Isolated but Innovative

Learning from Islands

Island living has many charms—you need only turn on HGTV or flip through the pages of an in-flight magazine to briefly indulge in the appeal of escaping to an island. While the perks of living on an island may seem as endless as the ocean views, living surrounded by the ocean has its drawbacks. Stable, reliable access to power is taken for granted on the mainland U.S., but on an island, this isn't the case.

In the face of unstable access to traditional—and typically fossil fuel-based—generation sources, islands have become fertile ground for testing deployments of renewable resources and inventive strategies for load management. We invite you to take a tour of three U.S. islands where local utilities and governments, alongside residents and business owners, have developed novel approaches to ensure consistent access to clean and renewable power that might just inspire creative actions on the mainland.

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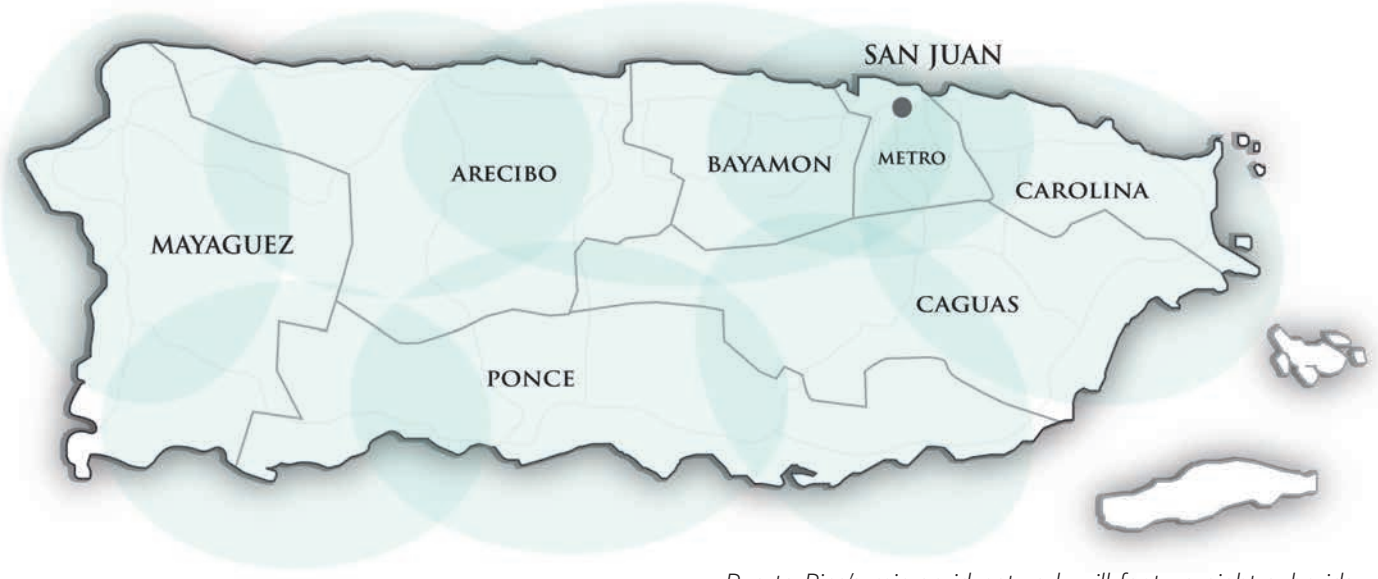

Puerto Rico's microgrid network will feature eight subgrids, powered by smaller generators.

Puerto Rico

The hurricanes of September 2017 devastated the island of Puerto Rico. First, Hurricane Irma downed powerlines and caused flooding. Then, a mere two weeks later, Hurricane Maria raged across the island and caused the longest blackout in U.S. history—it took 328 days for power to be restored to all neighborhoods.[1] Most of the generation facilities, located on the south side of the island, sustained minimal devastation. However, the transmission and distribution lines that provide power to the mountainous regions and the highly populated communities on the north side of the island sustained significant damage. The average citizen went 84 days without power after Hurricane Maria.[2]

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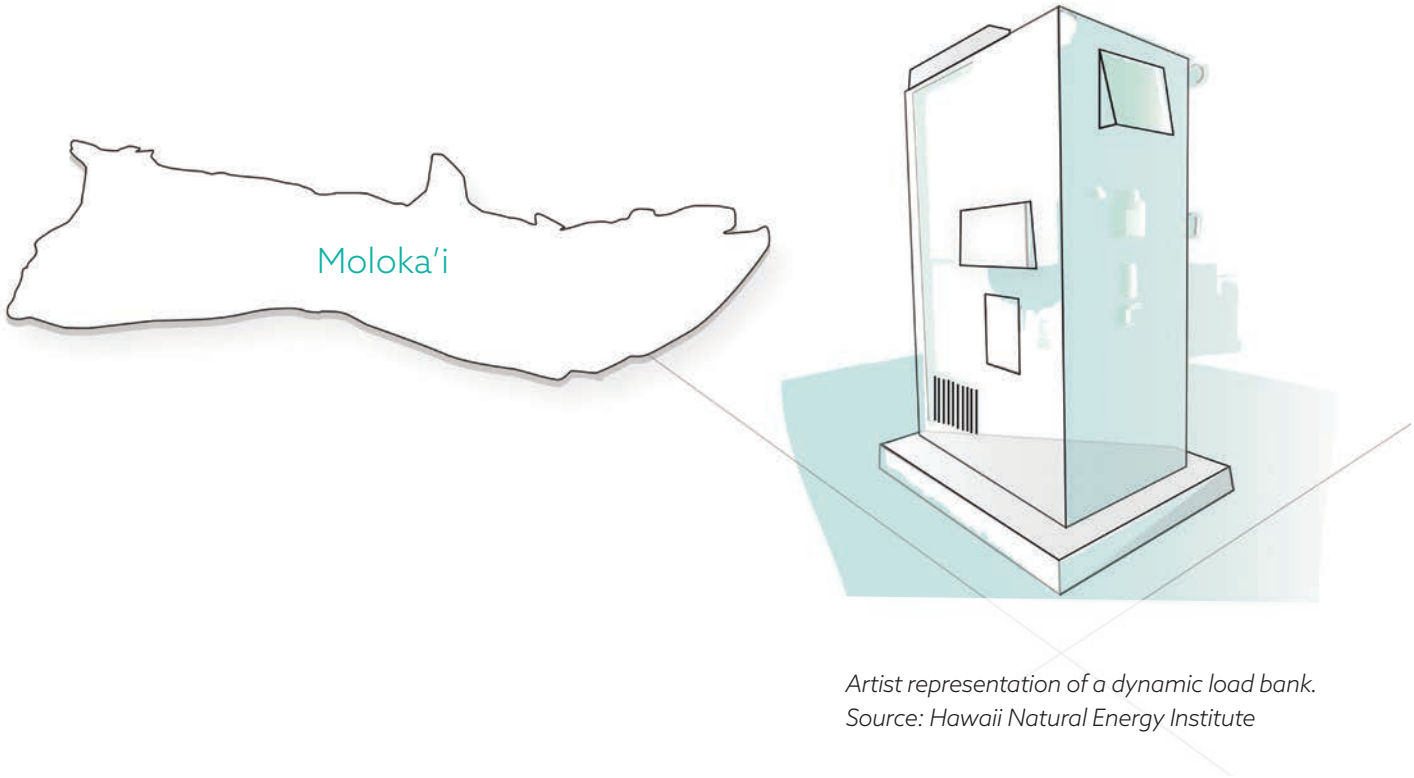
Lacking electricity for months on end, individuals, businesses, and communities turned to microgrids with solar-plus-storage systems to provide power and pump water.[3] Looking toward the future and in response to concerns about a vulnerable centralized system, the Puerto Rico Electric Power Authority (PREPA) put forth an innovative plan to redesign the power system and decentralize generation, dividing the island into several mini grids (with smaller microgrids) together under normal operation, or independently, in the case of a disaster.[4] The plan also increases reliance on solar energy with battery storage for resiliency and as a step towards meeting a goal of 100% renewable generation by 2050. All in, Puerto Rico is significantly reducing the likelihood of a repeat of the 2017 outages.



Artist representation of a dynamic load bank.
Source: Hawaii Natural Energy Institute

Hawaii

Hawaii has some of the highest electricity costs—more than double the national average—driven by the reliance on coal and petroleum to meet the state's energy needs.[5] Given these high costs, renewables, particularly solar, have offered the opportunity for Hawaiians to produce their own energy at a lower cost. Commercial and residential customers have adopted solar in large numbers and, in 2018, the state set a goal of 100% renewable energy generation by 2045.

High solar adoption has brought its own challenges, such as overproduction, which can lead to blackouts. The Island of Moloka'i, serviced by Maui Electric Co. (MECO), has developed programs to counteract overgeneration, and stands as a model for the rest of the state with higher levels of solar penetration than the other islands. MECO recently installed a state-of-the-art resistive dynamic load bank to accept excess solar energy. The bank removes energy from the grid when energy is overproduced and allows for an additional 725 kW worth of new rooftop solar energy panels to be built without overloading the grid.[6] Additionally, MECO recently approved purchasing electricity from a new solar project with a 3-megawatt battery expected to come online in Moloka'i in late 2019. This utility-scale energy storage model will allow excess solar energy to be banked and then used when solar production is not available.[7] Hawaii is one to watch as the state works toward 100% renewable energy in the next few decades.

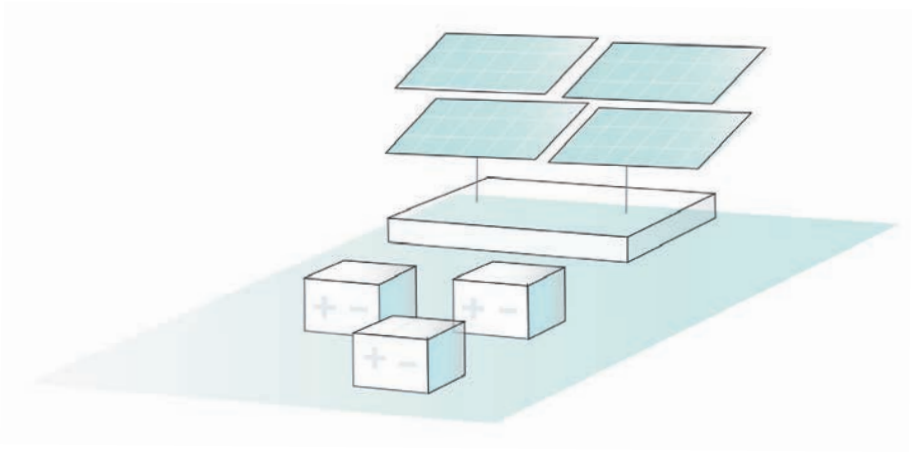
Isle au Haut, Maine

As Maine's rocky coast curves east and the cold water becomes more hospitable to seals and lobsters than humans, crustaceans scurry over a 6.5-mile 15 kV underwater cable that connects Isle au Haut with the mainland that provides it with power. Because this cable is two decades past its expected life, residents worry it will be too expensive to replace and the island will revert to diesel to power its homes, school, town hall, and local store. With an eye on cleaner and more resilient alternatives, Isle au Haut Electric Power Company plans to convert to a non-profit co-op and sever its reliance on Emera Maine.[8] Jim Wilson, president of the island's utility has thought through this scenario many times. "We can fail but if we do, it's our own fault. The other side of that coin is that if the mainland grid goes dark, Isle au Haut will be insulated from that broad-scale failure."[9] In doubling down on stability, the tiny island on the tip of Maine will likely produce 100% renewable power through a 300Kwh solar array, 1 MWh of battery storage, and microgrid. Another win-win for islanders? Avoided costs of grid-purchased power.

"We can fail but if we do, it's our own fault. The other side of that coin is that if the mainland grid goes dark, Isle au Haut will be insulated from that broad-scale failure."

— Jim Wilson

President, Isle au Haut Electric Power Company



A rendering of Isle au Haut's solar-plus-storage microgrid.

Our Take

If necessity is the mother of invention, then we hope mainland utilities are taking a page from islands. As customers increasingly demand utilities come to the table with bold solutions to climate challenges and the industry transitions away from fossil fuels, there will be a lot to learn from these island testing grounds.

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