

Accelerating the transition of India's power sector

USAID's GTG program put in place the building blocks for power sector reforms that are central to meeting India's renewable energy ambitions.



The Greening the Grid (GTG) program was a partnership between the United States Agency for International Development (USAID) and the Ministry of Power (MoP), Government of India, under the U.S.-India Strategic Clean Energy Partnership (SCEP), one of the tracks under U.S.-India Climate and Clean Energy Agenda Partnership 2030. USAID designed GTG — a US\$30 million, five-year (2017-2021) program — to provide flexible yet systems-based approaches to support the efforts of India's central and state governments and the private sector to manage large-scale integration of renewable energy (RE) into the electric grid. GTG was implemented by Deloitte Consulting LLP.

GTG demonstrated a wide range of technical interventions to support the MoP's efforts to build a resilient and self-reliant power sector and meet India's ambitious RE targets. The Renewable Integration and Sustainable Energy (RISE) initiative, the central component of the GTG program, implemented a series of prioritized innovation pilots. These pilots were multi-implementer work programs designed to test and evaluate the building blocks for RE integration in India's state and national power grids. The program collaborated with India's key power sector stakeholders to design and implement the pilots and analyze their key insights. As India marches toward its goal to install 450 GW by 2030, the rich body of evidence from GTG-RISE pilots will prove critical in securing the Indian grid's resilience and reliability and pave the way for realizing India's clean, green energy goals.

Strategic Levers of the GTG program

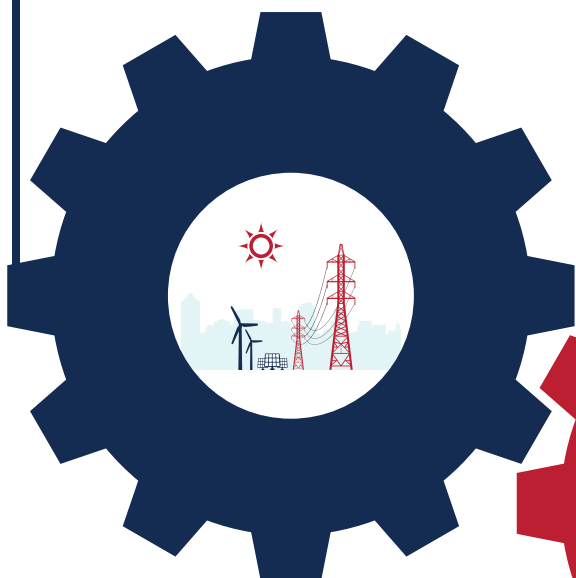
The GTG program combined four intertwined components, led by specialized partners, to validate the key building blocks of grid flexibility and inter-state power trade and create enabling conditions to scale.

Power system planning reforms

The Department of Energy's National Renewable Energy Laboratory (NREL) and Lawrence Berkeley National Laboratory (LBNL) conducted collaborative grid integration studies with India's key technical institutions at state and national levels. NREL also provided capacity building of India's power sector stakeholders, and supported grid integration pilots through modeling and developed open source tools.

India regulatory partnerships

The National Association of Regulatory Utility Commissioners (NARUC) partnered with the Central Electricity Regulatory Commission (CERC) to exchange best practices and case studies on policies, regulations, and markets in India. In addition, GTG-RISE through India's Forum of Regulators (FOR) supported 15 states with market transaction settlement plans and 19 states to finalize regulations to enable a well-functioning real-time electricity market.



US-India system operators partnership

US Energy Association (USEA) provided capacity building workshops, bootcamps, executive exchanges, peer reviews, and webinars for grid system operators, state-level regulators, and utilities to learn international practices. USEA facilitated relationships between the GOI and private sector and connected Indian stakeholders with experts in the US at the Federal Energy Regulatory Commission (FERC), US independent system operators, US Public Utilities Commissions, and other US utilities.

GTG-Renewable Integration and Sustainable Energy (RISE)

Implemented by Deloitte Consulting LLP (Deloitte), the GTG-RISE initiative included grid integration pilots to demonstrate the success of new technologies, methodologies, and pathways to enable integration of larger amounts of renewables into the grid at the state and regional level. As the secretariat and the coordination hub for the overall GTG program, GTG-RISE took the lead in enabling coordination and joint intervention opportunities across components.

THE GTG PROGRAM: KEY HIGHLIGHTS AND SUCCESSES



Modelled India's roadmap to **175 gigawatts (GW)** of renewable energy with National and two Regional Grid Integration studies.



Successfully made **2,120-megawatt (MW) coal capacity flexible**, creating room for 375 MW of RE to enter the grid.



Supported CERC launch India's groundbreaking real-time electricity market (RTM) in June 2020 with day-ahead market (DAM) reform implementation in April 2022.



Supported 15 states implement Scheduling, Accounting, Metering and Settlement of Transactions in Electricity (SAMAST) Framework



Showcased the value of Battery Energy Storage System (BESS) in the transmission sector.



Modeled BESS to support distribution utilities in balancing supply and demand and expand electric vehicle (EV) infrastructure.



Demonstrated how system operators can balance real-time fluctuations in supply and demand using automatic generation control and dynamic reactive power compensation.



Mobilized **\$22.72 million** in stakeholder investment with pilot results.



Trained around **2000+ people** in various workshops, international conferences, study tours, bootcamps, and webinars.



Modeled Demand Side Management (DSM) to flatten the demand curve for a distribution utility to optimize peak power procurement and power supply network planning.



Supported POSOCO for National Open Access Registry (NOAR)—an automated platform for real-time trades in power markets.



Developed open-source tools (EVOLVE and EFFORT) to help distribution utilities better understand impacts of emerging technologies and design optimized time-of-use (TOU) tariffs.



Supported 11 states in drafting and finalizing 19 (18 notified) DSM regulations and forecasting and scheduling (F&S) regulations for wind and solar generators.



Supported CERC to redesign ancillary services (AS) market through international practice review; evaluation of alternatives; simulations and estimations of economic impact; and more.



Mainstreamed women in the energy sector through South Asia Women in Energy (SAWIE), a platform to promote gender equality and women leaders in energy sector.

OUR RESULTS



More details about the GTG-RISE pilots and publications can be made available upon request. Kindly write to mhazra@usaid.gov for more details.

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