U.S.-INDIA STRATEGIC CLEAN ENERGY PARTNERSHIP

RENEWABLE ENERGY PILLAR

July 2023

GOVERNMENT OF INDIA
MINISTRY OF NEW AND RENEWABLE ENERGY

USAID FROM THE AMERICAN PEOPLE

USTDA U.S. TRADE AND DEVELOPMENT AGENCY

DFC U.S. International Development Finance Corporation

EXIM EXPORT-IMPORT BANK OF THE UNITED STATES

OUTLINE

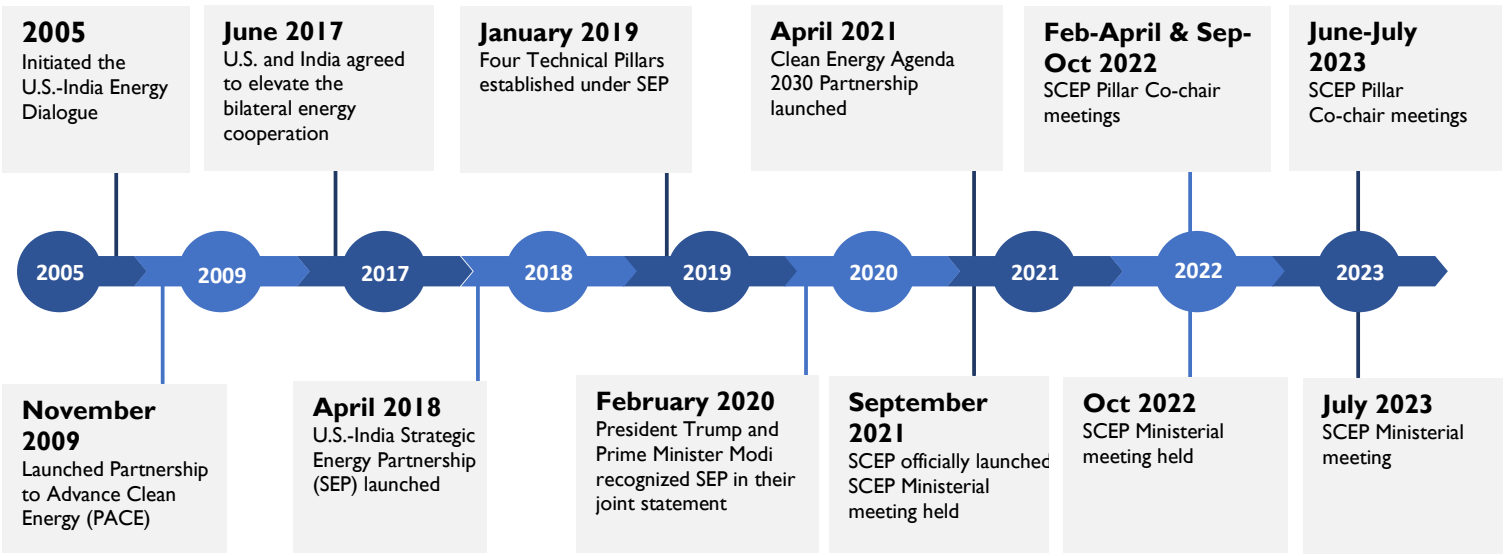
The long history of energy cooperation between the United States and India have powered lives and livelihoods. On the margins of the April 2021 Leaders' Summit on Climate, President Biden and Prime Minister Modi announced the launch of U.S.-India Climate and Clean Energy Agenda 2030 Partnership, to advance shared climate and clean energy goals. The Agenda 2030 Partnership includes two tracks in the form of the Strategic Clean Energy Partnership (SCEP) and the Climate Action and Finance Mobilization Dialogue. The SCEP was earlier established as the Strategic Energy Partnership in 2018 and had replaced the U.S.-India Energy Dialogue, the previous intergovernmental engagement for energy cooperation.

The SCEP advances energy security and innovation with greater emphasis on electrification and decarbonization of processes and end uses, scaling up emerging clean energy technologies while finding solutions for hard-to-decarbonize sectors. Engagement with the private sector and other stakeholders will remain a priority.

STRATEGIC CLEAN ENERGY PARTNERSHIP PILLARS

- **Renewable Energy Pillar**
- **Sustainable Growth Pillar**
- **Power and Energy Efficiency Pillar**
- **Responsible Oil and Gas Pillar**
- **Emerging Fuel & Technology Pillar**

THE JOURNEY SO FAR



PILLAR OVERVIEW

The Strategic Clean Energy Partnership's Renewable Energy Pillar objectives are aligned to drive faster deployment of renewable energy for inclusive and resilient development, taking into account national circumstances and sustainable development priorities. The overarching goal is to enhance equitable economic development, universal energy access, and energy security in India, with broader benefits through South Asia and the Indo-Pacific region as a whole.

The Renewable Energy Pillar has the following objectives

- Supporting India in achieving 450GW renewable energy target by 2030
- Expanding the use of distributed renewables
- Strengthening the U.S.-India relationship and improving trade ties between the two countries

Thematic Areas of the Pillar

Policy, Institutional and Regulatory Measures ↔ Demonstration, Assessment, and Tools ↔ Financing Mechanisms ↔ Capacity Building and Best Practices

Cross-Cutting issues on Environment, Water, Health, and Private Sector Engagement

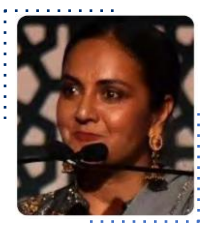
U.S.-India SCEP Ministerial Chairs

Jennifer M. Granholm
Secretary
U.S. Department of Energy

Hardeep Singh Puri
Minister of Petroleum and Natural Gas & Minister of Housing and Urban Affairs Government of India

RENEWABLE ENERGY PILLAR CO-CHAIRS

DINESH JAGDALE
Joint Secretary
Ministry of New and Renewable Energy
Government of India



ANJALI KAUR
Deputy Assistant Administrator
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KEY ACHIEVEMENTS

Workshop on Training program on "Techno-economic Considerations for the Design of Green Hydrogen Projects" organized by USAID's South Asia Regional Energy Partnership (SAREP) program on February 3, 2023 (Photo Credit: SAREP)

- MOU signed between Indian Railways and USAID on June 14, 2023, to jointly work to combat climate change and achieve Indian Railways' target of net-zero emissions by 2030. The partnership will aim to accelerate the deployment renewable energy, energy efficiency technologies, and solutions conforming to net-zero target. The MoU also featured in the U.S-India Joint Leader's statement during Prime Minister Modi's visit to the U.S.
- Supported Indian Railways in successful award of 900 MW capacity of round the clock renewable energy in by facilitating the bid process. This will lead to deployment of around 3.3 GW of renewable energy capacity towards IR's 2030 net-zero goals.
- Launched the Phase 2 of South Asia Group for Energy (SAGE) in May 2024. SAGE 2.0 will deepen the partnerships between Indian Nationals Institutions and U.S. National Labs through joint analysis and studies on wind energy, bio energy, etc.
- Supported Ministry of New and Renewable Energy (MNRE) on policy changes and development of a scheme to enable large-scale repowering of old and inefficient wind turbines in India including facilitating national level stakeholder consultation for the draft Repowering Wind Policy in November 2022.
- Supported Forum of Regulators (FOR) in developing model guidelines and regulations on: (1) Management of RE curtailment for wind and solar generation, (2) Green energy open access, and (3) Energy storage and electric vehicles that were issued.
- Supported Haryana Electricity Regulatory Commission (HERC) in preparing Green Energy Open Access Regulations 2023 which allow connectivity and open access to electricity generated from green energy sources.
- Developed two feasibility studies for 50 tonnes per day (TPD) and 100 TPD green ammonia plant for NTPC Renewable Energy Limited (NTPC REL) and designed tender for 100 TPD green ammonia plant by introducing latest decarbonization technologies in Green Hydrogen.

KEY ACHIEVEMENTS

- Developed a report on the Investment landscape of Green Hydrogen in India which shall enable investments by simplifying the sector value chain for financing institutions.
- Supported Indian Railways with low-carbon resource procurement strategies by deployment of a power procurement tool. The tool will assist Indian Railways in the analytics-based assessment of procurement options for informed decision making for renewable energy procurement.
- Supported Power Company of Karnataka Limited (PCKL) in procurement 1 GW x 8 hours per day storage from Pumped Hydro Storage capacity by assisting in reviewing bid documents and recommending modifications to make the selection process competitive.
- Scaled-up efforts for rating of solar rooftop vendors with the Confederation of Indian Industry-Green Business Center (CII-GBC) by increasing the outreach activities to reach 3000+ vendors, registering eight assessor agencies, completing the ratings for ten vendors, with 25+ more vendors in the pipeline to build consumer trust in solar rooftops, thereby helping increase uptake.
- Organized training program on Techno-economic Considerations for the Design of Green Hydrogen Projects in February 2023 with 50 participants from PSUs, state governments, and private sector.
- Conducted training on net zero for 175 officials of Indian Railways in collaboration with the Indian Railways Institute of Electrical Engineering, Nashik, focusing on renewable energy and energy efficiency. Launched a training program in collaboration with Indian Railways Institute of Civil Engineering (IRICEN), Pune focusing on design and construction of net zero buildings.
- Conducted workshop on Scaling Rooftop Solar Deployment and Energy Efficiency in Mini Micro and Small Enterprises (MSME) clusters with Energy Efficiency Services Limited (EESL) in January 2023 with participation of 40 representatives from 15 organizations including 12 MSME units/associations.
- Partnered with an Indian non-banking finance corporation for an Alternate Investment Fund (AIF) with a capitalization of INR 500 crores (approximately $70 million) to deploy capital for innovative clean and climate smart technologies.
- Launched the report Institutional Framework of RE forecasting in India in May 2023. The report includes review of international experience on type of forecasting and key takeaways for India.
- Hosted the first South Asia Clean Energy Forum (SACEF) in New Delhi in May 2023 with focus on the theme "Catalyzing Partnership for Clean Energy Transition,". 3000 participants attended the event.

Memorandum of Understanding with Indian Railways to combat climate change and achieve net-zero carbon emissions by 2030

MOU signed between USAID & Indian Railways (Photo Credit: USAID)

In June 2023, the United States, represented by the U.S. Agency for International Development (USAID), and Indian Railways signed a Memorandum of Understanding (MOU) to combat climate change and achieve Indian Railways' target of net-zero carbon emissions by 2030. USAID Deputy Administrator Isobel Coleman and Indian Railways Board Member Naveen Gulati signed the MOU, on June 14, 2023, in the presence of the Chairman and Chief Executive Officer of Indian Railways, Anil Kumar Lahoti. Under this MOU, the collective expertise, resources, and innovation of the two partners will be leveraged to accelerate the deployment of renewable energy, energy efficiency, and energy storage technologies, aligning with the net-zero goal. Together, USAID and Indian Railways aim to develop sustainable solutions that enhance energy efficiency, reduce carbon footprints, and ensure a greener future for railway operations. USAID will also strengthen capacities of railways on clean energy, promote e-mobility, and collaborate on outreach and communication of clean energy initiatives.

USAID and Indian Railways have a longstanding partnership focused on reducing greenhouse gas emissions, promoting energy security, and advancing sustainable practices. This partnership has included the installation of solar panels and energy-efficient lighting and appliances at approximately 1,000 railway stations across India. The United States and India are transitioning to affordable and sustainable energy sources that drive economic growth, support healthcare systems, and foster climate-resilient investments. The MOU further reinforces this robust climate change and clean energy partnership, contributing to both national and global climate targets.

Indian Railways awards its first tender for round-the-clock (RTC) procurement of electricity with 100% renewable energy


First tender being awarded for round-the-clock (RTC) procurement (Photo Credit: SAREP)

India's growing economic needs include vast transport investments, from which the derived energy demands will have a huge impact on global markets. USAID's South Asia Regional Energy Partnership (SAREP) program in partnership with MNRE is providing extensive support to Indian Railways to expand the use of renewable energy and energy efficiency in its operations. SAREP helped Indian Railways in the design and issue of a tender for the procurement of 900 MW round-the-clock (RTC) power from grid-connected renewable energy. This is the first tender in the country for RTC purchase of electricity with 100 percent renewable energy component. SAREP program helped Indian Railways in undertaking a detailed analysis of various possible scenarios of configuration, impact of various parameters as part of the project design on tariffs, and a detailed analysis on Indian Railways' energy costs and tender documents. The tender was concluded in May 2023 and will lead to deployment of close to 3.3 GW of RE projects on ground for supply of 900 MW RTC power. The success of this tender will greatly help Indian Railways in achieving its net-zero carbon emission target by 2030. SAREP is now supporting Indian Railways in planning and designing of phase-2 RTC procurement.

Power Procurement Planning Tool for Indian Railways


A training workshop on the Power Procurement Planning Tool for IR on March 22, 2023 (Photo Credit: SAREP)

Achieving a net-zero carbon emitter status for Indian Railways (IR) by 2030 is a key component of India's global climate commitment. Renewable Energy will play a key role in this net-zero ambition. MNRE and USAID's SAREP program developed a power procurement planning tool for IR to support its low-carbon resources procurement strategies including aggregating the optimum capacities that can be tied up. A training workshop on the power procurement planning tool was organized for the Electrical Energy Management Directorate (EEM), and Renewable Energy Management Company Limited (REMCL) on March 22, 2023. The workshop focused on enabling participants to get hands-on training on the tool which will help IR in designing its future RE power procurement plan.

Policy support for repowering of old wind turbines to enable better utilization of best wind resource sites in India

Repowering old turbines in wind-rich states and prime locations will improve wind resource utilization. Repowering of older turbines can help increase efficiency and generation. Towards this, the Ministry of New and Renewable Energy (MNRE), issued a draft 'National Repowering Policy for Wind Power Projects, 2022' on October 17, 2022, to create a facilitative framework for repowering of wind projects in India. The MNRE-USAID's SAREP program supported in developing the outlines of a policy and a scheme, including project-selection criteria, incentives framework for existing owners, and business models for repowering to enable large-scale repowering of 10,000+ MW worth of wind capacity. Once implemented, the policy and associated scheme will create a market for larger and more efficient wind turbines, thus leading to new investment, creation of green jobs, and increased clean energy deployment in the country.

National Workshop on Wind Repowering in India on November, 2022 (Photo Credit: SAREP)

A national workshop on wind repowering in India was organized on November 07, 2022, where experts and speakers shared their perspectives on repowering wind power projects and on the draft national repowering policy for wind power projects published by MNRE. SAREP is extending its support to the Government of Gujarat in revising the state wind repowering policy. SAREP earlier had conducted feasibility studies to assess the potential of wind repowering in Gujarat, Maharashtra, and Tamil Nadu. The micro siting for selected sites revealed that repowering existing wind sites with newer and larger turbines can result in an increase of 2-4 times in annual electricity generation.

Market Insights for Rooftop PV (dGen) Tool

DOE's National Renewable Energy Laboratory (NREL), working with the Center for Study of Science, Technology and Policy (CSTEP), developed a Distributed Generation Market Demand (dGen) model customized for India to calculate the technical, economic, and adoption potential of rooftop and distributed solar photovoltaic (PV) resources. The tool can inform decision makers, utility planners, and investors on how regulations, policy decisions, incentives, and cost scenarios may impact adoption of rooftop PV, insights on location and scale of potential solar investments, as well as the sensitivity of investments to market and policy risks. NREL and CSTEP held a joint webinar to demonstrate the capabilities of the tool to the wider modeling community in India and published a final report.

Distributed Generation Market Demand (dGen) Model (Photo Credit: SAREP)

Deployment of tools & practices for strategic planning for renewable energy

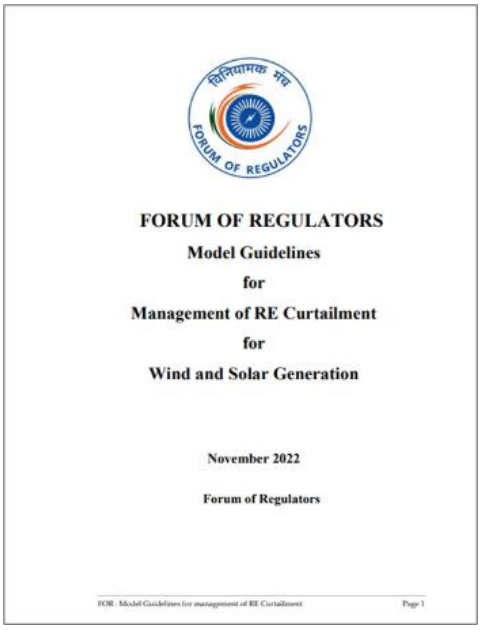
USAID SAREP Team in a workshop for the use of Renewable Energy Procurement Optimization and Smart Estimation (REPOSE) software tool (Photo Credit: SAREP)

USAID's SAREP program in partnership with MNRE expanded the work undertaken by Partnership to Advance Clean Energy Deployment (PACE-D 2.0 RE) to improve resource planning for renewable energy. The use of Renewable Energy Procurement Optimization and Smart Estimation (REPOSE) software tool for power distribution companies (DISCOMs) was expanded to several Indian states. Based on request and interest received from Nepal, SAREP supported deployment of the REPOSE tool at Nepal Electricity Authority (NEA) and is currently assisting NEA in building capacity to use the tool through trainings planned in July 2023.

Engagement with the Forum of Regulators (FOR) for supportive regulatory frameworks for renewable energy

USAID is partnering with FOR to develop regulatory frameworks, guidelines, and state implementation roadmap for scaling renewable energy and its grid integration. USAID's SAREP is providing support to various technical committees of FOR on resource adequacy, ancillary services mechanism, management of RE curtailment, green energy open access, and energy storage. It supported FOR in development and issuance of three key guidelines and regulatory framework:

- Model regulations on methodology for calculation of Green Energy Open Access charges. This regulation was also adopted by Haryana Electricity Regulatory Commission with technical assistance from SAREP.
- Regulatory framework for energy storage and electric vehicles
- Model guidelines for management of RE Curtailment for wind and solar generation



FORUM OF REGULATORS

Model Guidelines

for

Management of RE Curtailment

for

Wind and Solar Generation

November 2022

Forum of Regulators

Currently, SAREP is supporting FOR in developing a state level implementation roadmap for long-term resource adequacy framework for system planning and procurement. Additionally, support is also being provided for the Deviation Settlement Mechanism (DSM) Expert Committee in development of guidelines/regulations for DSM Amendments.

Sub-national support for scaling clean energy deployment

USAID bilateral program with MNRE and Ministry of Power (MOP) have extensively worked with states and cities on clean energy deployment. The MNRE-USAID SAREP program is partnering with the State Government of Haryana, Gujarat, Andaman and Nicobar Islands, Assam, Karnataka and Madhya Pradesh in scaling renewable energy deployment.

Haryana: Assisting Government of Haryana to revise the Haryana Solar Power policy. After conducting detailed research, analysis of regulations and multiple discussions in the state, SAREP recommended revisions in the policy and developed the revised draft policy which was presented to Haryana Renewable Energy Development Agency (HAREDA) on June 19th, 2023. The revised policy once released will help scale up solar energy deployment in the state.

Gujarat: Assisting Government of Gujarat in revision of policy on the repowering of the wind projects in Gujarat, in accordance with the National Policy of Repowering of the Wind Projects, 2023. SAREP prepared the policy recommendations and draft policy document, which was presented to the Energy Department, Gujarat on June 9, 2023. The revised policy once released will upscale the wind resource utilization which will result in higher clear energy generation.

Andaman and Nicobar Islands: Greening of Islands is one of the major initiatives of MNRE where the aim is to transition from generation of electricity from diesel gensets to sustainable renewable sources. MNRE-USAID SAREP program conducted an analysis to design an optimized Photovoltaic (PV) + Battery energy storage system (BESS) + Diesel Generator (DG) solution for Teressa Island of Andaman & Nicobar Islands. The analysis was submitted to MNRE in April 2023, which demonstrated the use case that Teressa Island can become energy independent using a local and reliable microgrid system of solar, battery, with minimum utilization of diesel gensets. SAREP is also looking at partnering with the Andaman administration to develop a roadmap to enhance clean energy deployment in Andaman & Nicobar Islands.

Assam: Assisting Assam Electricity Regulatory Commission (AERC) in designing of Demand Response Program/Pilot for Assam, and preparation of Draft Regulation for Energy Storage System. SAREP is also supporting AERC in preparation of model resource adequacy regulations.

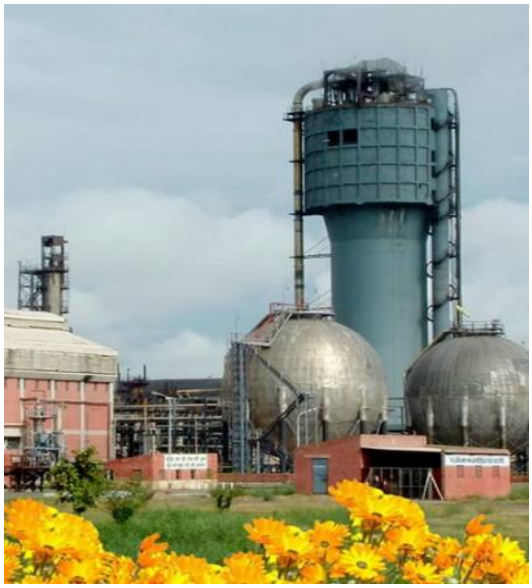
Karnataka: Assisted Power Company of Karnataka Limited (PCKL) in procurement 1 GW x 8 hours per day storage from Pumped Hydro Storage capacity by reviewing bid documents and recommending modifications to make the selection process competitive. SAREP is also supporting Karnataka State Electricity Regulatory Commission (KERC) in updating the Conditions of Supply of Distribution Licensees for the state of Karnataka.

Developing green hydrogen ecosystem in India

Green hydrogen is emerging as a critical component of GOI's clean energy and climate strategy. In January 2023, Government of India (GOI) launched the National Green Hydrogen Mission, which also increased interest from state governments and private sector entities. Other South Asian countries are also increasingly looking towards hydrogen as an alternative source of fuel to reduce their carbon footprint and meet their growing energy needs. USAID, U.S. Department of Energy, and the U.S. Department of Commerce are undertaking several activities focused on technical assessment, capacity building, and forging partnerships with private sector stakeholders.

- **Techno-commercial feasibility studies on green hydrogen and its derivatives:** USAID through SAREP is providing technical assistance to National Thermal Power Corporation Renewable Energy Limited (NTPC-REL) on green hydrogen and its derivatives. SAREP conducted a techno-economic feasibility study for NTPC-REL for setting up a 50-ton-per-day green ammonia plant at National Fertilizer Limited, Nangal, Punjab. The facility will generate green ammonia locally using 100% renewable electricity. Further SAREP developed a financial model to calculate levelized cost of generation (LCOG) for green ammonia which was submitted to NTPC-REL in December 2022.

  SAREP also conducted a techno-economic feasibility study of another 100 tons-per-day green ammonia plant at Jubilant, Uttar Pradesh. The study covers the technical aspects of ammonia generation and reduces storage infrastructure by introducing advanced technologies in the ammonia loop. SAREP is also assisting NTPC-REL in conducting a techno-economic feasibility study for the Green Methanol facility which is underway. The assistance will help NTPC-REL in ascertaining technical and commercial viability of such projects in the future based on green hydrogen.



Green ammonia plant at Jubilant, Uttar Pradesh (Photo Credit: SAREP)

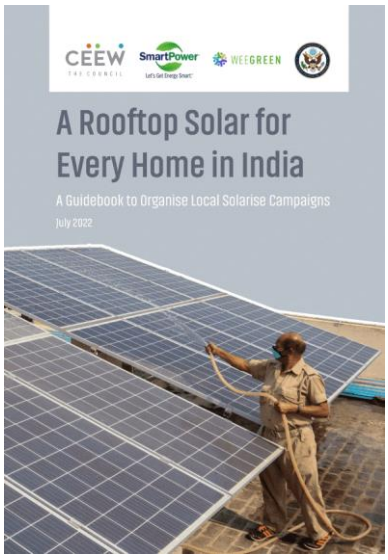
- **Enabling Green Hydrogen Deployment:** Enabling the deployment of advanced energy solutions, such as green hydrogen, is an important objective of the Government of India. SAREP in partnership with the Skill Council for Green Jobs (SCGJ) organized a training program for better understanding of 'Techno-economic Considerations for the Design of Green Hydrogen Projects', on February 3 in New Delhi.

Accelerating deployment of distributed solar

- **Policy Paper on Scaling Rooftop Solar Deployment in India:** To achieve the Nationally Determined Contributions (NDCs), the Government of India envisages 500 GW of non-fossil energy capacity in the country, of which 40 GW is targeted from Rooftop Solar (RTS). USAID-MNRE SAREP program conducted an RTS market outlook assessment, studying the adequacy of the existing policy, regulatory, tariff landscape, associated challenges in scaling up RTS and identifying international experience through primary and secondary research. The final findings and recommendations from the study were presented and submitted to MNRE on June 8th, 2023. SAREP will continue to extend support to MNRE for RTS deployment.

Rooftop Solar (RTS) (Photo Credit: USAID)

- **The U.S.-India Clean Energy Finance Task Force (CEFTF) Advances Rooftop Solar Deployment in India and Beyond:** The CEFTF's implementing partner, Council on Energy, Environment, and Water (CEEW), released a Solarize Campaign Guidebook that leverages lessons from a Solarize Campaign carried out in two of New Delhi's residential districts of 28,000 residents. CEEW, in collaboration with Indian power distribution companies, BSES Rajdhani Power Limited and BSES Yamuna Power Limited, launched the Solarize Campaign based on successful community-based, peer-to-peer consumer aware campaigns carried out by SmartPower in the United States. The U.S. Department of State's Bureau of Energy Resources (ENR) co-hosted with the India-led International Solar Alliance a June 13 virtual workshop on the Solarize Campaign Guidebook with nearly 50 participants from ISA Member States from India, Africa, Caribbean, and Latin America. The virtual workshop also included a presentation based on a community solar report with data and analysis based on the Indian states of Bihar and Meghalaya. U.S. experts from SmartPower and Colorado emphasized the great potential to adapt these successful models beyond India. Launched in 2015, the CEFTF is an interagency initiative that draws on the financial expertise of countries' governments and private sectors to tailor business and finance models to India's context and strengthen India's ability to raise private capital to finance its ambitious renewable energy targets.



- **Scaling Rooftop Solar in Ministry of Micro, Small and Medium Enterprises:** USAID-MNRE SAREP in association with Energy Efficiency Services Limited (EESL) organized a workshop on scaling Rooftop Solar Deployment and Energy Efficiency in MSME clusters in Karnal, Haryana, on January 30, 2023. In the workshop, participants discussed rooftop solar business models for MSMEs, the regulatory and policy landscape for the same, benefits of demand aggregation, quality, performance, and financing solutions for MSMEs.

Workshop on scaling Rooftop Solar Deployment and Energy Efficiency in MSME clusters (Photo Credit: SAREP)

Accelerating deployment of battery energy storage (BESS)

- **Promoting Behind the Meter (BTM) energy storage:** There is a rapid growth of solar in India displacing fossil fuel generation. Energy storage systems for rooftop, commercial and industrial buildings can help mitigate the challenges posed by the "duck curve" phenomenon. Due to high variability of solar energy at different times of the day there is a difference of power prices at different times of the day. The problem is exacerbated by the increase in evening household power demand. USAID-MNRE SAREP is conducting a study for analyzing a simple bottom-up energy storage system to solve challenges with the 'duck curve' by adding battery storage to individual household and commercial & industrial systems to level out the net power curve. The study will analyze battery time-of-use optimization to overcome time-of-use pricing structures where electricity rates vary based on the time of day. With energy storage, businesses can charge the batteries from captive solar panels or charge during periods of low electricity prices and discharge during times of higher prices. This allows users to save money by using stored energy during peak rate periods.

Battery energy storage (Photo Credit: USAID)

- **Advancing utility scale battery energy storage:** The undergoing transition in the electricity sector across in India is witnessing a steady integration of a large quantum of renewable energy, both at the bulk power system level and the distribution network level. Therefore, the intermittent nature of RE-based power generation requires an adequate amount of flexibility in the power system to address the sudden changes in power, where the battery energy storage systems (BESS) can play a key role. The revenue stream that BESS generates varies by location in the grid, other assets connected in the grid, and the strength of the transmission network, which makes its critical are for detailed study. USAID-MNRE SAREP is conducting a study to develop a staff paper for state electricity regulatory commissions that determines the role of BESS and its revenue stream for three Indian states (Haryana, Gujarat, and Assam) where investment and operational costs of transmission, generation, and storage are co-optimized. The study will also identify the specific needs of policy and regulatory design to support BESS adoption and scaling in these states.

Developing Ocean Thermal Energy Conversion in India

- **Ocean Thermal Energy Conversion Feasibility Study:** A USTDA grant to the National Institute of Ocean Technology (NIOT), an Indian public research and development institute, would fund a feasibility study to support the development of two utility-scale ocean thermal energy conversion (OTEC) power plants to provide baseload electricity in the Andaman and Nicobar Islands in India. OTEC power plants produce renewable energy by harnessing the temperature differences (thermal gradients) between ocean surface waters and deep waters, particularly in tropical areas where the thermal gradient tends to be larger. The study would be co-funded and conducted by a consortium led by marine engineering company, PCCI, Inc. The grant is currently awaiting MNRE and Department of Economic Affairs approvals.

Financing mechanisms for clean energy deployment in India

Clean energy financing is necessary for India to meet its clean energy commitments. India has set a target of installing 500 GW of RE by 2030 as part of its climate goals. This means that the country needs to set up nearly 35 GW every year. Such a large deployment of Green Capacity would necessitate mobilizing $500 billion over the next eight years. To enable this, MNRE-USAID SAREP has worked to facilitate the use of new and innovative financing instruments by large developers, financial institutions, and PSUs for clean energy deployment. This includes expanding the use of innovative instruments such as green bonds, alternate investment funds (AIFs), Infrastructure Investment Trusts (InVITs), etc. for which following actions have been taken:

- **Financing Strategy for NTPC Green:** Supporting corporates and PSUs such as NTPC Green, Indian Railways, Power Finance Corporation (PFC) Limited, and SJVN Ltd, on developing a framework for financing strategy. Recently, SAREP assisted NTPC Green Energy Ltd. (NGEL) in creating a comprehensive financing strategy, including a financial model and guidance on foreign exchange risk management, while also developing a business case for utilizing green bonds as a capital source. The financial strategy of 45 billion USD will enable deployment of 60 GW RE capacity by 2032. The finance strategy was presented to NTPC Green Board and accepted by them. SAREP is now extending similar support to SJVN Ltd.

- **Green Hydrogen Investment Landscape Report:** USAID-MNRE SAREP conducted a study on the investment landscape and opportunities in India in green hydrogen and identified potential global investors who may be keen on investing in green hydrogen in India. The report covers the description of value chain of hydrogen (generation, storage, transport, usage) elaborating on end application; Identification of the major players – developers, government agencies, OEMs, technology providers, investors, other hydrogen ecosystem players for each of the sub-sectors; Assessment of the investment potential by 2030 as per end application and value chain; and identification of key challenges faced by stakeholders in structuring/financing green hydrogen projects and financing (including structuring bankable projects and access/cost of finance) such projects. The report was launched in May 2023 during the first South Asia Clean Energy Forum organized by USAID.

- **Credit Guarantees for Small RE Developers and Manufacturers:** Despite a potential of 16-18 GW of rooftop solar in micro, small, and medium enterprises (MSMEs) across India, less than one GW has been implemented thus far. When scaled, this approach offers the opportunity to unlock solar rooftops for an important customer segment. USAID and US International Development Finance Corporation (DFC) have established a $140 million credit guarantee program with RBL Ltd, Caspian Impact Investment, Electronica Finance Ltd (EFL) and cKers Finance to enable financing for small scale project developers, technology providers, and end users for adoption for clean energy technologies. As a key achievement under this program-
    - RBL has lent $41 million for clean energy projects under the $75 million USD guarantee. This represents 55% of the total amount available.
    - Under the new $20 million credit guarantee, Caspian has issued 28% of the authorized coverage amount.
    - EFL reached 252 loans for rooftop solar to MSMEs, largely in Gujarat, Maharashtra, Tamil Nadu, Karnataka, NCR and Rajasthan covering 18.2MW.
    - cKers has issued 2 loans for approximately 14% of the authorized coverage amount.

Improving renewable energy forecasting for institutional framework and capacity

Report Launch during SACEF 2023 (Photo Credit: SAREP)

USAID through the South Asia Group for Energy is supporting efforts to improve the current institutional framework and institutional capacity for forecasting of RE generation to meet India's enhanced target of non-fossil generation capacity by 2030. Based on review of international experience on type of forecasting, institutions involved in RE forecasting, model used, and horizon of forecasting, gaps in the existing framework and key takeaways for India were identified and presented to National Institute of Wind Energy (NIWE), India and the MNRE. The final report was released in the inaugural session of the South Asia Clean Energy Forum in May 2023. The report, prepared by National Renewable Energy Lab in collaboration with NIWE, reviewed international experience on type of forecasting (centralized, decentralized or hybrid; responsibilities of RE forecasting; forecasting time horizon; forecasting models; and forecasts in scheduling & dispatch for five regions) and key takeaways for India. This activity will improve the current institutional framework for forecasting renewable energy generation to meet the enhanced target of 500 GW of non-fossil energy by 2030.

Supported India's Regulators to Understand Financial Derivatives Market and Optimization of Battery Energy Storage Systems (BESS) for the Grid

USAID through its Energy Utility Partnership Program (EUPP) and South Asia Regional Program conducted a study tour in November 2022 for a delegation of Indian state regulators, along with CEA, MOP, and POSOCO, to Brussels and Oslo. The study tour included examination of international best practices in two areas: (1) To ensure liquidity in the market and protect the interests of the smaller players, the delegation obtained frameworks on the regulatory environment, strategies, and uses of financial derivatives in energy markets, (2) The delegation identified European policy structures to enable R&D and utilization, current economic viability of battery technology, uses and benefits of BESS for renewable energy integration and efficient grid operation for application in India.

Study Tour underway for an Indian delegation at Brussels and Oslo (Photo Credit: USAID)

Awareness workshop on Green Hydrogen for Financial Institutions:

As green hydrogen is a nascent sector, the banks/financing institutions (FIs) have a higher risk perception, which impedes their ability to provide finance at optimal costs. Their effective participation is essential to ensure growth of the sector in order to meet the envisaged targets. With this perspective in mind, SAREP organized a capacity building program in partnership with ICICI Bank on green hydrogen for the banks/FIs on 7th July 2023 in Mumbai. During the workshop, SAREP experts and industry practitioners took sessions on policy and regulatory aspects, plant sizing, electrolyser market, costing, risks and global perspective. A total of 97 participants from 18 banks/FIs attended the capacity building workshop. As a next step, similar workshops at regional level or alternatively deep-dive sessions on specific aspects of green hydrogen shall be scheduled in future.

South Asia Group for Energy (SAGE 2.0) partnership launched to drive excellence in bioenergy and wind energy

The Phase 2 of the South Asia Group for Energy (SAGE) launched during SACEF 2023 (Photo Credit: SAREP)

The Phase 2 of the South Asia Group for Energy (SAGE) was launched in May 2023 in the South Asia Clean Energy Forum (SACEF). SAGE is a consortium of USAID, the US Department of Energy (DOE) and U.S. National Laboratories (NREL, Pacific Northwest National Lab and Lawrence Berkeley National Lab) and represents excellence in research and international development in the energy sector. The Consortia implements research, analysis, and capacity building activities throughout South Asia whose outputs and recommendations are seen as independent and trusted across the globe. Given the advanced technical knowledge embedded in the National Labs, SAGE seeks to elucidate and provide implementation strategies for energy sector-related opportunities that equip USAID partner governments with critical information and consultation to allow strategic investments on South Asia's path to self-reliance. SAGE will provide a vital contribution towards achieving the goals of the U.S. India- Strategic Clean Energy Partnership. Through SAGE, the ongoing partnership between MNRE Indian institutions and U.S. National Lab will be deepened. Currently, the work on biomass supply chain management has been initiated by PNNL with NIBE. Consultations with NIWE are ongoing to finalize the scope of work plan for SAGE 2.0.

U.S.-India Climate Technologies Action Group

The U.S.-India Climate Technologies Action Group (CTAG) is a collective initiative of U.S. Trade and Development Agency (USTDA) and the U.S. India Strategic Partnership Forum (USISPF) with the aim to integrate private and public sector inputs on concrete initiatives that can contribute to advanced global action on climate, facilitate U.S. industry input on the latest climate resilient technologies, share U.S. business models with the Indian market to accelerate the development of the clean energy sector, mobilize capital for climate-smart infrastructure projects in India and strengthen the U.S.-India bilateral relationship. Under CTAG, USTDA will host a reverse trade mission and workshop in India focused on emissions reduction technologies in the oil and gas sector including carbon capture, utilization and storage (CCUS), methane abatement and net-zero hydrogen infrastructure.

A meeting of U.S.-India Climate Technologies Action Group (Photo Credit: USISPF)

India: GPI Procurement Assistance Program

A workshop under Interstate Clean Energy Procurement Program (Photo Credit: USTDA)

In August 2022, USTDA introduced the Interstate Clean Energy Procurement Program (ICEPP) inclusive of eight (8) states in India (Gujarat, Kerala, Haryana, Tamil Nadu, Maharashtra, Punjab, Karnataka and West Bengal). As part of the Interagency Agreement between the U.S. Department of State and USTDA, and in support of USTDA's efforts to facilitate sustainable investment in clean energy and level the playing field for U.S. companies in public tenders in the energy sector in India, ICEPP seeks to address the challenges of renewable energy procurement for policymakers and procurement officials by providing specialized training and resources. Through training and knowledge sharing across states, the outcomes for this proposed Program will be the increased skill levels of Indian states in the use of best value determinations in clean energy procurements, which will allow for greater public sector investment and competitiveness. The GPI held two in country workshops in Delhi, January 18-20, and 23-25, 2023. Following the workshops, a virtual training series will be developed to address clean energy procurement challenges discussed during the workshops. Following the virtual training series two subsequent study tours will bring India officials to visit the United States.

USAID organizes South Asia Clean Energy Forum (SACEF) 2023 – The First Regional Energy Forum

The first South Asia Clean Energy Forum (SACEF) took place in New Delhi, India, from May 2-4, 2023. The event, held on the theme 'Catalyzing Partnership for Clean Energy Transition', was organized by United States Agency for International Development (USAID) through the South Asia Regional Energy Partnership (SAREP) and the South Asia Regional Energy Hub (SAREH). It comprised 16 sessions across three days attended by 60+ speakers and 400+ participants from across the globe.

The opening session at South Asia Clean Energy Forum (SACEF) 2023 *(Photo Credit: SAREP)*

The forum began with a Partners' Day, featuring sessions by USAID partner organizations on topics such as 'Solutions Offered by USAID and U.S. Department of Energy National Labs through SAGE 2.0' to 'Decentralized Renewable Energy for Rural Livelihoods and Women Empowerment'. Over two days, energy stakeholders from public and private sectors in Bangladesh, Bhutan, India, Nepal, Maldives, and Sri Lanka actively participated in sessions and contributed to discussions around the region's clean energy transition.

Notable outcomes from the forum included the launch of SAGE 2.0, a report on Green Hydrogen Investment in India, and training resources for EV charging stations and smart meters. Esteemed speakers shared insights on financing mechanisms, technology, capacity building, and inclusive policies for clean energy development.

Accelerating gender equality in the renewable energy sector

Scaling innovative clean energy solutions for rural populations through a women led micro-entrepreneurship model

A women micro entrepreneur under the SAREP partnership fund (Photo Credit: SAREP)

Women entrepreneurship has the potential to transform the energy sector by bringing in new perspectives and solutions to address the energy challenges in rural India. USAID-MNRE SAREP under the SAREP Partnership Fund (SPF) are working with grantee Swayam Shikshan Prayog (SSP) to scale up access to innovative clean energy solutions for rural populations across five districts and 500 villages of Maharashtra and Bihar. The project is mainstreaming gender diversity by promoting women led micro-entrepreneurship business models for scaling access to innovative clean energy solutions such as prefabricated biodigester solutions which can generate clean cooking fuel and bio-slurry for farming, and subjee cooler, a portable storage solution which does not require an external energy source. A total of 2540 biodigesters and 20 subjee coolers have been installed under the program support till date. The grant aims at engaging and training 500 rural women micro for supporting the deployment of 7000 biodigesters and 2000 subjee coolers.

Gender Mainstreaming Spotlighted in South Asia's Energy Sector

Conference on 'Advancing Women's Leadership in Climate Action' in New Delhi *(Photo Credit: SAREP)*

USAID, in partnership with the US-India Strategic Partnership Forum (USISPF), organized a regional conference under the South Asia Women in Energy (SAWIE) banner on May 11, 2023. SAWIE is a platform jointly established by USAID and USISPF to raise awareness about gender mainstreaming in the Energy Sector in South Asia and promote women leadership. Prominent women leaders from the energy sector in South Asia participated in the event and discussed barriers to gender diversity in decision-making roles. They also proposed solutions to address these challenges. The conference focused on identifying and mentoring high-potential women leaders in the energy and infrastructure sectors. It emphasized the importance of gender-inclusive policies, corporate initiatives, and STEM fields to encourage qualified and ambitious women to pursue careers in the energy utilities sector in India and globally.

U.S.-INDIA STRATEGIC CLEAN ENERGY PARTNERSHIP

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