

INDIAN RAILWAYS

SCALING UP RENEWABLE ENERGY



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GOVERNMENT OF INDIA
MINISTRY OF NEW
AND RENEWABLE ENERGY

Overview

Indian Railways, the backbone of Indian economy, accounts for nearly two percent of the country's total energy consumption. Demand for energy is expected to triple by 2030 due to increasing freight volume, rise in number of passengers, and electrification of tracks.

In order to control the demand and lower its burgeoning energy bill, Indian Railways has set aggressive targets to produce renewable energy (RE), particularly solar power. It plans to install 5 GW of solar power by 2025, of which 1.1 GW is expected to come from solar PV rooftop.



World's second largest railway network - spread over 66,687 route km



Energy costs constitute nearly 24% of ordinary working expenses of Railway



Consumed nearly 17.5 Twh electricity and 2.9 billion liters of diesel in 2016-17



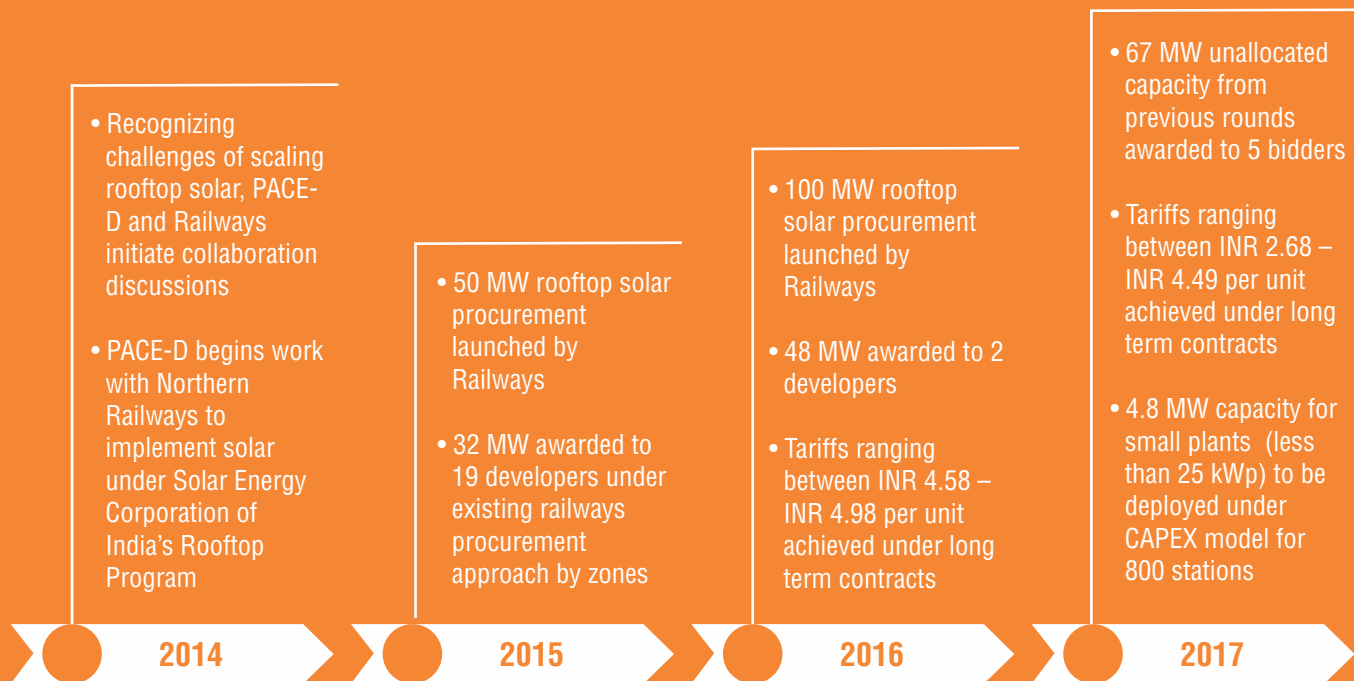
Energy demand is expected to triple by 2030 to 49 TWh due to increasing traffic growth



Rooftop Solar: Wheels of Change

The U.S.-India bilateral Partnership to Advance Clean Energy – Deployment Technical Assistance (PACE-D TA) supported the Indian Railways to identify cost-effective options to procure renewable energy, and design and develop its solar PV rooftop programs.

The Program initiated interaction with Indian Railways in June 2014 to understand the challenges faced by the organization in their go-green initiative. The PACE-D-Indian Railways partnership and resulting interventions evolved over the years based on the learnings and specific requirements of Indian Railways.



Key Interventions

50 MW Rooftop Program

- Renewable Energy Service Company (RESCO) implementation model for solar PV rooftop for various Zonal Railways.
- Site survey of seven cities with a cumulative capacity of more than 25 MW.
- Site survey framework for Indian Railways and capacity building of key staff.
- Model Bid Documents: Request for Proposal (RFP), Request for Quotation, and Power Purchase Agreement.
- Bid process management.

100 MW Rooftop Program

- Portfolio of sites based on key route analysis.
- Modification and streamlining of Model Bid documents.
- Bid process management.

Solar PV Rooftop on 800 Stations using Capital Expenditure (CAPEX) Model

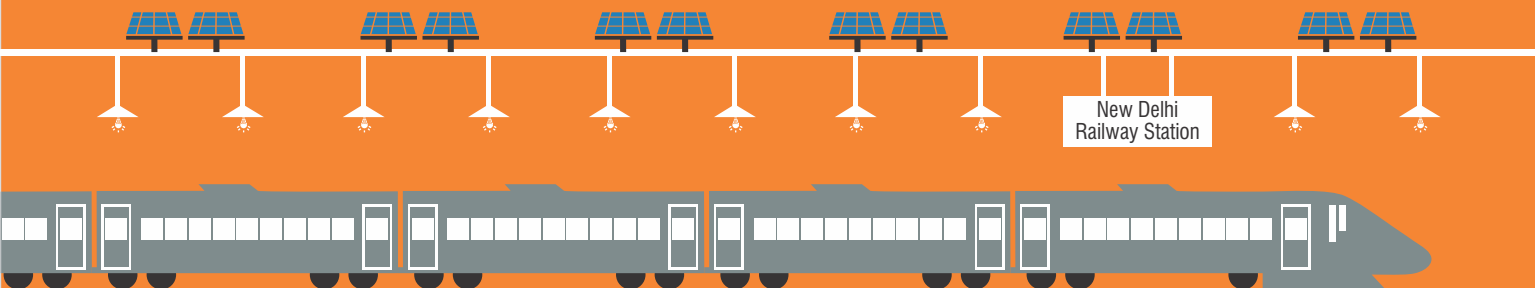
- Implementation model for solar PV rooftop for small railway stations.
- Engineering, Procurement, and Construction RFP and Operations and Maintenance Agreement.
- Conceptual framework and bid framework for a Centralized Monitoring Center for monitoring the performance of solar PV rooftop projects on stations.

RPO Strategy to Procure 500 MW Ground-mounted Solar PV

- Strategy for power procurement through intra and inter-state transmission options in respective states.
- Renewable energy supply curve for various Zonal Railways.

Strategy for Large-scale Renewable Energy Projects

- The PACE-D TA Program also assisted Indian Railways to understand the RE procurement options that would help it diversify its renewable energy portfolio including ground-mounted and rooftop solar, wind, etc. The Program carried out a study to understand the open access regulations for seven states and estimated cost of delivered power from solar and wind projects for traction and bulk non traction consumption points located within the state and outside the state. The findings will help Indian Railways to understand feasible RE penetration levels for traction load in a state and the load pattern of stations across different categories.



Key Learnings and Impact

- RESCO as suitable business model: The RESCO model is deemed suitable for Indian Railways as it is resource light with no investment or rooftop solar expertise required from Indian Railways.
- Centralized procurement process: Earlier Indian Railways had adopted a decentralized approach for rooftop solar procurement which led to delays as the respective railway zones took up the bidding process as per their availability of resources. In addition, Indian Railways found it difficult to track tendering. However, a centralized approach, through Railways Energy Management Centre, ensured standardized documents and streamlined the entire bidding process.
- CAPEX as business model for smaller stations: While the RESCO model is ideal for larger stations, the CAPEX business model is deemed suitable for rooftop solar implementation at small railway stations. Indian Railways is now considering procuring a cumulative capacity of 4.8 MW of rooftop solar for 800 stations across India.

Impact and Way Forward

The technical assistance provided by the Program has enabled Indian Railways to ramp up its solar PV targets and also explore renewable energy for traction load centres. The Program's support in rigorous vetting and reviewing of Model Bid documents has led to standardization of key documents. The Model Bid documents are now being used across various renewable energy procurement programs of Indian Railways and have resulted in savings of time and efforts for its internal staff. Similarly, a standard process has been set up for identifying additional capacities and managing the bids for solar PV rooftop and other renewable energy projects. This has streamlined the internal processes and in turn made the Indian Railways staff more self-reliant and confident in project execution.

The Program conducted analysis of various business models to assess the delivered energy costs, investment and savings for Indian Railways. Insights from these models helped create a decision making framework within the organization.

The initial 50 MW solar PV rooftop program of Indian Railway was the first such large-scale rooftop solar program in India.

The interventions such as standardized bid documents, analysis of business models and design of solar PV rooftop programs, can provide valuable lessons to other PSUs that plan to foray into solar PV rooftop, and help in scaling up solar PV rooftop deployment in India.

About the PACE-D TA Program

The Partnership to Advance Clean Energy – Deployment Technical Assistance (PACE-D TA) Program is a part of the overall PACE initiative, the flagship program under the U.S.-India Energy Dialogue. The six year initiative is led by the U.S. Agency for International Development and the U.S. Department of State and implemented in partnership with the Ministry of Power and the Ministry of New and Renewable Energy.

In the first five years, the PACE-D TA Program focused on three key components: energy efficiency, renewable energy and cleaner fossil technologies, with the overall aim of accelerating the deployment of clean energy, expanding U.S.-India trade and investment linkages, and facilitating knowledge exchange.

The Program's focus in the sixth year is largely on accelerating rooftop solar deployment across eight states: Andhra Pradesh, Assam, Haryana, Maharashtra, Punjab, Telangana, Uttar Pradesh and West Bengal. The Program is working with a range of stakeholders in the focal states to build and strengthen the institutional capacity of respective state distribution utilities and state nodal agencies to design, deploy and monitor rooftop solar programs. It is also assisting state electricity regulatory commissions in these states to design an enabling regulatory environment for faster uptake of rooftop solar.

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