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Electricity grids are the largest machines in human history, comprised of diverse equipment used to generate and transmit the power that enables our modern lifestyle. Behind the equipment and vast network of connections are the system operators, the people who ensure that our electricity needs are met at every second. In nations big and small, a reliable electricity supply underpins the economy and is central to daily life in today"s world. And while a temporary loss of electricity at home is an inconvenience, in critical facilities such as hospitals and military bases, it can be life threatening--causing disruption to essential services or military readiness. One way to address this risk is to develop microgrids--small networks that generate electricity for local consumption.

Hundreds of microgrids are in operation today, and they are growing in number around the world. They also present an opportunity to glean insights across various microgrid configurations, namely connected or isolated hybrid systems that integrate a high amount of variable, renewable energy resources.

In recent years, the costs of solar and wind energy have fallen significantly. The journey down the cost curve now means that solar and wind are cost competitive with traditional fossil fuel technologies. This enables microgrids to meet clean energy goals economically, while also achieving their primary purpose of providing adequate redundancy to ensure electricity supply reliability.

Microgrids can be connected to the larger electricity grid; however, in the event of a widespread outage, microgrids will disconnect from the main grid and continue to operate independently to maintain electricity supply to the homes and businesses that are connected to the microgrid"s electricity network. The same incentives leading to an increased uptake of connected microgrids--improved reliability, greater sustainability, and lower costs--are also driving the transformation of isolated microgrids, such as island grids. Island electricity systems are isolated from a larger electricity network, so they must supply their own electricity at all times without depending on a larger grid system for reliability and power quality management.

Caribbean islands, including those that partner with the Clinton Climate Initiative and the Islands Energy Program of Rocky Mountain Institute--often recognized as Rocky Mountain Institute-Carbon War Room (RMI-CWR)--exemplify isolated microgrids. For years, these grids have relied on diesel-based, centralized generation to supply electricity to residents and businesses. This is changing. Now, many isolated microgrids are leading the way in energy transitions to utilize energy efficiency and renewable energy at both utility and distributed scale.

Small island developing states demonstrated inspiring leadership during the 2016 Conference of the Parties in Paris, and are now taking steps to transform their electricity systems to utilize more locally available and sustainable resources. Solar photovoltaics (PV) and wind turbines for example, along with energy storage options, allow these isolated microgrids to meet international climate commitments, increase energy

independence, and reduce emissions. For example, Saint Lucia"s first utility-scale renewable energy project is underway; once fully constructed and operational, the 3 megawatt (MW) solar PV system could reduce CO2 emissions by 4,000 tons per year while having the capacity to provide electricity to the equivalent of 3,000 homes in Saint Lucia.

Islands in particular can lead both energy transition and knowledge sharing throughout the process. Large, developed countries have historically led innovation, technological advancements, and operational best practices. Acknowledging that the health of the grid and thus the national economy is rooted in a robust electricity supply, coupled with the disadvantages of energy dependence, governments and electric utilities on islands now have the unique opportunity to lead and advance renewable microgrids.

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Climate-change driven heat, hurricanes and wildfires are proving to be formidable enemies of the electric grid. A recent study from Climate Central found that more than 80% of major power outages are weather-related and that the last decade experienced an 80% increase in outages over the previous decade.

In the Caribbean, hurricanes and storms are the biggest weather threat. That"s why clean energy non-profit RMI has been hard at work in the region demonstrating the power of microgrids.

Since 2014, RMI has been active in 20 Caribbean jurisdictions and has supported more than two dozen solar and microgrid projects, according to Christopher Burgess, director of projects for the RMI Islands Energy Program. Fifteen of the projects are solar and storage microgrids.