



# Partnership to Advance Clean Energy – Deployment (PACE-D) Technical Assistance Program

# PROGRESS REPORT

(April 2014 – March 2015)



July 2015

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## FOREWORD

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U.S.-India bilateral collaboration on clean energy plays an important role in the strategic partnership between the two countries. This robust cooperation started in 1982 with the Alternative Energy Research and Development program and has expanded and evolved over the years to address the emerging challenges related to climate change and energy security.

In his visit to New Delhi in January 2015, U.S. President Barack Obama pledged to further expand the existing policy dialogue and technical work on clean energy with India, including the highly successful Partnership to Advance Clean Energy (PACE) umbrella program.

I am pleased to share with you that the five-year technical assistance program under the deployment track of the PACE program has made significant progress since its launch in July 2012. The PACE-Deployment Technical Assistance Program is not just facilitating the deployment of megawatts of clean energy; it is also transforming the market by engaging with stakeholders, including policy makers, regulators, financiers, project developers, and consumers to create awareness and promote innovative thinking on emerging clean energy technologies and their applications. The program has established enabling partnerships and processes to facilitate the effective uptake of energy efficiency and renewable energy technology in India. This report highlights the key activities and achievements of the program in the last year (March 2014-April 2015).

I want to take this opportunity to thank our bilateral partners, the Indian Ministry of Power, Bureau of Energy Efficiency and Ministry of New and Renewable Energy, and other stakeholders for their support and guidance.

USAID/India is honored to be an integral part of India's low-carbon journey.

**Colin Dreizin**  
Director, Clean Energy and Environment Office  
USAID/India

# PACE-D TA Program Progress Snapshot

As of March 2015

**17**  
**Partnerships  
Established**

- Institutional Strengthening Support: Haryana, Karnataka, Madhya Pradesh and Rajasthan
- Clean Energy Finance: The Climate Group and Chhattisgarh State Renewable Energy Development Agency
- Renewable Energy: National Institute of Solar Energy and Solar Energy Corporation of India
- Energy Efficiency: Nalanda University and Uttar Haryana Bijli Vitran Nigam Ltd.
- Microfinance: ESAF, MSF, Sarala, Swayamshree, SVCL, Saija and Vayam Renewable Ltd.

- Solar Pumps: Basix and Bangalore Electricity Supply Company Ltd.
- Net Zero Energy Buildings: Nalanda University and Uttar Haryana Bijli Vitran Nigam Ltd.
- Solar Rooftop: Indian Oil and Indian Railways
- Clean Coal Technologies: Sipat Supercritical Plant
- Smart Grid: Tripura State Electricity Corporation Ltd. and Ajmer Vidyut Vitran Nigam Ltd.

- Cleaner Fossil Technologies Utility Exchange Program
- Smart Grid Study Tour

**2**  
**International  
Study Tours**

**9**  
**Pilot  
Projects**

**2**  
**International  
Conferences**

- Advanced Technologies and Best Practices for Supercritical Thermal Power Plants
- Seminar on Net-Zero Energy Buildings in India

- Issue Paper on Green Bonds in India
- HVAC Market Assessment and Transformation Approach for India
- Assessment of Role of Energy Storage Technologies for RE Deployment in India
- Best Practices Manual for Indian Supercritical Plants
- Smart Grids: An Approach to Dynamic Pricing in India
- Smart Grids: A Roadmap for Communication and Application Interoperability in India
- Financing Renewable Energy in India
- Financing Energy Efficiency in India

**8**  
**Technical  
Reports**

**22**  
**Consultation  
Workshops**

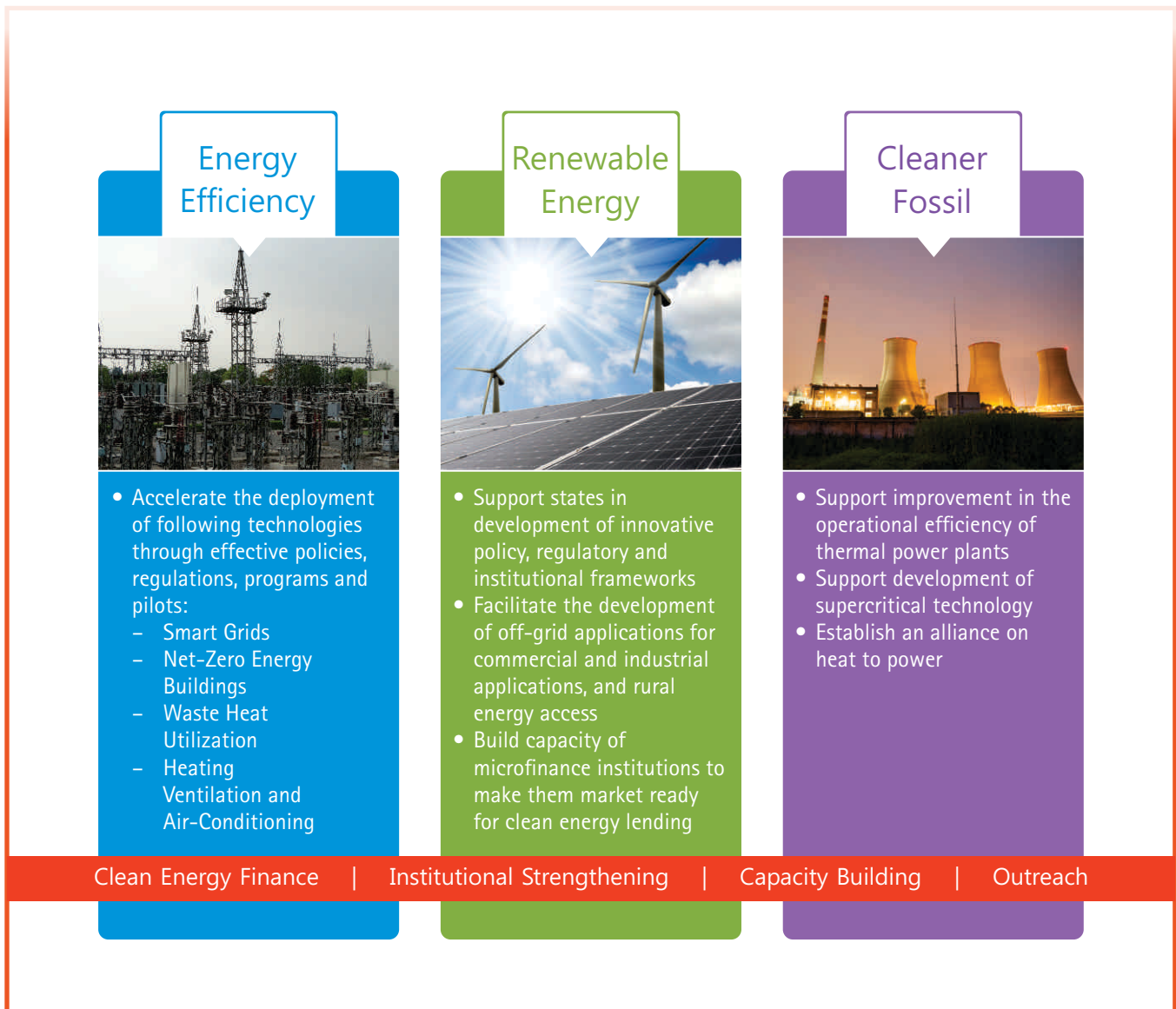
**14,000**  
**Person-hours  
of Training**

**27**  
**Training  
Programs**

# Program Overview

The Partnership to Advance Clean Energy–Deployment (PACE-D) Technical Assistance TA Program (“the Program”) is a five-year bilateral initiative led by the U.S. Agency for International Development (USAID) and the U.S. Department of State and implemented in partnership with the Ministry of Power (MOP) and the Ministry of New and Renewable Energy (MNRE). The core aim of the Program is to promote the adoption of low-carbon options in India via clean energy deployment, technology pilots, innovative financing mechanisms, enhanced human and institutional capacity, and public outreach and awareness.

Since its launch in July 2012, the Program has been working with a range of stakeholders including policy makers, regulators, state agencies, private companies, investors, clean energy associations, and others to create a sustainable enabling environment to help accelerate a shift to clean energy. The Program takes a holistic approach to facilitate knowledge sharing and knowledge transfer, and aligns its activities with the Government of India’s overarching clean energy targets and priorities.





# Institutional Strengthening

The PACE-D TA Program seeks to build the institutional capacity of state organizations in four focal states (Haryana, Karnataka, Madhya Pradesh and Rajasthan) to promote clean energy technology deployment. The increased institutional capacity will enable these states to propose, adopt, and implement effective policies, regulations and programs to support wide-scale deployment of clean energy technologies. For instance, two initiatives have already been adopted: the Karnataka Solar Energy Policy and Demand-Side Management (DSM) Regulations for Haryana. Other initiatives are under active consideration, such as a renewable energy and energy efficiency policy for Karnataka. The technical assistance being provided to the focal states is helping to build capacity, and the intention is that these states lead the way, and other states replicate and expand on these clean energy interventions.

## Karnataka



Karnataka has between 240 to 300 sunny days a year, and is estimated to have nearly 20 GW of solar power potential. The state has set aggressive capacity addition targets under the state's new Solar Energy Policy (2014-2021). Electricity supply companies including Bangalore Electricity Supply Company (BESCOM) are taking the lead by rolling out new initiatives for solar projects. The PACE-D TA Program is working with BESCOM to design, develop, and implement two initiatives under the policy framework. These initiatives will result in the installation of a significant amount of decentralized solar energy capacity and will yield significant reductions in greenhouse gas emissions.

- **Solar Rooftop Scheme:** BESCOM's rooftop photovoltaic (PV) scheme, launched in November 2014, is the first of its kind in the country. BESCOM is a distribution utility, and has developed an easy-to-follow framework of detailed processes, template forms and systems, so that any stakeholder can design, develop and install their own solar PV rooftop systems. This scheme is being disseminated as a shared, open-source framework, with information made



Solar Rooftop Project at Chinnaswamy Cricket Stadium



available to all. The PACE-D TA Program assisted BESCO to develop the required processes, forms, formats and guidelines. The program team also designed a standardized training format for solar PV rooftop deployment.

Since the launch of its solar rooftop scheme, BESCO has received more than 333 applications to install a total of 17 MW of solar PV power. As of April 2015, 775 kWp has already been installed, including 400 kWp at the Chinnaswamy Cricket Stadium in Bangalore. The program team supports BESCO with technical backstopping: it provides advice on the interconnection of systems, on outreach initiatives that raise awareness, and on training and capacity building of utility personnel. The program team takes part in expert technical and process committees set up by BESCO to advise it on solar rooftop schemes. The program team is developing a handbook guide to encourage other utilities like BESCO to roll-out similar solar rooftop schemes across India.

*“The technical assistance provided by the PACE-D TA Program has enabled BESCO to accelerate the implementation of its rooftop PV scheme - till date we have received 333 applications for deployment of nearly 17 MW of solar rooftop systems.”*

**Satish Kumar**  
General Manager – DSM  
BESCO

- **Surya Raitha Irrigation Pumping Scheme:** The Surya Raitha scheme, launched by the Government of Karnataka in September 2014, is designed to replace conventional electrical irrigation pump-sets with energy-efficient, net-metered solar-powered pump sets. The PACE-D TA Program is providing technical assistance to BESCO in the design and development of the pilot project being established under this scheme. The pilot project will help to identify and address technical challenges and also to evaluate best practices in institutional arrangements on the ground, so that these can be replicated throughout the state. The program team is supporting the Karnataka government in the process of managing the bids, including advising on the terms of reference and evaluation criteria for the pilot project. The scheme will improve livelihoods, conserve electricity, and enhance the quality of irrigation by providing farmers with reliable, uninterrupted, daytime power supply. Furthermore, it will significantly reduce transmission and distribution losses of conventional grid power supply by replacing this source of energy with locally-generated clean energy.

## Rajasthan



The desert state of Rajasthan has almost 300 days a year of sunlight, making it a prime candidate for solar projects. While the potential for large capacity, grid-connected solar projects has begun to be realized, the market opportunity for decentralized and small rooftop systems remains untapped. One of the main barriers is a widespread lack of clarity around the governing regulatory conditions, such as the legal standing of third-party-based rooftop installations. The program team, in collaboration with the state's energy department and nodal agency, prepared a white paper and provided policy advisory support to develop net metering. The program also provided inputs to modernize regulations to reflect current and future market needs. The program team is developing a detailed framework for the interconnection of solar PV rooftop systems on behalf of the state's largest distribution utility, the Jaipur Distribution Company. Under this initiative, the program team is designing a framework that includes the detailed processes, forms, formats and systems to encourage and support customers to design, develop, and install solar PV rooftop systems. The program team helped to develop a compliance mechanism under the renewable purchase obligation (RPO) for open access/captive consumers. This included design of the overall framework, outline of the institutional structure of the compliance cell, and preparation of an RPO information manual for obligated entities. Rajasthan is also facing a demand-supply gap in terms of both energy generation and installed capacity. There is a tremendous potential to reap the benefits of implementing energy-efficiency measures such as demand-side management and energy conservation building codes. The program team prepared a draft EE policy for the state covering the period 2015-2019. The Government of Rajasthan is preparing to roll out a mandatory Energy Conservation Building Code (ECBC) in the Jaipur municipal area in the near future.

## Haryana

Haryana has an average demand of 4,500–5,500 MW, and this increases significantly during summer peak hours. The state's economy which is based predominantly on agriculture and manufacturing is growing fast. In 2014, the Program provided technical assistance to the Haryana Electricity Regulatory Commission to develop DSM regulations to ease the state's power crunch. These regulations were notified in November 2014. The program team started working with state distribution utilities to build the capacity for planning, designing, and implementing DSM projects. While other states have notified DSM regulations, there has been very little progress in terms of submitting DSM proposals and taking them forward for implementation. Haryana is likely to be among the first few states to move quickly toward DSM project implementation and to realize the inherent benefits of adopting this policy.



## Madhya Pradesh



More than 680 off-grid solar PV systems have been installed in Madhya Pradesh by different vendors under the programs being implemented by the state nodal agency Madhya Pradesh Urja Vikas Nigam Limited (MPUVNL). The Program Team is working with MPUVNL to establish a Centralized Monitoring Centre (CMC), which will assist the agency to monitor the performance of these off-grid installations. A conceptual framework was prepared, and based on this framework a Detailed Project Report was developed and adopted to implement the CMC. The program team developed a detailed terms of reference for the recruitment of an IT service provider and a request for proposal and outlined the bid process management for MPUVNL to select the IT provider.

## Knowledge Sharing between States

The Program organizes regular knowledge exchange workshops to facilitate networking and knowledge-sharing among key partner agencies including state nodal agencies (SNAs), distribution utilities, electricity regulatory commissions, and electricity departments of various states. The program organized its second knowledge exchange workshop on February 18–19, 2015 in New Delhi. Representatives of SNAs and electricity regulatory commissions from Haryana, Karnataka, Madhya Pradesh, Tamil Nadu, and Rajasthan participated in the workshop. The discussions focused on solar rooftops, solar pumping, CMC, Solar Energy Training Network (SETNET), and Bureau of Energy Efficiency's initiatives to promote energy efficiency, including municipal DSM, ECBC and financing. The workshop also included a site visit to the solar rooftop and EE project at *Paryavaran Bhawan* (Office of Ministry of Environment, Forest and Climate Change) to get first-hand experience of a nearly zero-energy building and solar rooftop installation.



Workshop participants taking a tour of the solar rooftop project at *Paryavaran Bhawan*, New Delhi

# Clean Energy Finance

One of the biggest challenges to scaling up clean energy in India is the lack of appropriate financing mechanisms to tap into various capital markets for affordable, long-term financing. High interest rates continue to present a major hurdle for clean energy deployment. Also, while domestic debt is expensive due to underdeveloped capital markets, foreign debt becomes expensive due to the associated hedging costs, leaving the project developers with limited options for more affordable financing. Similarly, traditional sources of financing such as project financing from banks have several limitations, such as low sectorial lending limits, high costs of borrowing, and a mismatch between borrowing and lending cycles. These financing sources will not be able to meet the projected demand for financing required to meet the aggressive targets set by the Government of India for clean energy deployment. Therefore, there is a critical need to explore new sources of finance such as: global capital markets, pension funds, sovereign funds, and insurance companies, among others.

Since 2012, the program team has been working with a wide range of financial sector stakeholders to leverage public and private funds for clean energy deployment. The program team is building the capacity of financial institutions and project developers, with the aim of increasing clean energy investments in India.

## Decentralized Energy Debt Fund

A mismatch exists between the supply and demand of capital, primarily debt, for deployment of decentralized energy solutions, particularly in rural areas in India. Targeted interventions are required to address this challenge, and to support business models through early stage demonstration efforts. This will increase the likelihood that projects will be able to scale up and access more mainstream financing.

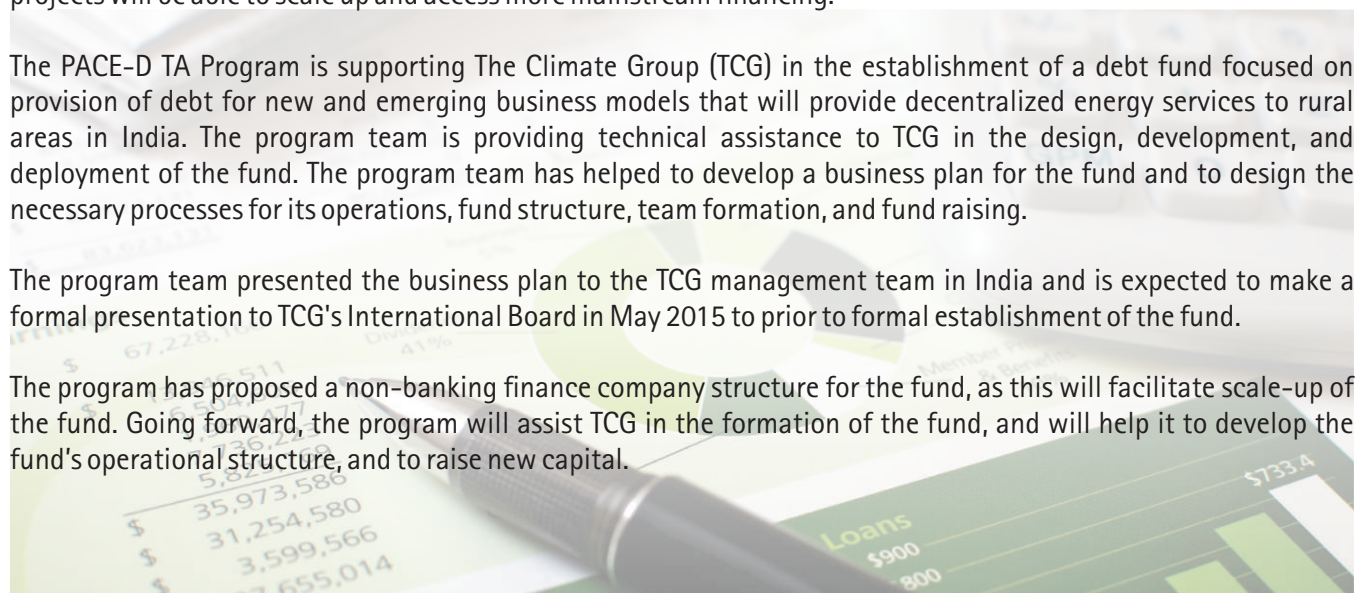
The PACE-D TA Program is supporting The Climate Group (TCG) in the establishment of a debt fund focused on provision of debt for new and emerging business models that will provide decentralized energy services to rural areas in India. The program team is providing technical assistance to TCG in the design, development, and deployment of the fund. The program team has helped to develop a business plan for the fund and to design the necessary processes for its operations, fund structure, team formation, and fund raising.

The program team presented the business plan to the TCG management team in India and is expected to make a formal presentation to TCG's International Board in May 2015 to prior to formal establishment of the fund.

The program has proposed a non-banking finance company structure for the fund, as this will facilitate scale-up of the fund. Going forward, the program will assist TCG in the formation of the fund, and will help it to develop the fund's operational structure, and to raise new capital.

*"TCG appreciates the technical assistance extended by PACE-D TA Program to explore the possibility of setting up a dedicated debt financing mechanism for the decentralized renewable energy sector. We strongly believe that long term debt financing has tremendous potential to unlock private investments into the segment and thereby pave way for India to achieve energy for all in the coming years."*

**Jarnail Singh**  
India Program Manager  
The Climate Group







**Launch of Issue Paper on Green Bonds in December 2014**

From left to right: Mark Newton, Lead Energy Specialist, USAID/India; Upendra Tripathy, Secretary, MNRE; and K S Popli, CMD, IREDA

### **The Launch of Green Bonds in India**

Green bonds have witnessed significant success globally and are being acknowledged as an important tool for financing clean energy technologies in developed economies. Green bonds, also known as climate bonds, are fixed-income securities that raise capital for projects with positive environmental implications, such as those based on renewable energy, energy efficiency and climate change mitigation. While green bonds have found buyers in markets like Europe, the U.S. and China, they had not been used in India until recently. It is estimated that green bond issues amounted to almost USD 35 billion worldwide in 2014, while they are yet to take off in India.

The PACE-D TA Program is leading efforts to launch green bonds in India, and recently published a paper to highlight international market trends, with recommendations on how best to introduce green bonds to India. The paper was formally issued by Upendra Tripathy, Secretary, MNRE, at a consultation workshop organized by the Indian Renewable Energy Development Agency (IREDA) on December 20, 2014. The PACE-D TA Program organized a webinar in the same month, in collaboration with the Climate Bond Initiative, to raise awareness about the many benefits of green bonds. These events were attended by financial stakeholders such as Yes Bank and India Infrastructure Finance Company Limited, Indian clean energy project developers, and bilateral and multilateral development agencies. Through these events, the program team developed a better understanding of India's market requirements, and offered technical assistance to support potential issuers of green bonds in India. In February 2015, Yes Bank successfully issued green infrastructure bonds, raising INR 10 billion (USD 157 million). This is a major move in the promotion of green bonds in India. The funds raised from this financial instrument will be used by the Yes Bank to finance green infrastructure projects in renewable energy, including solar power, wind power, biomass, and small hydropower. Although IREDA began issuing tax-free bonds in February 2014 to raise funds, the initiative by Yes Bank is the first-ever bond issue by a commercial bank in India to raise money specifically for green energy projects.

### **Corporate Social Responsibility Funds for Energy Access**

Distributed clean energy systems can play a key role in addressing the energy access challenge and can improve the quality of life of people living in rural India. However, the deployment of such technologies is capital-intensive, and substantial bridge financing is needed to complete the required investments. The PACE-D TA Program is working with Chhattisgarh State Renewable Energy Development Agency (CREDA) to set up a "Distributed Renewable

Energy - Community Fund (DRE - CF)" aimed at accessing companies' corporate social responsibility (CSR) contributions. This strategy can generate a pool for targeted investments in community-owned organizations such as cooperatives and self-help groups to serve the needs of households, schools, health centers and other community infrastructure.

Under this approach, users pay for services, and a proportion of these funds will be set aside to cover maintenance and up-keep of assets. The majority of the funds raised would be consolidated in an escrow account. This revolving fund would then be available to the community to replicate and scale-up similar initiatives in the same area—and potentially in neighboring areas, as applicable on a case by case basis. The program team is talking to several commercial firms to seek their commitment to invest in the scheme and contribute toward the proposed fund.



#### MOU signing between USAID and CREDA

From left to right: Dinesh Babu, COP, PACE-D TA Program; Colin Dreizin, Director - CLEEO, USAID/India; SK Shukla, CEO, CREDA; and Sanjeev Jain, Chief Engineer, CREDA

### Promoting Energy Efficiency Financing

Investments in EE are recognized as one of the most cost-effective options to reduce costs, deliver increased economic productivity, and increase energy security. Yet the rate of investment in EE technologies and projects in India is lagging far short of its potential. This is largely due to the risk perception associated with lending to develop new technologies. The Bureau of Energy Efficiency (BEE) has developed a risk-sharing mechanism—a Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE)—to provide partial coverage of risk exposure to commercial banks against loans issued for EE Projects. The PACE-D TA Program is supporting BEE to launch this Fund by mid-2015. As part of this initiative, the program team prepared an RFP to select a monitoring and verification agency for the Fund and provided inputs on the Fund's operational rules. In India, many bankers and financial institutions have limited experience in energy efficiency lending: in response to this, the program team organized training workshops in Delhi and in Mumbai in September 2014 to raise awareness of some of the key technical and economic aspects of energy efficiency projects, implementation business models, financing needs, risks, and risk management approaches. The program team prepared and submitted draft guidelines on energy efficiency project financing and training modules for loan officers of financial institutions for BEE for review. The guidelines are expected to be finalized in May 2015. The program is also supporting BEE to organize a "Training of Trainers" workshop, in collaboration with the Indian Banks Association.

The program team completed a survey of energy service companies (ESCOs) and financial institutions in partnership with the Alliance on Energy Efficient Economy (AEEE). This survey helped identify a potential pipeline of energy efficiency projects best positioned to benefit from BEE's risk and venture capital funds for energy efficiency.

# Renewable Energy

India is aggressively promoting clean sources of energy to not only reduce its dependency on fossil fuels and lower its carbon footprint, but also to improve energy access in general. The PACE-D TA Program is working closely with MNRE to accelerate RE deployment in new and emerging areas through innovative applications by supporting pilot projects and by increasing access to finance. It is also facilitating large-scale capacity-building of technical professionals required to meet India's proposed capacity target of 175 GW of renewable energy by 2022.

## Deployment

**Technical Assistance to Indian Oil for Solar Rooftops:** The storage depots, terminals and refineries of oil companies and large industries are prime locations for solar rooftop installations. Indian Oil Corporation Ltd. (IOCL), with support from the PACE-D TA Program, applied for and received an allocation of 15 percent financial assistance from MNRE, under its scheme for promotion of solar PV rooftop systems in public sector facilities.

IOCL is working on the design and development of solar PV rooftop projects at three of its refineries (Panipat, Baroda and Barauni) with assistance from the PACE-D TA Program. First, the program team helped to identify potential sites for the solar rooftop installations at the three refineries, and it later developed feasibility reports and detailed technical specifications for the systems, and other documentation as per MNRE guidelines to better access financial assistance. Once MNRE sanctions this intervention, the PACE-D TA Program will assist IOCL to develop and manage the bid process to procure 5 MW of solar PV rooftop systems, while also ensuring that appropriate quality standards are maintained and the commissioning of the projects takes place on time.

**Off-Grid Irrigation Pumping:** Solar-powered water pumps can be an ideal solution for many villages and rural areas with no access to grid-based electricity services. This is particularly true in locations with high levels of solar radiation, such as the state of Bihar. Although more than 95 percent of the villages in Bihar are connected to the grid and electrified, access to three phase electricity supply for irrigation services is very poor. The state also suffers from a high peak-power deficit of nearly 26 percent, and an energy deficit of 15 percent, both among the highest in the country. This means that many farmers have to rely on diesel for irrigation, which is a polluting source of power and is often not an affordable solution.

The PACE-D TA Program is working with BASIX, a not-for-profit organization, to demonstrate the techno-commercial feasibility of solar irrigation pump-based micro-grids in Bihar. The program team aims to install 12 irrigation pump sets across three villages in Bihar through its pilot project with BASIX. These pump sets will use a shared service model

*“The PACE-D TA Program has played a key role in IOCL identifying sites for rooftop installations and assisting in the design of solutions that could be deployed on these rooftops.”*

**Subodh Kumar**  
General Manager  
Alternative Energy &  
Sustainable Development  
Indian Oil Corporation Ltd.





to pump and distribute water and commercial rates will be charged for the water delivery (this is still substantially cheaper than diesel-based water pumping). The pilot showcases how community-based institutional structures can deliver and manage water services and collect water revenues, providing payment security on the investments in the process. In the future, this initiative may serve as a model to be replicated across the states of Bihar, UP and West Bengal and further afield. The program team has met with stakeholders, including the HUL Foundation, Schneider Foundation and The Climate Group to explore their interest in partially financing this demonstration project with BASIX.

**Energy Storage Pilot:** Cost-effective ways of storing electrical energy can help make the grid more efficient and reliable in India, and can also help to compensate for the variability inherent in wind and solar power. Understanding the need for efficient energy storage, the program team carried out an assessment of the role of energy storage technologies in renewable energy deployment in India. Based on these findings, MNRE expressed a keen interest to support demonstration projects for energy storage technologies for small-scale and grid-connected MW-scale renewable energy applications, through viability gap funding. The program is in the process of developing a market-based approach to encourage stakeholders to identify and develop demonstration projects using different implementation and business models. With technical inputs from the PACE-D TA Program, MNRE aims to invite expressions of interest from stakeholders for the design and development of new and innovative energy storage solutions for integration of renewable energy technologies. The demonstration program is expected to help in acquiring the desired technical knowledge and economic insights on the approaches for greater deployment of energy storage technologies in India.

### Inclusive Growth of Microfinance Institutions

One of the key objectives of the PACE-D TA Program is to enhance access to clean energy sources for impoverished rural areas through innovative community-driven financing mechanisms like microfinance. As part of its microfinance component, the program focuses on facilitating enhanced lending for clean energy technologies and products to the rural poor. It promotes clean energy lending portfolios of microfinance institutions (MFIs), and helps to build partnerships between MFIs and renewable energy product/technology suppliers. The program also builds the capacity of partner MFIs and technology suppliers to develop and expand clean energy product markets through improved service delivery and efficient after-sales service.

The program team issued an expression of interest to more than 400 institutions to attract and establish partnerships with potential MFIs. Of the 400 approached, thirteen MFIs expressed interest and eight were later shortlisted and selected based on pre-determined selection criteria. The program has since signed MOUs with two MFIs—SVCL and Saija—in March 2015. As part of the technical assistance to the MFIs, the program team successfully conducted vision-building exercise sessions for two MFI partners in February 2015 to develop business plans to accelerate clean energy lending.





## Building an Army of Solar Professionals

India proposes to deploy 100 GW of solar energy by 2022. To achieve this target and successfully operate and manage the solar power plants, it is critical to build qualified/skilled manpower in solar energy science and technologies. A study, conducted by CII-Green Business Centre for MNRE in 2010, estimated that 0.65 million solar energy professionals will need to be employed to achieve the earlier target of 20 GW.

The National Institute of Solar Energy (NISE), an autonomous center of excellence under MNRE, has identified training of solar energy professionals as one of its key focus area. Towards this end, it has designed the Solar Energy Training Network (SETNET), in collaboration with the PACE-D TA Program. SETNET aims to provide MNRE with a structured platform for technical and business capacity building and training in the solar energy space.

*“The technical support provided by the PACE-D TA Program has enabled NISE to conceptualize and roll out SETNET. We today have 35 SETNET partners and are now ready to upscale our training activities at NISE.”*

**Dr. P. Saxena**  
Director General  
National Institute of Solar Energy  
(NISE)



SETNET Partner Consultation Meeting held in March 2015

The core objective of SETNET is to ensure the availability of skilled manpower to meet the national solar deployment targets. SETNET's guiding framework includes the prioritization of training needs with concurrent industry interface and the introduction of a standardized curriculum and content delivered by accredited trainers. The framework also recommends working with a wide range of partner organizations to deliver training.

Since the approval of SETNET by the Governing Council of NISE, the PACE-D TA Program has provided technical assistance to selected partner organizations through a public call of expression of interest. A total of 35 partner organizations were selected from amongst 100 respondents. In March 2015, a consultation with selected partners was organized by NISE and the program team presented SETNET's operational strategy. This detailed presentation included the approach and framework for, industry interface, curriculum and content development, training delivery, and revenue sharing amongst others.

# Smart Grids

India generates about 250 GW of power each year, yet nearly 23 percent of this amount is lost in energy transmission and distribution. The aggregate technical and commercial losses due to pilferage, defective meters, and errors in meter reading hamper the growth of distribution utilities and deplete state finances. What is more, these losses are a waste of generated electricity that could otherwise be used productively. One way to address this challenge is to adopt smart grid technologies and solutions, to monitor, measure and control power flows in real-time. This, in turn, can help pinpoint where losses occur and help utilities to reduce and eventually eliminate most of the losses.

The program team is working with the Ministry of Power, via the India Smart Grid Task Force (ISGTF), to support the design of a regulatory framework for smart grids, and to build the capacity of smart grid pilot projects.

## Technical Assistance for Smart Grid Regulations

Smart Grids cannot evolve without dynamic and flexible regulations. The PACE-D TA Program prepared draft smart grid regulations under the guidance of the technical committee constituted by the Ministry of Power. The proposed smart grid regulations cover different themes such as investment, tariff design, safety and standards, customer service, establishment of a smart grid cell, and engagement of state nodal officers.

The proposed regulatory framework provides flexibility to experiment with new technologies and applications, while duly protecting the legitimate interests of consumers and prosumers. The program team submitted draft regulations to the Forum of Regulators (FOR) in early 2014 for review. The FOR will take forward the process of finalizing these regulations through an appropriate consultation process. When the model regulations are endorsed, the states can then adopt and adapt these regulations to best match the needs of their respective states.

## Building the Capacity of Utilities

One of the key initiatives of the PACE-D TA Program is to build the capacity of the 14 utilities that are implementing smart grid pilot projects. In the last year, the program team organized two capacity-building workshops—one each at Puducherry and Udaipur in April and October 2014, respectively. The workshops provided a platform for utility personnel to build their capacity and share knowledge on smart-grid-related issues and topics. While the Puducherry workshop revolved around issues faced by utilities during the pre-award stage, the Udaipur workshop focused on the importance of communication technology in the successful deployment of smart grid projects. Both workshops included a site visit to showcase a live demonstration of smart grid solutions to utility participants. During the coming months, the program team plans to further deepen its engagement with smart grid initiatives by supporting one utility more closely (Tripura) among the 14 pilots on specific implementation needs. It also plans to engage with the recently announced National Smart Grid Mission and the National Smart Grid Knowledge Centre to identify potential areas of partnership.



Participants of Smart Grid Training in Udaipur held in October 2014

# Green Buildings

## Net Zero Energy Buildings (NZEBS)

The mainstreaming of NZEBs in India is dependent on several factors: enabling policy interventions, market transformation, and awareness raising campaigns to catalyze interest of the building and energy sectors in NZEBs. The PACE-D TA Program has developed concepts notes for an NZEB Alliance, an NZEB knowledge portal and NZEB design awards, to support the scale-up of NZEBs in India.

In June 2014, the program organized a stakeholder consultation to seek expert opinion on the feasibility and resource requirements of these initiatives. Experts welcomed the proposed NZEB knowledge portal as a one-stop information-sharing platform for professionals and end users alike, and recommended using the portal as a launch pad for an NZEB Alliance. In response to these recommendations, the Program developed the structure for the NZEB knowledge portal to raise awareness of NZEBs in India. The portal is in the final stages of development and is expected to launch in 2015.

The program team also continues to provide assistance in the selection of energy-efficient materials, technologies, and design strategies for both NZEB pilots—Nalanda University campus and the head office of Uttar Haryana Bijli Vitran Nigam Limited.

## Technical Update of the Energy Conservation Building Code (ECBC)

The first energy code for buildings in India was established in 2007 by the Ministry of Power. The ECBC established minimum energy-efficiency requirements for the design and construction of new buildings. However, building technologies and materials have since changed and a technical update is required to keep the code current and relevant to today's market practices.

The PACE-D TA Program is working with the Bureau of Energy Efficiency to facilitate a technical update process for the ECBC 2007, and has completed several key milestones. The methodology and structure of the code update have been finalized after consultations with the working groups constituted to oversee the update process. Similarly, a baseline of typical Indian commercial building types was established, through an exhaustive study that collated the baseline specifications of prototype buildings across five climatic zones. The study categorized the Indian commercial building sector into 16 prototype buildings based on different design patterns, operational schedules, and functional uses. The program interviewed nearly 70 designers, engineers and developers to collect the information for establishing the baseline. The baseline study was a precursor to the stringency analysis, the task of conducting a lifetime cost benefit analysis for proposed energy conservation measures in the code. The program has begun work on the Stringency Analysis Reports for building envelope, lighting, electrical and comfort systems. The stringency reports will be presented to the technical working groups in 2015.

*“Updating the Energy Conservation Building Code (2007) is a key activity for BEE. We are happy to work with the PACE-D TA Program to prepare the draft ECBC 2015 which will then be taken for formal approval from the Government.”*

**Sanjay Seth**  
Energy Economist  
Bureau of Energy Efficiency



## ECBC Implementation

The PACE-D TA Program is providing technical assistance to Rajasthan to implement the ECBC. It has supported Rajasthan Renewable Energy Corporation Limited (RRECL) to draw up an action for ECBC implementation. A high-level task force, comprising various urban development agencies in Rajasthan, has been set up to undertake strategic planning for ECBC implementation and to ensure its time-bound execution. The task force, chaired by the Energy Secretary of the Government of Rajasthan, will oversee development and notification of ECBC compliance and enforcement procedures, and will launch the mandatory ECBC compliance regime in the state. The task force met in November 2014 and again in March 2015.

A cadre of duly qualified and trained professionals will be needed to enforce compliance with the code in a competent manner and to implement the intent of the ECBC effectively. In recognition of this, the PACE-D TA Program is helping BEE to launch the ECBC Professional Empanelment Program, a professional certification program to test and recognize professional consultants with required skills. So far, the program team has prepared the structure, syllabus and institutional arrangements for the empanelment program examination. The program team has prepared a compendium of study materials for prospective candidates and a question bank for the examiners, to support the launch of a pilot examination scheme.

## Heating, Ventilating and Air-conditioning (HVAC)

The need to optimize energy use by HVAC systems takes on added urgency when considering the fast-expanding construction market in India. The program team undertook a HVAC market assessment study, which was the first of its kind to map the penetration of energy-efficient HVAC systems in India. The study also explored the barriers to greater uptake of high performance HVAC systems. The findings of the study were collated in a technical report, which was launched by Dr. Ajay Mathur, Director General, BEE, at a stakeholder workshop in August 2014. The study highlighted important revelations about the perception of energy-efficient HVAC technology among end users. While EE considerations are factors in HVAC purchase decisions, uncertainty about the cost benefits and perceived risks of changing technology impede buyers from investing in energy efficient HVAC technology. The program team is working with BEE to raise awareness of the economic and environmental benefits of deploying highly efficient HVAC systems in India.



Launch of HVAC Market Assessment Report in August 2014

From left to right: Bhaskar Natarajan, DCOP-EE, PACE-D TA Program; Sanjay Seth, Energy Economist, BEE; Ajay Mathur, Director General, BEE; Mark Newton, Lead Energy Specialist, USAID/India; and Apurva Chaturvedi, Program Management Specialist, USAID/India

# Waste Heat Utilization

## Industrial Energy Efficiency

India's fast-growing industrial sector is ideally placed to increase production efficiency and profitability by applying energy-efficient best practices in industrial plants. Waste heat utilization (WHU) is one such technology that can contribute significantly to India's efforts towards energy conservation. Large quantities of heat from industrial processes and equipment such as boilers, kilns, ovens, furnaces can be recovered.

The program team undertook a WHU market assessment study and conducted a WHU pilot feasibility study for a sponge iron unit. In addition, the team developed a background paper outlining the strategies that are being deployed globally to promote WHU technologies.

The focus of the program in 2014 was to carry out a situational analysis on low-grade WHU (150–300°C), with a view to developing an appropriate policy mechanism to attract investment in identified high-priority low-grade WHU technologies in industries. The structured analysis assessed the current level of penetration in industries and prioritized sectors and technologies to be targeted through policies designed to increase market penetration. The program team mapped the availability of funding sources and sinks in the sugar, textile, pulp and paper, fertilizer, chlor-alkali, iron and steel, aluminum, cement and power sectors. An assessment of selected sectors—sugar, textile, iron and steel—found the savings potential to be 9.7 million tons of coal. The program team also prepared a compendium of low-temperature WHU technologies. This will be presented to an expert group, to solicit ideas on how best to integrate the inputs into the policy-making process, in order to prioritize WHU in India.

The program team organized a stakeholder consultation meeting at Pali, Rajasthan in August 2014 to present the findings relevant to the textile sector, and to gather feedback on the challenges and impediments in the adoption of low-grade WHU technologies. Pali has a cluster with over 900 textile mills, which are a key focus of BEE's national program for energy efficiency in micro, small and medium enterprises. BEE is now leading the market transformational activities as per the feedback received from participants at the Pali workshop.

Going forward, the PACE-D TA Program will support BEE in the development of a strategy paper to promote WHU through appropriate policy mechanisms.





# Key Events



Clean Energy Knowledge Exchange Workshop

February 18-19, 2015  
(New Delhi)

Consultation Workshop on Distributed Renewable Energy – Community Fund

January 5, 2015  
(Raipur)



Smart Grid Capacity Building Workshop

October 17-18, 2015  
(Udaipur)



Capacity Building Workshop for EE Financing

September 11, 2014  
(Mumbai)



Capacity Building Workshop for EE Financing

September 9, 2014 (New Delhi)



Workshop on Low Grade WHU for Pali Textile Industry Cluster

August 12, 2014 (Ranakpur)



Workshop on HVAC Market Assessment and Transformation Approach for India

August 5, 2014 (New Delhi)



Stakeholder Consultation for Solar Rooftop

July 9, 2014 (Bengaluru)



Consultation Workshop on Nearly Zero Energy Buildings

June 5, 2014 (New Delhi)







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