director, IREDA signed the MoU at a brief function held on March 24, 2014 at MNRE in New Delhi.

Tarun Kapoor, Joint Secretary, MNRE; Dr NP Singh, Advisor, MNRE; Dr Pankaj Saxena, Director, MNRE; SK Bhargava, Director (Finance), IREDA were among the senior officers present at the signing of the MoU.

For the financial year 2014-15, IREDA has set sanction and disbursements targets as ₹ 4,400 crore and ₹ 2,500 crore respectively.

IREDA to provide refinance to banks &FIs

As part of its initiative to provide adequate and quality power to domestic and other consumers while reducing reliance on fossil fuels and opting for cleaner and greener fuels, the Government had announced in the Union Budget, its decision to provide funds from the National Clean Energy Fund (NCEF) to IREDA to on-lend to viable renewable energy projects.

Accordingly, IREDA has introduced the IREDA NCEF Refinance Scheme in terms of which it would provide scheduled commercial banks and financial institutions (FI) upto 30 per cent of their loan component at an interest rate of 2 per cent p.a. In turn, the banks/ FIs would be required to provide refinance to borrowers at a rate not exceeding 5 per cent p.a.

The Scheme comes into operation with effect from 11.11.2013 and accordingly, banks/ FIs can apply for refinance for eligible loans sanctioned on and after 11.11.2013 and for which disbursements have been made.

IREDA's Debutant Tax-free Bonds get thumbs up from investors

The Indian Renewable Energy Development Agency (IREDA), a non-banking financial institution registered with the country's central bank, the Reserve Bank of India is responsible for funding of projects with the aid of renewable sources. It had received an allocation for issuance of Tax free Bond of ₹ 1000 from Central Board of Direct Taxes, Department of Revenue, Ministry of Finance, Government of India. In terms of approval, IREDA opened the issue for Subscription with the Issue size of ₹ 500 crore, with an option to retain over-subscription up to ₹ 500 crore, aggregating to a total of upto ₹ 1,000 crore.

IREDA, which is administratively controlled by the Ministry of New and Renewable Energy (MNRE), had proposed public issue of tax-free secured, redeemable, non-convertible bonds in the nature of debentures having tax benefits under section 10(15)(iv)(h) of the Income Tax Act, 1961.

The issue was open for subscription from February 17, 2014 to March 04, 2014.

The Bonds were rated by Brickwork Rating India Private Limited as "BWR AAA (SO) [pronounced BWR Triple A (Structured Obligation)] (Outlook: Stable), and Credit Analysis & Research Limited as "CARE AAA (SO) [Triple A (Structured Obligation)]." Bonds, which have such kind of ratings are considered as very secure with regards to timely servicing of financial obligations and they have very low credit risk.

The bonds are listed on the Bombay Stock Exchange and the National Stock Exchange.The different coupon rates, which were offered by the bonds, include 8.41 per cent per annum for 10 Years, 8.80 per cent for 15 years, and 8.80 per cent for 20 Years, respectively, to Category- IV Investors i.e. Retail Individual Investors and coupon rates of 8.16 per cent per annum for 10 Years, 8.55 per cent for 15 Years and 8.55 per cent for 20 Years, respectively, to Category- I, II and III Investors i.e. Qualified Institutional Buyers, Domestic Corporates and Domestic High Net Worth Individuals, respectively.

The final subscription eligible for allotment was ₹ 484.12 Crores, ₹ 120.21 Crores, ₹ 107.22 Crores and ₹ 10.10 Crore unders Retail Individual Investor category, High Net worth Individual Category, Corporate Category and QIB category respectively as against the base issue allocation of ₹ 200 Crore, ₹ 150 Crore, ₹ 100 and ₹ 50 Crore.

The money raised through the bond would be used for funding renewable energy and energy efficiency projects, thereby increasing the resource base of the Company.

Healthy Cooking

Amid depleting reserves of fossil fuel and escalating energy cost, the need for efficient cooking has gained prominence over the recent times. With advancement in technology, the concept of solar cooker is not only adopted at domestic levels, but a number of community based cooking in temples, schools, orphanages, hospitals, etc is being done through this. The Ministry of New and Renewable Energy is also promoting the use of solar cookers across the country, especially in the rural areas where there is continuous shortage of cooking fuel. Here is a list of some solar cookers available in the Indian market.

BOX SOLAR COOKER — KAVITA SOLAR

- Compact design and quality
- Manufactured with best raw materials
- Product is tested multiple times before being delivered to the clients
- The product could be customized as per the need
- Portable and very low maintenance issues

BOX TYPE SOLAR COOKER — BHAMBRI ENTERPRISES

- Consists of box and a reflector fitted lid
- The cooking utensils get heated up to 80° C which is enough for proper cooking
- Due to gradual cooking process, essential vitamins are retained
- Healthy and tasty food is prepared

DOMESTIC SOLAR COOKER — TINYTECH PLANTS

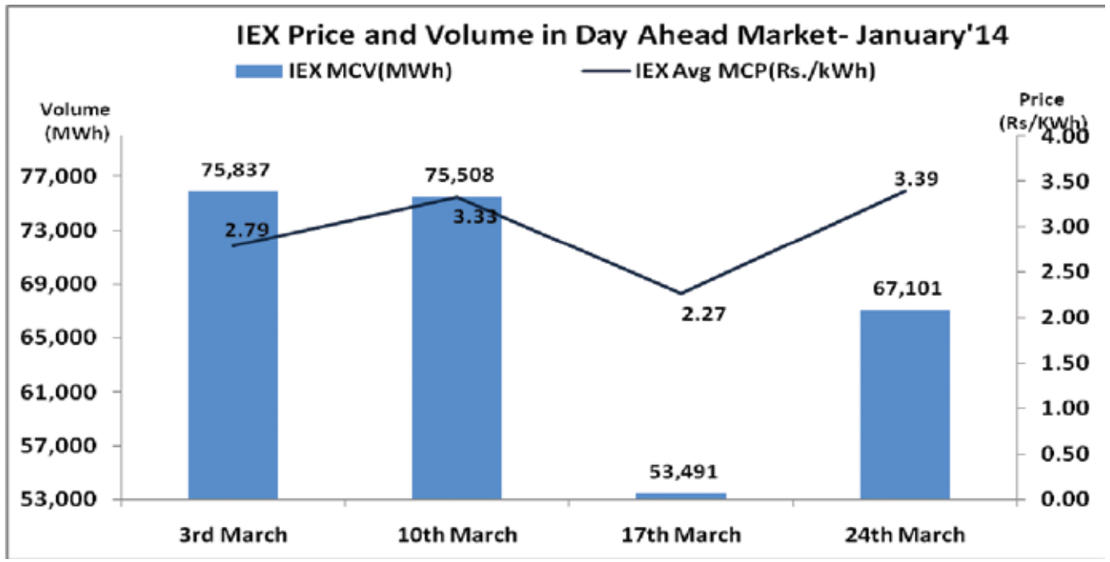
- Smooth finishing and high reliability
- Double glazing consisting of toughened glass and ordinary glass
- Various specifications as per the requirements of our clients
- Efficient cooking in economical price

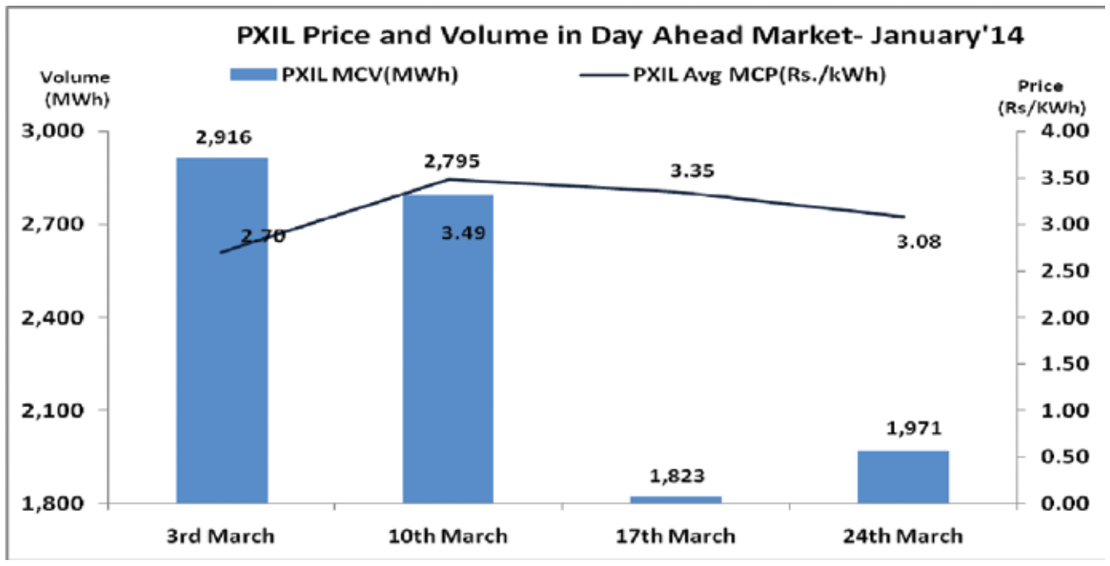
COMMUNITY SOLAR COOKER — SUNITA SOLAR

- Food is cooked at a constant and low temperature
- The original taste, ingredients - proteins and vitamins are preserved
- No need of supervision while cooking
- For all type of cooking and roasting recipes
- Easy handling, very low maintenance cost

Trading fluctuates at power exchanges

The power trading data at the two exchanges-the Indian Energy Exchange (IEX) and the power Exchange India Limited (PXIL)-for the month of March 2014. The data presented shows the trend on every Monday across the month.





Apr **23-25**

Offshore Wind Conference

London, UK

A premier event for the European offshore wind industry, it aims to focus on offshore wind energy market development in Europe with respect to technological enhancements, financing & insurance, grid connection & regulations and other related activities. The exhibition presents a perfect opportunity to showcase products and services to top decision-makers.

www.greenworldconferences.com/produkt_135_offshore_wind_conference.htm

May **5-7**

Renewable Energy World India 2014

New Delhi, India

The event is one of India's premier conference and exhibition in the Indian renewable energy sector. Under the theme- Power. Key to India's Future Growth- the event will bring together decision makers, technical experts and professionals from leading companies involved in RE generation, transmission and distribution within the country and around the world.

http://www.renewableenergyworldindia.com/index.html#rewi_3

Jun **5-7**

Green Summit 2014

Bangalore, India

The event, supported by the Government of Karnataka, aims to provide a platform to showcase the immense business and transformational opportunities in the renewable energy sector. It will be a meeting point for policy makers, global experts, business leaders and other stakeholders who will try to address critical questions about the growth and widespread adoption of renewable energy.

http://www.greensummit.in/index.php

June **8-12**

International Conference on Clean Energy 2014

Istanbul, Turkey

The 14th edition of the multi–disciplinary conference on renewable energy and technologies aims to provide a forum for the exchange of latest technical information in the sector. The research endeavors of the scientists, engineers and environmentalists participating in this conference will make significant contributions towards facilitating a clean energy future.

http://www.icce2014.net/icce2014/index.php?conference=icce2014&schedConf=icce2014

June **12-14**

RENERGY 2014

Chennai, India

The exhibition cum conference is one of the most comprehensive renewable energy events in India, organised by TEDA and supported by MNRE. It will provide an opportunity for the policy makers, power developers, manufacturers, financial institution, researchers and other stakeholders to chart the future course of action in the renewable sector.

http://www.renergyteda.com/

June **23-26**

European Biomass Conference and Exhibition

Hamburg, Germany

The international conference and the concurrent industrial exhibition is considered as one of the leading international events in the biomass energy sector providing an ideal platform to researchers, industry personnel and policy makers to exchange dialogue. The 22nd edition will highlight progress in research, technological development and production processes in the sector.

http://www.conference-biomass.com/

JULY 2014

July **7-10**

Intersolar North America

San Francisco, USA

The conference-cum-exhibition is a premier event of the solar industry in North America that aims to provide the solar professionals a common platform to exchange information and develop business opportunities in the US solar market. The event attracts solar industry leaders from around the world and across the solar value chain who help in shaping the solar industry in the region.

www.intersolar.us/en/intersolar.html

July **22-23**

SolarTech India 2014

New Delhi, India

The event will be an enriching platform for the solar energy players to know about the latest technology, project financing, insurance, and project development in India. It will bring together policy makers, project developers, equipment manufacturers and other stakeholders to chart further course of action in the solar energy market.

www.greenworldconferences.com/produkt_104_solartech_expo_india_2013.htm

RNI NO.: APENG/2010/38296 POSTAL REGISTRATION NO.: HD/1153/2011-13