Haiti grid-scale energy storage

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About 49% of the population of Haiti had access to electricity as of 2022. In rural areas, that number is closer to 2%, and while 80% of Haiti"s urban areas have access to electricity, that access may not be reliable.

"Even when a household is connected to the power grid, they might only have power for three to eight hours a day." explained Josue Noel, the energy program management specialist at the United States Agency for International Development (USAID). "In the event of an outage, they may be without electricity for days or even weeks."

More than two centuries of foreign interference, political instability, economic constraints, and natural disasters have left the Caribbean nation one of the poorest in the world and among those with the highest rates of energy poverty. Haiti"s energy access and infrastructure remain critically underdeveloped.

In addition, Haiti relies heavily on imported fossil fuels, which are expensive, harmful to the environment, and exacerbate existing challenges to Haiti"s energy sector. Renewable energy technologies like solar power are on the rise but have been slowed by longstanding challenges, including limited opportunities to gain specialized technical expertise.

In the face of these obstacles, Haiti is forging a path toward energy resilience with support from USAID and the National Renewable Energy Laboratory (NREL). Central to this effort is the development of energy modeling frameworks and trainings, microgrids, agrivoltaics, and off-grid solar power to enhance energy resilience and security in Haiti. Through a series of collaborative projects, USAID and NREL are working together with Haitian stakeholders to enhance local workforce capabilities, develop robust regulatory frameworks, and, eventually, deploy cutting-edge technologies.

In a bid to reshape Haiti"s energy landscape, USAID and NREL will support Haiti"s ministries and government in formulating the country"s Integrated Resource and Resilience plan, which is a comprehensive energy sector master plan that envisions a sustainable, secure, and resilient energy future for Haiti. This plan will serve as a long-term guide for energy stakeholders and will include key analysis, cost estimations, and planning to help inform decision-making.

"I expect USAID-NREL"s help with developing minigrid regulation to play a catalytic role in boosting minigrid development in Haiti," said Nicolas Allien, a senior energy consultant who previously served as head of the energy unit at Haiti"s Ministry of Public Works, Transportation, and Communication. "Of course, the next step is to make sure those regulations are adopted and enforced."

Haiti enjoys abundant sunlight throughout the year, making it an excellent candidate for solar power systems. However, the land most suitable for solar generation deployment often overlaps with prime agricultural areas

for small-scale farmers, creating potential for conflict between energy access and the preservation of local food security and livelihoods.

To address the intricate connection between energy access and food security, the work with Haiti explores the potential for agrivoltaics--a convergence of solar energy generation with agricultural activities. Through research and stakeholder engagement, USAID and NREL published a framework to adapt agrivoltaic solutions for minigrid contexts in Haiti. These solutions aim to boost energy production, thereby addressing energy poverty, and increase agricultural yields, thereby addressing food insecurity.

In parallel with other efforts like minigrid development and national grid planning, off-grid solar also has the potential to play an important role in advancing Haiti"s energy access. As the name suggests, off-grid solar systems operate independently from the traditional electricity grid. However, the market and business models for off-grid solar in Haiti are still nascent. This highlights a need to build foundational capacity for off-grid solar--in other words, to prepare Haitian stakeholders to understand, plan, and manage off-grid solar and other clean energy projects.

"Off-grid solar, along with minigrids, agrivoltaics, and other solutions based on renewables, are the future for Haiti," Noel said. "But one major issue for us, in both the public and private sector, is access to trained, qualified professionals."

With these needs in mind, NREL worked with the Facult? Des Sciences de l"Universit? d"Etat d"Ha?ti to develop a bilingual primer course that provides key information and concepts for off-grid solar in Haiti. This program aims to equip stakeholders with the requisite skills and knowledge to leverage off-grid solar technologies effectively.