Juzel Lloyd, *Lawrence Berkeley National Laboratory*
Hamna Tariq, *Energy for Growth Hub*
August 2025

Powering the Islands: Is Nuclear Energy the Next Frontier for the Caribbean?

The Caribbean is home to some of the highest electricity prices in the world, driven by isolated markets with limited grid interconnection and a heavy reliance on imported fossil fuels, making the region especially vulnerable to supply chain shocks. Yet even as countries across the region pursue greater energy independence, nuclear energy has long remained off the table. However, that may be changing.

FIGURE 1: Caribbean Electricity Tariff vs United States and Global Average

Country	Residential tariff (USD$/kWh)
Cayman Islands	0.43
Barbados	0.31
Bahamas	0.28
Belize	0.22
Jamaica	0.22
Trinidad and Tobago	0.06
United States	0.19
Global Average	0.17

Created with Datawrapper

Source: Global petrol prices (December 2024)
Notes: Sample of Caribbean countries representative of the region. Most Caribbean countries have a higher residential tariff than the global average of $0.165/kWh. The United States' current residential tariff is $0.192/kWh. Trinidad and Tobago is a producer of oil and natural gas, hence its relatively low residential tariff.

In December 2023, Jamaica signed onto the global Declaration to Triple Nuclear Energy Capacity by 2050, and in October 2024, signed an MoU with Canada to explore advanced nuclear technology. Across a growing number of technical meetings and regional energy forums, the possibility of small modular reactors (SMRs) powering the region is emerging as a new point of discussion.

Unlike conventional, large-scale nuclear plants, which are unrealistic for the region's small grid sizes, SMRs can be a potential alternative: more compact, resilient, and weather-hardened sources of firm power. With rising energy needs, weather vulnerability, and volatile import

costs, nuclear could offer a crucial complement to energy sources in the Caribbean. But the road ahead remains steep, and the real test lies in financing, regulation, and sustained political momentum.

What's There Now: Research Reactors and Preliminary Moves

The Caribbean currently has no nuclear power plants. The only operating nuclear energy facility in the region is Jamaica's SLOWPOKE-2 research reactor, a 20 kW unit used for research and training since 1984. In 2015, Jamaica passed the Nuclear Safety and Radiation Protection Act, establishing the Hazardous Substances Regulatory Authority (HSRA) to oversee nuclear safety. With support from the International Atomic Energy Agency (IAEA), Jamaica has since made slow but steady progress towards building the legal and institutional frameworks needed for civil nuclear power. Jamaica's partnership with Atomic Energy of Canada Limited and Canadian Nuclear Laboratories to cooperate on nuclear science and technology, including SMRs, signals an important step towards the island's nuclear readiness.

Elsewhere in the region, interest in nuclear energy is mixed. In the 1980s, Cuba began (but never completed) the construction of a Soviet-backed nuclear power plant. The Dominican Republic hosts a radioactive waste facility but has made no nuclear power commitments. A 2021 DOE-sponsored feasibility study identified two potential sites for SMRs in Puerto Rico, noting their potential to support grid resilience in a hurricane-prone environment. While regional interest in nuclear remains limited beyond Jamaica, that does not diminish its potential as a valuable asset for Caribbean islands seeking resilient energy options.

Why Nuclear Could Make Sense in the Caribbean

For most island states, reliable baseload electricity remains elusive. Hydropower varies across the region, and is notably absent in the larger economies such as the Bahamas, Dominican Republic, Jamaica, and Puerto Rico. Significant geothermal energy potential exists — particularly for the volcanic Eastern Caribbean islands — but high upfront costs have been a major barrier to deployment. Fossil fuels dominate power generation, often accounting for over 90% of electricity supply across the Caribbean. High dependence exposes countries to price spikes and fuel import disruptions, while driving some of the highest electricity tariffs globally and weakening long-term energy security.

To solve this issue, most Caribbean islands are turning to renewable sources such as solar and wind power. While these sources are critical components, they alone cannot provide the stability, reliability, or firm capacity these islands need — especially as their energy demands grow with economic growth. Islands like Jamaica require diversified energy systems that include resilient power sources that can complement renewables.

Nuclear energy offers a firm, energy-dense alternative that can operate around the clock and with high structural integrity, making it well-suited to weather-vulnerable regions. For small islands with limited land and high power needs, such as Jamaica (where peak demand tops 692 MW), SMRs and microreactors, ranging from 1 MW to 300 MW, could offer a compact, long-term solution. A 300 MW SMR can use up to 7.5 acres of land. Comparatively, utility scale

solar takes 5-7 acres of land per MW or 1,500 to 2,100 acres to generate the same amount of electricity.

Even while sized to serve only a small portion of the energy mix, their key role would be in adding a resilient power source to the grid. And though upfront costs are high, nuclear's large energy density and reliability can help drive down electricity prices over time. This is because nuclear power plants operate at high capacity factors and require relatively little fuel, resulting in lower operating costs compared to fossil-based alternatives.

Why It Hasn't Happened

Despite its promise, nuclear development in the Caribbean faces serious headwinds.

First, the upfront costs are staggering. According to IEA's latest nuclear report, capital costs of SMRs in China average $2,500 per kW or $250 million for a 100 MW SMR (which would be a reasonably sized plant for Jamaica). For comparison, Jamaica's latest national budget is roughly $7.9 billion. Average capital costs of SMRs in the US are about $5,000 per kW. With limited fiscal space, Caribbean governments will need major external financing and risk guarantees to pursue any nuclear project. The World Bank's removal of its nuclear financing ban is a step in the right direction.

Second, legal frameworks require reform. While Jamaica has signed an agreement with Canada to explore nuclear technologies, the island's laws currently prohibit the development of a nuclear power plant. Legal reforms will be needed before a commercial plant can move forward. Other Caribbean nations have yet to formally explore nuclear energy, but could start by undertaking exploratory research and feasibility studies.

Third, public perception remains a major hurdle. Safety concerns and unfamiliarity are compounded by limited public engagement and technical capacity. The team operating Jamaica's research reactor is small (under 20 people), and nuclear engineering training remains minimal across the region.

Finally, siting remains a challenge. While SMRs offer structural advantages, like compact, weather-hardened designs, the region's seismic activity, hurricanes, and weak grid interconnection still demand careful planning and broader infrastructure upgrades.

Still a Long Way to Go

Nuclear is not around the corner in the Caribbean: no country has formally integrated it into its energy strategy, and no reactor deals have been signed. Still, new pathways may be emerging. The US government's recent executive orders supporting new 123 Agreements could open the door for future partnerships. The MoU with Canada is another signal that Jamaica is laying early groundwork for potential deployment.

More than any single project, what matters now is building the groundwork: regulatory readiness, public trust, site assessments, and financing options. Jamaica, as the region's current leader, could become a blueprint for others if it reverses its nuclear ban and makes tangible progress on its deal with Canada.

Conclusion

Caribbean nations seeking to diversify away from expensive, unreliable power systems should consider giving nuclear power a seat at the table, just as they have with other firm sources such as geothermal and hydropower. SMRs won't solve all problems, but they could offer firm power in ways other sources, such as solar and wind, cannot. With several islands facing land constraints, rising electricity demand, and vulnerability to fuel price shocks, excluding nuclear energy would mean ignoring one of the few scalable options capable of providing baseload power under such conditions. If the Caribbean wants to build resilient and affordable electricity systems, it should keep exploring nuclear's role in the region's future energy mix.