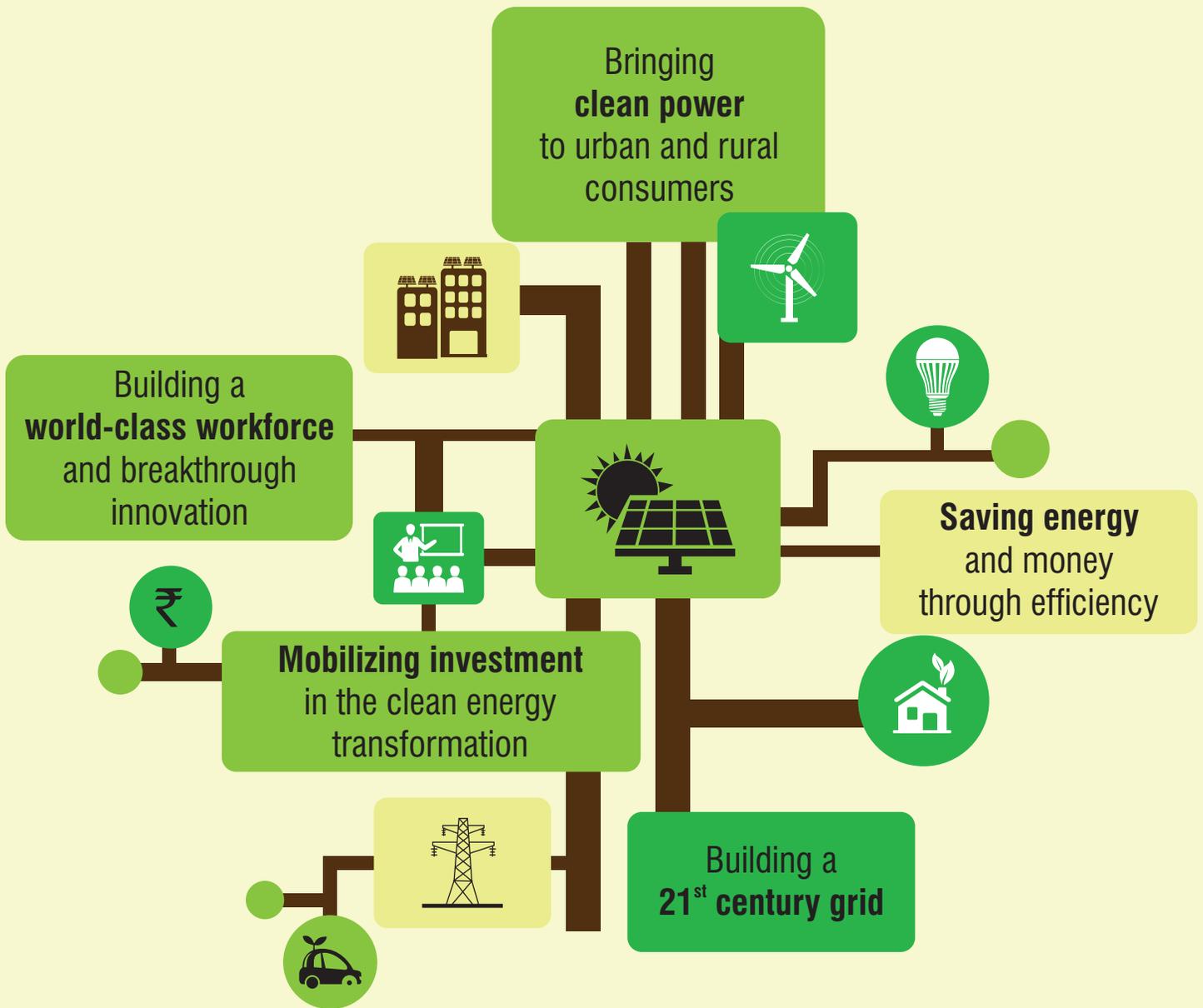


U.S.-India Partnership to Advance Clean Energy



An Initiative of the U.S.-India Energy Dialogue
A Progress Report | August 2016





A Progress Report by:

The Department of Commerce (USDOC), Department of Energy (USDOE), Department of State (USDOS), Export-Import Bank of the United States (Ex-Im), Overseas Private Investment Corporation (OPIC), U.S. Agency for International Development (USAID), and U.S. Trade and Development Agency (USTDA).

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Executive Summary

The year 2015 marked a defining moment in the global quest for a sustainable future for humanity. The Governments defined their vision for a post-2015 development agenda by agreeing upon a set of sustainable development goals. Under the United Nations Framework Convention on Climate Change, 159 countries inked a new universal agreement in December 2015, in Paris, to address the threat of climate change and deliver on the opportunity of combating it.

India's climate change pledge is centered on increasing the proportion of clean energy in the country's energy mix. In turn, three factors are key to achieving the national target of 175 gigawatts (GW) of renewable energy: achieving 100 GW of solar energy, 60 GW of wind power and maintaining the stability of the power grid while bringing this unprecedented level of intermittent renewable energy online. Bilateral cooperation between the U.S. and India gets to the heart of these challenges. The U.S.-India Partnership to Advance Clean Energy (PACE) is the flagship program to spur low-carbon development by supporting research and deployment of clean energy through PACE-R (research) and PACE-D (deployment) initiatives, and promoting energy access through its Promoting Energy Access through Clean Energy (PEACE) initiative.

In June 2016, President Obama and Prime Minister Modi reiterated their commitment to pursue and develop long-term low greenhouse gas emission development strategies. Both the countries also signed a memorandum of understanding to further enhance cooperation on Energy Security, Clean Energy and Climate Change. The U.S. welcomed the launch of the International Solar Alliance (ISA) led by India, recognizing the critical role it can play in accelerating solar power. To this end, the two nations committed to launch the third initiative of the ISA, focused on off-grid solar for energy access, at its Founding Conference in India. Other key recent announcements included:

- The creation of a USD 20 million U.S.-India Clean Energy Finance initiative, equally supported by the U.S. Foundations and India, which is expected to mobilize up to USD 400 million to provide clean electricity to up to one million households by 2020;
- A commitment to establish the U.S.-India Clean Energy Finance Hub as the coordinating mechanism to focus U.S. Government efforts that will increase renewable energy investment in India, in partnership with leading Indian financial institutions;
- A USD 40 million U.S.- India Catalytic Solar Finance Program, supported equally by the U.S. Foundations and India, that could mobilize up to USD 1 billion of projects by providing needed liquidity to smaller-scale renewable energy investments, particularly in poorer, rural villages that are not connected to the grid; and
- Expansion of successful cooperation on solar rooftop to five new Indian states to improve utilities' capacity to scale their programs, and continuation of the work on large-scale renewable energy integration into the Indian power grid.

Partnership to Advance Clean Energy (PACE)



Research (PACE-R)

A Joint Clean Energy Research and Development Center working to develop cutting-edge clean energy breakthroughs

Focal areas include: solar energy, buildings energy efficiency, second generation biofuels, and smart grid and grid storage.

Deployment (PACE-D)

A joint effort by nine agencies to accelerate clean energy deployment

Focal areas include: energy efficiency, renewable energy, clean energy finance, and grid integration.



Access (PEACE)

Promoting Energy Access through Clean Energy

Focal areas include: finance and technology innovation for clean energy solutions, skills development and ecosystem strengthening.

Recent Highlights

Research (PACE-R)

New Software Tools: The U.S.-India Joint Center for Building Energy Research and Development developed COMFEN-India, a free online software tool for evaluating different façade configurations to determine the impact of design parameters on building performance from the standpoint of energy and thermal comfort.

New High-biomass Sorghum: The U.S.-India Consortium for Development of Sustainable Advanced Lignocellulosic Biofuel Systems released new high-biomass hybrid plant which holds promise for the development of clean burning plant-base fuels. It was jointly developed by the International Crops Research Institute for the Semi-Arid Tropics and the Indian Institute of Maize Research.

Deployment (PACE-D)

U.S.-India Clean Energy Finance Facility: Several U.S. Foundations, in partnership with OPIC and the Government of India (GOI), have committed to set up the U.S.-India Clean Energy Finance Facility. The Foundations and the GOI will each raise up to USD 10 million to support project preparation activities for distributed solar projects in India. USTDA will also coordinate with this finance facility from its experience in other regions.

USAID and ADB Partnership on Solar Parks: USAID signed a memorandum of understanding with ADB to facilitate USD 848 million in funding to develop solar parks in India. The focus will be on public-private partnership models.

Smart Grid Training for Utilities: In the first of its kind initiative, a comprehensive training program on Smart Grid for utilities was organized in Delhi by the USAID PACE-D Technical Assistance Program. It developed a standardized training curriculum on Smart Grid for utility professionals and organized the training program in partnership with the National Smart Grid Mission.

U.S.-India Air Conditioning Challenge: India's Minister of Science and Technology and Earth Science launched the Advanced Cooling Challenge at the 7th Clean Energy Ministerial in San Francisco in June 2016. This global campaign challenges stakeholders to develop and deploy super-efficient and climate-friendly cooling technologies. Several companies and businesses have already responded to the Call-to-Action issued as a part of this challenge.

Improving the Financial Viability of Solar Rooftop through Gross Metering: USAID, through the PACE-D Technical Assistance Program, built a case to introduce Gross Metering for solar rooftop in the state of Karnataka. This will help expand the market for solar rooftop by addressing the challenges to the financial viability of the current deployment approach. The Karnataka Electricity Regulatory Commission introduced the concept of Gross Metering for the domestic consumer category in May 2016, setting a precedent for state-level solar rooftop development in India.

Solar Resource Maps and Data: High resolution and accurate maps are required to identify good quality solar energy project sites. USDOE's National Renewable Energy Laboratory published updated solar resource maps and data for India in March 2016, providing 15 years of hourly information on a free, online platform.

New Pilot to Green the Grid: USAID launched a new pilot on 5 MW Automated Demand Side Management (ADSM) in partnership with Bangalore Electricity Supply Company and U.S.-based ADSM service provider Innovari. This pilot will validate the use of ADSM as a balancing resource for system operators, and address issues related to solar rooftop integration at the distribution level.

Launch of Large-scale Solar Rooftop Programs by Indian Railways and Indian Oil: The USAID PACE-D Technical Assistance Program provided technical support to Indian Railways to procure 150 MW of solar rooftop power. It also supported Indian Oil to design, develop and procure 6 MW of solar rooftop installations in its refineries.

Energy Access (PEACE)

PACEsetter Grants for Clean Off-the-Grid Energy Projects: The PACEsetter Fund, a joint U.S.-India USD 8 million facility, approved nine innovative projects in its first round of funding. These include Creation of an Energy Development Finance Company-EDFC, Waste to Energy Innovation at Small-scale, Microgrid Remote Monitoring and Control, Developing the World's First Pay-As-You-Go Integrated Home Energy System in India, and community-based solar pumps, among others.

Clean Energy Women Entrepreneurs: USAID's program on Partnership on Women's Entrepreneurship in Clean Energy trained 1,010 women as village level entrepreneurs to market clean energy products. This helped the women entrepreneurs to increase their monthly income by 30 percent.

Awards for Energy Innovations: Seven social enterprises—Technology and Action for Rural Advancement, Jnana Prabodhani, Prakti, Gram Oorja Solutions, Avani Bio Energy, Boond Engineering and Development, Simpa Energy—received funds from the Millennium Alliance, a joint initiative of the USAID and the Federation of Indian Chambers of Commerce and Industry. These funds will help provide clean lighting and cooking solutions to villages.



As you put clean energy within the reach of all, it will create unlimited economic opportunities that will be the foundation of the new economy of this century.

Indian Prime Minister Narendra Modi
at the launch of International Solar Alliance,
November 30, 2015

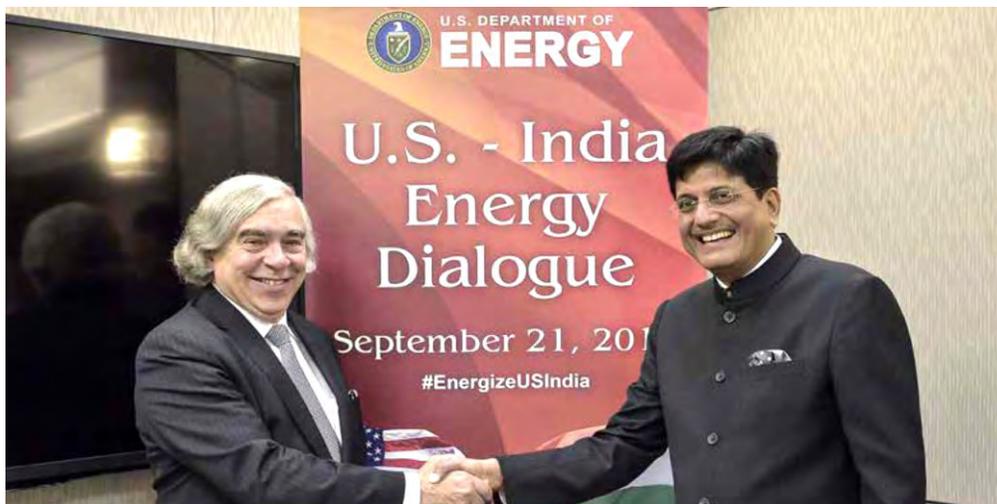
If we put the right rules and incentives in place, we'll unleash the creative power of our best scientists and engineers and entrepreneurs to deploy clean energy technologies and the new jobs and new opportunities that they create all around the world.

U.S. President Barack Obama
at the First Session of COP21,
November 30, 2015



U.S.-India Energy Dialogue 2015

The Energy Dialogue is an annual opportunity for high-level talks on priorities for bilateral energy cooperation and to take stock of existing projects. At the 2015 Dialogue in Washington D.C., the U.S. Secretary of Energy Ernest Moniz and India's Minister for Power, Coal, New and Renewable Energy and Mines Piyush Goyal led the discussion of strategic topics such as grid integration of renewable energy; off-grid clean energy access; super-efficient appliances; clean energy finance; and the future of coal in electricity. They reviewed the progress of the three PACE-R consortia on their joint research and development in solar energy, buildings efficiency, and advanced biofuels. Six of the seven multi-agency Working Groups also met from September 16-18, 2015. The Civil Nuclear Energy Group met in August 2015 and July 2016.



Secretary Moniz and Minister Goyal at the U.S. India Energy Dialogue 2015

Power and Energy Efficiency Working Group (PEEWG)

The USDOE and India's Ministry of Power lead the PEEWG. The work is aimed at strengthening the ecosystem for smart grid deployment and renewable energy integration, and rationalizing energy use through efficient technologies. Power sector discussions focused on grid resiliency, smart-grids, and renewable energy integration. The discussions on energy efficiency focused on buildings, lighting, and space cooling, and introduced USDOE's Solar Decathlon program.

New Technology and Renewable Energy Working Group (NTREWG)

The USDOE and India's Ministry of New and Renewable Energy lead the NTREWG. It focuses on the enabling environment to expand renewable energy deployment and promote energy access through clean energy. The Group continued to facilitate collaborations with India across multiple U.S. government agencies. These activities include USAID collaborations to deploy solar rooftop, USTDA pilot projects to use fuel cells at communications towers, and USDOE projects focused on solar resource assessments, solar reliability studies, and a new effort to upgrade India's alternative energy research centers. The group also identified linkages between NTRE projects and related efforts, including PACE-R, the Sustainable Growth Working Group, and the Greening the Grid initiative.



Sustainable Growth Working Group (SGWG)

USAID and India's National Institution for Transforming India (*NITI Aayog*) co-chair the SGWG. It is aimed at sharing knowledge, expertise, methods and approaches, tools, and best practices for low carbon growth. The work focuses on energy data management, energy/environmental modeling, and geospatial analysis of renewable energy options. These are mutually supportive, and directly relevant to the NTREWG and PEEWG, so the 2015 agenda also focused on building awareness of the potential synergies for groups focused on deployment.



Oil and Gas Working Group (OGWG)

The USDOE and India's Ministry of Petroleum and Natural Gas co-chair the OGWG, which is aimed at strengthening mutual energy security and promoting increased trade and investment. The Group's activities focus on India's policy and regulatory framework, exchanging information on pipeline security and offshore safety, and exchanging information on petroleum reserves storage.

Coal Working Group (CWG)

The USDOE's Office of Fossil Energy and India's Ministry of Coal co-chair this Group. CWG focuses primarily on identifying and introducing U.S. mining and related services, and research organizations to Indian contacts. The following key areas for information exchange were discussed: capacity building for underground coal gasification; dry coal beneficiation; planning of large capacity opencast mines; rehabilitation and reclamation of mined areas; pre-combustion moisture removal of raw lignite; and mining of deep seated lignite deposits, amongst other issues.

Civil Nuclear Energy Working Group (CNEWG)

The USDOE and India's Department of Atomic Energy work towards sustained bilateral research and development cooperation under the CNEWG. The two sides work in a number of areas, including advanced alloys for light water reactor applications, service induced flaws in reactor components, boiling water reactor corrosion, verification and validation of digital instrumentation and control, steam electrolysis, small specimens, nuclear/renewable hybrid systems, advanced risk assessment models, and seismic risk assessments. Notably, Oak Ridge National Laboratory and Bhabha Atomic Research Center are working to publish the results of their performance characterization of D9, a corrosion-resistant steel alloy, under light water reactor conditions. The most recent meeting was at Argonne National Laboratory in July 2016.

PACE-R Working Group

The Energy Dialogue's newest working group met for the first time this round. It focused on reviewing the progress of the PACE-R research consortia and on identifying "deployable outcomes" that could be linked to PACE-D through the other Working Groups.



Clean Energy Finance

India is on an aggressive path to expand its green infrastructure. Initiatives such as 175 GW of renewable energy, the 100 Smart Cities, and the National Smart Grid Mission are a clear signal of the country's commitment to low-carbon growth. To achieve this vision India will require massive capital investment. U.S. agencies are working with Indian financial institutions to develop innovative financing mechanisms and build institutional capacity to lend money for clean energy projects. Through PACE, the U.S. and India have mobilized over USD 2.5 billion since 2009 to support clean energy deployment. In 2016, the two countries announced two new initiatives that are expected to mobilize up to USD 1.4 billion in climate finance for Indian solar projects. They also announced a new Clean Energy Finance Hub that will serve as a mechanism to coordinate the U.S. Government's effort on clean energy finance in India.

A Bilateral Approach to Scale Finance for Clean Energy

Clean energy finance is a key area of the U.S.-India partnership. The countries established the U.S.-India Clean Energy Finance Task Force in February 2015 to design innovative financial mechanisms to increase the flow of private capital investment in clean energy. The task force, co-chaired by Special Envoy, U.S. Department of State, Amos Hochstein and the Secretary of India's Ministry of New and Renewable Energy, Upendra Tripathy, met in April 2016 in Washington D.C., and in July 2016 in New Delhi to review the recommendations made by stakeholders. These included standardized power purchase agreements, and warehousing, amongst others. In addition to the government-to-government meetings, the Task Force also convened high-level dialogue with leading finance experts from commercial banks and institutional investors for deliberations on scaling clean energy finance in India.



U.S.-India Clean Energy Finance Facility

In connection with Prime Minister Modi's visit to Washington, D.C. in June 2016, several U.S. Foundations, OPIC and the Government of India (GOI) committed to setting up the U.S.-India Clean Energy Finance Facility. The Foundations and the GOI will each raise up to USD 10 million to support project preparation activities for distributed solar projects to unlock OPIC financing and mobilize public and private capital to expand access to distributed clean energy solutions. The U.S. Foundations include the David and Lucile Packard Foundation, the Jeremy and Hannelore Grantham Environmental Trust, the John D. and Catherine T. MacArthur Foundation, and the William and Flora Hewlett Foundation. USTDA, among others, will coordinate with this finance facility for purposes of clean energy portfolio consistent with their mandates and successful experience coordinating in other regions, notably Africa and Central America/Caribbean.



Ambassador Jonathan Addleton, Mission Director, USAID/India and M. Teresa Kho, Country Director, India Resident Mission, ADB at the MOU Signing Ceremony

Mobilizing Finance for Solar Parks

USAID and ADB signed a memorandum of understanding (MOU) in May 2016 to facilitate USD 848 million in funding to develop solar parks in India. Through the agreement, USAID will align the technical resources of the PACE-D Technical Assistance (TA) Program and Greening the Grid initiative to support ADB's investments in the development of solar parks. The work will initially focus on designing and developing public-private partnership models for solar parks in the state of Rajasthan. India plans to establish 25 solar parks with a combined capacity of 20 GW of solar power by 2020. The USAID-ADB partnership will help finance the development of solar parks in support of the GOI's solar energy targets.

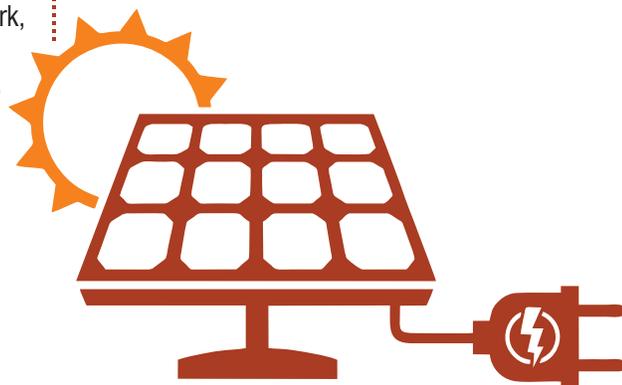


Supporting India's Solar Energy Goals

In March 2016, OPIC approved the ReNew HoldCo Private Limited's master financing facility. With a planned net commitment of USD 250 million, OPIC will provide financing to develop, build, and operate solar PV projects awarded under India's National Solar Mission program. The facility will strengthen India's energy security through 200 to 300 MW of new solar generation. OPIC also supported a USD 5 million loan guarantee for the Calvert Foundation, which it plans to use to finance USD 8 million in debt with Intellegrow, a non-banking finance company. Intellegrow specializes in lending to small and medium enterprises working in sectors that have strong social impacts, including the supply of clean and affordable energy to low income populations.

Solar Rooftop Rating Framework

Financing solar rooftop photovoltaic projects remains a key challenge in India due to the limited knowledge, understanding and institutional capacity of banks and financial institutions (FIs). USAID's PACE-D TA Program developed a tool to assist them to evaluate and fund such projects. Following its launch in September 2015, the Program worked with the Indian Renewable Energy Development Agency (IREDA) and its credit rating agencies to map the key technical, financial, commercial, policy and regulatory parameters impacting the viability and risks associated with solar rooftop deployment. The Program used the tool to customize IREDA's rating framework for solar rooftop projects. IREDA and its credit rating agencies are using it to evaluate loan applications. The first loan, sanctioned by IREDA using this framework, is a 10 MW solar rooftop project.



Unlocking the Potential of Green Bonds

Banks and FIs have been the traditional sources of capital for infrastructure projects. Now there is a growing need to tap new sources to meet the accelerating capital requirements of clean energy projects in India. USAID's PACE-D TA Program and the Climate Bonds Initiative (CBI) are building capacity to launch Green Bonds among FIs such as IREDA, YES Bank and India Infrastructure Finance Company Ltd. The Program organized three roundtables in 2016 to build awareness of Green Bonds among institutional lenders and investors, and project developers. It supported CBI to organize the first "India Forum" of the Green Infrastructure Investment Coalition in London in June 2016 to enable potential Indian Green Bond issuers to interact with international investors and other stakeholders.



Market Opening Ceremony by India Forum Participants at the London Stock Exchange

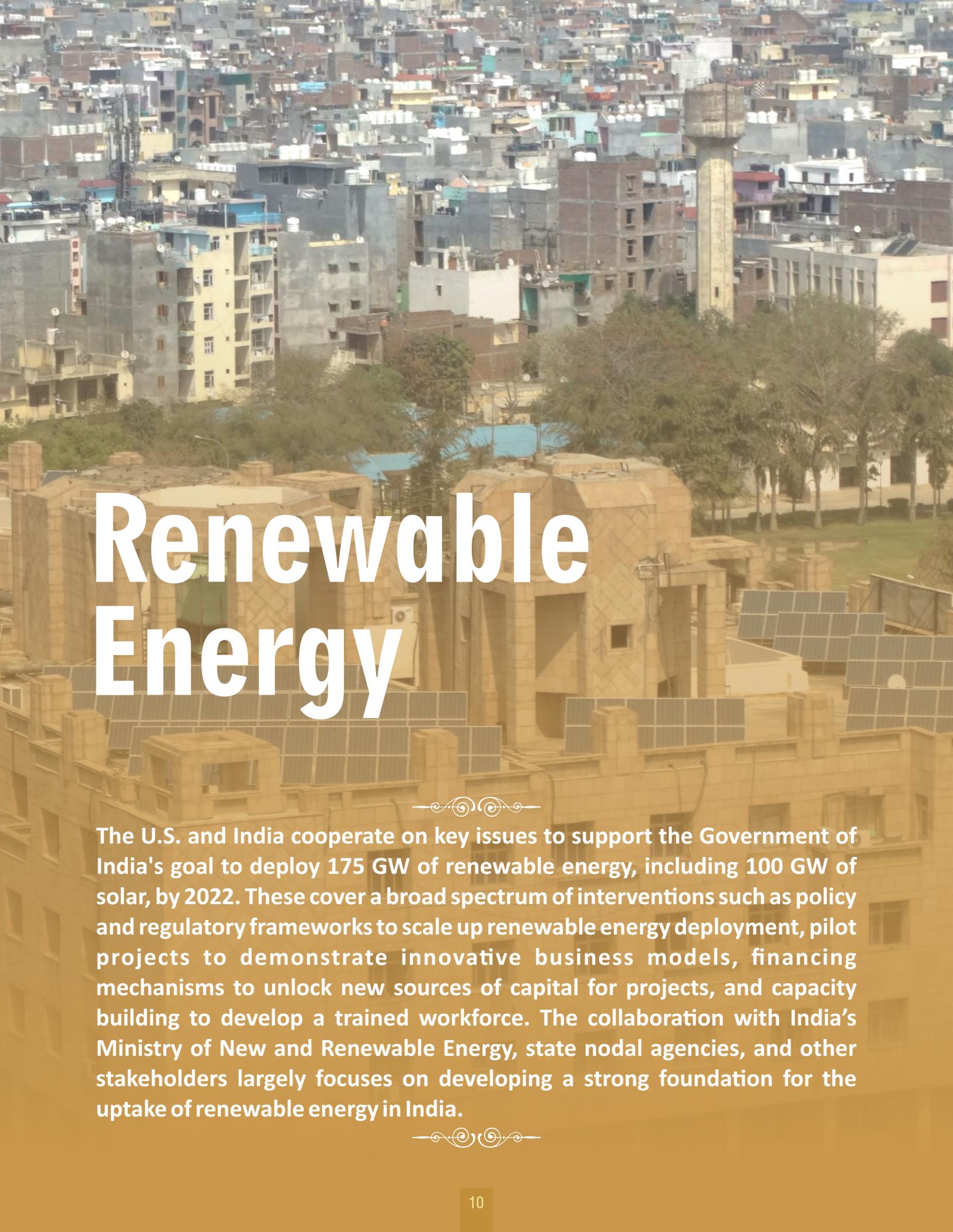


Mainstreaming Energy Efficiency Finance in Corporate Loans

USAID's PACE-D TA Program is collaborating with Tata Cleantech Capital Ltd. (TCCL) to demonstrate the concept of mainstreaming energy efficiency finance in Indian banks and FIs through the Corporate Energy Audit Program (CEAP). An industrial client of TCCL was selected as the first pilot under the CEAP initiative. The Program selected an energy auditor and sponsored the audit jointly with TCCL. The investment grade detailed project report identified investment requirements for energy efficiency and renewable energy which would go towards reducing the energy bill of the industrial unit. The report was subsequently presented to the senior management of the client. The Program, in partnership with TCCL, also organized a workshop in Mumbai in August 2016 to promote CEAP amongst other FIs.

Determining the Potential for Energy Efficiency Financing

The GOI, through the Bureau of Energy Efficiency (BEE), has created two financial instruments: the Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE) and Venture Capital for Energy Efficiency (VCFEE). They are designed to scale up financing for energy efficiency projects in India. USAID's PACE-D TA Program prepared a market study to identify a potential pipeline of energy efficiency projects that would help estimate the demand for BEE's two financing instruments. The study showed that energy service companies with a smaller capital base are likely to benefit more. The findings also reveal that commercial banks require specific expertise on energy efficiency to develop appraisal procedures. The market assessment identified a potential pipeline of 337 projects valued at USD 290 million (INR 1,936 crore) over the next two years.



Renewable Energy

The U.S. and India cooperate on key issues to support the Government of India's goal to deploy 175 GW of renewable energy, including 100 GW of solar, by 2022. These cover a broad spectrum of interventions such as policy and regulatory frameworks to scale up renewable energy deployment, pilot projects to demonstrate innovative business models, financing mechanisms to unlock new sources of capital for projects, and capacity building to develop a trained workforce. The collaboration with India's Ministry of New and Renewable Energy, state nodal agencies, and other stakeholders largely focuses on developing a strong foundation for the uptake of renewable energy in India.

PACE-R Renewable Energy Consortia

Solar Energy Research Institute for India and the U.S. (SERIIUS)

SERIIUS carries out fundamental and applied research, analysis and assessment, outreach, and workforce development through specific joint projects in three research thrusts: Sustainable Photovoltaics, Multiscale Concentrated Solar Power, and Solar Energy Integration. Its vision is to ready these solar electricity technologies toward the long-term success of India's Jawaharlal Nehru National Solar Energy Mission and the USDOE's SunShot Initiative. SERIIUS is co-led by the Indian Institute of Science - Bangalore and the U.S. National Renewable Energy Laboratory.

Photovoltaics

SERIIUS is developing a multiscale modeling capability to help understand the potential impact of new solar photovoltaics (PV) materials and approaches. This approach has been applied to existing (silicon) and emerging technologies (perovskites). The program is also developing an integrated approach to understand PV reliability and failure modes in the diverse climate zones of India.

Multiscale Concentrated Solar Power

A key area of SERIIUS is to develop innovative components to enable low-temperature Rankine cycle systems using organic working fluids and high-temperature Brayton cycle system using supercritical CO₂. Work this year moved from the design to the construction phase for the new technology components that would enable scalable systems in these two areas.

Solar Energy Integration

Key activities include technology road-mapping, techno-economic and environmental analysis, and assessment; and solar-energy integration and storage analysis. Recent initiatives include a comparison of a low cost solar technology (copper indium gallium selenide cells) manufacturing cost in the U.S. and India; and correlation between modeled output and actual PV output.



U.S. and Indian Researchers Discussing Organic Photovoltaic Materials and Devices

U.S.-India Consortium for Development of Sustainable Advanced Lignocellulosic Biofuel Systems (SLABS)

SLABS focuses on production of renewable fuels from plant biomass, involving stems and leaves, instead of grains. It is developing a fully integrated supply chain that includes several species of biomass crops adapted to one or more harsh environmental conditions, best management practices for these crops for a number of scenarios, and an efficient biomass conversion process with a minimal environmental footprint. SLABS is co-led by the University of Florida and the Indian Institute of Chemical Technology.

Sorghum

Released several new high-biomass sorghum crops including RVCSSH 28, which comes from a female line developed at International Crops Research Institute for the Semi-Arid Tropics and a male line developed at Indian Institute of Maize Research, both partners from India. Significant progress was also made with the identification of factors that protect against anthracnose, a fungal disease that can severely reduce yield and quality of biomass and grain in warm and humid climates around the world.

Switchgrass

Established five commercial sites in Missouri, representing different production conditions (e.g. low fertility soil; shallow soil profile; areas prone to flooding) to evaluate yield, mowing regimens and the effect of nitrogen fertilizer applications.

Pearl millet

Developed several new cultivars and hybrids with biomass yields as high as 25 Mg ha⁻¹. The most promising entries were evaluated in farmer trials in the Indian states of Gujarat and Madhya Pradesh.

Bamboo

Evaluated different accessions in different locations to identify the best suited accession for each site.

Biomass processing and residue management

Developed and optimized biomass processing procedures for both switchgrass and sorghum at the University of Florida Stan Mayfield pilot biorefinery.

Microbial biocatalysts

Continued efforts to further improve *E. coli*, a workhorse of industrial biotechnology, to produce butyric acid.

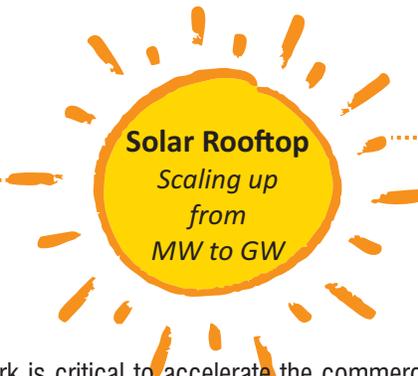
Value-added products

Generated a polystyrene co-butyl acrylate latex, an enhanced plastic.



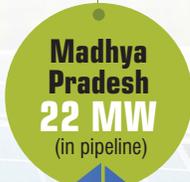
Partnership Hybrid Sorghum RVCSSH28

PACE-D Renewable Energy Component

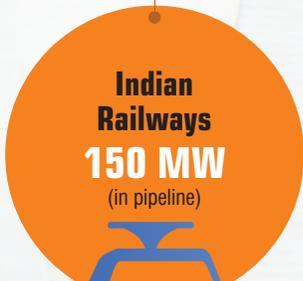


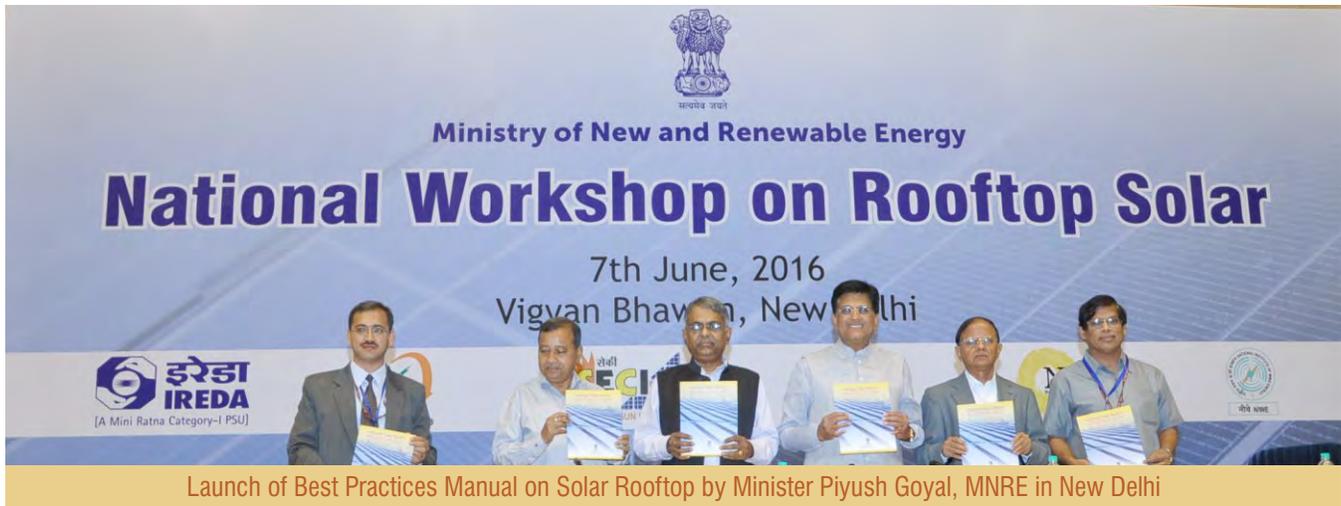
A market-based enabling framework is critical to accelerate the commercial development of India's solar PV rooftop sector, which has a target of 40 GW by 2022. USAID's PACE-D Technical Assistance (TA) Program is working with national and sub-national stakeholders to address critical process and market-related constraints faced by the solar PV rooftop sector in India. These include policy guidelines, innovative regulatory frameworks and business models, standardized contracts and lease agreements, utility-based interconnection frameworks, and financing guidelines, among other issues. These interventions will help simplify the process of developing, deploying, monitoring and financing solar rooftop projects – providing the requisite thrust to the market. The TA provided by the Program is facilitating the deployment of several solar rooftop efforts across India.

Focal States



Public Sector Undertakings





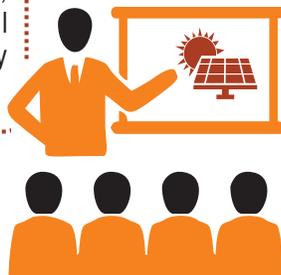
Launch of Best Practices Manual on Solar Rooftop by Minister Piyush Goyal, MNRE in New Delhi

Best Practices Manual for Implementation of Solar Rooftop

India's solar rooftop market is undergoing an encouraging expansion, but it is still nascent compared to the fast growing utility-scale market. One of the key bottlenecks is the lack of awareness among stakeholders. To address this, India's Ministry of New and Renewable Energy (MNRE) and USAID's PACE-D TA Program, in partnership with the Gujarat Energy Research and Management Institute, developed a Best Practices Manual as a guide for policy makers, project developers, utility engineers, financiers, manufacturers, and new entrepreneurs working on building India's solar rooftop infrastructure. The Manual is a 'go-to' document for stakeholders to help them design, implement, finance and monitor solar rooftop projects. It was launched at MNRE's National Workshop on Solar Rooftop in June 2016 in New Delhi.

Assessing the Need for Solar Training

The USAID PACE-D TA Program is conducting a comprehensive training needs assessment to identify the training requirements at various levels in the solar energy sector to meet the national deployment target. It has completed the "Landscape Analysis" after holding in-depth consultations with more than 50 solar companies. A dedicated Task Force has been established to guide, steer and monitor project activities. The Task Force comprises top officials from MNRE, National Green Jobs Skills Council (SCGJ), National Institute of Solar Energy (NISE) and USAID.



Building a Diverse Solar Workforce

To achieve the 100 GW solar target and successfully manage the solar power projects, it is critical to have qualified and skilled manpower for design, development, financing, implementation, and operation and maintenance. The USAID PACE-D TA Program is working with the NISE and the SCGJ to offer a standard set of solar training curricula for utilities, entrepreneurs and banks. The Program organized six courses for utility professionals that trained 500 utility engineers on different facets of solar rooftop processes. It also organized two courses for entrepreneurs, attended by nearly 80 participants. These efforts will help utilities and entrepreneurs understand the market ecosystem and effectively set up solar rooftop projects/businesses.

Renewable Purchase Obligation (RPO) Compliance Framework

The USAID PACE-D TA Program is assisting Rajasthan Renewable Energy Corporation Limited (RRECL) to develop a RPO compliance reporting framework for the state. It has also developed a web tool for RPO compliance monitoring. Compared to the current manual system, the proposed framework and web tool will significantly improve RRECL's efficiency in monitoring RPO compliance and reporting non-compliance to the regulatory commission. The framework and the tool can be customized by other state nodal agencies to monitor RPO compliance in their states.

Promoting Solar Rooftop through Gross Metering

Most states in India use the Net Metering framework to promote solar PV rooftops, including the state of Karnataka until recently. However, Net Metering has only worked for the high paying industrial and commercial consumers, leaving out other stakeholders such as schools and hospitals that have a high potential for solar rooftop. The USAID PACE-D TA Program built a rationale to introduce Gross Metering in Karnataka and subsequently presented it to the Karnataka Electricity Regulatory Commission (KERC). In May 2016, the KERC introduced the concept of Gross Metering for the domestic consumer category, setting a precedent for state-level solar rooftop development in India.

Solar Irrigation

When promoted through appropriate business models, solar irrigation has tremendous potential to reduce farmers' demand for power and their dependence on diesel. USAID's PACE-D TA Program supported two pilot projects to demonstrate the financial viability of their respective business models and encourage stakeholders to deploy solar pumping technologies on their farms. The Program also supported Madhya Pradesh Urja Vikas Nigam Ltd. (MPUVNL) to design its solar irrigation pumping policy. These projects will reduce the carbon footprint of ground water irrigation, and also improve irrigation services by providing farmers reliable, uninterrupted, daytime power.

3,500 pumps

will be installed under the solar irrigation pumping policy developed by MPUVNL.

130 solar pumps

have been installed under the Karnataka government's *Surya Raiitha* Grid-connected Solar Pumping scheme. It is focused on testing the implementation model for large-scale grid integrated solar pumping to generate inputs for designing a state-wide program.

10 solar pumps

have been installed for decentralized solar PV pumping in Bihar. The pilot aims to demonstrate the viability and potential of a new business model where water services are delivered to farmers via pumps owned by entrepreneurs and self-help groups.

Solar Resource Assessments

The USDOE collaborates with India's NISE to enhance the quality and accuracy of India's solar resource maps and data. This helps to identify high-quality, bankable projects – accelerating the deployment of solar energy in India by increasing confidence in the estimated output of the solar power plants and reducing risk. The USDOE's National Renewable Energy Laboratory (NREL) used data from five ground measurement stations in India to validate the satellite-based data from 2002-2011 and published the data and maps in early 2014. NREL is working with NISE to collect performance data on PV modules deployed at their campuses comparing the impacts of the prevailing climate in both locations. NREL released updated satellite-based solar radiation data for India in March 2016. It provides 15 years of hourly solar radiation data and incorporates improved information on aerosols such as dust, smoke, haze, and particulates that can partially block solar irradiation. Developers can access the updated dynamic maps and data in a geographic information system format through the National Solar Radiation Database – a free, online platform. To ensure developers in India know how to access and use the data in financial analyses, USDOE, India's MNRE and Department of Science and Technology, sponsored three workshops on Solar Resource Assessment and Solar Project Development. They featured experts from NREL and research institutions in India affiliated with the SERIUS project.

Knowledge Exchange on Energy Storage

Energy storage systems can store and release electricity to meet fluctuating demand, so they can address various integration issues related to intermittent renewable energy generation, transmission and consumption. To facilitate knowledge transfer of energy storage technologies, USTDA organized a Global Energy Storage Reverse Trade Mission and a study tour to the U.S. The Reverse Trade Mission, in April/May 2016, included delegates from India, Brazil, Colombia, Turkey, the Philippines, and Vietnam. The Indian participants were from Tata Power Delhi Distribution Limited and Bangalore Electricity Supply Company. They met with U.S. companies that provide energy storage products and services, viewed energy storage installations, and discussed best practices with U.S. regulatory officials. USTDA also sponsored an energy storage study tour for six energy officials and two private sector representatives from India in April 2016. It was part of a USTDA grant for IL&FS Energy Development Company Limited, which is developing two innovative integrated wind - solar PV energy storage projects in Andhra Pradesh and Gujarat. In addition, USTDA is partially funding a feasibility study and pilot project to assess the technical, economic and financial viability of deploying solar hybrid methanol-based fuel cell (SHMBFC) technology from Ballard Power Systems that would provide continuous power to telecom towers in India. The project is assisting Idea Cellular, India's third largest mobile services operator, in its effort to replace stationary diesel engines by demonstrating SHMBFC technology at five different telecom tower sites.

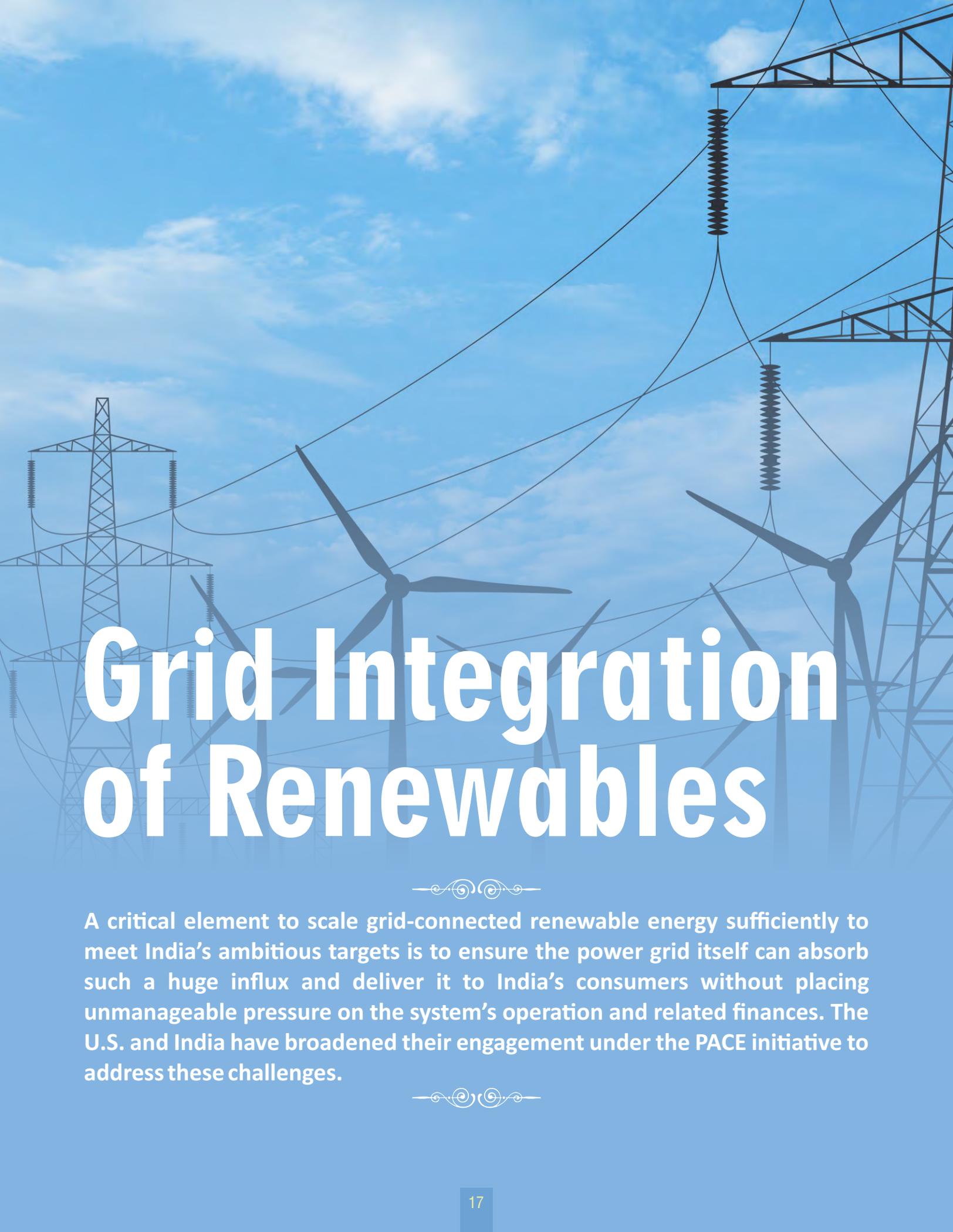


Site Visit to Primus Power in the U.S.

Energy Storage Pilot Projects

Energy storage technologies can enable greater amounts of renewable energy to be integrated into the grid, and enhance the use of solar and other stand-alone renewable energy technologies for standalone applications. The USAID PACE-D TA Program assisted MNRE to evaluate proposals received against the Expression of Interest and provided technical assistance to shortlist ten proposals for funding. The proposals are currently going through MNRE's approval process. Energy storage was also a focal area of the knowledge exchange tour to the U.S. in April 2016. The delegates visited Primus Power where they were introduced to the latest research in flow batteries.





Grid Integration of Renewables

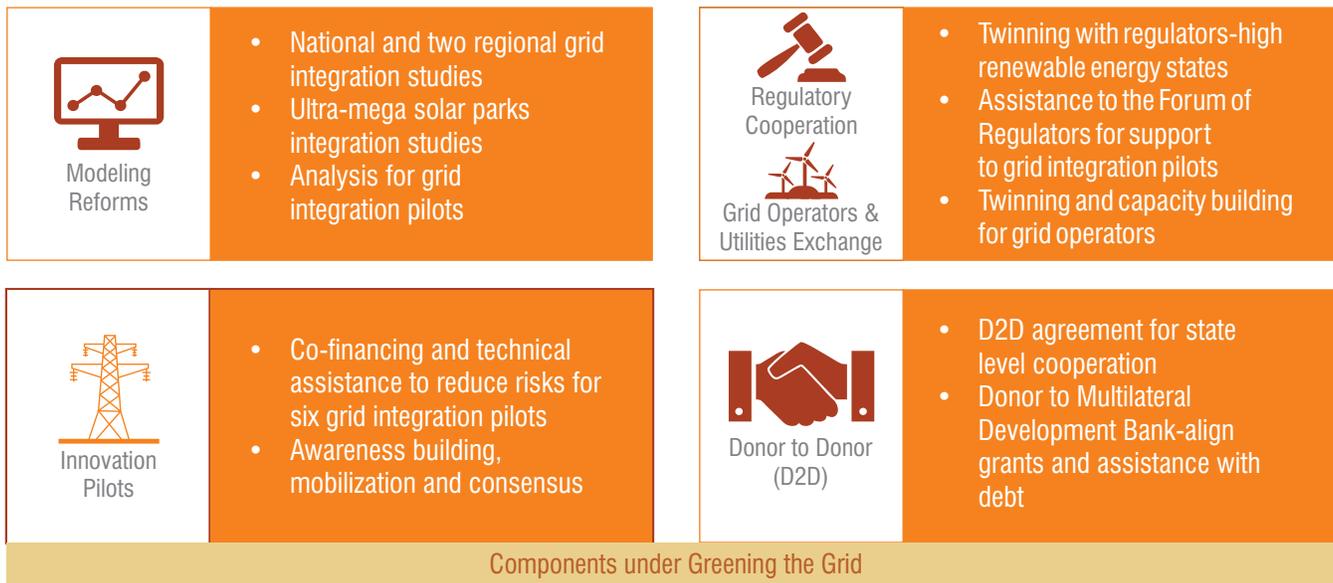
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A critical element to scale grid-connected renewable energy sufficiently to meet India's ambitious targets is to ensure the power grid itself can absorb such a huge influx and deliver it to India's consumers without placing unmanageable pressure on the system's operation and related finances. The U.S. and India have broadened their engagement under the PACE initiative to address these challenges.

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Greening the Grid: A New Initiative

India's renewable energy is concentrated (by region, season, and time of day), and output is more variable and uncertain than conventional baseload power. This makes interconnecting and integrating it into the grid a significant challenge. To address this, USAID and India's Ministry of Power (MOP) jointly designed and launched Greening the Grid (GTG), a five-year USD 30 million program to support India's efforts to manage large-scale integration of renewable energy into the power grid. Several components under the GTG initiative have already been launched.

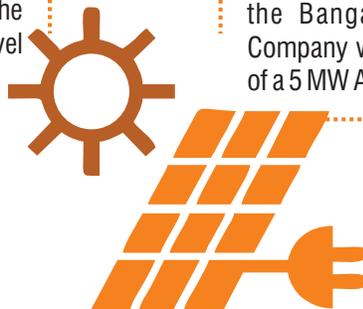


A National and Two Regional Grid Integration Studies

The studies are implemented jointly by the U.S. National Renewable Energy Lab and India's Power System & Operation Company (POSOCO), with grid operators and transmission planners from six western and southern renewable energy-rich states. They are modeling the challenges of operating the power grid with 175 GW of renewable energy and comparing the potential solutions. This will equip India's central and state governments with tools and capacity to do similar studies in the future. Forty-five power system professionals have been trained to use the Plexos grid dispatch software package. Three Grid Integration Review Committees, comprising of experts and senior Government of India officials, have been established, which met three times in the last one year to review the integration studies and provide it with rigour. The national level study is expected to be completed in October 2016.

Automated Demand Side Management (ADSM) Pilot

The focus of the first pilot under GTG is to test a new resource to balance the power grid as the proportion of renewable energy increases, and to address the power quality issues related to the integration of solar rooftop systems on the distribution network. This public/private partnership between USAID/India, Innovari (a U.S. ADSM developer) and the Bangalore Electricity Supply Company will support the deployment of a 5 MW ADSM pilot.



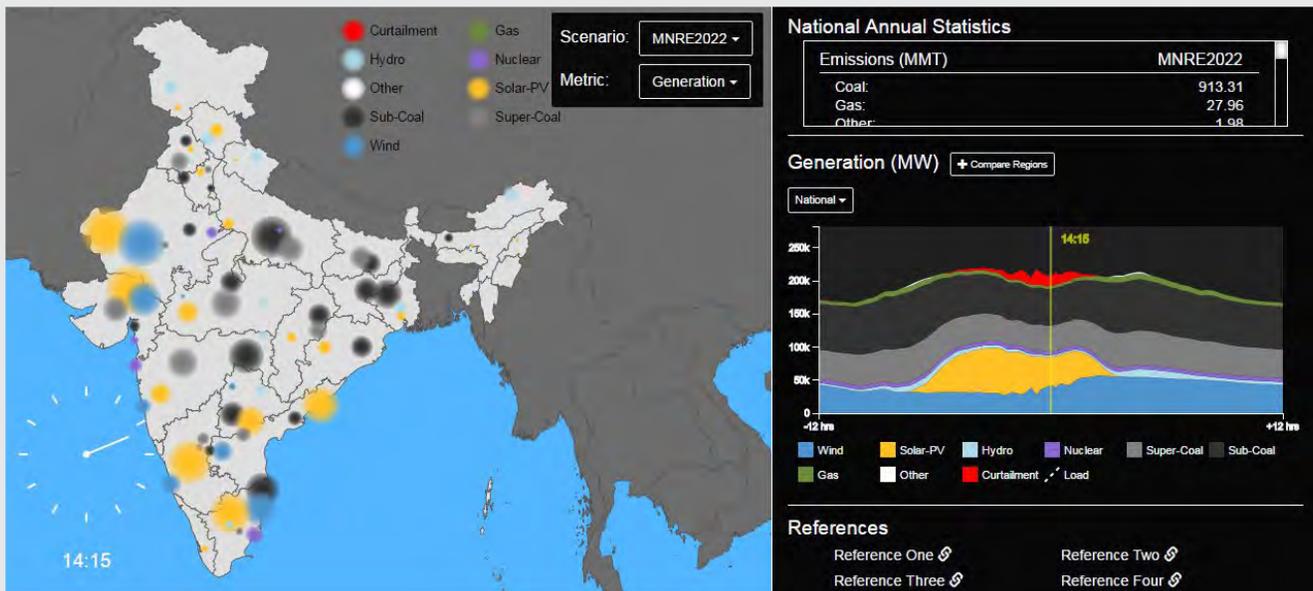
U.S.-India Regulators Partnership Launched

In August 2016, the U.S. National Association of Regulatory Utility Commissioners (NARUC) and India's Central Electricity Regulatory Commission (CERC) organized the first regulatory exchange to share experiences in power sector reforms to support renewable energy integration from several regional transmission organizations and independent system operation in the U.S. The U.S. regulators visited the states of Rajasthan and Tamil Nadu to discuss the potential for more concrete cooperation in support of India's objectives. These states are at the forefront of India's renewable energy transition.

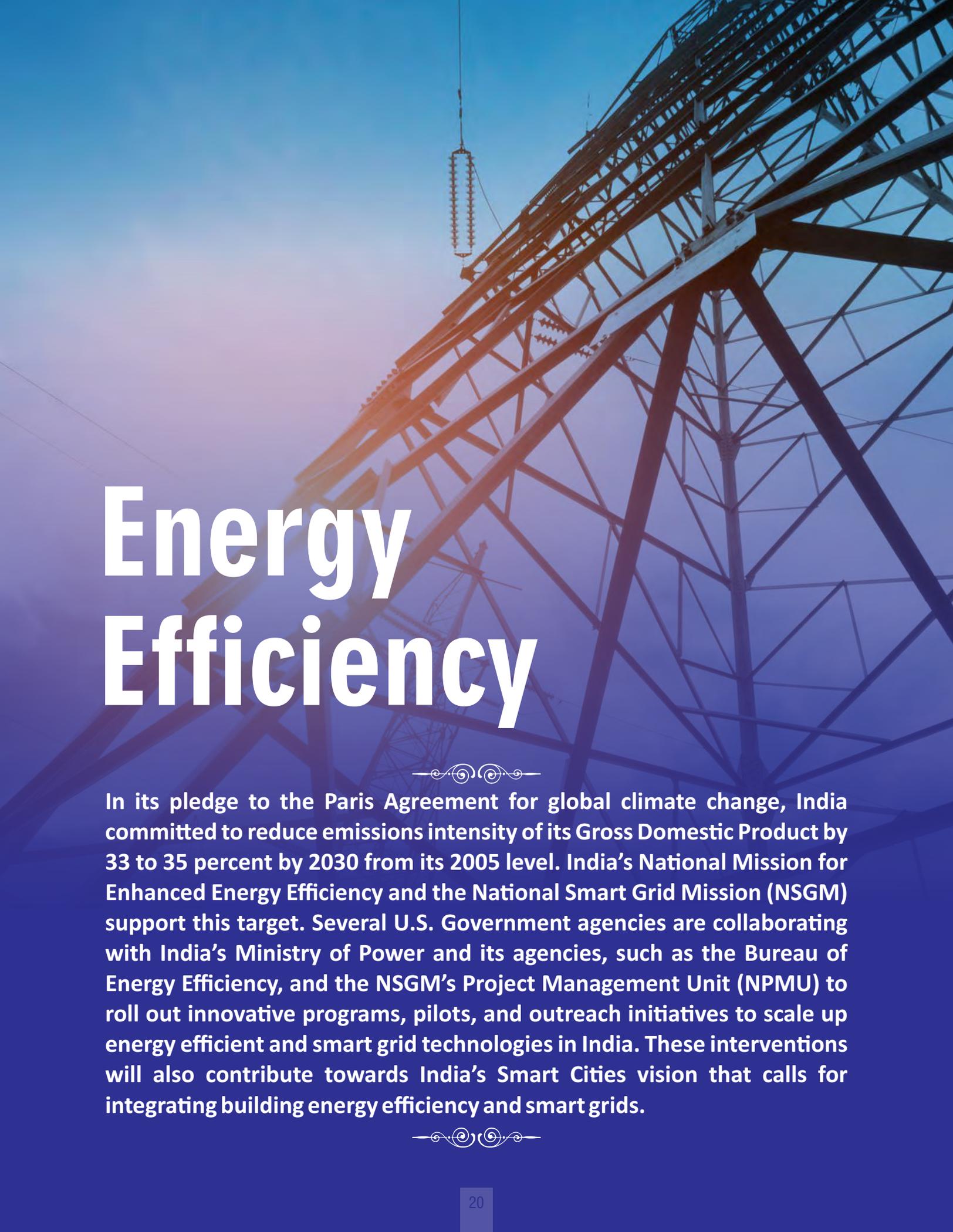


An Enhanced Engagement between U.S. and Indian Power Grid Operators

The U.S. Energy Association and POSOCO are rolling out a joint program to enhance the capacity of India's power grid operators. A high level delegation from India's MOP, CERC and POSOCO visited the U.S. in May 2016 to examine the market-based practices of U.S. grid operators. In June/July 2016, 45 Indian power grid operators from 13 states completed two intensive courses on renewable energy forecasting, following an exchange with peers from around South/Southeast Asia. As the first step to develop a more institutional approach to capacity-building, a U.S. system operator completed a review of the practices of the grid operators in Maharashtra and Western region.



Snapshot of India's Renewable Energy (RE) Generation Map developed by NREL for the 2022 RE scenario in the PLEXOS Model



Energy Efficiency

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In its pledge to the Paris Agreement for global climate change, India committed to reduce emissions intensity of its Gross Domestic Product by 33 to 35 percent by 2030 from its 2005 level. India's National Mission for Enhanced Energy Efficiency and the National Smart Grid Mission (NSGM) support this target. Several U.S. Government agencies are collaborating with India's Ministry of Power and its agencies, such as the Bureau of Energy Efficiency, and the NSGM's Project Management Unit (NPMU) to roll out innovative programs, pilots, and outreach initiatives to scale up energy efficient and smart grid technologies in India. These interventions will also contribute towards India's Smart Cities vision that calls for integrating building energy efficiency and smart grids.



PACE-D Energy Efficiency Component



Launch of Smart Grid Training Curriculum by USAID and Ministry of Power in Delhi

Towards a Smarter Grid

While India is increasing its energy generation capacity to meet the growing aspirations of over 1.2 billion citizens, it is also embracing "smart" technologies to conserve energy and be more responsive to consumer needs and demands. The Government of India (GOI) announced the National Smart Grid Mission (NSGM) in March 2015 to build a strong institutional structure to support the foundation for a dynamic smart grid network in the country. It also set up the NSGM's Project Management Unit (NPMU) for day-to-day operations. USAID's PACE-D TA Program is working with the Ministry of Power (MOP) and the NPMU on several interventions to help translate the broad objectives of India's NSGM into concrete actions.

Enabling Regulatory Framework

The Program supported MOP to develop draft smart grid regulations covering different issues such as investments, tariff design, customer engagement, and engagement of state nodal officers. The regulations, formally adopted by India's Forum of Regulators in June 2015, have paved the way for state electricity regulatory commissions to adopt them with changes to suit their state-specific requirements.

Training of Utility Professionals

The Program developed a comprehensive smart grid curriculum and organized a three-day training program for utilities, with the NSGM. The first of its kind training on smart grid for utilities, held in July 2016 in Delhi, is a step towards facilitating the GOI's target of training 10 percent of utility personnel on smart grid technologies. The Program also organized an executive orientation training on smart grid for the top management of utilities in January 2016 in Bengaluru. This smart grid training curriculum will be institutionalized under the Knowledge Center of the NSGM.

Pilot Projects

The Program is providing support to two smart grid pilot projects: Tripura State Electricity Corporation Limited (TSECL) in Tripura and Ajmer Vidyut Vitran Nigam Limited (AVVNL) in Rajasthan. It is helping TSECL to develop a strategy for measurement and verification, document lessons learned, and review software documentation. Similarly, the Program's focus in AVVNL is to demonstrate the benefits of select smart grid components, through a "rental" model.



Participants of Smart Grid Training at a Site Visit in Delhi



Smart Grid Lab to Demonstrate Latest Technologies

Tata Power Delhi Distribution Limited (TPDDL) has set up a smart grid test lab, a key implementation result of USTDA's long running cooperation with TPDDL over the past decade. The lab, launched in February 2016, will serve as a demonstration site for various smart grid technologies and will help foster collaborative partnerships between TPDDL, consumers, students, technology providers and other utilities in India. USTDA's project-related recommendations to TPDDL have helped the utility identify and respond to problems throughout its grid.

Promoting Smart Grid in India

USTDA has created a robust smart grid portfolio in India, including five feasibility studies and pilot projects with distribution companies that have been seeking ways to implement cutting edge smart grid technologies. These projects epitomize USTDA's approach to "smart" development in emerging markets, as they aim to provide the foundation for resilient electricity grids that support low-carbon economic growth. USTDA's Regional Director for South and Southeast Asia, Henry Steingass, participated in the second edition of the conference on smart grids and smart cities, organized by India Smart Grid Forum, on March 15-19, 2016, in New Delhi. He also witnessed the signing of two contracts with U.S. companies related to USTDA's prior smart grid work. Innovari signed a contract with Reliance Infrastructure for automated demand side management, and Silver Spring Networks signed a contract with Calcutta Electric Supply Company, a previous USTDA Grantee.

State-level Initiatives to Promote Energy Efficiency

Rajasthan's power transmission company—Rajasthan Rajya Vidyut Prasaran Nigam (RVPN)—transmits bulk power from generators to the power distribution companies. RVPN reached out to USAID's PACE-D TA Program to identify energy efficiency and conservation measures in its 400-plus substations. The Program audited the selected substations and identified USD 3.3 million in potential investments that could save 12 million kWh annually (annual savings of INR 6 crores - nearly USD 1 million), enough to light 2.4 million homes. The GOI's national energy services company, EESL, has submitted a proposal to RVPN for investing in two substations on a pilot basis. A decision from RVPN is expected for implementation.

Reducing energy demand during the peak hours is beneficial, both to the utility as well as the consumer. While the utility can better manage its load and reduce "blackouts", consumers can reduce their energy bill by availing the incentives offered by the utility for demand side management (DSM). The USAID PACE-D TA Program partnered with Haryana Electricity Regulatory Commission to draft DSM regulations for the state of Haryana. The regulations will help reduce the number of hours of load shedding, better manage the peak load, and increase system reliability in Haryana. The Program also prepared two guidelines—Cost Effectiveness Assessment and Evaluation, Measurement and Verification—for DSM projects in Haryana. These guidelines will improve the distribution company's capacity to effectively implement DSM projects to address clean energy issues.

Building Energy Efficiency

Nearly two-thirds of India's commercial and high-rise residential structures that will exist in 2030 are yet to be built. This offers a huge opportunity for the use of energy efficiency and renewable energy technologies in the building sector to reduce energy consumption and greenhouse gas emissions at the national level.

Energy Conservation Building Code (ECBC) Technical Update

India established the ECBC in 2007 to set the minimum energy performance for commercial buildings in India. The market has changed significantly since then, driving the need for an updated code that reflects the latest designs, technologies, and standards. USAID's PACE-D TA Program is supporting BEE to update the ECBC which will set the benchmark for the future buildings in India. For this, a Steering Committee (chaired by BEE's Director General) and a Technical Committee (chaired by BEE's Energy Economist) have been set up, along with five Working Groups. The Program organized regional stakeholder consultations for western, southern, and eastern India in early 2016, and a national workshop in May 2016. The ensuing recommendations are being collated in the interim ECBC Stringency Analysis Report which will be reviewed by BEE and Working groups.

Preparing Vision Document on Energy Efficient Buildings

A stakeholder consultation was held under the chairmanship of Chief Secretary, Government of Delhi, in August 2016, to deliberate on the future of buildings in Delhi to make them sustainable and energy efficient. Towards this end, the USAID PACE-D TA Program will assist the Delhi Government in preparing a vision document and roadmap for green buildings in Delhi and provide technical assistance for its implementation.

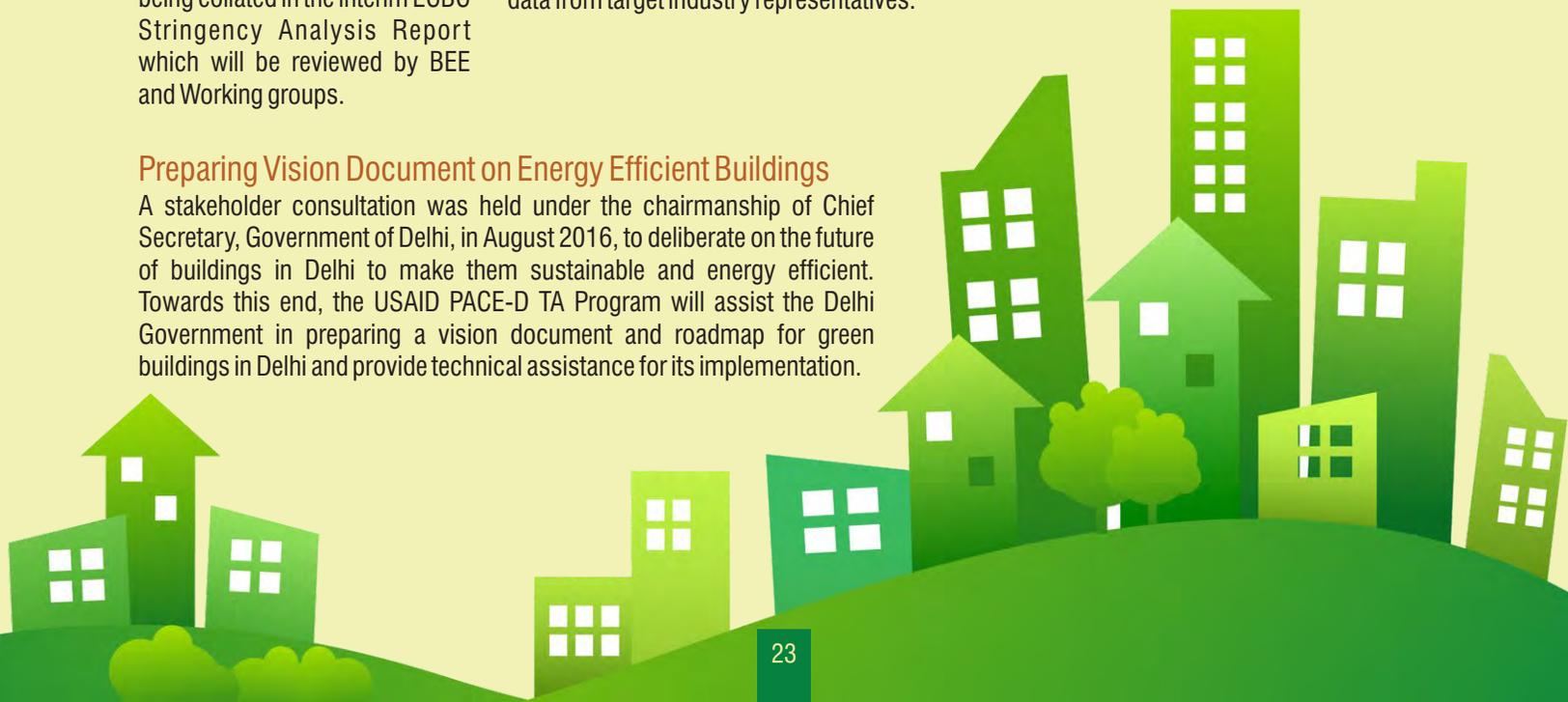
ECBC at the State Level

For the building code to be a success on the ground, it must be adopted by the respective states and enforced through their local urban bodies. The USAID PACE-D TA Program provided technical assistance to amend the Haryana building bye laws, prepared roadmap for ECBC implementation and a detailed compliance procedure to enable the building industry to move towards ECBC compliance in a phased manner.

Similarly, the USDOE and the Pacific Northwest National Laboratory (PNNL) are working with Indian stakeholders to accelerate ECBC implementation. PNNL hosted a stakeholder consultation with the Gujarat Energy Development Agency and the Indian Society of Heating, Refrigerating and Air Conditioning in November 2015 to facilitate ECBC adoption in Gujarat. In Visakhapatnam, one of India's first 20 Smart Cities, PNNL co-hosted a stakeholder meeting with the Visakhapatnam Urban Development Authority (VUDA) in February 2016. PNNL developed recommendations on the ECBC roadmap and is helping VUDA to develop an ECBC cell. In the Gujarat International Finance Tec-City (GIFT), PNNL is working with local authorities to explore options of incorporating ECBC into the local Development Control Regulations and building permitting procedures. It is also providing support to develop a pilot ECBC-compliant building in the GIFT city.

Energy Efficient Data Centers

Data center spaces can consume 100-200 times more electricity than standard office spaces. As their energy intensity rises, data centers are prime targets for energy efficient design. The USDOE, BEE, the Lawrence Berkley National Laboratory (LBNL), and the Confederation of Indian Industry (CII) have teamed up to improve the energy efficiency of Indian data centers. In 2015-2016, LBNL and CII developed recommendations on how India could best incorporate new data centers into the revised ECBC. They hosted a workshop on a potential market-based program for data centers in Bengaluru and followed up with key IT companies. A draft set of metrics was developed and a pilot survey is underway to collect data from target industry representatives.



Net Zero Energy Buildings (NZEB) Knowledge Portal

NZEB utilizes renewable energy resources such as solar to balance its annual energy consumption and generation. Mainstreaming NZEBs in India will require stakeholder awareness and market transformation. The USAID PACE-D TA Program has developed a knowledge portal that provides detailed information on NZEB practices and policies, and features a knowledge center to support NZEB design by comparing the pros and cons of various design strategies, and technologies for renewable energy and energy efficiency. The knowledge portal, launched in May 2016, can be accessed at www.nzeb.in.



P. K. Pujari, Secretary, MOP with Ambassador Jonathan Addleton, Mission Director, USAID/India at the NZEB Portal Launch

Best Practices Guide for High Performance Indian Office Buildings

Researchers from LBNL, along with government and industry representatives from India and the U.S., are developing a guide to empower building designers, owners, and operators to create commercial buildings in India that are best-in-class in terms of energy efficiency, cost efficiency, and occupant comfort. It will culminate in the publication of the second version of the Best Practice Guide for High-Performance Indian Office Buildings. It will provide ambitious (but achievable) energy performance benchmarks derived from a set of representative state-of-the-art office buildings in India.



U.S.-India Air Conditioning Challenge

Building on the U.S.-India Collaboration for Smart and Efficient Cooling, India's Minister of Science and Technology and Earth Science launched the Advanced Cooling Challenge at the 7th Clean Energy Ministerial (CEM), in San Francisco in June 2016. This global campaign challenges governments, companies, and other stakeholders to develop and deploy at scale super-efficient, smart, climate-friendly, and affordable cooling technologies. Many companies and businesses have already responded to the Call-to-Action issued by the CEM AC Challenge, including: Ingersoll Rand, Honeywell, Danfoss, Goodman, Daikin Applied, and the San Francisco International Airport. The AC Challenge also received supporting commitments from leading organizations, including the Children's Investment Fund Foundation, the Institute for Governance and Sustainable Development, ClimateWorks, the Natural Resources Defense Council, and the United Nations Environment Programme.

Promoting Super-Efficient Air Conditioners

The USAID PACE-D TA Program has partnered with EESL to design and deploy a nationwide program on super-efficient air conditioners (ACs). These ACs are expected to consume less power than BEE's five-star rated ACs.

PACE-R Energy Efficiency Component

U.S.-India Joint Center for Building Energy Research and Development (CBERD)

CBERD promotes high-performance, smart, energy-efficient buildings. It is developing a design and operation software, integrated sensors and controls platforms, building energy monitoring solutions, and new benchmarking methods. The vision is to increase the potential to save operational energy while delivering enhanced occupant comfort. It is co-led by the Lawrence Berkeley National Laboratory in the U.S. and the Centre for Environmental Planning and Technology (CEPT) University in India.

New software tools

- Developed COMFEN-India, a free online software tool that can assist in daylighting and solar control using façade design in a building.
- Initiated development on new tools including a code compliance ruleset for ECBC, and a new, early design stage optimization tool for use by architects and engineers.

Building technologies

- Developed and tested building component and technology prototypes such as laser-cut panels to be used in windows, phase-change material ceiling tiles, and sensors and controls technology for smart power strips. These prototypes will help save energy.

Test beds and apparatus

- Set up new labs including building systems fault detection and diagnostics lab in the International Institute of Information Technology, Hyderabad; and building envelope test lab in CEPT University.

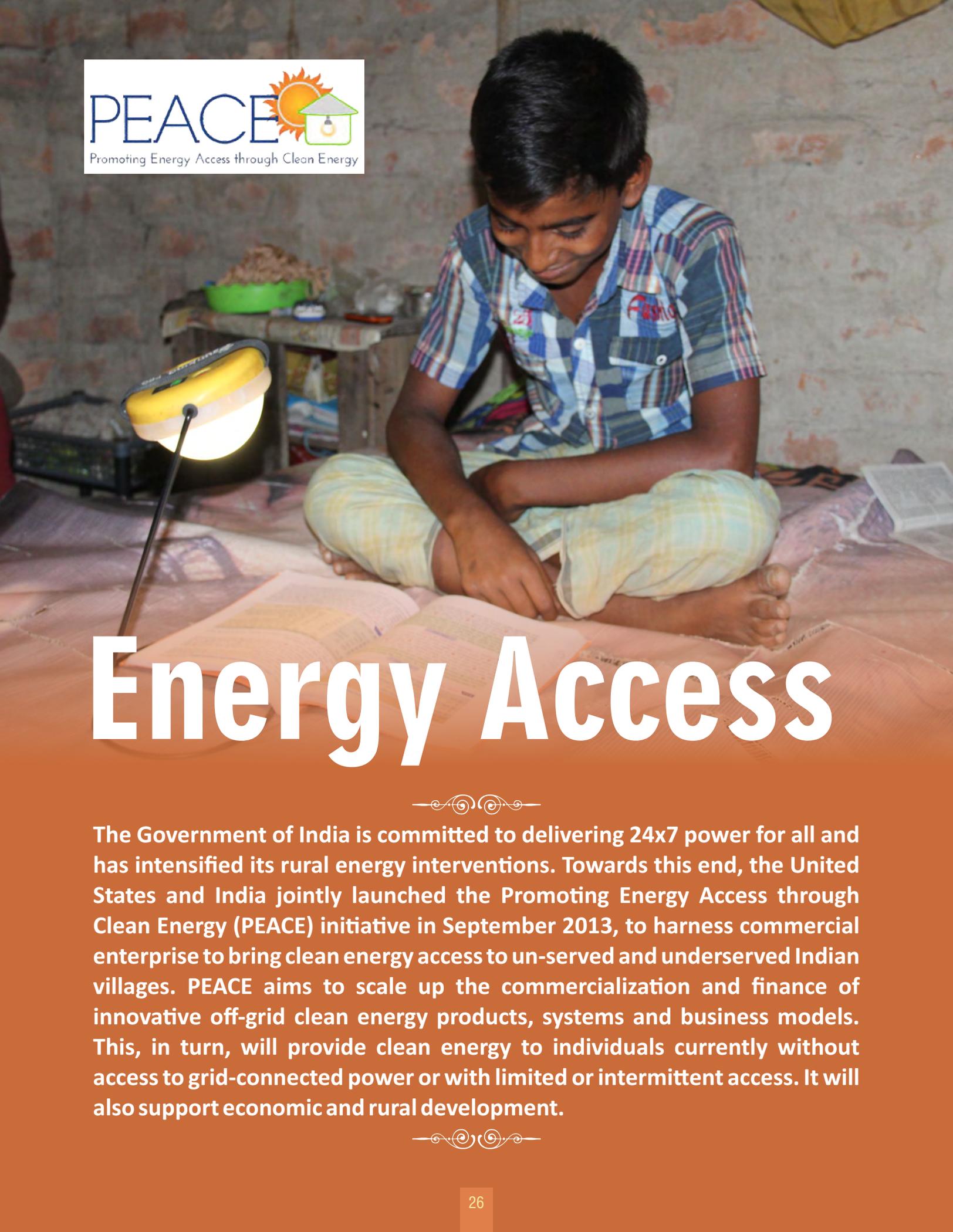
Scientific exchanges

- Organized eight two-way research exchanges including two long-term exchanges from Berkeley to Indian research institutions.



Photo: CEPT University

Laboratory Set Up for Clear Sky Simulation, for Enabling CBERD R&D on Building Envelopes



Energy Access



The Government of India is committed to delivering 24x7 power for all and has intensified its rural energy interventions. Towards this end, the United States and India jointly launched the Promoting Energy Access through Clean Energy (PEACE) initiative in September 2013, to harness commercial enterprise to bring clean energy access to un-served and underserved Indian villages. PEACE aims to scale up the commercialization and finance of innovative off-grid clean energy products, systems and business models. This, in turn, will provide clean energy to individuals currently without access to grid-connected power or with limited or intermittent access. It will also support economic and rural development.



Promoting Clean Energy and Women Entrepreneurship

Women entrepreneurs play a key role in promoting clean energy adoption at the village level. USAID's Partnership on Women's Entrepreneurship in Clean Energy (wPOWER) is empowering female entrepreneurs to educate people in their communities on the benefits of using clean energy products. In June 2016, USAID organized a Global Exchange on Clean Energy and Women Entrepreneurship in Kopernik, Indonesia. This facilitated transfer of best practices from wPOWER India to Kopernik which is in the process of establishing the Wonder Women Network in collaboration with Energia. Five members from wPOWER India, including two rural women entrepreneurs, took part in the exchange program. They shared best practices in building and scaling women entrepreneurs network, entrepreneurship ecosystem creation, practical training on clean energy sales and marketing, and private sector partnership, etc. The wPOWER initiative, which ended in June 2016, created a robust ecosystem that allowed clean energy women entrepreneurs to access technology, finance and markets.

wPOWER Impact

Creation of a Sustainable Business Ready Network of Empowered Clean Energy Grassroots Women Entrepreneurs (GWEs)



Network of **1,010** GWEs

Greater Awareness, Knowledge and Adoption of Clean Energy Products among Rural Population



1,010,000 people reached

Transformation of Grassroots Women Entrepreneurs as Community Climate Change Leaders



30% average increase in monthly income of GWEs

Significant Leveraging



Cash: USD **1.8 million**
In-kind: USD **2.6 million**

Number of Partnerships Signed



15



Bridging the Energy Gap

The Clean Energy Access Network (CLEAN) focuses on off-grid energy solutions by addressing lighting, cooking, and pumping needs of rural India. Established in April 2015, CLEAN now has 106 member organizations that are working together on scaling the decentralized energy market in India.

Key Progress

- Provided inputs for India's national policy on microgrids.
- Finalized paper on policy alternatives to kerosene subsidies.
- Completed four training of trainers workshops.
- Facilitated development of *Suryamitra* handbook for Green Jobs Sector Skill Council.

Integrating Clean Energy into Sustainable Landscapes

Sustainable landscapes are critical to India's transition to low emissions development. With clean energy as an offshoot, these interventions can help in addressing climate change challenges such as forest emissions from deforestation. USAID's Partnership for Land Use Science (Forest-PLUS) program is promoting bio-briquettes as an alternative to fuelwood to rural communities. The bio-briquettes reduce the dependence on wood from forests for cooking purposes which, in turn, helps in protecting local forests. Forest-PLUS has trained over 500 villagers on how to prepare bio-briquettes. Similarly, the Program is promoting low-cost solar water heaters in Rampur - a snowbound town that requires water and space heating almost throughout the year. A total of 115 solar water heaters have been installed in six villages in Rampur. This has reduced fuelwood consumption by nearly 30 percent.

Supporting New Ways to Expand Energy Access

USAID's Development Innovation Ventures (DIV) is an open innovation fund that sources, tests, and accelerates breakthrough ideas for global development. As of June 2016, DIV has funded more than 40 innovations in India, including energy innovations that aim to change millions of lives at a fraction of the cost.



ORB ENERGY

Stage 2: USD 1.5 million

Orb energy offers in-house financing solutions to make solar systems more affordable to small and medium sized enterprises. Orb has relied on cash sales in the past, which constrained its growth. DIV funds have helped Orb to roll out a 3-5 year credit option, enabling companies to eventually own their systems. Through the in-house financing facility supported by DIV, Orb had installed 400 kilowatts of capacity by May 2016.

BIOLITE

Stage 2: USD 1 million

BioLite's HomeStove converts the heat of fire into usable electricity to power small electrical devices. DIV's funding helped BioLite to hone its business model, ensuring that the stoves were profitable across markets. BioLite has distributed nearly 10,000 HomeStoves till date.

SIMPA NETWORKS

Stage 2: USD 1.5 million

Simpa provides "pay-as-you-go" solar home systems to rural India which saves its customers from large upfront costs. DIV funding is helping Simpa work with local banks to finance sales growth without carrying the risk on its balance sheet. DIV funding has enabled Simpa to sell 15,000 units and obtained USD 25 million in follow-on funding as of May 2016. Additionally, OPIC provided Simpa with a USD 4 million loan to expand its customer base.

J-PAL SOUTH ASIA – HUSK POWER

Stage 1: USD 0.1 million

Husk Power produces biomass-fuelled mini-power plants that increase access to electricity in rural India. DIV's funding helped Husk Power to introduce reliable metering technology for off-grid power.

MERA GAO POWER (MGP)

Stage 2: USD 0.3 million

MGP has designed a solar-powered, village-level microgrid to provide electricity to off-grid villages. DIV's funding helped MPG to establish its first commercial microgrid, providing power to 50 homes at a reduced cost of USD 1,000, down from USD 3,000.

GRAM POWER

Stage 2: USD 1 million

Gram Power combines locally generated electricity, typically via solar panels, with its proprietary Smart Meters. This lets customers to purchase power as they might buy pre-paid minutes for a cell phone. Gram Power will use DIV funding to rollout 40 microgrids across Rajasthan and Uttar Pradesh, bringing power to nearly 4,200 households.



Ensuring Power for Bottom of the Pyramid

One of the key issues in rural India is providing affordable and sustainable energy that not only provides basic lighting but also promotes livelihood generation. Towards this end, three social enterprises received funds from the Millennium Alliance (MA), a joint initiative of the USAID, Federation of Indian Chambers of Commerce and Industry and the Technology Development Board. The funds provided by MA helped the enterprises to provide clean lighting and cooking solutions to villages. It also provided them with networking opportunities, business support services, and technical assistance. The MA initiative aims to identify game changing innovations and help scale them for maximum developmental impact.

Millennium Alliance: Round 3 Awardees

Technology and Action for Rural Advancement

Development of Integrated Energy and Revenue Management System for Mini-grids

Potential Impact: Can impact 25,000 households (100,000 individuals) by providing direct access to electricity for lighting, and income-generation activities.

Jnana Prabodhani

Table Top Solar Panel Laminator in rural locations for decentralized manufacturing of solar panels

Potential Impact: Plan to install three laminators in Maharashtra, create 50 local entrepreneurs and manufacture and sell panels and related products for 3,000 households.

Avani Bio Energy

Harnessing the destructive energy in pine needles for rural development

Potential Impact: Job creation for rural people in villages, and reduction in carbon emission.

Gram Oorja Solutions Pvt. Ltd.

Biogas-based Cooking Grid

Potential Impact: Touched over 25,000 lives across four states, providing people access to drinking water and cooking fuel.

Prakti

Scaling Prakti Multi-fuel Clean Cook Stoves in India, Bangladesh and Nepal

Potential Impact: Will launch 2,000 stoves in six states in India, 500 stoves in two districts in Bangladesh, and 500 stoves in two districts in Nepal.

Boond Engineering and Development Pvt. Ltd.

Pre-paid Mobile Payment based Solar Micro Grids

Potential Impact: Access to clean energy and quality lighting, and improved quality of life.

Simpa Energy Pvt. Ltd.

Expanding solar-as-a-service to lower income households and micro-enterprises in rural India

Potential Impact: Can expand to new areas and impact more lives.





U.S. Ambassador to India, Richard Verma and Secretary Tripathy, MNRE with the Awardees of PACEsetter Fund - Round 1

Grants for Clean Off-the-Grid Energy

The U.S. Embassy and India's Ministry of New and Renewable Energy (MNRE) awarded grants to nine Indian clean energy innovators under the first round of funding of the PACEsetter Fund in May 2016. The Fund, established in June 2015, is a joint initiative between the U.S. and India to improve the commercial viability of off-grid renewable energy businesses and organizations. An expression of interest for the first round of funding was issued in October 2015 and the Fund received nearly 150 applicants from all across India. The Fund has now issued an expression of interest for its second round of funding and the awardees are expected to be announced in early 2017.

Winning Organizations

- Ahuja Engineering Services Pvt. Ltd. • BioLite • Grassroots Energy • Shri Shakti Alternative Energy Ltd.
- Energy Development Finance Company • OptimaHeat Technologies • Customized Energy Solutions India Pvt. Ltd.
- Mera Gao Micro Grid Power Pvt. Ltd. • Environment Conservation Society (Switch ON)

Promoting Off-Grid Super-Efficient Appliances

As a part of the PEACE initiative, the U.S. Government has committed funds to support a range of technology, policy and market development activities to accelerate deployment of affordable, high-quality super-efficient appliances and equipment for off-grid use in India. The Global Lighting and Energy Access Partnership (Global LEAP) has developed an off-grid appliance product testing and data platform – a tool that will help policymakers, investors, and other market stakeholders in India to make informed decision about off-grid appliances based on energy performance and quality. Global LEAP experts are currently providing technical assistance to MNRE to leverage this data to inform the development of technical specifications for off-grid solar programs. In partnership with The Climate Group and in support of the PEACE initiative, Global LEAP also organized the Efficiency for Access (E4A) Day at the India Energy Access Summit on August 12, 2016. The day featured side events that highlight the role of efficient end-use technologies – including energy efficient community lighting, indoor LEDs, household appliances and income generating equipment – in the energy access context. As a part of E4A Day, Global LEAP partnered with the CLEAN Network to host an Off-Grid Industry Networking Event, convening over 150 off-grid industry leaders and market stakeholders to explore business opportunities and partnerships in India.



Showcase of Energy Efficient Appliances at the India Energy Access Summit in New Delhi

Scaling Microfinance to Deliver Clean Energy

India accounts for one third of the global population without access to electricity, a large majority of whom live in the rural areas. Microfinance institutions (MFIs) can play a key role in addressing this challenge by offering credit for energy products and services. To facilitate this, the USAID PACE-D TA Program is supporting seven MFIs. In the initial phase, the Program assisted the MFIs in preparing business plans including financial projections for their proposed clean energy lending initiative. It also built their capacity by organizing site visits to demonstrate “live” energy-lending operations of other MFIs, and help them understand business models, operation processes and systems on the ground. The Program organized three technology showcase events (April 2015, March 2016 and August 2016) to provide a platform to technology providers to showcase their product range to MFI partners and discuss issues relating to functionality; quality or assurance standards; warranties; after-sales, etc. Similarly, it also organized two investor forums (December 2015 and February 2016) to introduce the opportunity of energy lending to the investor community.

Making an Impact

- 184,693 lighting and cooking solutions sold.
- USD 7.2 million investment leveraged for partner MFIs.
- 8,576 person-hours of training provided (56% of which were women).

Consumer Financing for Clean Energy Services

USAID’s Renewable Energy Microfinance and Microenterprise Program (REMMP) is designed to improve access to modern energy services in underserved communities while at the same time helping USAID partners to reduce carbon emissions. A key goal of REMMP is to increase the availability of consumer financing for clean energy services and products, such as solar household systems. In India, REMMP is working with ten partners, including microfinance institutions and asset finance companies, to identify and document successful business models for scaling sales and distribution of decentralized renewable energy products.



#USIndiaDosti

#EnergizeUSIndia

#ChaleinSaathSaath