

EC-LEDS MEXICO: ADVANCING CLEAN ENERGY GOALS

USAID Mexico supports collaboration between the Government of Mexico and the National Renewable Energy Laboratory (NREL) under the EC-LEDS program.



THE EC-LEDS PROGRAM

Low emission development strategies (LEDS) are development plans that promote sustainable social and economic development while reducing greenhouse gas emissions over the medium to long term.

Enhancing Capacity for Low Emission Development Strategies (EC-LEDS) is a flagship U.S. government-led effort that assists countries in developing and implementing LEDS. The program enhances partner country efforts by (1) providing targeted technical assistance and (2) building a shared global knowledge base on LEDS.

EC-LEDS country partners include Albania, Bangladesh, Cambodia, Colombia, Costa Rica, Gabon, Georgia, Guatemala, Indonesia, Jamaica, Kazakhstan, Kenya, Macedonia, Malawi, Mexico, Moldova, Peru, the Philippines, Serbia, South Africa, Thailand, Ukraine, Vietnam, and Zambia.

EC-LEDS works with the government of Mexico to help meet its goals of reducing greenhouse gas emissions from the energy sector. The program targets specific, highly technical areas where Mexico has indicated the program can add value and make an impact.

Mexico's energy sector produces almost 20% of the national carbon dioxide emissions and 7% of black carbon. As part of its comprehensive strategy to reduce carbon emissions and address climate change, the Mexican government aims to generate 35% of its electricity from clean energy by 2024. In addition, Mexico's Nationally Determined Contribution (NDC) commits Mexico to a 25% reduction in greenhouse gas emissions and short-lived pollutant emissions by 2030, with a conditional goal, dependent on international support, of a 40% reduction in greenhouse gas emissions (Figure 1). The EC-LEDS program supports Mexico in reaching these goals through international cooperation.

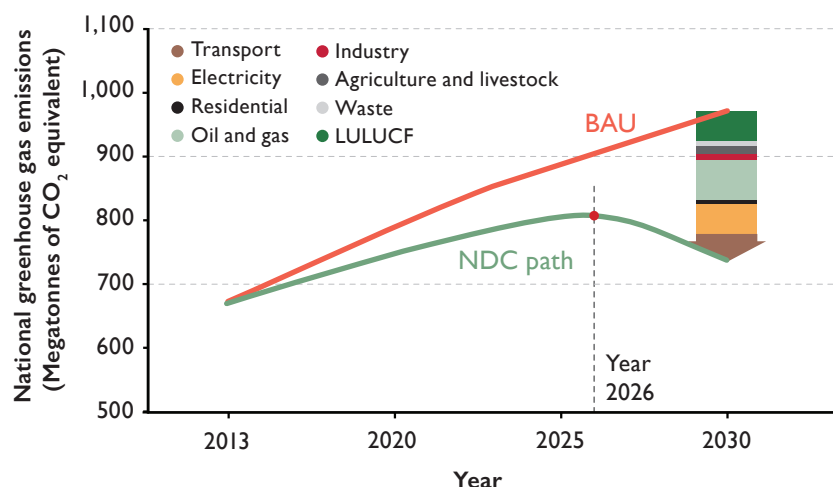


Figure 1. By following the Intended Nationally Determined Contribution (NDC) path rather than the Business As Usual (BAU) path, Mexico can slow the growth of and eventually reduce greenhouse gas emissions. SOURCE: IECC/INECC.GOB.MX/DOCUMENTOS/DESCARGA/2015_INDC_ING.PDF

In December 2015, Mexico passed the Energy Transition Law, which provides a legal framework for many actions that will help Mexico reach its clean energy and NDC goals. The law regulates the sustainable use of energy, articulates the electric industry's obligations regarding Mexico's clean energy targets, and establishes a tradeable clean energy certificate system for meeting clean energy targets. Concurrently, Mexican energy reform has led to the restructuring of the Mexican electricity sector and introduction of a new wholesale electricity market in January 2016, which will open the energy sector to private sector participation. The EC-LEDS program supports the Mexican government's clean energy goal and energy sector reform through analysis, technical assistance, and implementation support for clean energy technologies, policy design, and innovative financial solutions.

EC-LEDS and the government of Mexico are partnering in five key areas: renewable energy zones, geospatial data science, distributed generation, electric grid system support and integration, and subnational clean energy assessment and planning.

RENEWABLE ENERGY ZONES IN MEXICO

DESIGNING RENEWABLE ENERGY ZONES

The Energy Transition Law stipulates that the government of Mexico must obtain and use detailed information to evaluate zones with high potential for clean energy project development and to guide transmission expansion.

Designated renewable energy zones (REZs) can attract private investment for the development of large-scale renewable energy and transmission projects in specific geographic areas. EC-LEDS is helping Mexico develop and implement a REZ methodology and supports the implementation of that methodology. The REZ process (Figure 2) will enable analysis to define high renewable energy resource

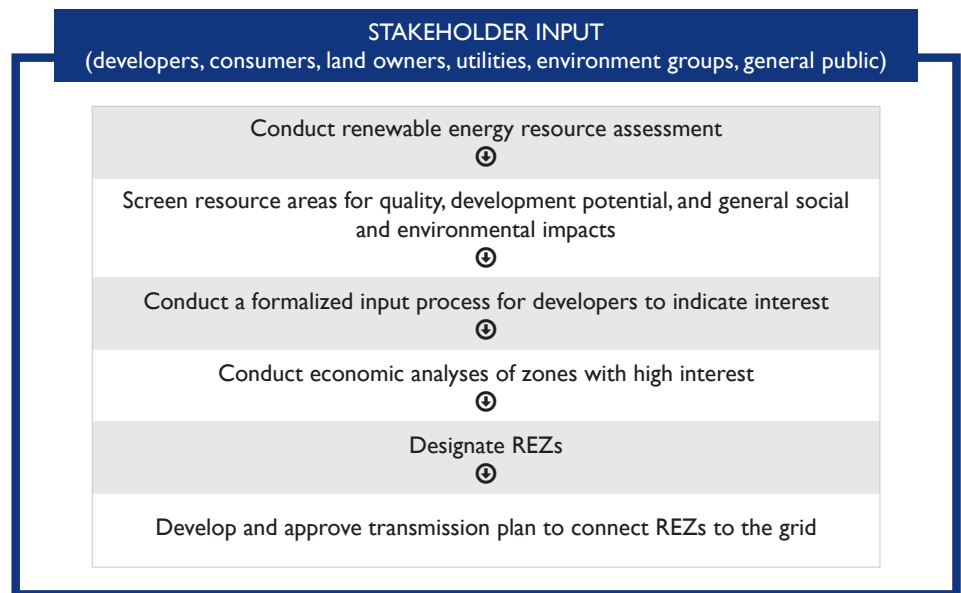


Figure 2. Developing a REZ involves a combination of technical and regulatory actions and is informed by stakeholder engagement at all phases. SOURCE: NREL/FS-6A20-65988

potential areas, facilitate public and private sector participation, and identify areas with strong economic drivers for investment in new transmission that will lead to cost effective renewable energy development. The overarching goal is to design and construct transmission infrastructure in a way that cost-effectively delivers the electricity generated by clean energy resources to load centers across the country.

GEOSPATIAL DATA SCIENCE ENHANCING RENEWABLE ENERGY RESOURCE CHARACTERIZATION

High-quality, detailed renewable energy resource data allow Mexico to perform technical, market, and policy analyses essential for facilitating clean energy investment and deployment. Through EC-LEDS, resource data experts have processed high-resolution solar satellite

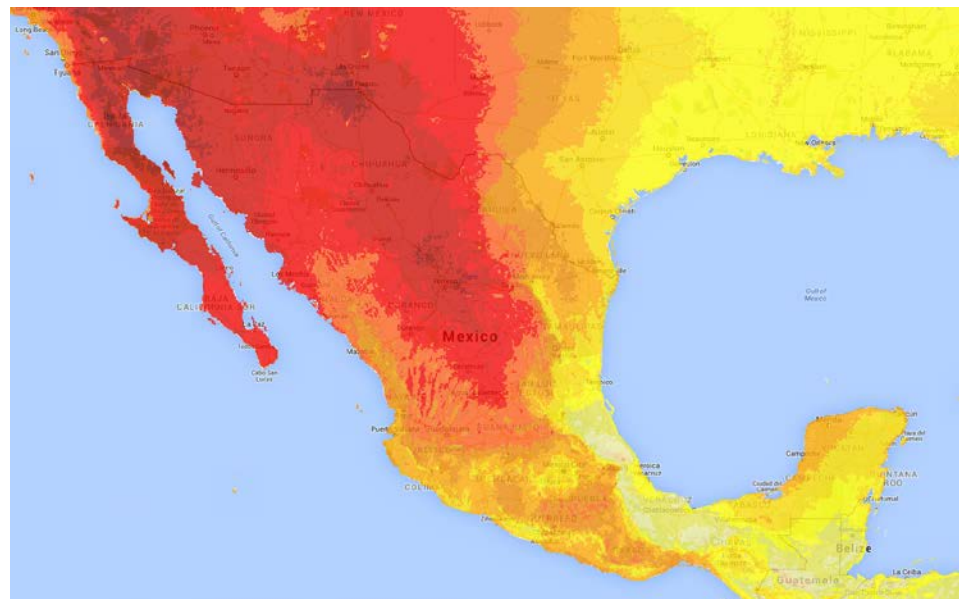


Figure 3. The National Solar Radiation Database for Mexico illustrates the country's excellent solar resource. Darker colors indicate higher solar resource. SOURCE: [NSRDB.NREL.GOV/NSRDB-VIEWER](https://nsrdb.nrel.gov/nsrdb-viewer)



Figure 4. Two delegates from Mexico's Electric Regulatory Commission (CRE) visit NREL to discuss different approaches to distributed generation compensation. PHOTO COURTESY OF EC-LEDS

data to enhance Mexico's existing renewable energy inventory (Figure 3). The program is fostering peer-to-peer expert assistance among U.S. experts and the Geophysics Institute at Universidad Nacional Autónoma de México (UNAM) and Comisión Federal de Electricidad (CFE) to improve Mexico's capacity for solar data collection, quality control, and calibration. The EC-LEDS program is also building high-resolution wind data that will be provided to Mexico in the future. An online geospatial toolkit is in development to complement Mexico's Atlas of Clean Energy Zones (AZEL) and allow users to access and query data.

DISTRIBUTED GENERATION

CREATING A DISTRIBUTED GENERATION RENEWABLE ENERGY OUTLOOK

The Mexican government informs the public about how it will meet clean energy goals through its National Electricity System Development Program (PRODESEN). With the Mexican government, EC-LEDS experts are developing guidelines and methodologies for forecasting distributed generation growth so that Mexico can have a more

comprehensive renewable energy outlook, understand potential impacts to the distribution network, and create appropriate policies and regulations.

CRAFTING DISTRIBUTED GENERATION COMPENSATION POLICY

Financial incentives for distributed generation can drive deployment of these technologies. Under Mexico's energy reform, distributed generation system owners will be compensated for the energy and other services they provide to the electric grid. EC-LEDS is supporting the Mexican government to develop methodologies for choosing among compensation mechanisms based on costs and benefits to various actors (Figure 4). These methodologies and the new electricity tariffs will be fundamental for Mexico to design appropriate policies.

MODELING SOLAR DISTRIBUTED GENERATION ENERGY SCENARIOS FOR BAJA CALIFORNIA SUR

Given Baja California Sur's high solar resources, current fossil fuel generation, and isolation from Mexico's electricity grid, the Mexican government is interested in

understanding the potential for and the impact of solar distributed generation in the Baja California Sur system. EC-LEDS supports renewable distributed solar scenario modeling. Potential technical challenges and solutions from this modeling will inform Baja California Sur power transformation roadmap.

CREATING ANALYTICAL TOOLS

EC-LEDS is creating Mexican versions of several existing, user-friendly distributed generation modeling tools, including the [System Advisor Model](#), to enhance Mexico's capacity to conduct technical, financial, policy, economic development, and market penetration analyses of distributed generation.

ELECTRIC GRID SYSTEM SUPPORT AND INTEGRATION

INTEGRATING CONCENTRATING SOLAR POWER WITH GEOTHERMAL

Developing geothermal resources can contribute to Mexico's clean energy goals. When geothermal fields diminish concentrating solar power plants (Figure 5) can augment the temperature of the geothermal resource. EC-LEDS, in partnership with the Mexican government, conducted a feasibility study that evaluated integrating concentrating solar power technologies in the Cerro Prieto geothermal plant in Baja California Norte. CFE is considering including this project—the first of its kind in Mexico—in its next capital investment plan.

EVALUATING THE NATIONAL ELECTRICITY SYSTEM DEVELOPMENT PROGRAM

PRODESEN is the indicative program for power sector generation, commissioning and decommissioning of power plants, and the expansion and upgrade programs for the national transmission grid and the general distribution networks in Mexico. The EC-LEDS program is assisting the Ministry of Energy (SENER), CRE, the Independent Grid Operator (CENACE), and CFE to design

appropriate methodologies and processes and harmonize the analytical tools for the development and evaluation of PRODESEN. This grid expansion program must comply with various requirements of reliability and flexibility, as well as the building of infrastructure to use renewable energy resources from a REZ.

EVALUATING ENERGY STORAGE

Storage technologies can provide flexibility to electricity grids with high penetrations of variable renewable energy. EC-LEDS will assist Mexico, through the Consultative Council for Energy Transition, with technical, economic, and financial studies for various energy storage solutions. These studies will help Mexico form of policies and regulations and evaluate of projects.

SUBNATIONAL CLEAN ENERGY ASSESSMENT AND PLANNING

CRAFTING CLEAN ENERGY PLANS FOR VARIOUS MEXICAN STATES

With the passing of the energy reform, various Mexican states with high renewable energy resources are positioning themselves to take advantage of newly created opportunities and to provide economic growth in their state, all while contributing to the reduction of greenhouse gas emissions and the achievement of clean energy goals. The EC-LEDS program helps states evaluate their renewable energy potential from wind and solar resources and promote state clean energy programs and policies.



Figure 5. A concentrating solar power collector. PHOTO BY WARREN GRETZ, NREL 02333

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