

## News Updates

### [India plans for 20 GW capacity of solar parks by 2020, Live Mint, \(Aug'14\)](#)

The [Ministry of New and Renewable Energy](#) (MNRE) has issued a proposal to implement 25 ultra-mega solar power projects with capacities between 500 MW and 1,000 MW. The projects will be set up over a period of five years

- MNRE has proposed a gross budgetary support of INR 4,050 crore (USD 654 million) for setting up 25 solar parks adding up to 20 GW of capacity
- Some of the identified sites for the construction of plants are in the states of Andhra Pradesh, Telangana, Madhya Pradesh, Karnataka, Rajasthan, Odisha and Punjab. The parks will be developed in partnership with state governments and Solar Energy Corporation of India (SECI) will act as the implementation agency.

### [PM Modi launches "Make in India" programme to boost domestic manufacturing, The Times of India, \(Sep'14\)](#)



Source: <http://pmindia.gov.in/>

The 'Make in India' campaign is a very ambitious programme launched by the Government of India. The programme includes a broad vision of promoting domestic manufacturing in the country. It provides a strong policy framework to support solar manufacturing in India and also make it more price-competitive on a large-scale. It provides financial incentives in various forms such as:

- Exemption from excise duties on solar glass, EVA encapsulants, backsheets and flat copper wire (used in manufacturing PV ribbon)
- Full exemption on custom duty for EVA sheet, backsheet, flat copper wire and specific raw materials
- Provision of basic custom duty on machinery and equipment required to set up solar energy facility is reduced to 5%
- Full exemption from excise duty on machinery, equipment etc. required for the installation of solar energy systems.

### [India drops solar anti-dumping duty plan, REUTERS, \(Sep'14\)](#)

India has decided not to levy antidumping duties on imported solar cells from the U.S., China, Taiwan and Malaysia

- The Ministry of Finance, Government of India rejected a recommendation made by the Directorate General of Anti-Dumping and Allied Duties (DGAD), Ministry of Commerce and Industry. DGAD had proposed anti-dumping duties ranging from INR 6.81 per watt (USD 0.11 per watt) to INR 50.15 per watt (USD 0.81 per watt) to be imposed on crystalline silicon cells and modules and thin film modules imported from China, Malaysia, Taiwan and the US.
- According to an industry estimate, India imported solar products worth nearly 60 billion rupees (USD 984 million) in 2013, whereas domestic manufacturers' sales amounted to less than 2 percent of the said figure.

### [US DoE to fund PV infrastructure development and CSP research, Renewable energy focus.com, \(Oct'14\)](#)

The US Department of Energy (DoE) has announced a 15 million USD support for solar PV and energy storage integration into the grid in the US. It has also allocated a 25 million USD grant for Concentrated Solar Power (CSP) research and development activities

- The PV related funds aim to create cost-effective and reliable solutions for distributed PV and energy storage
- Smart loads, demand response, load forecasting and other advanced functionalities for better grid management are areas of focus in PV development
- CSP research funds target to improve performance and efficiency of the various components in CSP plants
- Technical breakthroughs and advances in lowering the cost of electricity produced by CSP are the key highlights in CSP research objectives.

### [Government revises National Solar Mission's \(NSM\) target, The Hindu, \(Oct'14\)](#)

MNRE targets adding 15 Giga Watts (GW) of grid-connected solar PV from the second batch of Phase II projects. The earlier plan was to add 9 GW between 2013 and 2017.

- 15 GW target is spread across three tranches. In the first tranche, a 3 GW capacity has been targeted between 2014-15 (FY 15) and 2016-17 (FY 17). A 5 GW capacity has been allocated for

FY 16 and FY 18 timeframe. In the final tranche, a 7 GW will be allocated between FY 17 and FY 19

- The first tranche will include installations in solar parks. The state of Andhra Pradesh has been identified to set up a solar park. In addition, 250 MW of capacity will be allocated under domestic content requirement
- In the first tranche, the solar power produced would be bundled with unallocated thermal power in the ratio of 2:1. The average cost of bundled power would be around INR 4-4.5 per unit. NTPC Vidyut Vyapar Nigam Limited (NVVNL) has been designated to execute the programme.

#### [Scope for reduction in solar prices with technology breakthroughs, The Hindu, \(Nov'14\)](#)

US based companies, GT Advanced Technologies (GTAT) and SunEdison have recently announced technical advances that can bring down the cost of manufacturing solar modules significantly

- GTAT's 'Merlin' technology helps in 80% reduction in silver paste consumption, used as an electrode in solar cells
- Waree Energies in a tie up with GTAT announced that they would deploy the 'Merlin' technology in their modules which can bring down the cost by 10%
- SunEdison aims to bring down the cost of producing polysilicon, used as raw material in solar cells, by engaging 'high pressure Fluidised Bed Reactor (FBR)' technology. FBR technology reduces the energy requirement for making a kilogram of polysilicon by almost 90% compared to conventional manufacturing process.

#### [India to formulate a "Renewable Energy Act", Indian Express, \(Nov'14\)](#)

The government has plans to frame "Renewable Energy Act 2015" to create a comprehensive framework for investment in the sector

- The proposed Renewable Energy Act will help in streamlining generation, tariff, grid usage etc. It will also help in attracting the much required capital into the sector
- Financial instruments that facilitate low cost capital for renewable energy sector (primarily for solar) is on the anvil.

#### [Budget 2015: Lukewarm response from the Renewable Energy sector, Live Mint, \(Feb' 15\)](#)

The recent budget has slashed the renewable energy ministry's funds to INR 300 crores, down by 45%

when compared to last year's allocated funds which was INR 550 crores

- However, the Government of India has proposed to increase the Clean Energy Cess from INR 100 to INR 200 per metric tonne of coal, a move that will raise electricity tariffs and finance clean energy initiatives
- To boost the solar manufacturing sector, an excise duty cut on round copper wire and tin alloys for use in the manufacture of solar PV ribbon (used in solar PV cells) is proposed
- Excise duty on solar water heater system has been reduced from 12% to 0 % without Central Value Added Tax (CENVAT) credit or 12.5% with CENVAT credit.

#### [First Renewable Energy Global Investors Meet & Expo, RE-Invest 2015, held in New Delhi, Business Standard, \(Feb' 15\)](#)



Source: <http://pmindia.gov.in/>

- The meet was organised by the Union Ministry of New and Renewable Energy as a follow up to the Make in India Initiative announced by the Prime Minister
- The central theme of the meet was to further the growth of renewable energy and energy efficiency sectors in the country and showcase India as an investment destination for these sectors
- RE-Invest 2015 encouraged investors to set up projects and manufacturing facilities on renewable energy equipment & products
- Green Energy related installations of 266 GW capacity were committed. Approximately 2,800 delegates from 42 countries participated in the event.

#### [India targets 175 GW of green power by 2022, The Economic Times, \(Feb' 15\)](#)

The government has announced an ambitious renewable installed capacity target of 175 GW over the next seven years

- Of the 175 GW, solar power has a share of 100 GW followed by 60 GW from wind; 10 GW from

biomass energy and 5 GW from small hydro complete the total installed target

- As of December 2014, the installed capacity from Renewable Energy (RE) is around 33.79 GW with a major share from wind (67%), followed by small hydro (12%) and solar power (9%)
- Presently, contribution from RE generation is about 6.5% of the total electricity mix. It is proposed that RE generation should account for 12% over the next three years.

## Interview



*Dr. Ashvini Kumar, Director (Solar), Solar Energy Corporation of India (SECI), Ministry of New and Renewable Energy has over 30 years of experience in the field of Solar Energy. Dr. Kumar obtained his PhD. in Solar Energy from IIT Delhi in 1981 and has been involved in the promotion and development of solar energy technology. He has co-authored three books, several review articles and authored over 50 research papers on solar energy and related areas.*

*This section is based on discussions with Nagalakshmi Puttaswamy, Vaishalee Dash and Dr. Sharath Rao from Center for Study of Science, Technology and Policy (CSTEP), Bangalore.*

**MNRE and also, in the recent FY 16 Union Budget the Government of India has announced 100 GW target for solar installations by 2022. How do you think can this target be achieved?**

Currently, Renewable Purchase Obligation (RPO) targets have been established by all the 29 states in India and the Regulatory Commissions are progressively tightening their compliance norms. In addition, RPO targets, especially solar, are being considered for upward revision, which would generate sufficient demand for solar energy in the market.

Plans are also there to introduce Renewable Generation Obligation (RGO), which is expected to give a thrust to solar power generation. Amendments are proposed in the National Tariff Policy and the government envisages aligning all the targets with the National Action Plan on Climate Change (NAPCC) goal of having 15% share of electricity from renewables by 2020. Further, attractive central and state schemes and an enabling environment would ensure that there is a good level of competition in the sector too.

In line with the scale-up plan for solar targets from 20 GW to 100 GW, broadly, two segments are being focused on. On the one hand, there are decentralised rooftop projects that would ensure wide-scale penetration among the masses. On the other hand there are centralised large-scale and ultra large-scale projects that would ensure optimum utilisation of

transmission resources and bring down solar tariffs through economies of scale. Solar Parks are an integral component for the latter.

The previous Union Budget had announced 25 solar parks. So, that is being pursued now in a focused manner. Already, 16 solar parks of about 10 GW have been identified. The idea is to look at larger chunks of land; pre-dominantly government owned so that it is made available at a faster pace and relatively costs too would be lower. States like Karnataka, Andhra Pradesh, Telangana, Madhya Pradesh, Gujarat, Rajasthan, UP and Kerala have all identified parcels of land for solar parks, which will be utilised to implement these projects. A few states are developing Joint Venture Companies with SECI to develop solar parks in the identified lands. It has been agreed by the Government to cover transmission lines from solar parks to the nearest sub-station of Central Transmission Utility under Inter-State Transmission Systems (ISTS); thus, socialising the cost of transmission for solar power. However, with higher penetration of solar, grid stability challenges could arise and appropriate measures would have to be taken.

**So is the major emphasis on solar parks? Or are there other modes to accomplish the 100 GW target?**

The 100 GW is being planned by having 40 GW through rooftops, 20 GW from solar parks, 20 GW through off-grid scheme and another 20 GW from Central Public sector units.

**Are there plans in the future of SECI establishing or revising solar installation targets? If so/not, what could be SECI's role?**

Solar target establishment or revision is a prerogative of MNRE. On this front, SECI's role is limited to providing the right kind of inputs and recommendations which assist in the growth of the solar sector. Thus we expect to be primarily engaged in facilitating and/or implementation of schemes, developing and/or proposing policy and financial interventions and also, developing our own projects. In addition, SECI shall serve as a key intermediary between the developer/industry and policy makers.

**Micro Grids (MG) and off-grid with MG are expected to play an important role in providing electricity to the un-electrified rural and remote regions. What are the bottlenecks to scale this model?**

According to our understanding and as far as we have observed in the field, small MG individually may not be financially attractive in many locations, due to which alternate approaches may have to be adopted. For example, there could be portable solar lamps with a good battery for low-income households that last

for years. Alternatively, an entrepreneur-developer model could be one of the solutions. A third approach could be that of community ownership of Distribution Companies (Discom).

Regarding bottlenecks, the weak financial health of Discoms, low collection efficiencies and low level of awareness amongst the rural populace are important issues. Working on models that can cater to increased demand over time, without being a drain on financial resources, is also important.

**Un-electrified consumers initially need basic lighting and subsequently they would require higher amount of electricity. As such wouldn't it be appropriate to offer services of solar energy in the beginning and pursue grid extension as and when it becomes viable/feasible.**

Decentralised or 'off-grid' solar lighting system is a great option. It can be installed immediately and the country already has two decades of experience. Additional demand can be catered to when the main grid becomes accessible, which will make it more sustainable. Our first priority is and continues to be to provide basic lighting application and we are working on different models like portable lights.

**Please offer your thoughts on the amount of time that would be required to scale this initiative and to achieve the targets beyond lighting? What role do you anticipate for SECI?**

It is difficult to suggest a particular time-frame. The government is working on this and has established several initiatives. Recently, the government introduced *Deendayal Upadhyaya Gram Jyothi Yojana* which includes feeder separation, metering of distribution transformer, rural electrification etc. with a financial outlay of approx. INR 43,000 crores. Segregation of feeders is already prevalent in a few states. Andhra Pradesh and Rajasthan have also come up with 24/7 power schemes.

SECI is also working on the formulation of strategies to have greater sustainable basis for various solar energy initiatives. We shall have schemes that link funds to programs. We have reached out and convinced several Central Public Sector Units (CPSUs) to earmark Corporate Social Responsibility (CSR) funds for solar projects. These have been specifically targeted for electrification of villages in Jharkhand and Chhattisgarh. We also ensure that the projects are implemented timely and with quality.

**Are you implementing CSR projects on behalf of other companies?**

Yes, as mentioned earlier, we are working with Rural Electric Corporation Ltd., Power Finance Corporation, etc. in their CSR initiatives. Most of these are in the off-grid segment such as solar lanterns, MG etc.

**What is the role of SECI in promoting rooftop solar?**

Rooftop solar has a big potential in the country. SECI is implementing a pilot scheme for MNRE which has a few major desirables viz. discovery of costs, as MNRE is providing subsidy on benchmark cost basis, developing feedback on the performance including grid connectivity and metering aspects, and sensitising states to expedite policy formulation. In addition, SECI invited city-specific bids from developers and a very good response was received. So far, we have allocated 60 MW capacity covering 37 cities across the country. I should mention that the MNRE benchmark price was INR 130/Wp, when the programme was taken up. In the first bidding itself the average price dropped to INR 90/Wp, and lately to INR 70/Wp as the weighted average. SECI also helped Delhi Metro Rail Corporation (DMRC) to set up a 500 kWp system in one of the stations through a Renewable Energy Service Company (RESCO) model. A vendor was selected to execute this work. SECI is also planning to have a large roof top PV programme in RESCO mode in the near future.

**Is the DMRC installation operational? At what rate is the consumer procuring electricity?**

The rooftop solar system at Dwarka metro station in Delhi is fully functional. As per provisions of power purchase agreement between the DMRC and the developer, payment for the energy supplied from the solar plant is directly made by DMRC to the developer. For the first three years, the tariff has been set in the range of INR 6.5/kWh with a provision of escalation thereafter by 3% annually for the next 10 years.

**Can SECI issue green bonds to reduce the cost of finance for developers using Indian modules?**

SECI is a new organisation and we are in the process of building the institution and adding capacity. We would like to assist developers in setting up projects or facilitating them. IREDA and various banks could issue green bonds. SECI would like to connect these financial institutions to the pertinent developers at present.

**Are you also looking at Domestic Content Requirement (DCR) for the utility scale plants?**

Development of the Domestic Solar Manufacturing segment is an important area, especially in view of the ambitious solar plans. Therefore, DCR for utility scale plants cannot be ruled out. Every effort would be made to bring the domestic solar manufacturing industry at par with global players.

**The Government of India is encouraging foreign companies to set up manufacturing plants in India. What are your thoughts regarding this?**

Wafers coming from outside add 15-20% value to cell/module making because of which there is a large price difference. In the beginning of Phase II we found a price difference of INR 1 crore/ MW in the VGF requirement for projects with locally sourced crystalline Silicon cell and module and fully imported crystalline Silicon modules. Utilities want power at cheaper rates. At the Central government level we are trying to support domestic manufacturers by providing a higher Viability Gap Fund. They, however, have to compete with the foreign manufacturers in any case.

**Why do you think domestic manufacturers have not been able to compete? China gives dedicated power to their manufacturers at zero or very low tariff. Tax exemptions are also being given.**

There are two very important components, which determine the cost of solar PV cells. One is the financing cost while the other is the cost of energy/electricity. The Indian industry has been

requesting the government for support on these two counts. The current banking system in India offers higher interest rates with lower tenure of loans which means capital intensive projects engaging domestic source of finance are expensive. Infrastructure projects need long tenure loans to support large capacity projects, as construction period could be longer than expected in real conditions.

## SERIIUS Updates

### Internal Meeting

A meeting was held at Hyderabad on March 13 and 14, 2015 and was hosted by ARCI (International Advanced Research Centre for Powder Metallurgy and New Materials). The meeting was attended by the team leads representing the SERIIUS thrusts from the Indian side of the consortium. The meeting provided a platform for researchers to discuss their work progress and address bottlenecks experienced in the project.

## SERIIUS - MAGEEP Scholars

The McDonnell Academy Global Energy & Environmental Partnership (MAGEEP) scholarship aims at providing researchers from both India and United States an opportunity to interact and exchange knowledge. A brief description of the research work carried out by the scholars during 2014 exchange programme is given below:



**Arun D Rao (IISc)**  
IISc Mentor: *Prof Praveen C Ramamurthy*  
NREL Mentor: *Dr. Dana Olson*

Arun D Rao worked in PV thrust where devices were fabricated based on ternary blend using a synthesised low band gap based polymer and P3HT: PCBM. To understand the enhancement in ternary blend, photo physics and charge transport properties were measured using Time Resolved Microwave Conductivity (TRMC) and Charge Carrier Extraction by Linearly Increasing Voltage (CELIV) techniques.



**Sagar Khivsara (IISc)**  
IISc Mentor: *Prof. Pradip Dutta*  
SNL Mentor: *Dr. Cliff Ho*

Sagar Khivsara modelled and analysed a directly heated supercritical carbon dioxide (s-CO<sub>2</sub>) receiver being developed in CSP thrust. Along with other Sandia National Laboratory (SNL) research scientists, Sagar is co-authoring two papers. In addition, he and his colleagues described a novel volumetric s-CO<sub>2</sub> receiver design with short-term integrated storage and also identified the anticipated impact, technical risks/issues, and other challenges for the proposed design.



**Neha Bharat Mahuli (IITB)**  
IIT B Mentor: *Prof. Shaibal Sarkar*  
NREL Mentor: *Dr. Maikel van Hest*

Neha Bharat Mahuli worked on a strategy to reduce the interface recombination at the TiO<sub>2</sub> interface at NREL. Pre-characterised TiO<sub>2</sub> was used to characterise the interface engineering in a Dye Sensitized Solar Cell (DSSC) configuration wherein intensity modulated photocurrent and photovoltage (IMPS and IMVS) measurements were used to investigate the photogenerated charge carrier dynamics.



**Arpita Singh (IISc)**  
IISc Mentor: *Dr. Monto Mani*  
ASU Mentor: *Dr. G. Tamizhmani*

Arpita Singh conducted a study to determine the role of building geometry on altering wind regimes and consequent impact on alleviating/aggravating dust settlement. The study under PV Thrust was conducted on a mock roof and it was observed that wind direction plays a role in the variation of dust accumulation from one panel to other.



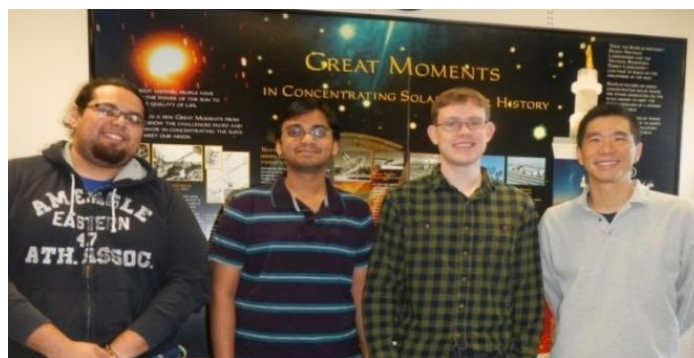
**Raja Sekhar Baddula (IITB)**  
**IITB Mentor:** Prof. Anil Kottantharayil  
**CSM Mentor:** Prof. Reuben T. Collins

Raja Sekhar Baddula fabricated a low cost solar cell by using nanostructures. He explored the option of silicon nanowire as base material for solar cell. At Colorado School of Mines (CSM) he decorated the Si-nanowires with Si nanoparticles followed by the deposition of PEDOT:PSS layer and also investigated possible enhancements in the efficiency of solar cells.



**Niraja Swaminathan (IITM)**  
**IIT-M Mentor:** Dr. Lakshmi Narasamma N  
**ASU Mentor:** Dr. G. TamizhMani

Niraja Swaminathan performed accelerated stress tests at Arizona State University (ASU) for testing the reliability and durability of Uninterrupted DC Power Meter (UDPM) units for India-specific climatic conditions. These units have been developed at IITM for decentralised solar PV applications, specifically for powering DC fans and lights for the residential sector.



SNL/IISc SERIIUS team (from L to R): J Ortega, S Khivsara, J Christian, C Ho

**Consortium Leads**

Indian Institute of Science, India & National Renewable Energy Laboratory, USA

**Research Thrust Leadership**

Indian Institute of Technology Bombay, Center for Study of Science, Technology and Policy, Sandia National Laboratories, RAND Corporation

**Consortium Partners**

**Institutes and National Laboratories**

International Advanced Research Centre for Powder Metallurgy and New Materials, National Institute of Solar Energy, Lawrence Berkeley National Laboratory

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