

Energy in the US Virgin Islands and Small Island Developing States



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1. Introduction

Small Island Developing States, also known as SIDS, are a collection of fifty-eight islands across the world which experience similar social, environmental and economic challenges. They are disproportionately affected by the impact of climate change, particularly due to their small land area being submerged as sea levels rise, and the increased frequency of natural disasters which are costly and can take years to recover from.

Our report focuses primarily on the Small Island Developing State of the United States Virgin Islands (USVI), but the implications and applications discussed in this briefing can and should be applied to other SIDS, and adjusted for their particular geographic, social, and political circumstances.

Throughout this briefing, we will take a closer look at energy solutions to diversify energy and electricity sources in the US Virgin Islands. Currently, a lack of energy diversification is causing extreme dependence on fossil fuels for all forms of household, commercial and transportation energy use. This is a concern for energy security to the United States citizens of the US Virgin Islands.

We propose that the United States Department of Energy invest in the US Virgin Islands to create a fully autonomous, energy independent state - pioneering a holistic energy structure for Small Island Developing States in order to advance small regional energy solutions.

2. Geography, Natural Resource and Geostrategic Area in Connection to Energy

The US Virgin Islands (USVI) are geopolitically significant in their immediate territory and as an overseas territory of the USA, but more so, their identity as Small Island Developing States (SIDS) incorporate them into a community that expands far beyond the Caribbean. SIDS are mostly distributed throughout the Caribbean and South Pacific, with others scattered throughout the Indian and Atlantic Oceans. SIDS share common characteristics in their vulnerabilities and unusual geographic features. They also offer unique opportunities for energy infrastructure development and pilot economic ventures. Each Small Island Developing State has distinctive features and resources, so the development of energy transitions in these states may all look different, while sharing other common features.

The USVI are part of a chain of islands known as the Lesser Antilles, located about 45 miles east of Puerto Rico, in the Caribbean Sea (Encyclopedia Britannica, n.d.). The USVI consists of three main inhabited islands: St. Croix, St. John, and St. Thomas. There are also an additional fifty smaller islets that are a part of the US Virgin Islands, but they are small with rugged terrain, thus not inhabited by people. Due to their equatorial location and climate, there is great potential for the USVI to generate solar power, but topography of the islands and frequent tropical storms must be considered

when implementing solar and wind infrastructure. Natural disasters are a major player in energy infrastructure, as well as social wellbeing.

The USVI's economy is primarily formed around tourism and manufacturing. The 2019 GDP amounted to 4.1 Billion USD. The population is calculated to be just over 105,000, but due to the 2 million tourists that visit each year, the number of people on the islands at any given time can be much higher than just the local population (World Bank, n.d.). As an unincorporated territory of the United States, the islands are heavily reliant on imports for food and fuel. The islands operate two separate power grids on St. Thomas and St. Croix. As of 2010, less than ten percent of the US Virgin Islands' electricity was produced via renewable energy, and the existing renewable energy infrastructure is entirely solar.



Figure shows map of existing Small Island Developing States (Hickey, 2020).

3. US Virgin Islands Context and History

Through the 1400s, the Virgin Islands were settled by the Arawak people, who were then displaced by the Carib people, the namesake of the Caribbean region. In 1493, Christopher Columbus arrived at the Island of St. Croix on his second voyage to the Americas (Government of the Virgin Islands, n.d.).

Perhaps the most pertinent historical references include the island's context in history as a stage ground for later attacks in the English-Spanish conflict or as a stopping point en-route home from American exploration. Such exploration included Columbus in 1493, as well as Sir Hawkins, a mogul in the slave trade who stopped at the islands with a cargo of slaves towards Hispañola. The islands had a minor role in slave transportation following the sale of the Dutch West India Company to private bidders seeking to build slave pens.

Spanish claim of the islands discovery but never settled the Territory, though some sources suggest the first Spanish settlers mined copper on the main island of Virgin Gorda though there is no archaeological evidence of such mining or settlement.

The location of the islands was historically significant for the Dutch as midway territory between Dutch colonies in South America (Suriname) and New Amsterdam (now New York City), using the islands as cargo exchanges.

The United States Purchased the US Virgin Islands from Denmark in 1917 as a cautionary measure to ensure that the islands would not be seized and used as a German submarine base. The inhabitants at the time became regarded as citizens of the United States in 1927. They have a non-voting delegate to congress and hold a different governing body, while still being a part of the US.

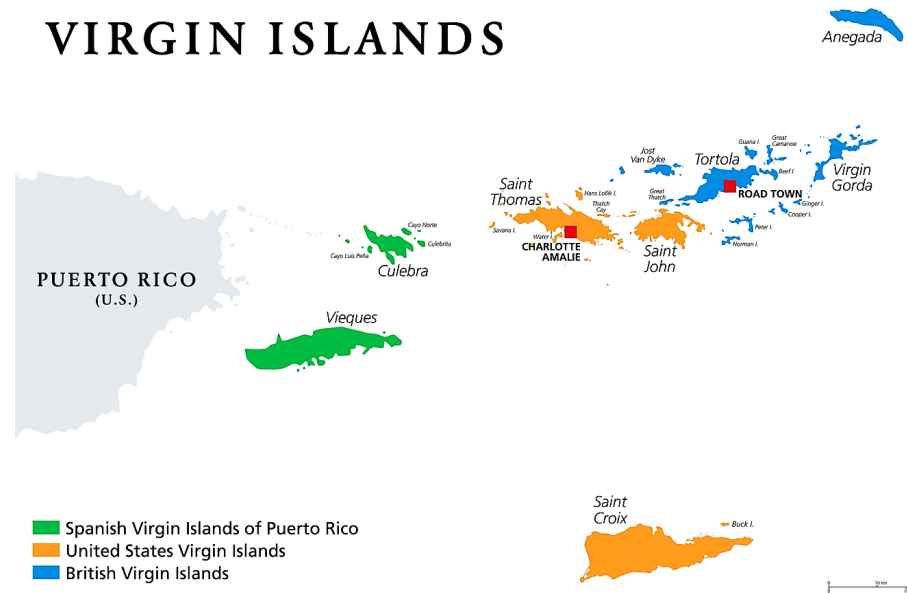


Figure shows map of Virgin Islands (World Atlas, 2022).

4. Actors: People, Organizations, Relationships & Networks

The United Nations (UN) has been a major global actor involved with SIDS. Several UN programmes have been designed in order to support SIDS economically, socially and environmentally. The three major programmes were the Barbados Programme of Action (1994), the Mauritius Strategy (2005) and the SAMOA Pathway (2014). The Barbados Programme of Action affirmed policy, measures, and actions to be taken on regional, national and international scale to allow SIDS to achieve sustainable development. The Mauritius Strategy was implemented in 2005 to address the gaps recognized in the Barbados Programme of Action, it notes an increased focus on culture, health and economy. The SAMOA Pathway recognized the specific and unique conditions that SIDS face, including food security and disaster risk reduction; it pivoted toward the implementation of sustainable energy and disaster mitigation by

connection of SIDS globally, UN agencies, and other international development partners (UN, n.d.). The USVI are not represented at UN-Member states meetings, although other SIDS are a part of the UN. In total, there are 38 SIDS that are UN member states and 20 that are non-UN members.

There are currently multiple organizations working on the USVI initiatives to reduce fossil fuel use by 60% by 2025. The National Renewable Energy Laboratory (NREL) is one of the main actors in implementing practices to reduce fossil fuel usage in the USVI. Oil companies are also major players in the transition for islands to become less dependent on fossil fuels. The USVI does not have any known crude oil reserves, though the island of St. Croix hosts one of the world's largest crude oil refineries. However, this refinery has been in and out of operation since 2012 and is currently processing less than half of its earlier production of 500,000 barrels per day (Energy Information Administration, 2022). The location of a refinery in the Caribbean is particularly valuable given the closure of many facilities in recent years and proximity to producers such as the USA, Guyana and Brazil. The USVI has particular strategic relevance to US energy with the presence of such a high capacity refinery and exclusion from the Jones Act (Van Schaik 2022). The refinery facility on St. Croix, formerly known as HOVENSA, is plagued with issues including a recent Prevention of Significant Deterioration permit under the Clean Air Act, which indicates significant detrimental effect on the local environment (US EPA 2022). Such environmental impact due to facility degradation is a direct impact from the oil industry onto the local community influencing the health and wellbeing of the island's inhabitants. Following bankruptcy, the facility was acquired in January 2022 and deemed a worthwhile venture given the elevated petroleum prices following the COVID pandemic and period of inflated petroleum market due to the Russia-Ukraine crisis (Van Schaik 2022). The projected reopening of the facility will continue to impact the local economy, but also further strengthen US security in supply.

Citizens and businesspeople of the USVI will also be impacted by any energy transition that occurs on the island. The households of the islands are impacted by the cost of energy and electricity, as well as any person or business involved in the transportation sector. This includes people who have motorized vehicles on land or in the water, as all transportation-related fuels are dependent on imported fossil fuels. Currently, most of the renewable electricity on the islands is from household solar-panels, and non-commercial sun-farms. Local solar panel installers are also projected players set to benefit from the transition away from fossil fuel use.

The USVI Water and Power Authority (WAPA), created in 1965, is the unanimous public utility company for all the US Virgin Islands. The WAPA is a particularly vulnerable actor because it is a major supplier of energy and water, and is also a controller of desalination plants, which if damaged, could have major effects for the entire community dependent on WAPA utilities. Current actions taken by WAPA have included upgrading existing power plants to facilitate different fuels, particularly liquefied petroleum gas (LPG), with a floating LPG storage unit feeding the plants on St. Thomas and St. Croix (Wärtsilä & Newnham, 2020). Techniques such as ocean thermal energy conversion (OTEC), offshore wind, marine and hydrokinetic (MHK) energy were excluded from the NREL roadmap for USVI due to limited commercial deployment (National Renewable Energy Laboratory, 2011), but Ocean Thermal Energy Corporation

conducted a feasibility study for an OTEC project commencing in the USVI (Ocean Thermal Energy Corporation, 2022). Plans for such developments were not found, but propose an interesting future for niche renewable energy plans tailored to island geography.

5. Issue Contested

Island transitions to renewable energy present complications in the technical, political, financial and social fields. Technological issues include land availability and grid integration. Regulations, building codes, and high project costs can also present stumbling blocks for the integration of renewable energy sources. Socially, there can be resistance to projects due to the alteration of natural land and the visual impact of renewable energy sources, such as the placement of solar panels or wind turbines (National Renewable Energy Laboratory, 2011). Lock-in can also occur with energy and electricity customers who may be skeptical of new processes. (Shah, 2022).

Another complication to anticipate with the transition to renewables on Small Island Developing States is that these island inhabitants may feel that it is not their responsibility to make changes because they are not the primary producers of carbon emissions that are contributing the most to climate change. They may feel that it is in the hands of larger emitters such as the United States or China to make appropriate changes in their energy procedures and consumption in order to slow the pace of climate change. The key in combating this social obstacle is making it known that Small Island Developing States have the unique opportunity to lead the way in small-scale energy transitions because of their unique and isolated geographic characteristics.

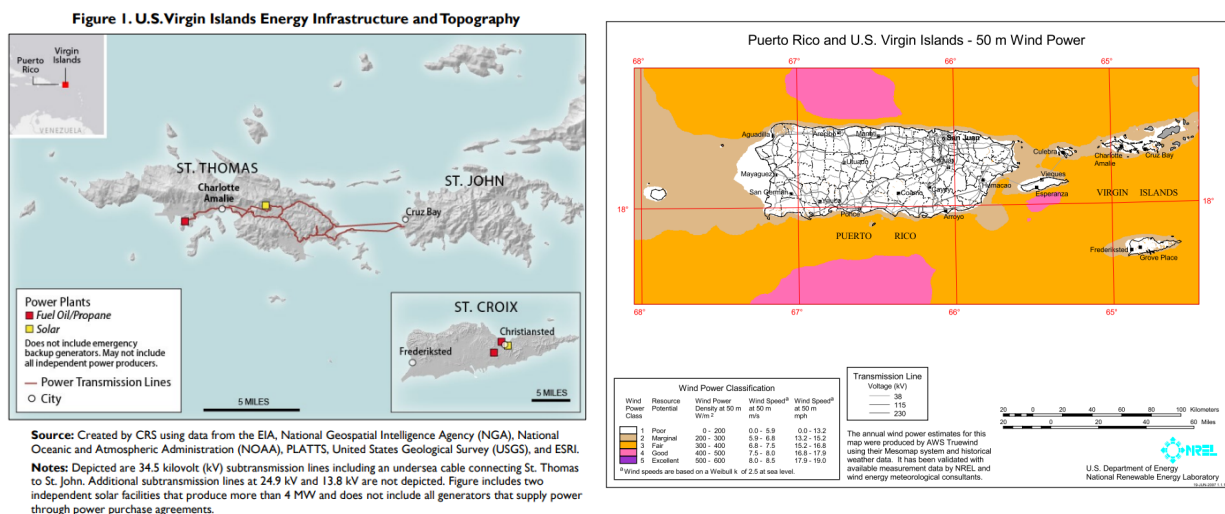
It should be understood that introducing renewable self-dependent energy systems to small island developing states is not an approach at stopping large-scale carbon emissions, but rather, is a way to mitigate negative economic and environmental impacts of current dependencies of Small Island Developing States on fossil fuels. By diversifying the energy sources and decreasing dependence on fossil fuels, there will be more energy security and overall independence for the people residing in these Small Island Developing States. These islands have a remote location that offers the trial of closed-loop energy systems that are much harder to implement in larger regions or nations. By moving toward the transition to renewable systems in Small Island Developing States, these systems can be used as models to eventually implement into larger communities.

The cost of residential electricity in the US Virgin Islands is nearly three times the average in the continental United States, averaging in 2021 to be 43 cents per kilowatt hour, significantly greater than the average of 14 cents per kilowatt hour in the US (Energy Information Administration, 2022) and 33 cents kilowatt hour on average in the Caribbean (National Renewable Energy Laboratory, 2015). The electricity generated in the US Virgin Islands is 98.9% composed of fossil fuel sources, all which are imported. The remaining 1.1% of electricity on the islands is generated by solar panels.

By diversifying energy sources, the islands will be less vulnerable to fluctuations in global oil prices, which could both lower and stabilize household electricity prices (Sheppard, 2013). The USVI experiences an abundance of sunshine, which makes solar a very plausible renewable energy source for the islands, particularly when

considering the price of solar power is continually becoming a more affordable option for renewable energy on domestic and solar farm scale (National Renewable Energy Laboratory, 2015). Wind power has faced limited investment due to costs relating to development, siting and projects. In both wind and solar projects, damage to equipment during hurricane season could prolong payoff time due to high frequency of costly repairs. Wind speed estimates indicate community-scale wind development projects are feasible at 50m hub heights, with marginal resource potential (WINDEXchange 2007). WAPA has identified maximizing development of solar and wind resources as a strategy to reduce energy costs, along with the pursuit of biomass energy (Clark, Campbell, and Austin 2018). In order to reduce intermittency associated with solar power, biofuel acquired from landfill utilized in waste-to-energy systems presents a desirable resource with the positive externality of reducing issues with landfill (Clark, Campbell, and Austin 2018). The energy generation in waste-to-energy and biomass projects is proportional to the energy contained in the waste and remains a large emitter of greenhouse gasses - particularly NO_xs. Despite emissions, they are considered renewable and can act as a fuel source during downtime periods of solar and wind energy.

Current renewable energy targets set by WAPA, NREL and DOE seek a 60% reduction in fossil fuel usage for energy by 2025. An integrated renewable energy system is key to achieving such a target, alongside increasing efficiency in existing systems and strengthening grid ties with Puerto Rico.



Left figure shows the existing power grid supply in USVI (Clark, Campbell, and Austin 2018).
 Right figure shows wind power availability in USVI (WINDEXchange 2007).

6. Power, Advantage & Boundaries

The prospective benefits to the USA of autonomous energy regions which further US access to oil resources by reduced external consumption and improved relationships with suppliers are significant. Without conducting thorough cost-benefit analysis, the prospective investment required by the US Government into USVI is unknown, but both parties stand to benefit from trade negotiations over refinery products and renewable energy resources. With the status of the USVI debts, the finances required for such transition are scarce but following the Energy Policy Act of 2005 (P.L. 109-58) authorizing the DOE and DOI to assist insular area governments by technical and financial measures, USVI could benefit from existing US Congressional policy (Clark, Campbell, and Austin 2018). Under the act, the DOI can assist with grants for power line projects to protect systems from hurricanes or typhoons and consideration could be given to allow for improving system resiliency. The power dynamic within the relationship between the United States and the USVI is complex, with executive power exercised by the local government in the USVI. As such, the prospective investment by the US Government could create a complex power balance where the USVI are expected to align further with United States policy. It is worth noting here, the Treaty of Tlatelolco prevents any nuclear weapon positioning in the USVI, so military levers are limited.

From the areas discussed, it is proposed that the Department of Energy investment into a renewable energy structure in the USVI could act as a model for all SIDS. It is also recommended that the Department of States brings the USVI into the conversation with the UN, incorporating the USVI voice into creating policy and measures that impact them directly.

7. Implications Beyond the Region in Question

The United States has eight small island territories. One of which is the US Virgin Islands. The USVI and Puerto Rico are located in the Caribbean. American Samoa, the Commonwealth of Northern Mariana Islands, the Federated States of Micronesia, Guam, the Republic of the Marshall Islands, and the Republic of Palau are all located in the Pacific region. Among these eight small islands, there are almost four million residents and United States Citizens.

These eight islands are only eight of fifty eight Small Island Developing States. The residents of these SIDS are quickly being harmed and displaced by the impacts of rising sea levels, which confirms the need for quick action in order to assure energy security for residents of these regions.

By beginning with investing in development in the United States Virgin Islands, the US can lead the way in developing small regional energy independent systems that can be applied to other Small Island Developing States and eventually to other small communities to produce their own energy.

Energy independence for Small Island Developing States means improved energy security for the inhabitants of these islands, driving down current costs of household and transportation energy use. The affordability and accessibility of energy are extremely important in energy security for Small Island Developing States and their overseas counterparts. By enhancing the energy security measures in the United States Virgin Islands and other US island territories, security is improved for the immediate regions as well as for the continental United States. With increased security of US island territories, there is less opportunity for other countries to take advantage of both contiguous and offshore insular area vulnerabilities.

Given the tailoring of the proposed renewable energy plan in the US Virgin Islands, it is clear a renewable energy plan for island communities is multifaceted. Every proposed region will have its own distinct renewable resource availability, and some may have more or less resources than the US Virgin Islands. With expansion of renewable island energy infrastructure, it is important to take into consideration the opportunity for the unique resources offered in each region and their specific strengths for local renewable energy development.

As noted, the intention of the United States' investment into the US Virgin Islands transition to renewable energy is the first step in blazing a new path in energy devolution for Small Island Developing States and other communities ahead. This transition offers an opportunity for the United States to pioneer the technology and infrastructure implementation in remote locations, which can lead to further implementation for countless other communities to become less dependent on fossil fuel consumption, and more energy independent. If the United States does not take action on developing sustainable energy for Small Island Developing States, the door opens for other nations or private investment where focus shifts from positive energy independence to profit margins and ROI. It is time to take action on behalf of the citizens of United States Small Island Developing States such as the US Virgin Islands, and for SIDS around the world.

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