USAID/DOMINICAN REPUBLIC

Caribbean Financial Landscape Assessment of Clean Energy Investments

PHASE II REPORT

November 4, 2022

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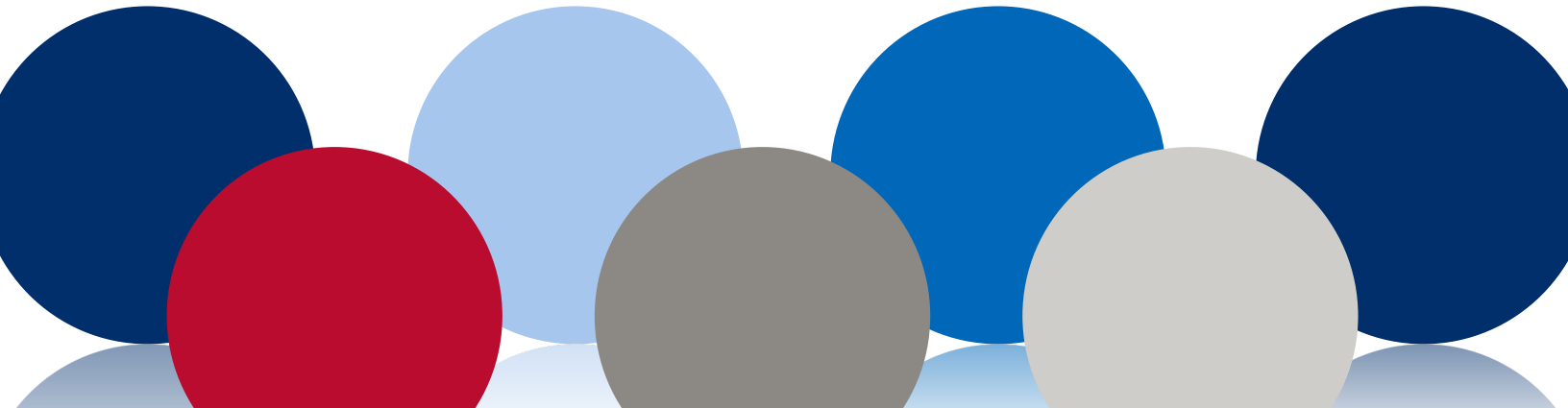

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Acronyms and Abbreviations

ADFD	Abu Dhabi Fund for Development
AFD	Agence Française de Développement
ANARSE	Autorité Nationale de Régulation du Secteur de l'Energie
BESS	Battery Energy Storage System
BLPC	Barbados Light & Power Company Limited
BPD	Banco Popular Dominicano
CARICOM	Caribbean Community
CCCCC (5C's)	Caribbean Community Climate Change Center
CCREEE	Caribbean Center for Renewable Energy and Energy Efficiency
CDB	Caribbean Development Bank
CEI	Caribbean Energy Initiative
CIBC	First Caribbean International Bank
CREIP	Customer Renewable Energy Interconnection Programme (CREIP)
DEP	Draft Energy Policy
DFID	Department for International Development
DGDC	Dominica Geothermal Development Company
DOMLEC	Dominica Electricity Services
DR	Dominican Republic
EE	Energy Efficiency
EDH	Electricité d'Haïti
ESA	Electricity Supply Act
EUCIF	European Union's Caribbean Investment Facility
FI	Financial Institution
FiT	Feed-in Tariffs
FTC	Fair Trading Commission
GAC	Global Affairs Canada
GCCA+	Global Climate Change Alliance Plus
GCF	Green Climate Fund
GCPI	Grenlec's Community Partnership Initiative
GDP	Gross Domestic Product

GEA	Guyana Energy Agency
GPL	Guyana Power and Light Incorporated
GRIF	Guyana REDD+ Investment Fund
IBRD	International Bank for Reconstruction Development
IDA	International Development Association
IDB	Inter-American Development Bank
IEA	International Energy Agency
IPP	Independent Power Producer
IRC	Independent Regulatory Commission
IRP	Integrated Resource Plan
IsDB	Islamic Development Bank
JCCCP	Japan Caribbean Climate Change Project
JHTA	Jamaica Hotel and Tourism Association
JICA	Japanese International Cooperation Agency
JIRP	Jamaica Integrated Resource Plan
JPS	Jamaica Public Service
KII	Key Informant Interview
LAC	Latin America and the Caribbean
LMIC	Low- and Middle-income Countries
LUCELEC	St. Lucia Electricity Services Limited
MCI	Making Cents International
MSME	Micro, Small, Medium Enterprise
NDC	Nationally Determined Contributions
NDF	Nordic Development Fund
NETS	National Energy Transition Strategy
NGO	Non-governmental Organization
NM	Net Metering
NREL	National Renewable Energy Laboratory
NURC	National Utilities Regulatory Commission
OECS	Organization of Eastern Caribbean States
O&M	Operations and Management
PPA	Power Purchase Agreement
PSG	Project Specific Grant

PURC	Public Utilities Regulatory Commission Act
PURCA	Public Utilities Regulatory Commission
PV	Photovoltaics
RBF	Results-Based Financing
RBP	Results-based Payments
RE	Renewable Energy
RIC	Regulated Industries Commission
SCESA	Saint Christopher Electricity Supply Act
SEEC	Sustainable Energy for the Eastern Caribbean
SIDS	Support for Small Island Developing States
SME	Small and Medium-sized Enterprise
S-REP	Sustainable and Resilient Energy Plan
SVG	St. Vincent and the Grenadines
T&T	Trinidad and Tobago
T&TEC	Trinidad and Tobago Electricity Commission
UAE-CREF	United Arab Emirates Caribbean Renewable Energy Fund
UKAID	United Kingdom Agency for International Development
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USD	United States Dollars
VAT	Value-added Tax
VINLEC	St. Vincent Electricity Services Limited
WB	World Bank
WEO	World Energy Outlook

I. Introduction

As the impacts of climate change intensify and imported fuel remains costly, many Caribbean countries are planning national energy transitions to incorporate renewable energy (RE) into their energy supply, and some are implementing energy efficiency (EE) projects to reduce demand. The Caribbean is heavily dependent on imported fossil fuels (FF), and the region faces some of the most immediate impacts of climate change with increasingly frequent and intense natural disasters. The effects can be devastating, as they were in 2017, when Hurricane Maria directly affected 80 percent of the population in Dominica, killing 31 people, damaging 90 percent of roofs and structures, and leaving Dominicans without electricity for months; damages and losses were estimated at around $1.3 billion, or 224 percent of Dominica's 2016 GDP.[1]

Caribbean countries are also transitioning to RE to meet commitments to reduce greenhouse gas (GHG) emissions. While low in absolute emissions, some Caribbean countries have among the highest per capita GHG emissions in the world; Guyana, Suriname, and Trinidad and Tobago ranked 6th, 9th, and 15th in per capita GHG emissions in 2021.[2]

With strong and growing interest in RE, many Caribbean governments have set ambitious goals; the Dominican Republic (DR) aims for 30 percent and Jamaica aims for 50 percent RE by 2030, Guyana targets 27 percent RE by 2027 and Barbados and Dominica plan to reach 100 percent RE by 2030.[3] Despite these ambitious goals, the share of RE in Caribbean energy remains relatively low at 10 percent of the region's energy consumption in 2020.[4] Several persistent obstacles constrain RE expansion, including:

1. **Financial constraints**: There exists a wide variety of real and perceived costs and risks with funding RE projects in the Caribbean.
2. **Institutional, legislative, and regulatory constraints**: Several countries lack an enabling legislative and regulatory environment for renewable energy; energy sector stakeholders identify insufficient institutional, human, and technical resources to ensure the transition.

Variation in the deployment of RE across the Caribbean has been driven by the underlying policy, legislative, and regulatory frameworks within countries, as well as the presence or absence of coordinated, strategic planning for both RE and measures to increase EE. Some countries in the region lack the necessary frameworks to significantly increase the amount of energy they generate from renewable sources and attract RE investment. Moreover, some of the existing frameworks operate ineffectively or inefficiently in practice, perhaps due to insufficient institutional, human, and technical resources. This leads to administrative backlogs that keep projects from coming to fruition and discourage investors from launching new RE projects. EE programs also are underdeveloped and/or not prioritized in many Caribbean states.

[1] ACAPS, "Dominica: The Impact of Hurricane Maria," Disaster Profile, January 2018.

[2] World Resources Institute, "Climate Watch Historical GHG Emissions" (Washington, D.C., 2022).

[3] Most RE targets are expressed in terms of generation capacity, as opposed to consumption, or are not specified. In the unspecified cases, we assume generation capacity.

[4] Organización Latinoamericana de Energía (OLADE), "Sistema de Información Energética de Latinoamérica y El Caribe," Sistema de Información Energética de Latinoamérica y el Caribe, accessed September 5, 2022.

"Over [the] decades in the Caribbean, we have seen many, many, many project announcements and a lot of big announcements in the media on new projects, on renewable energy. Only 10 percent of them materialized." — Multilateral Caribbean energy expert

Technical and financial assistance required. To overcome the institutional and financial constraints and increase RE and EE in the Caribbean, countries in the region require both technical and financial assistance. The type and level of needed assistance varies by country. Countries whose policy, legislative, and regulatory frameworks are more conducive to market-facilitated RE investments, such as the DR and Jamaica, may only require minimal financial assistance and be able to rely on market mechanisms, products, and services that leverage private financing sources to increase the share of RE. They may also benefit from moderate technical assistance focused on transactions facilitation and coordination, competitive negotiation, tendering, and project-level technical support, including technical and financial due diligence.

Countries with less clear policy, legislative, and regulatory frameworks, including Barbados, Dominica, Guyana, Grenada, Haiti, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, and Trinidad and Tobago will likely require more substantial technical and financial assistance to meet RE and EE goals. Assistance may include detailed high-level support to develop the policy and legislation required to implement a supportive framework for RE and EE, followed by a mix of grants, concessionary loans, and blended finance options to improve the enabling environment and fund RE and EE projects. Country conditions will likely dictate the sequencing and combination of assistance that will be most impactful, although in many cases, technical and financial assistance implemented in parallel may be merited.

A. Objective and Scope

This study supports USAID's Caribbean Energy Initiative (CEI) and new Climate Strategy 2022–2030 by recommending specific financial mechanisms to support private-sector investment in large, utility-scale RE and EE projects.[5] Developing RE/EE initiatives requires tailored financing mechanisms to meet the public sector's needs, particularly those to support grid-scale projects, as well as the private sector's needs, especially small- and medium-sized enterprises (SMEs).[6]

The first phase of this study aimed to support USAID's efforts by providing insight into demand for RE and EE in 12 countries in the Caribbean, cataloging existing RE and EE projects and existing financing mechanisms, then selecting a subset of five countries for deeper study. The countries included in the initial phase were Barbados, Dominica, DR, Grenada, Guyana, Haiti, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, and Trinidad and Tobago. In the second phase of the project, the research team conducted key informant

[5] In discussions about this assessment, USAID defined small- to medium-sized RE projects as approximately 8MW to 83MW. However, since four countries in the study have total installed energy capacity of less than 60MW, we use a more standard definition of small RE energy projects for small island states of <1MW and medium size up to 20MW. USAID did not provide a range for small- to medium-sized EE projects in terms of MW of reduced or avoided demand or cost of implementation.

[6] For the purpose of this assessment, SMEs are defined using the DR's legislation: small business is an economic unit, formal or informal, that has 16 to 60 workers and assets of RD3,000,000.01 (three million one cent) to RD12,000,000.00 (twelve million pesos) and that generates gross income or annual billing from RD6,000,000.01 (six million one cent) to RD40,000,000.00 (forty million pesos), annually indexed for inflation. A medium-sized enterprise has 61 to 200 workers and assets of RD12,000,000.01 (twelve million one cent) to RD40,000,000.00 (forty million pesos) and that generates annual revenue from RD40,000,000.01 (forty million one cent) to RD150,000,000.00 (one hundred and fifty million pesos) annually indexed for inflation: Dominican Republic National Congress, "Ley No. 488-08, Que Establece Un Régimen Regulatorio Para El Desarrollo y Competitividad de Las Micro, Pequeñas y Medianas Empresas (MIPYMES)," December 19, 2008.

interviews (KIIs) to better understand obstacles to private financing for RE and EE in five countries: Barbados, Dominica, DR, Guyana, and Jamaica. The present report provides analysis of these interviews and concurrent analysis of publicly available data to offer recommendations to USAID for the design of financial products, mechanisms, and technical assistance to facilitate private funding flows to RE/EE projects in the Caribbean.

The report is organized as follows: Section I introduces the context and purpose of the report. Section II focuses on RE demand and the conditions necessary for private investment in RE. Section III describes the current funding sources for RE and EE projects in the Caribbean. Section IV describes the policy, legislative, and regulatory reforms needed to foster an enabling environment for RE and EE investments. Section V provides tailored technical and financial assistance recommendations for USAID to consider for supporting RE and EE in the region. Annex 1 suggests indicators to track the progress of RE and EE in the countries of interest. Annex 2 lists the key questions driving this study and identifies where in this report to find answers to each question. Annex 3 lists organizations providing RE- and EE-related programming in the Caribbean region. Annex 4 describes the methods and data collection of this assessment. Annex 5 presents country-specific chapters from the desk review report for 12 countries in the Caribbean: Barbados, Dominica, DR, Grenada, Guyana, Haiti, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, and Trinidad and Tobago. Annex 6 summarizes the incentives for small-scale RE generators in the region, specifically in the form of Feed-in-Tariff (FiT) rates. Annex 7 summarizes Caribbean energy stakeholders' thoughts on the institutional and regulatory environment for RE and EE.

II. Renewable Energy in the Caribbean and the Necessary Conditions to Reach RE goals

Caribbean countries have high aspirations for RE, but these vary greatly across the region. Many Caribbean governments have set ambitious goals; the DR aims for 30 percent and Jamaica aims for 50 percent RE by 2030, Guyana targets 27 percent RE by 2027, and Barbados and Dominica plan to reach 100 percent RE by 2030.[7] Table 1 presents RE targets by country, the total installed power capacity (MW), the current RE share (percent), and the gap between the current RE share of installed capacity;[8] **this gap represents, in theory, the available market for RE in each country**.

Table 1. RE target, current installed RE, and the market gap

Country	Target RE Share	Current Total Installed Power Capacity (RE and non-renewable)	Current RE Share (Installed Capacity)	Open Market Gap[+]
Barbados	100% by 2030	299.7 MW	17.0%	83.0%

[7] Achieving 100 percent energy in countries with hydro or geothermal sources is possible, provided sufficient investment. Countries without a nonvariable RE source to ensure base load capacity may eventually achieve 100 percent renewable energy, but with high cost to ensure sufficient storage or investment in nonvariable RE technologies such as hydrogen. See Denholm et al., "The Challenges of Achieving a 100 percent Renewable Electricity System in the United States," Joule 5, no. 6 (2021): 1331–52.

[8] Some country RE targets represent aspirational statements rather than policies and therefore, do not specify whether the goal is expressed in terms of installed capacity or in terms of generation.

Country	Target RE Share	Current Total Installed Power Capacity (RE and non-renewable)	Current RE Share (Installed Capacity)	Open Market Gap[+]
Dominica	100% by 2030	27.4 MW	30.0%	70.0%
Dominican Republic	30% by 2030	4,870.0 MW	24.3%	5.7%
Grenada	70% by 2030	55.6 MW	6.5%	63.5%
Guyana[++]	47% by 2027 (near 100% by 2040)	348.6 MW	17.0%	30.0%
Haiti[++]	47% by 2030	285.0 MW	28.0%	19.0%
Jamaica	30% by 2030 (or goal of 1384 MW of renewables by 2037)	1,100.0 MW	17.0%	13.0%
St. Kitts and Nevis	100% by 2030	70.0 MW	6.0%	94.0%
St. Lucia	50% by 2030	94.7 MW	7.0%	43.0%
St. Vincent and the Grenadines	59% by 2027	52.1 MW	15.0%	44.0%
Suriname	52% by 2027	503.0 MW	36.0%	16.0%
Trinidad and Tobago	10% by 2021 (missed)	2,118.0 MW	0.0%	10.0%

[a] Barbados National Energy Policy 2017-2037. [b] Sustainable and Resilient Energy Plan (S-REP) for Dominica. Clinton Foundation, 2019. [c] United Nations Climate Change Nationally Determined Contributions Registry, 2020. [d] The National Energy Policy of Grenada: A Low Carbon Development Strategy for Grenada, Carriacou, and Petite Martinique, 2011 . [e] Guyana's Low Carbon Development Strategy, 2030 (draft for consultation). [f] CCREEE 2020 Report Card . [g] Integrated Resource Plan: A 20 Year Roadmap to Sustain and Enable Jamaica's Electricity Future, 2020. [h,i] CCREEE 2020 Report Card . [j] Energy Action Plan for St. Vincent and the Grenadines, 2010. [k] CCREEE 2020 Report Card. [l] Framework for the development of a renewable energy policy for TT January-2011.

[+] RE targets are often expressed in terms of generation capacity, as opposed to consumption, or are not specified in documentation. In those latter cases, we assume these are expressed in generation capacity.

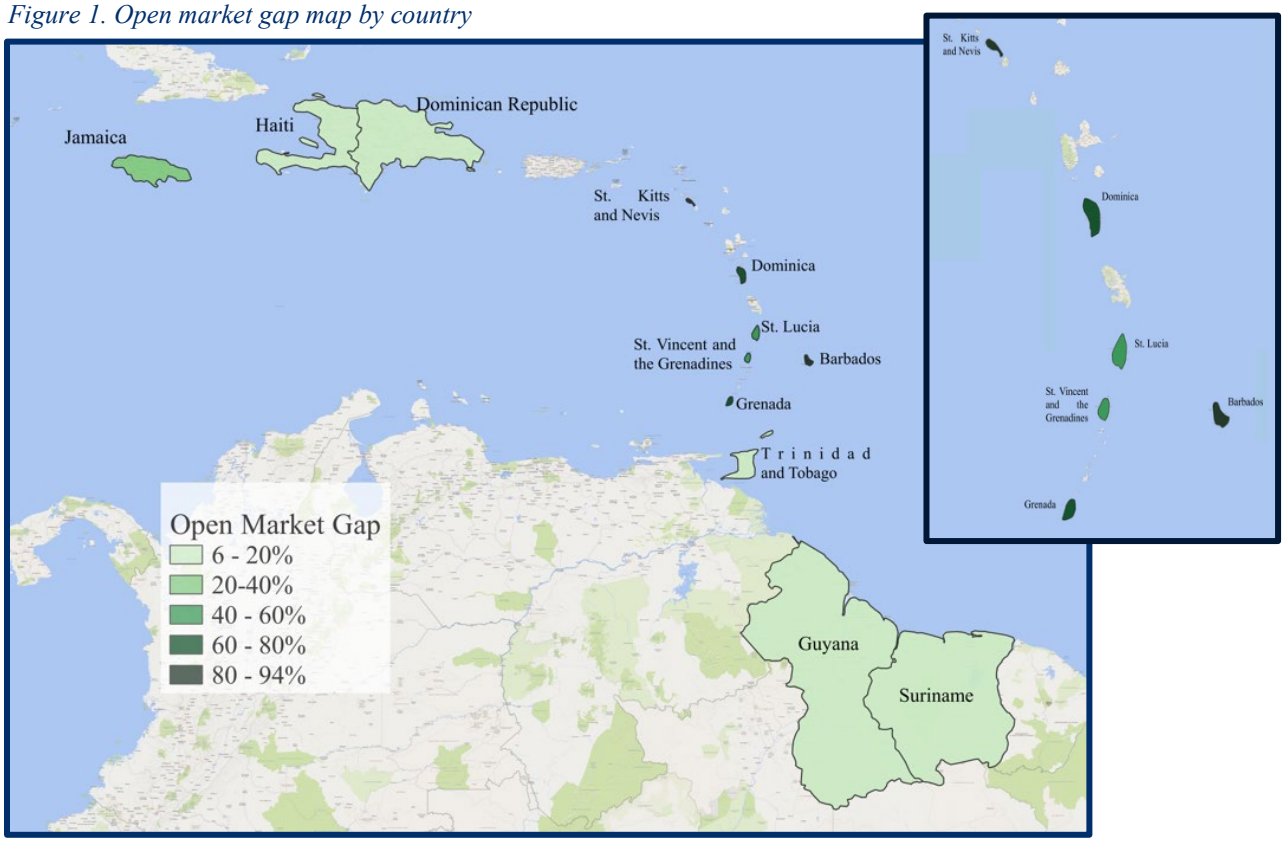
[++] Open market gap is the current gap to the target, not considering future increases in demand for energy or the need to replace (and decommission) FF energy sources.

[+++] All study countries have 100-percent electricity access, except Haiti at 46.6 percent and Guyana at 92.5 percent.

The feasibility for Caribbean countries to meet ambitious RE targets varies substantially. In countries like the DR, the open market gap is relatively small (5.7) and a stronger enabling environment for RE is likely sufficient to support the required investments. While the open market gap is somewhat larger in Jamaica, it too can realize the required investments with a stronger enabling environment. In other countries, such as Dominica, Grenada, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines, open market gaps are larger, ranging from 16 to 94 percent, but may still be attainable thanks to their substantial potential for developing geothermal renewable energy resources. Similarly, Suriname could achieve its goals through hydropower. However, the enabling environments in a number of these countries may not yet be conducive to achieving these RE goals (see Sections IV and V). Other countries may face heightened obstacles to achieve their renewable energy goals because of ambitious targets in the absence of access to plentiful geothermal or hydro resources (Barbados), or in the presence of abundant access to low-cost FF (Trinidad and Tobago), or due to severe political instability

(Haiti). Thus, the extent to which RE targets serve as aspirational versus practical goals must be evaluated on a case-by-case basis. Countries planning a transition to variable RE sources must also address grid stability issues and will likely need FF sources to meet base load requirements for some time.

Figure 1. Open market gap map by country



Notes: As defined in Table 1, open market gap is based on RE targets relative to current production levels.

As the map in Figure 1 shows, there is a substantial gap between current RE production levels and the ambitious goals set by most countries in the Caribbean.

> "I did some calculations the other day and for Caribbean nations to meet the targets that they've set themselves largely around 2030, they'd have to have a rate of adoption of renewable energy and rates of demand reduction overall that … far exceeds historical bounds, whether locally and globally. I say that to say I'm fairly doubtful, personally speaking, that they're going to make them. That being said, it's good that people are ambitious." —Caribbean multilateral energy researcher

While market gaps may be large as a proportion of currently installed capacity, the total MW necessary to meet targets varies by country. Table 2 presents the projected additional RE capacity required to meet peak load demand estimates in 2030 and the associated installation costs for each country. For example, Table 2 indicates that Barbados needs an additional 353 MW of RE to meet demand and its RE target in 2030; this is above the existing 299.7 MW of currently installed capacity, which includes both RE and non-renewable sources reported in Table 1, and accounts for replacement of non-renewable capacity over that period (see Table 5.9

in the Barbados Country Rapid Assessment located in Annex 5 for more details).[9] Similarly, in the DR, Table 2 shows that 1,547 additional MW of RE are needed to meet projected peak load demand in 2030, above and beyond the existing 4,870 MW of the currently installed (RE and non-renewable) production capacity reported in Table 1, and accounting for capacity replacement over that period (see Table 5.1 in the Dominican Republic Country Rapid Assessment located in Annex 5 for more details).

Table 2. Projected additional RE capacity to meet peak load demand by 2030 and installation costs

Country	Additional RE capacity by 2030 (MW)	Installation costs for RE (US$ millions)†
Barbados	151[a]	$147 to $192^
Dominica	9[a]	$8 to $11
Dominican Republic	1,547[b]	$1,501 to $1,964
Grenada	Not Available	Not Available
Guyana	512[c]	$497 to $650
Haiti	Not Available	Not Available
Jamaica	209[a]	$203 to $266
St. Kitts and Nevis	Not Available	Not Available
St. Lucia	100[d]	$97 to $127
St. Vincent and the Grenadines	46[e]	$45 to $59
Suriname	Not Available	Not Available
Trinidad and Tobago	609[f]	$591 to $774

[a] Calculated based on Ministry of Energy, Small Business, and Entrepreneurship (MESBE) and Mott McDonald, "Integrated Resource & Resiliency Plan for Barbados," June 22, 2021. [b] IRENA, "Renewable Energy Prospects: Dominican Republic" (Abu Dhabi: Remap2030, International Renewable Energy Agency (IRENA), November 2016), https://www.irena.org/publications/2016/Jul/Renewable-Energy-Prospects-Dominican-Republic.

[c] Cooperative Republic of Guyana, "Guyana's Low Carbon Development Strategy 2030 (Draft for Consultation)," November 2021, 110. [d] Kaitlyn Bunker et al., "Saint Lucia National Energy Transition Strategy and Integrated Resource Plan" (Rocky Mountain Institute, 2017). [e] St. Vincent and the Grenadines, "Energy Action Plan for St. Vincent and the Grenadines," January 2010, 54. [f] Marzolf, N. C., Cañeque, F. C., Klein, J., and Loy, D. (2015). A unique approach for sustainable energy in Trinidad and Tobago. Inter-American Development Bank.

† Calculated where RE installed capacity expansion estimates are available and based on NREL "2021 Annual Technology Baseline (ATB)" using Utility Scale PV (Class 10 Advanced for lower bound and Class 1 Conservative for upper bound). Countries with geothermal resources might have higher upfront costs for exploration and installation.

^ One knowledgeable key informant suggested that 100 percent RE in Barbados will require about $1 billion, more than twice the cost projection in the table above.

All additional RE capacity and installation cost projections presented in the table draw on data reported in the country rapid assessments located in Annex 5.

Achieving RE targets will require substantial investments, although the amounts vary widely (Table 2). For the DR to meet its goal of 30 percent RE, it will need to add 1,547 additional MW of RE capacity, which will cost approximately $1.5 to $1.9 billion over the next decade.

[9] Capacity replacement does not account for depreciation, which implies that these are conservative estimates.

Dominica, on the other hand, could achieve its goal of adding 9MW of RE by investing $8 to $11 million, depending on the mix of hydropower and geothermal. Overall, we estimate that the eight countries require more than $4 billion in financing to achieve RE installed capacity goals over the next decade. **Donor and public funding alone will be insufficient to meet this target; private finance must be leveraged.**

A. What Is Needed for Private Financing to Help Close the Gap in RE Energy?

Private investors need to see market potential. The tables above demonstrate that the Caribbean represents a sizable potential market for RE projects. However, for RE projects to succeed, several conditions must be met. Most importantly, **the market must be conducive for private investors to make a profit from RE sales at an acceptable risk level and RE should be cost competitive in comparison to fossil fuels**. In many markets, a FiT policy has traditionally provided a guaranteed, above-market price for independent power producers (IPPs), which, along with long term (15- to 25-year) contracts reduces the risks associated with implementing renewable energy production. The existence of FiTs varies in the Caribbean. Jamaica currently lacks a FiT, Barbados recently introduced a FiT, and the DR recently replaced its expired FiT regime with a competitive award system for concessions. The lack of a FiT is no longer a disincentive to investors in RE in several of the Caribbean countries in the study because the decrease in the cost of RE generation compared to FF means that RE developers can justify RE investments based on their commercial merits independent of existing additional incentives.

Tables 3 and 4 demonstrate the cost of RE compared to the cost of FF by source for the Caribbean region (in $/kWh) in 2020. These tables show that the cost of utility solar and wind, the two least expensive but variable RE sources, are less expensive than or comparable to FF, followed closely by non-variable hydropower. Biomass and geothermal generation are comparable to or more expensive than FF. Table 4 further shows that the cost of FF varies substantially in the region, from a low of $0.05 (liquified natural gas [LNG]) in Trinidad and Tobago to a high of $0.22 in Guyana. With the exception of Trinidad and Tobago, producing electricity from FF is more expensive than utility solar and onshore wind. Indeed, RE sources have become substantially more cost competitive in the past decade[10] to the point where RE sources, like solar and onshore wind, now represent the least cost sources of new electricity generation in most markets around the world.[11]

Table 3. Cost of renewable energy for the Caribbean region (country-level data not available)

Cost of Utility Solar ($/kWh)	Cost of Wind ($/kWh)	Cost of Hydropower ($/kWh)	Cost of Biomass ($/kWh)	Cost of Geothermal ($/kWh)
$0.04 to 0.13	$0.05 to 0.12	$0.08 to 0.12	$0.07 to 0.21	$0.12 to 0.21

Source: Malaika Masson, David Ehrhardt, and Veronica Lizzio, Renewable Power Generation Cost in 2019 for Solar and Wind in "Sustainable Energy Paths for the Caribbean" (Inter-American Development Bank, March 2020).

[10] The improved cost competitiveness of RE sources is based on the IEA World Energy Model that combines technology costs and system value through the value-adjusted scaled cost of electricity, but does not include grid-related integration costs. See the following for more details: International Energy Agency (IEA), "World Energy Outlook 2018." IEA: Paris, France, 2018.

[11] International Energy Agency (IEA), "World Energy Outlook 2021." IEA: Paris, France, 2021.

Table 4. Cost of fossil fuel-based electricity by country (2020)

Country	Cost of FF in 2020 ($/kWh)†	FF – Utility Solar* Cost Differential in 2020 ($/kWh)†	FF – Wind Cost* Differential in 2020 ($/kWh)†
Barbados	$0.21	$0.08 to 0.17	$0.09 to 0.16
Dominica	$0.16	$0.03 to 0.13	$0.04 to 0.12
Dominican Republic	.	.	.
Grenada	$0.10	-$0.03 to +0.06	-$0.02 to +0.05
Guyana	$0.22	$0.09 to 0.18	$0.10 to 0.17
Haiti	.	.	.
Jamaica	$0.15	$0.02 to 0.11	$0.03 to 0.10
St. Kitts and Nevis	$0.21	$0.08 to 0.17	$0.09 to 0.16
St. Lucia	$0.21	$0.08 to 0.17	$0.09 to 0.16
St. Vincent and the Grenadines	$0.21	$0.08 to 0.17	$0.09 to 0.16
Trinidad and Tobago	$0.05 (LNG)	-$0.08 to +$0.01	-$0.7 to +$0.00
Suriname	$0.17 to 0.20	$0.04 to 0.16	$0.05 to 0.15

† These estimates are from 2020 and have since likely increased due to supply chains associated with the COVID-19 pandemic, Russia's invasion of Ukraine, and other factors resulting in increased fuel prices and inflation.

** Utility solar and wind costs are for the entire region.*

The market must be sufficiently large. Interviewees for this study warned that RE developers are less interested in smaller countries, where they do not find economies of scale. As one Caribbean energy expert explained, "…for 10 MW of solar, or for 20 … the transaction costs are just too high for the developer for that kind of risk for those economies of scale." Rather, the larger populations and economies of the DR and Jamaica are more attractive to RE developers.[12]

The policy, legislative, and regulatory environment must enable RE deployment by IPPs. Without appropriate legislation, power producers are discouraged from investing in a given market. Table 5 uses three objectively answerable yes/no questions from the Caribbean Renewable Energy Forum (CREF)–Castalia RE Island Ranking and RE Marketplace to characterize the legislative and regulatory environment of each country in the study:

- Does the country have an Integrated Resource Plan (IRP) that was produced within the last 3 years?
- Are there clear and effective licensing processes and requirements in place for IPPs?
- Is there a standard arrangement in place for customers to sell electricity to the utility at a reasonable price, for a reasonable time frame, and with a clear interconnection agreement?

The results presented in Table 5 suggest that the DR and Jamaica have the enabling policy, legislative, and regulatory environments for IPPs. Several other countries, such as Barbados, Dominica, Grenada, Guyana, and St. Lucia are approaching a conducive environment, but lack one of the three key characteristics. Other countries in the region lack most or all of the IPP-enabling characteristics.

[12] Trinidad and Tobago's relatively large energy needs are met with its abundant gas reserves.

Table 5. Conduciveness to market-facilitated investment

	BA	DO	DR*	GRE	GUY	HAI	JA*	SKN	SL	SVG	SUR	T&T
Does the country have an IRP that was produced within the last 3 years?	✓[a]	✓[c]	✓		✓		✓	[d]	✓			
Are there clear and effective licensing processes and requirements in place for IPPs?	[b]	✓	✓	✓			✓		[f]	[g]		
Is there a standard arrangement in place for customers to sell electricity to the utility at a reasonable price, for a reasonable time frame, and with a clear interconnection agreement?	✓		✓	✓	✓		✓	[e]	✓	✓	✓	
Score	2	2	3	2	2	0	3	0	2	1	1	0

[a] Barbados' revised IRP has been submitted to the parliament and is waiting for approval. [b] The existing framework allows for IPPs, but none have been established due to challenges in grid integration that have precluded Power Purchasing Agreements (PPAs) from being signed to date. [c] Following Hurricane Maria, Dominica has adopted a Sustainable and Resilience Energy Plan (SREP) as a substitute for an IRP, which it reviews on an annual basis and updates as merited. [d] An IRP is currently in progress in St. Kitts and Nevis, but existing plans are outdated. [e] Interconnection standards and energy export compensation mechanisms have been proposed in St. Kitts and Nevis, but are not approved. [f] Although IPPs are allowed in St. Lucia, none have been established due to various challenges. [g] IPPs are allowed, but there is no evidence of established IPPs at this time.

**Light blue indicates countries where legislation and regulation are conducive to RE investment.*

The appropriate financial and political environment creates a low cost and low risk of doing business in a country and is favorable to investment. Project developers and private investors weigh the risk of investing, in part, on the perceived financial soundness and favorable political environment of a country. In the DR, for example, one RE project developer stated that while the IPP-enabling legislative regime has been in place for several years, the political environment under the current president is far more favorable toward PPAs than under the previous administration. This has drawn the developer to explore several more IPP projects in the DR. In addition, indicators of financial soundness or the ease of doing business in a particular country may also influence investors. Each investor will determine what level of risk they are willing to take, but the sovereign rating provides a measure of comparison for the risk of investing in a particular country. Table 6 shows Moody's sovereign ratings summary for six of the countries included in this study with the corresponding country default risk premium, reflecting additional borrowing costs due to risk considerations.[13] Trinidad and Tobago and the DR received a category below investment grade (i.e., speculative); Barbados received a substantial risk rating; Jamaica and St. Vincent received a highly speculative risk rating; and Suriname received the lowest, extremely speculative risk rating. Only Suriname had a negative credit rating outlook. In addition, Barbados', St. Vincent and Grenadines', and Suriname's credit information system had

[13] Moody's ratings reflect opinions of the relative credit risk of fixed-income obligations. Rankings range from Aaa to C. Ratings of Ba1 and below are considered non-investment grade

zero coverage of their adult population, while the credit information systems in the DR, Jamaica, and Trinidad and Tobago covered 53 to 100 percent of the adult population.[14] The country's lending rates directly reflect the country's general risks and financial transactions-specific sources of risks. For example, Suriname (14.81 percent in 2021), Haiti (13.35 percent), and Jamaica (12.06 percent) posted among the highest lending rates in the region. Of the six country credit ratings presented in the table below, five were not changed during the past 2 years. Trinidad and Tobago were downgraded by Moody's in November 2021.

Table 6. Financial environment by country

Country	Foreign Currency Sovereign Ratings and Risk Premium			Financial Market Environment
	Credit Rating[a]	Risk Premium	Outlook[b]	Credit Information Coverage of Adult Population
Barbados	Caa1 (substantial risk)	6.38%	STABLE	Zero
The Dominican Republic	Ba3 (speculative)	3.06%	STABLE	100%
Jamaica	B2 (highly speculative)	4.68%	STABLE	53%
St. Vincent and the Grenadines	B3 (highly speculative)	5.53%	STABLE	Zero
Suriname	Caa3 (extremely speculative)	8.51%	NEGATIVE	Zero
Trinidad and Tobago	Ba2 (speculative)	2.56%	STABLE	81%

[a] Foreign Currency Sovereign Ratings reflect the sovereign's capacity and willingness to mobilize foreign exchange to repay its foreign-currency denominated financial obligations on a timely basis. [b] Moody's rating outlook is an opinion regarding the likely rating direction over the medium term. Rating outlooks fall into four categories: Positive (POS), Negative (NEG), Stable (STA), and Developing (DEV). Sources: Moody's Investors Service, "Moody's Investors Service" (New York, 2022) and Aswath Damodaran, "Equity Risk Premiums (ERP): Determinants, Estimation, and Implications," The 2022 Edition, March 23, 2022.

Lenders want to see a pipeline of investment opportunities. Banks have a smaller appetite for one-off projects. Instead, they want to foresee a regular and preferably growing pipeline of projects, in part to amortize the effort of learning about a particular sector, the specific technologies of that sector, and the applicable regulations. Bankers in the Caribbean interviewed for this study noted further that some banks lacked specific funds for clean energy projects and, therefore, could not offer attractive credit conditions. Other bankers noted that renewable energy was no longer technically challenging and that banks, particularly the larger international banks, competed to attract projects.

Retail tariffs should be cost reflective. Investors prefer financially healthy utilities, so consumer tariffs should reflect the utilities' costs. The electricity tariffs residential customers paid in June 2022 range from lows of about $0.05 per kWh in countries that possess their own fossil fuel deposits to highs of almost $0.60 in countries reliant on imported fuel. The average tariff for residents in the region is $0.37 per kWh compared to an average tariff among middle-

[14] For countries not covered in Table 6, Dominica, St. Lucia, Grenada, and St. Kitts and Nevis had zero adult population coverage, while Guyana had 32 percent coverage and Haiti 5.3 percent. In addition, Dominica, St. Lucia, Guyana, and Haiti had weak legal rights for lenders and borrowers and weak insolvency framework, while Grenada and St. Kitts and Nevis had strong for both counts.

income, non-oil-producing countries of $0.45 per kWh. Commercial tariffs in four of the focal countries we have information for are supported by state subsidies.

Table 7. Regional statistics for electricity tariff paid by residential customers

Regional Statistic	Unit price in 2015 ($ per kWh)	Unit price in 2019 ($ per kWh)	Unit price in 2022 ($ per kWh)
Average	0.27	0.28	0.29
Standard Deviation	0.12	0.10	0.15
Range	0.06 – 0.37	0.05 – 0.36	0.02 – 0.42

Source: Caribbean Electric Utility Services Corporation (CARILEC), "Electricity Tariff Survey Report June 2022" (Sans Souci Castries, 2022).

High technical and commercial losses in utilities may signal potential problems. Caribbean countries suffer from substantial energy losses (both technical and commercial). St. Kitts and Nevis reports combined technical and commercial losses of 20 percent, Jamaica reports 26.5 percent, the DR 33.3 percent, and Haiti estimates 60 percent. These high loss rates imply the need for substantial investment on the part of utilities to address chronic technical losses through infrastructure upgrades and increased investment in monitoring and enforcement improvements to reduce commercial losses. High losses weaken the overall health of the energy system, particularly the financial health of the utility, which may constrain investment in grid improvements and/or may be passed through to customers in the form of higher tariffs.[15] High losses may influence IPPs' willingness to invest in RE over fears of a utility's solvency or ability to meet its financial obligations timely, regardless of the cost competitiveness of renewables and a supportive regulatory regime.

B. Summary

In summary, private investment of approximately $4 billion is necessary for the Caribbean region to meet its RE goals over the next decade. Market size, relative profitability of potential RE investments versus fossil-fuels, stable legislative regime, and sound financial environment all will play a role in attracting the necessary private investment in RE. How existing financing mechanisms and programs influence RE and EE adoption in the region is the topic of the next section.

III. Current Funding Sources for RE and EE

RE development in the Caribbean has historically relied on donor funding, whereas future RE development will require investment from the private sector. In 2022, other than in the DR and Jamaica, there exist few privately funded RE IPPs. Yet, our analysis of documents and interviews with public and private stakeholders found that financing from both donors and private sources is available and accessible to RE projects in several of the countries in the study. Additionally, a group of multilateral institutions have positioned themselves to play an enabling role, connecting financiers with RE projects (see Annex 3 for a list and descriptions of their activities). This study finds that financing is not the most immediate binding constraint that impedes RE investment; policymakers must consider improving a country's policy and

[15] State-owned utilities may receive government subsidies to offset losses rather than passing costs on to customers.

regulatory framework to increase the returns and reduce the costs and the risk faced by private RE developers.[16] However, policymakers should be aware that when they succeed in reducing the immediate policy and regulatory constraints, access to finance will likely emerge as an impediment. In such a case, policymakers should correctly sequence interventions that affect the level of returns and risks and the cost of capital to stimulate and sustain high RE investment rates and advance the country's transition toward clean energy.

In brief, the key constraint faced by RE projects in the Caribbean is institutional; country governments lack RE- and EE-friendly enabling legislation and planning to encourage private investment (see section IV. Political Economy and Policy Reform). Below, we describe current financing and gaps in financing for utility-scale RE, auto-produced RE and for EE projects in the Caribbean.

> "No, the State has left the generation area, apart from an investment that was made in the period 2014–2018 in a coal plant with State resources […] In general, it is done by private companies. And the expectation is that in the future this will be even more intense. In other words, […] the State is left out of any investment initiative in generation and the effort is concentrated in the private sector."
>
> —DR multilateral energy stakeholder

A. Funding for Utility Scale RE[17]

Utility-scale RE projects are not common across the Caribbean. To date, donor finance has formed the bulk of project finance for RE. While privately financed RE projects are fewer and more recent, our research revealed that private financiers are abundant and willing to invest in the RE sector, particularly in countries with larger potential markets such as the DR and Jamaica. However, several interviewees cite opaque government approval procedures as well as planning uncertainty as their primary constraints to developing and implementing projects. The fact that private financiers are more recent entrants to the RE space suggests that some of these constraints may be relaxing and the Caribbean is experiencing transition.

1. Donor Finance

Aside from several projects in the DR and Jamaica, donors have financed large utility scale RE projects and TA in the RE sector. While donor-dominated financing made sense when renewable energy projects were relatively new, less understood, and not competitive, several Caribbean countries are poised to transition to private financing for most RE and EE. Considering the RE targets across the region, donor finance, while necessary, is not sufficient; our estimates suggest that the Caribbean needs financing of many billions of dollars over the coming decade to achieve RE goals.

Donor support continues to play a critical role in this transition. Donor support is needed to alleviate local institutional constraints that inhibit private finance, including assistance to countries in the production of detailed energy master planning documents (such as Integrated

[16] Applying Hausmann, Rodrik and Velasco (2005), the Caribbean region's average borrowing cost ranks in the world's lowest 33 percent of countries, suggesting that finance is not the most binding constraint impeding investment. On the other hand, RE projects increased (28 new projects with $785 million in investments under construction, and total planned capacity of 1,479 MW) when the DR reformed contract negotiations and adopted more competitive procedures. This suggests that institutional factors may have impeded RE investment.

[17] Utility scale RE is defined here as any project set up for the explicit purpose of selling electricity to the grid. This is characterized by multi-MW installations, often in the form of, but not limited to, IPPs.

Resource and Resilience Plans [IRRPs]), clear and unambiguous legislation and rules for participation in RE markets, and development of local human resources and grid technology.

In terms of financial constraints, donor finance helps on two key fronts. First, private participation is nascent. Donor action can catalyze private sector's participation. The Caribbean includes some cases where the use of grants, blended finance, or concessional loans has helped to mobilize private finance in a co-financing arrangement. One example of such an arrangement is a 30 MW geothermal generation asset currently developed in Nevis with a combination of donor support provided by multiple donors and private financing. Novelty structures for concessional finance provided by donors have included parallel financing of an EE scheme by the Caribbean Development Bank in Barbados, and installment sale financing of two hydropower projects in Guyana by the Islamic Development Bank. See Table 8 for examples of donor-financed RE projects in the Caribbean and elsewhere. Additional examples for the Caribbean can be found in Annex 3.

Second, some states present unique technical challenges that may preclude participation by private financiers without added incentives. Guyana has a major population center that is served by an electricity grid. However, there are over 200 communities—referred to as the hinterland—that are far too geographically dispersed for central grid service. Instead, as our interview in Guyana suggested, concessionary finance (i.e., lower-than-market financing terms for private firms to build) and grant finance are preferred to provide hinterland communities with electricity in the form of RE mini-grids. RE projects also require new sites, often large surface area, and frequently must be built in remote locations, which means they may not be close to existing grid lines or may pose topographic challenges, as is the case in mountainous Dominica. Taking on the cost of connecting to the grid from an optimally sited RE project may deter private investors. In some cases, RE developers are required to pay for the new grid connection with the future benefit the transmission company compensates over time. For example, according to current regulations in the DR, the RE developer initially bears the costs of connecting new electricity generation and the corresponding reinforcements required in the existing grid. In this case, the transmission company compensates for the generator costs throughout the life of project.

> "We need financing to construct more solar mini grids to service those 200 plus [hinterland] communities that I referred to […] So there is a need for financing in that area, and I don't need to mention the need for low-cost financing […] we love grants […] We can easily put together a portfolio of projects setting out what this could look like. And it can range from $80 million to maybe $200 million, depending on the scale, the scope, and the number of communities to be serviced."
>
> — Stakeholder in Guyana

Table 8. Examples of donor-financed utility scale renewable energy investments

Project	Donor	Financing type	Description
Scaling Up Renewable Energy in Haiti	World Bank	Grant	The project provides $19.6 million in funding to increase distribution infrastructure for RE and add solar power ad battery storage to the existing grid.
Geothermal Resource Development in Saint Lucia	World Bank	Grant	The World Bank is providing $21.9 million to support exploratory drilling, capacity building, technical assistance, and market engagement with

Project	Donor	Financing type	Description
			the goal of facilitating geothermal energy generation in St. Lucia.
Geothermal Risk Mitigation Project in Dominica	World Bank	Grant	The World Bank is providing $27 million project to support the construction of a 7 MW small geothermal power plant in the Commonwealth of Dominica.
Guyana Utility Scale Solar Photovoltaic Program	IDB/NORAD	Grant	The IDB is providing $83.3 million in financing to support the construction of a 33 MW solar farm.

2. Private Finance

Privately financed utility scale RE projects have begun to emerge in the Caribbean, especially over the last 3 years, predominantly in the DR (we document at least five within the last 3 years), with two in Jamaica and none in any of the other focal countries. Photovoltaic (PV) installations dominate these privately financed RE projects, although there are wind farms too; and the typical size ranges from about 25 MW to 50 MW of installed capacity. Within the DR, about 309 MW of RE projects supported by private finance are in the pipeline. Two key financiers of these projects within the DR are local banks BHD León and Banco Popular Dominicano (BPD). Local banks and investors such as BHD and BPD will likely be essential sources of finance in the early stages of RE and EE market growth because they are already comfortable with the local financial conditions, understand the regulatory environment and political landscape, and will likely have better access to other relevant information through contacts at energy ministries and regulators.

> "[O]ne of the of the aspects that perhaps stops developers in that they often want the State to grant them a purchase contract … [t]he so-called PPA, which is not necessarily an obligation for the Dominican State to do so. That is one of the reasons for the matter of, let's say, the financing that they have to have a PPA guarantee them and a cash flow, and perhaps the financial organizations require these developers to have that." —Stakeholder in DR

For private finance to enter and thrive in the RE space requires that risks be both low and clearly understood. First, as our interviews in Barbados and the DR indicated, this means that one of the fundamental objects in the investment process—the PPA—be consistently available and long term, at least 20 years or more. Ideally, it should last longer than the payback period of RE projects. The Government of DR uses contract periods of 10, 15, and 20 years in recommending reference prices for PPAs.[18] This reduces planning uncertainty and enables financiers to make the large upfront investment needed for RE projects. Currently, acquiring long-term guaranteed PPAs appears uncertain to private financiers. Additionally, RE electricity, when sourced from solar or wind, is variable because it depends on environmental conditions. PPAs need to account for this characteristic. Owners of variable RE assets are unable to perfectly match their supply with demand. This creates two revenue risks for RE producers that dispatchable fossil fuel generators do not face: curtailment risk and price risk. Curtailment risk is present when periods of high RE generation (e.g., high wind or high sunshine) coincide with low electricity demand.

[18] Comisión Nacional de Energía (CNE) Republica Dominicana, "Recomendación Sobre Los Precios de Referencia a Considerar Como Modelo Para Determinación de Las Retribuciones Competitivas Aplicables Durante El Año 2022 a Instalaciones de Generación Que Participan En El SENI, Acogiéndose al Régimen Especial Establecido Por La Ley Numero 57-07.," Núm. CNE-AD-0036-2022 (2022).

When this occurs, not all electricity generated is required by consumers and will not be fed into the grid. Curtailment risk may be ameliorated in part by policies such as priority dispatch of RE and technology solutions, such as batteries (to store electricity until sufficient demand exists). However, both are dependent on local circumstances and may affect producer's costs. Addressing curtailment risk fundamentally remains a contractual issue that must be addressed with robust PPAs that guarantee electricity offtake.[19] Depending on the market structure, generators may not be compensated for curtailed power.

Price risk is present when electricity markets that operate with a wholesale market have variable prices typically set by the generation cost of the marginal generating unit. In such a system, a dispatchable generating unit will operate whenever the power price is sufficiently high that it is profitable to do so. However, intermittent renewables are unable to select when they can sell power and therefore, must accept whatever the power price is at the time of generation. If power is sold at persistently low levels, renewable energy generators may face a risk of not collecting sufficient revenue to cover the cost of financing capex investments. These two revenue risks (curtailment and price) can, therefore, affect RE generators' ability to secure finance. RE generation tends to be capital intensive, especially in island states where there are additional initial equipment and transportation expenses, with significant upfront capital costs relative to operating and maintenance costs. Therefore, servicing debt payments makes up the major component of an RE project's cost profile. When securing project finance debt, a generator will make assumptions about generation (based on the physical characteristics of the asset and local weather conditions) and the likely price for generation. The two risks described above can both lower the total expected revenues and increase the error bars around that expected revenue, both of which will increase project risk in the eye of financiers and reduce their willingness to provide finance.

Second, because private finance for RE in the Caribbean is in early stages, more general risk mitigation might be required to encourage private sector's participation. This is already available in the form of the Credit Risk Abatement Facility (CRAF) accessible to CARICOM members (includes all focal countries but the DR) through the CARICOM Development Fund. In essence, CRAF guarantees (up to 80 percent) the principal sum of loans in the range of $25,000 to $750,000. This guarantee acts as collateral for SMEs to enhance their credit worthiness for financing RE and EE projects. It is currently in its early stages, so it is limited in scope and extent, and little is known about uptake, but it demonstrates an institutional tool with which to encourage private sector lending.

Finally, private financiers also note that residual technical challenges remain. Land is scarce, expensive, and difficult to acquire in some locales. In Barbados, while many RE technologies are well known, specific local conditions affect project risk. One local adaptation for PV is to install solar panels at a height that allows for other activities under the panels, such as shade farming and raising livestock. However, these raised panels are potentially subject to other risks,

[19] Priority dispatch is heavily dependent on local conditions and grid set up (e.g., the ability of a grid to transfer loads from supply centers to demand centers). Additionally, a producer could collocate battery storage to their installation, but that effectively increases their cost—their LCOE will be higher. In the former case, local circumstances determine the feasibility of priority dispatch of RE as a solution to the problem of curtailment risk. In the latter case, colocation of storage will affect producer's costs, thereby affecting contracting and the ability of producers to successfully implement (of course, PPAs could have higher payment for electricity to help incentivize collocation of battery). However, neither fundamentally addresses the need for a robust PPA. Curtailment risk remains a contractual issue and needs to be addressed in PPA contracts through guarantees on offtake.

including damage from high winds or hurricanes. Thus, local conditions modify risks and introduce the need to conduct novel risk assessments.

Table 9. Examples of risk reduction products for EE/RE financing

Risk reduction product	Backer/Lender	Country	Description
SME-scale loan guarantee	GIZ, CARICOM	CARICOM member states	CRAF seeks to incentivize lending to SMEs for EE and RE projects by guaranteeing of up to 80% of the principal of qualifying loans.
SME-scale loan guarantee	World Bank, Development Bank of Jamaica	Jamaica	The World Bank's Energy security and efficiency enhancement project includes a line of credit to provide retail financing to the private sector for EE and RE investments. This line of credit also includes a partial guarantee that allows financial institutions to provide EE/RE loans to SMEs without full collateral.
SME-scale loan guarantee	USAID, DFC, cKers Finance Private Limited, Electronica Finance Limited	India	USAID and DFC provide a loan guarantee to two Indian microfinance institutions to support the issuance of loans for rooftop solar, solar pumps, and mini grids.
Utility-scale political risk insurance	DFC	Central African Republic	DFC provides political risk insurance to clean energy finance firm, SunFunder, in support of their project to convert diesel-fueled telecom towers to solar in the Central African Republic.
Utility-scale political risk insurance	DFC	Iraq	DFC provided political risk insurance to Ellicot Dredges in support of their work in Iraq to repair hydroelectric dams, among other waterway improvements.
Utility-scale political risk insurance	MIGA	Egypt	MIGA issued a $98-million guarantee for Virto Finance SARL to refinance the Benban solar farm in Egypt.
Utility-scale political risk insurance	MIGA	Burkina Faso	MIGA issued a $4.5-million guarantee to GreenYellow SAS to safeguard their investment in solar generation in Burkina Faso.

B. Funding for Auto-Produced RE

A second type of RE investment—auto-produced—is oriented to partially or completely powering residential (homes), institutional (government hospitals, buildings or other), commercial (hotels, shops, and other businesses), and industrial facilities. The RE investment is for powering the facility it is installed for and may or may not sell any of the electricity it produces.

Examples from across the region demonstrate the growing appeal of auto-produced RE. In Jamaica, hotels are installing auxiliary power off-grid solar units to reduce their energy costs (currently about $0.48 kWh) and demonstrate an eco-friendly image. Project implementers also find auto-production for industrial or tourism-sector clients to be attractive investments. In the DR, in 2022, a project implementer is installing its first solar farm for a hotel and has several similar projects in its pipeline. For smaller energy users, Jamaica estimates it has reached approximately 12 MW of auto-production through a rooftop solar net metering plan for households and small businesses. Barbados has had even more success, reaching 70 MW of distributed RE from about 3,000 RE auto-producers through its policy of democratization and

efforts to encourage every Barbadian to contribute to the country's overall RE goal. To facilitate mass and equitable participation, there are programs such as the Energy Smart Fund, which provides subsidized loans (at an interest rate of 3.75 percent, or a 4.30 percent interest subsidy) and technical assistance grants to individuals and businesses for implementing RE and EE projects, and the Community Shared Projects program (developed by the utility regulator, the FTC), which is a FiT-type program to encourage groups of 15 or more individuals to develop a RE project and receive an additional 10 percent above the going FiT rate.

Auto-production is not without its downside. Jamaican energy sector stakeholders note that while Jamaica has a licensing program for solar installers, many non-licensed actors are installing PV systems with equipment purchased from China and enforcement of codes is outside the capacity of the regulatory bodies. Further, grid defection by larger auto-producers (i.e., those entities with sufficiently large RE auto-production to disconnect from the grid altogether) has a negative effect on the revenue of the utility, which is a particular problem when tariffs are set lower for low-use/low-income customers, while higher-use customers pay rates that, essentially, subsidize the lower-use customers. For example, except for Jamaica, commercial users in the region paid 22 percent higher electricity tariff than residential users.

1. Donor Finance

While private finance is necessary to achieve the gains in RE and EE commensurate with stated goals of the Caribbean countries in this study, grants and concessional finance may be required for specific mini-grid and auto-production interventions. Of the 12 countries in this study, only Guyana and Haiti do not have 100-percent electrification. Haiti, the poorest country in this group, has less than 50-percent electrification, weak infrastructure, endemic governance problems, and a poor investment climate. To address the problem of electricity access, donor grants and concessional finance are likely necessary to incentivize mini-grid installation, auto-production, densification and extension of the existing grid, and injection of RE into the grid, when conditions are favorable. Guyana's geography and historic development result in a major population hub and more than 200 geographically dispersed communities living in the hinterland. Their topography and lack of roads prevent extension of the grid to these communities, and their small size and relative poverty inhibit the installation of large utility-scale, non-variable RE, even when hydropower potential exists nearby. For those dispersed communities, micro-grids and mini-grids are the most likely infrastructure to power households and businesses and, because of the low potential returns, donors are the likeliest to finance these.

2. Private Finance

Commercial and industrial users can finance their captive/auto RE generation through regular banking channels because the scale of the investment needed is small relative to the kind of financing required for utility-scale projects. Auto-production may remain important in the tourism industry, particularly in countries where tariffs are high and customers can find reliable installation and maintenance companies (ESCOs), such as in the DR and Jamaica. It is not clear from our desk research and interviews how significant is auto-production or its impact on utility revenue or, potentially, tariff reform (if utilities try to combat grid defection with attractive pricing for particular industries).

At the household level, residential auto-production is the most common in countries with net metering and financing for the initial cost of equipment and installation, such as Barbados. Some examples of projects that have driven auto-production are:

- Roofs to Reefs Program (R2RP) by Barbadian government: ~50,000 small and new houses installed rooftop PV systems. The project offsets energy costs and reduces cost of house.
- CIBC First Caribbean International Bank offers RE loans to customers, including: (a) up to 100 percent financing, (b) loan amounts up to $50,000, (c) up to 10 years to repay, (d) competitive interest rates, and (e) low processing fees.

C. Funding for Energy Efficiency

Energy efficiency is a key area to help manage the transition to RE because it can help reduce costs and manage loads on the grid. Energy efficiency projects are funded depending on scale, ownership type, and by country. EE projects, while offering seemingly obvious benefits, are still complex and generate their own set of challenges. There are three major thrusts of EE activity:

1. **Street lighting**: Countries in the region are pursuing replacement of existing lighting stock with EE lighting. The DR and Guyana are transitioning to EE public lighting. The DR is processing a large, $75-million project funded by the World Bank to address EE, with replacement of public lighting as one item within the project. Interviews with stakeholders in the DR suggest that pursuing EE was non-trivial and required a lengthy, 7-year public dialogue.

> "Now, to get to this, to this program of this energy efficiency project, the journey has been long, there has been a dialogue with the country for 6, 7 years." — Stakeholder from DR

2. **Electric vehicles (EVs)**: Consideration of EVs is at an early stage and country governments already recognize the potential challenges from replacing existing vehicle stocks with EVs. For instance, a stakeholder in Jamaica suggested that a large politically important secondary economy existed around combustion-engine vehicles, including sales, parts, maintenance and, of course, fuel itself.
3. **Norms, labeling, education**: The third thrust of EE policies is labeling appliances, creating norms around energy-efficient behaviors, and educating consumers. These are all in their infancy, although stakeholders from government expressed their belief both in the potential of this pathway and the need to undertake it.

Several EE initiatives and programs are currently underway across the Caribbean. Notable among these are the Inter-American Development Bank-supported implementation of programs in the DR and Jamaica for EE in the public sector, as well as a residential EE program in Barbados supported by the Caribbean Development Bank.

D. Finance Enablers

Along with institutions that play a direct role in financing RE projects, many institutions are playing the role of middlemen, connecting financiers with investment opportunities, playing a preparation and packaging role for projects, and removing informational frictions. These are important enabling roles that remove critical market frictions: the existence of willing project financiers alone is not sufficient to ensure that investment of funds in Caribbean RE will take

place. A major role that these organizations play is matchmaking, ensuring that projects find financiers. The Caribbean Climate-Smart Accelerator, Caribbean Project Preparation and Investment Platform of the Carib-Export and Caribbean Association of Investment Promotion Agencies, Caribbean Center's for Renewable Energy and Energy Efficiency (CCREEE's) Project Preparation Facility, GET.invest, and Private Financing Advisory Network all work toward connecting RE projects with finance.

A second role that some organizations play in this intermediate space, such as CCREEE's Project Preparation Facility and the EU/GIZ's GET, is that of packaging and preparation of RE projects for investment. Thus, CCREEE's Project Preparation Facility helps project developers, project investors, financers, financial institutions, and the public sector with business plan refinement, project financial modelling and documentation, equity offer terms development, financier introduction, technical validation and feasibility studies, and environmental and social impact assessments. Part of this packaging role is to aggregate projects across geographies to make them more attractive as an investment. A lot of small- and medium-sized RE developments may be seen as a management headache for large investors. By aggregating them into a larger package of projects, investors may see a compelling project scale to invest in.

A third role that these organizations play is in removing informational frictions. Specifically, CCREEE's CARICOM Energy Knowledge Hub acts as a repository that potential RE project implementers and financiers can consult to ensure they are better prepared as they enter the RE space in the Caribbean. Many other groups have similar knowledge products and repositories, including National Renewable Energy Laboratory (NREL), International Renewable Energy Agency, and the Latin American Energy Organization (OLADE).

> "[You] need good IRRPs with a detailed pathway for RE expansion. This will naturally lead to better secondary legislation. So IRRPs are foundational." — Regional association

Relatedly, CCREEE also plays a more foundation-laying role that will enable its PPF pipeline: It helps countries in the region prepare resource plans—previously called Integrated Resource Plans and now called IRRPs, an alteration that acknowledges a changing environment and climate. While these IRRPs already exist for some countries (Barbados, Dominica, the DR, Guyana, Jamaica, and St. Lucia), CCREEE leads the update of and production of IRRPs for CARICOM members within the next 5 years. As one multilateral energy expert suggested, these IRRPs are foundational to RE development in the Caribbean because they lay out targets and feasible pathways to achieving those targets. Without a feasible pathway to achieving RE goals, investment will not flow into this sector: a clear plan with specifics on the type of technologies and geographies to be targeted in a given year is required.

While these three roles are important, a fourth potential role that is needed—but that none of the listed international organizations currently plays—is expediting and navigating local-government bureaucracy. Interviewees made it clear that beyond financing, clarity in the bureaucratic processes for getting an RE project approved was needed.[20] Until bureaucratic processes around

[20] Clear procedures for project approval, supported by adequate administrative capacity, are vital to accelerate the flow of viable, investable projects—both for clean energy supply and efficiency and electrification. Our analysis

RE investment are clarified across the region, an expediting role may help investors and project implementers navigate currently opaque processes. **Key informants from the banking sector in Barbados** suggested that two almost identical projects took radically different times to approval.

Table 10. Services that enable financiers' services

Primary Role	Funding Mechanism and Amount	Program
Match making	N/A	• Caribbean Climate-Smart Accelerator • Caribbean Project Preparation and Investment Platform (Carib-Export and Caribbean Association of Investment Promotion Agencies) • GET.invest (EU/GIZ) • Private Financing Advisory Network (UNIDO/REEEP) • Energy Transition Accelerator Platform
Project preparation services	N/A	• CCREEE's Project Preparation Facility • Climate Investment Platform (IRENA) • GET.invest (EU/GIZ) • Energy Transition Accelerator Platform
Project finance	• GGGI's Greenpreneurs Program: Aims to deliver over $1.2 million in grant funding to green micro and SMEs in the region	• Climate Investment Platform (IRENA) • OECS-focused Global Green Growth Institute's Greenpreneurs Program
Indirect finance, crowding in finance	• ETAF Platform: Anchor funding of $400 million from the Abu Dhabi Fund for Development (ADFD). ETAF aims to mobilize approximately $1 billion of capital by 2030 from various funding partners, investors, private sector, and donors.	• Technical Assistance Program for Sustainable Energy in the Caribbean (TAPSEC) • Credit Risk Abatement Facility (CRAF) • Energy Transition Accelerator Financing Platform (ETAF)
Knowledge/Data sharing and networking	N/A	• CARICOM Energy Knowledge Hub (CCREEE) • NDC Financial Initiative (OECS/Government of St. Lucia)
Technology	N/A	• Climate Chain

E. Summary of Key Financial Challenges to RE and EE in the Caribbean

To recap, RE developers can offer cost-competitive electricity supply versus fossil fuels, and private financiers are abundant and willing to invest in the RE sector, particularly in the countries with larger potential markets, such as the DR and Jamaica. However, Caribbean countries included in this study encounter the following financial challenges:

1. The peculiarities of local geographies and population densities result in a set of RE project scales that are unattractive—in an immediate sense—to private financiers. Specifically, mini-grids that serve remote communities—and are not grid connected—will require donor financing, especially if they contribute to national RE goals.

finds that permitting and construction of a single overhead electricity transmission line can take up to 13 years, with some of the longest lead times in advanced economies. World Economic Outlook 2022. Accessible at: https://www.iea.org/reports/world-energy-outlook-2022/executive-summary?utm_source=SendGrid&utm_medium=Email&utm_campaign=IEA+newsletters.

2. Private financing of RE projects is nascent and held back due to institutional challenges. There is a need to strengthen institutional frameworks, mitigate revenue risks, and support project development to mobilize private finance and initiate an RE pipeline:
    a. Institutional challenges (political and regulatory risk) create risk that results in reluctance to invest by private financiers. In the long run, this needs to be solved by improving policy, legislation, and regulation; in the short run, this risk could be managed with guarantees.
    b. Financiers are not comfortable with the revenue streams of RE projects, even in countries where these should theoretically be quite sound. Acquiring PPAs is inconsistent and PPAs for RE must account for production variability.
    c. There is low maturation of projects beyond the concept phase. This suggests problems at the project development phase. Solutions could center around capacity-building such as help with feasibility assessments and tender documents, along with financial support targeting the project development phase, which could be extended to the first few years of project development.

In summary, despite significant need, there are limited donor-support projects aimed at strengthening policy, legislative, and regulatory frameworks for supporting RE and EE in the Caribbean. Some exceptions include the World Bank, which has approved to finance $400 million for Electricity Reform for Sustainable Growth Development in the Dominican Republic;[21] the Inter-American Development Bank, which supports building the regulatory regime for the development of utility-scale RE across several countries in the Caribbean;[22] and USAID's Energy Sector Reform Project, which provides technical assistance to utilities, ministries, and regulators to develop policies, regulations, processes, and tools for the design and operation of more resilient and modern energy systems.[23] The next section describes the legislative, regulatory, and policy context in which countries are working to increase RE and EE.

IV. Political Economy and Enabling Environment Constraints

> "Legislation is there, but [there are] still plenty of bureaucratic hurdles. [They] may get through many stages of the process, then come across an insurmountable hurdle at stage five or stage seven … Another hindrance is that time taken can vary… Two almost identical projects can take vastly different time frames for approval—6 weeks versus 6 months—and this can throw investors off."
>
> —Caribbean Bank Association

Political economy can foster an enabling environment for RE and EE growth. The political economy, or collective norms, rules of the game, institutions, actors, processes, and policies, as

[21] World Bank, "Development Projects: Electricity Reform for Sustainable Growth Development Policy Loan - P175874," https://projects.worldbank.org/en/projects-operations/project-detail/P175874.

[22] See: Inter-American Development Bank, "BA-T1065: Supporting Energy Transition Implementation and Smart Energy Technology Expansion in Barbados Project Details," "JA-T1206: Implementation and Technical Support for the Energy Sector in Jamaica Project Details," "GY-T1164: Renewable Energy Actions in the Energy Matrix in Guyana Project Details."

[23] https://pdf.usaid.gov/pdf_docs/PA00ZM3B.pdf

well as legislative, legal, and regulatory frameworks[24] in a country define the extent to which RE and EE projects are faced with an enabling environment or challenges. Strong planning and coordination policy, including primary and secondary legislation, local institutional capacity, human resources, and knowledge curation and dissemination are needed to facilitate the development of RE and EE sectors, regardless of the types of public or private financing that are available. Donor finance has dominated the RE project space in the Caribbean. However, the region is seemingly at a juncture, where private financiers are poised to finance RE electricity generation at the utility scale (i.e., to sell to the grid as an IPP). While private finance is ready to invest, specific planning, policy, institutional, and financial constraints hold back this investment. Based on our desk review and interviews with energy sector stakeholders in the Caribbean (summarized in Section V), we highlight the following constraints that inhibit an enabling environment and investment:

1. **Long-term planning and coordination:** Five (5) of the 12 countries lack clearly defined long-term plans, coordination, and pathways to achieve RE goals. This is typically expressed as a master planning document, such as the IRRP of some Caribbean countries.
2. **Policy frameworks (legislation, legal, and regulation):** Policy frameworks are underdeveloped and, in some cases, there is a lack of policies to enable RE and/or private energy producers. This includes primary legislative frameworks to establish generation and procurement of RE by IPPs and consumption of RE by consumers, and secondary legislative frameworks needed for further development of the sector, such as clear rules for RFPs and PPAs, policies regarding social and environmental considerations, land acquisition and permitting, and complementary legal and regulatory frameworks that are opaque, inconsistent, or outdated.
3. **Institutional and technical capacity:** There is a lack of institutional capacity (human resources) and technical capacity to manage transparent procurements and comply with international norms and standards for procurements. While addressing the need for transparent "rules of the game" is one part of the challenge, having adequate human and technical resources to see through those rules is a distinct and essential component.
4. **Knowledge curation and dissemination:** Despite international donors' activity and the availability of relevant tools and resources from around the globe, knowledge sharing appears to be sporadic and ineffective, while donor coordination is inconsistent. Tools and resources do not often reference one another and are sometimes labeled in a region-specific way that might inhibit ease of use for interested parties in the Caribbean, and vice versa.

A. A Pathway to RE through Long-Term Planning and Coordination Is Lacking

A lack of clearly defined long-term plans and coordination among government stakeholders in many countries in the Caribbean inhibits pathways to achieve RE goals. Key informants from Jamaica and St. Lucia noted how the absence of up-to-date IRPs and the lack of availability of data for planning had hindered investment and the RE sector development. In Dominica, the market was liberalized in 2006, and government policy insisted any new energy capacity would come only from renewable sources; however, not all parties have been on the same page. In

[24] This integrative view of political economy is in line with Lee and Usman's (2018) definition that feature actors, interests and ideas, influence and interactions, institutions, and context. A.D. Lee and Z. Usman, "Taking Stock of the Political Economy of Power Sector Reforms in Development Countries -- A Literature Review," World Bank Policy Research Working Paper 8518, 2018.

2017, the regulator veered from the policy goals and approved a 1.5MW LNG thermal plant. Now, under new leadership and a new planning document (Sustainable and Resilient Energy Plan), the regulator is committed to fulfilling its mandate to "promote renewable energy sources […and] will not consider any proposals from fossil fuel IPPs."

With a lack of long-term planning and coordination, the progress of RE development is dependent on the commitment of small groups of individuals to mitigate climate change and reduce dependence on fuel imports, rather than clear, collaborative plans of action. Effective planning and coordination require dialogue and agreement in plans between key government agencies, such as ministries of finance, planning and development, energy, and natural resources, as well as utilities and regulators.

> "The motto that we have adopted […] is 'Inaction is not an option.' So, we're not going to sit there and not act, and say, 'Well, you know what, let the politicians deal with that.' They're not going to move, so we have to act to get things moving, because otherwise, nothing will happen."
> —Dominica energy sector stakeholder

B. Weak Policy Environments and Incomplete Legislative, Legal, and Regulatory Frameworks

An enabling policy environment, such as transparent primary and secondary legislation, legal, and regulatory frameworks, is crucial for supporting the development of RE. This includes primary legislation to establish generation of RE by IPPs and consumption of RE by consumers. It also includes secondary legislative frameworks to further RE development, such as clear rules for RFPs and PPAs. Complementary legal and regulatory frameworks that are transparent are also critical to the functioning of an effective RE sector. As documented in Table 5 of Section 2, there are varying degrees of enabling policy environments as well as legislative, legal, and regulatory frameworks in the Caribbean. Weak policy environments and incomplete legislative, legal, and regulator frameworks serve as an impediment to RE and EE investment and development, with the exceptions of the DR and Jamaica, although both countries could make improvements as well.

> Interviewer: "What is the country's current structure of PPAs?"
>
> Respondent: "So, despite my involvement, your guess is as good as mine."
> — Barbados energy expert

In addition to policy, legislation, and regulation, enabling environments require transparency and clear, timely processes so projects can be developed and implemented without costly delays.

> "… [E]ngaging the Ministry of Finance and or the Ministry of Planning, sometimes the same ministry early and in a very deep way, is very important to move the needle because that's the ministry that matters for some of these big political economic questions … it's all about collaboration, making the system work rather than me have [sic] an idea and I come and talk about it and then, if I have the authority, approve it, but instead look and see how we can make it work for the country. And if we don't do that, we are going to always be at odds and fighting each other and blaming each other for this and blaming each other for that, which is really unproductive behavior." — Barbados energy expert

C. Inadequate Institutional and Technical Capacity

Growth in RE and EE sectors in the Caribbean is constrained by a lack of strong institutions, human resources, and technical capacity. Key government institutions, such as the ministries of planning and development, energy, and natural resources, as well as utilities and regulators are often under-resourced. A lack of funds limits institutions' abilities to hire and train staff, manage growing departments or new projects, and conduct the assessments needed to inform decisions. Human resources, including managerial and technical expertise, are scarce in several of the focal countries. Energy sector stakeholders noted that attracting human resources is difficult when institutions are dysfunctional or lack resources to pay competitive salaries. Institutions try to overcome these gaps by hiring private consultants, but interviewees remarked that this does not solve the problem; instead, it contributes to a lack of institutional learning.

> "… [T]he people are there, they're bright, they can be trained. When it comes to the institutional factors and all, that's where things get a bit tougher." — Caribbean energy expert

In addition to constraints on capability to conduct assessments for new infrastructure, limitations in institutional capacity can also contribute to a lack of technical ability to monitor and manage existing infrastructure, which may additionally be outdated. For example, in Jamaica, key informants noted that a lack of technical capacity in key institutions had led to poorer electricity quality, which contributes to grid defection.

D. A Lack of Knowledge Curation and Dissemination

The World Bank, regional renewable energy bodies, the U.S. Department of Energy, and USAID have a variety of knowledge products and resources to support RE and EE adoption. However, these resources often do not reference one another and are sometimes labeled in a region-specific way that might inhibit ease of use for interested parties in the Caribbean, and vice versa. For example, the U.S.-funded Power Africa toolbox[25] bills itself as a "one-stop-shop" for information and funding opportunities for private-sector developers, governments, investors, utilities, and others and includes 31 transaction assistance tools, more than 100 finance tools, policy and regulatory reform tools, and capacity-building and information resources. Many of these resources would be appropriate for use in the Caribbean. The U.S.-funded Caribbean Energy Initiative (CEI) page should leverage Power Africa's resources for wider application in the Caribbean region. In general, donor coordination and knowledge sharing are sporadic and ineffective, according to several stakeholders interviewed for this study.

E. Resources for Coordination and Policy Reform

Several multilateral or bilateral donors and regional organizations currently provide technical assistance focused on political economy and policy reform to Caribbean nations (see Annex 3 for more details). As part of the CEI, USAID is launching the Caribbean Energy Sector Reform Project in partnership with RTI International. This effort is expected to provide technical assistance for energy reform to utilities, ministries, and regulators in the host countries to develop policies, laws, regulations, tools, and processes to design and operate more resilient and modern energy systems.

[25] See https://www.usaid.gov/powerafrica/toolbox.

The IDB, World Bank, UNDP (via Small Island Developing States: SIDS-DOCK), and the Caribbean Development Bank are leaders in providing technical assistance to develop enabling environments. Although there are instances of technical assistance-only projects, most projects in the region provide some form of technical cooperation alongside other funding for RE and EE projects. Two regional organizations, CCREEE and CARILEC also play a crucial role in supporting project preparation, developing IRRPs, and providing capacity-building, knowledge curation and dissemination, and other technical services.

In summary, energy sector stakeholders in the Caribbean highlight the need to prioritize policy reforms to foster an enabling environment to maximize the impact of public and private financing and catalyze the RE and EE sectors in the Caribbean. While there are several committed multilateral, bilateral, and regional stakeholders supporting and providing technical assistance to reform political economy and policy in the region, more emphasis and coordination is merited to develop strong enabling policy environments. Future technical assistance should focus on: (1) long-term planning and coordination, (2) policy frameworks (legislative, legal, and regulative), (3) institutional and technical capacity, and (4) knowledge curation and dissemination.

V. Recommendations

A. Review of Gaps

Donor finance has dominated the RE project space in the Caribbean. However, the region is seemingly at a juncture, where private financiers are poised to finance RE electricity generation at the utility scale (i.e., to sell to the grid as an IPP). While private finance is ready to invest, specific institutional and financial constraints hold back this investment. Based on our desk review of energy policies, projects and finance within the region and interviews with Caribbean energy sector stakeholders, we have identified several constraints.[26]

In terms of financial constraints, we have identified the following:

1. The particularities of local geographies and population densities result in a set of RE project scales that are unattractive—in an immediate sense—to private financiers. Specifically, mini-grids that serve remote communities and are not grid connected will require donor financing, especially if they contribute to national RE goals. Additionally, land scarcity and extreme weather events, such as hurricanes and earthquakes, present additional obstacles, because they require environmental and social considerations and/or increase insurance and installation costs. Weather events also increase the risk of disruptions and damage to infrastructure, especially because RE infrastructure requires substantial physical space and directly interacts with the environment.
2. Private financing of RE projects is nascent and held back by institutional challenges in several of the countries in the study. Therefore, there is a need to initiate an RE pipeline ("priming the pump"). Private financiers demonstrate reluctance due to institutional constraints. Removing these constraints will require the relevant institutions to understand

[26] Section V.D. contains tables that summarize key informant interviews respondents' (a) assessment of the problems in financing for RE and EE and the problems in policy/political economy for RE and EE, (b) recommendations for solutions to these problems, and (c) potential solutions USAID might consider implementing, including those recommended in this chapter.

where the bottlenecks are and remove them. Passing through a sufficient volume of RE projects will help these institutions learn and adapt.

In terms of institutional, legislative, and regulatory constraints, we have identified the following:

1. Several countries lack clearly defined pathways to achieve RE goals. A pathway is expressed as a master planning document, such as an IRRP, with a clear timeline, a pipeline of specific RE projects, or a procurement plan on how to achieve targets for RE capacity additions.
2. Policy and regulatory environments are inadequate, including poor planning and coordination by government agencies, legislative frameworks that need further development (secondary legislation on the rules for RFPs, clear rules on PPAs), regulatory and approval frameworks that are opaque and inconsistent.
3. Institutional (human resources) and technical capacity at the grid level (the ability to monitor and maintain infrastructure) are insufficient. While addressing the need for transparent "rules of the game" is one part of the challenge, having adequate human and technical resources to see through those rules is an additional challenge.

B. Recommendations for Addressing Financial Constraints

There are five key areas where USAID can play a pivotal role in terms of financing. We list these (not in rank order) and provide a description of each recommendation, the market barriers addressed by the recommendation, the role for USAID, and priority countries for action. Several of the recommendations (credit guarantees, equity for project development, and concessionary credit lines) target reduction of risk associated with medium- to large-scale RE. For these instruments, USAID might establish a single fund for their provision. Further, provision of these support options is not mutually exclusive and the optimal solution for some projects might be bundled to provide a comprehensive support package.

1. *Matching grant funding of mini-grids*: As noted earlier, RE electrification of geographically remote, difficult-to-access communities will likely not be seen as an attractive investment opportunity by private financiers. Assuming that some or all of the electrification of these remote communities through local RE-based mini-grids is part of the overall RE goals of Caribbean countries, USAID can play a direct role in supporting their financial viability by providing matching grant funding (where possible).[27] Specifically, USAID can offer grants to governments that have identified remote communities in need of RE mini-grids, particularly in Haiti and Guyana. This support could be provided through a results-based funding (RBF) scheme that links the pay out of funding to predetermined results.

Market Barriers Addressed

Peculiarities of population distribution and local geography mean that some communities will not be connected to a central electrical grid and benefit from the RE expansion. For the Caribbean to achieve its ambitious RE goals, these remote communities will need to be connected to RE sources of electrical power. For many of these communities, the private sector will not provide electricity service due to the financial viability gap between the required revenue for financial sustainability and the ability of customers in these communities to pay. This

[27] Matching funds may not be available in all circumstances. In these cases, USAID may choose to provide grant funding without matching.

financial viability gap has historically led to a need for some form of subsidization for rural electrification within many geographies across the globe,[28] and while there may be exceptions across the Caribbean, this need for subsidization is likely to remain the case for many currently underserved rural communities (we note that, as with any subsidy program, the need for a grant should be assessed on a case-by-case basis).

Role for USAID

In Caribbean countries where matching is feasible, USAID could support financing the development of mini-grids in remote communities:

- USAID could establish a fund for the purpose of providing RBF finance to implementing firms tasked with deploying mini-grids.
- To establish the fund, the Agency must work with the relevant ministry to identify and list potential communities.
- With prospective communities, stakeholders should devise a fair process to allocate funding to all or some subset of these communities. Criteria may include poverty and government RE targets.
- The implementing agency should issue a clear and well-targeted request for proposals to find the best-suited implementers with preference for women-owned businesses, SMEs, and businesses otherwise supporting USAID's goals for inclusion.
- Finally, USAID should consider ways to support the sustainable operations of remote-location RE mini-grids, taking ongoing lessons learned from other regions.

Product Characteristics

- USAID establishes the fund, then contracts implementing firms to install mini-grids that must deliver certain results against the payment of an incentive. These firms can be any third party that meets predetermined eligibility requirements for delivering the mini-grids. Typically, these parties will include private energy companies that can bring some of their own financing to leverage the matching mechanism and that specialize in mini-grids and other small-scale or off-grid energy solutions and/or existing utilities companies. The results must be well defined for the RBF scheme and typically be of a public good nature because the market is constrained or unwilling to provide the services without a financial incentive. These results must be easily measurable and verifiable.
- Implementing firms or utilities would own and operate the mini-grids, including generation assets, with operating and maintenance budgets collected through consumer bills.
- The proposed result for payment is predicated on connection of new customers. A non-repayable per-connection subsidy would be paid entirely on verification of a new operating connection.
- The scheme must be set up with a simple verification and payment process to minimize transaction costs and delays in disbursement.

[28] AMDA, 2022: Benchmarking Africa's Minigrids report.

- An RBF model for delivery of mini-grids has been commonly adopted in rural areas with limited access to electricity, particularly in Africa, for example, through the multi-donor Universal Energy Facility. [29]

Priority Countries

The two priority countries for this effort are Guyana, with its hinterland communities, and Haiti (if feasible), which has low electricity access.

Advantages and Disadvantages

A summary of the advantages and disadvantages of results-based funding is shown in Table 11.

Table 11. Advantages and disadvantages of results-based funding

Advantages	Disadvantages
• **Promotes connection of customers in hard to electrify areas** • **Mini-grids commonly face a financial viability gap between revenue needed for financial sustainability and what their customers are able to pay** • **Shifts the financial risk of not achieving results from USAID to the implementing firm** • **RBF grants are typically considered to be a cost-effective use of development funds, encouraging of investment, and increasing the mini-grid developers' ownership of the scheme**	• Scheme requires a non-repayable grant subsidy and therefore, does not generate a surplus fund[30] • Unpredictability and delays associated with existing mini-grid RBFs have hampered implementing companies' ability to raise capital • Due diligence process to assess applicants for delivery of mini-grids can cause delays • Disbursements are made once investments are made; therefore, developers must source their own finance for the initial capital expenditure, which may be difficult for some developers

2. *Credit guarantees:* RE remains nascent in many Caribbean countries, with FIs not yet comfortable with RE projects and their associated revenue streams. While risk perceptions remain high, credit guarantees provide a solution that can help FIs become comfortable with projects and leverage private finance in a way that would not be achieved by provision of a grant. A credit guarantee is a contract between a lender and a guarantor to cover the borrower in case of a default. The guarantee would be financed by the guarantor, but with a portfolio of guaranteed investments that can cover the default risk on multiple times the face value of the guarantee facility. Put another way, a credit guarantee would allocate the risk of a project to an entity with greater capacity to manage that risk. The guarantee may cover general default or specific risks, such as regulatory or political risk.

Market Barriers Addressed

A guarantee is designed to address high perceived risk of investment, in particular:

- Perceived creditworthiness of borrower (which may stem from a lack of creditworthiness of utility counterparty of PPA)

[29] Sustainable Energy for All. Universal Energy Facility. URL: https://www.seforall.org/results-based-financing/universal-energy-facility. Accessed: 01 November 2022.
[30] A surplus fund occurs when the present value of estimated cash inflows from the financial product (excluding any origination and utilization fees and borrowing charges of FIs) equals or exceeds the present value of USAID's initial cash outflows.

- Perceived risks regarding the regulatory and political environment associated with the transition to RE
- Perceived revenue risks from curtailment and price risks

Role for USAID

USAID could provide a risk guarantee facility directly or more likely, supply the funds to an implementing third party. In either case, USAID would allocate a pool of funds (that are not intended to be repaid) to establish a guarantee facility. Dependent on the implementing structure, these funds would either:

- Be used to establish a guarantee facility provided and managed by DFC with direct payments of the cost of the guarantee facility contributed by USAID. DFC would directly enter contracts with financiers of RE projects to cover borrowers in case of default.
- Transfer funds to a managing third party (this could be a vehicle established for the specific purpose of the fund, such as a private-fund manager). That fund would then use DFC guarantee products to enter into contracts with RE developers who cover their obligations in cases of default, and then use such contracts as security in applying for project financing.

In either case, the guarantor would maintain the size of the fund to cover contingent liabilities from guarantees, including expected pay-outs plus proceeds from liquidation.

Product Characteristics

- Product is targeted toward utility-scale RE projects. Therefore, exact terms will be tailored to the unique project characteristics. The product may be packaged alongside other support products, as appropriate.
- USAID can structure the guarantee facility as a loan portfolio guarantee or portable guarantee. The first facility guarantees the RE loan portfolio of a lender (e.g., bank), while the second guarantees the loan of a borrower, in this case RE developers. The latter facilitates RE developers' access to financing and enables them to negotiate favorable credit term—lower borrowing cost, collateral requirements, and longer grace and repayment periods.
- USAID should ensure sustainability of the guarantee facility in structuring the financial product. USAID can establish a Guarantee Fund that will provide an initial seed money to establish a guarantee facility. Under both the loan portfolio and portable guarantee facility, the Fund will require lenders to add, on top of their lending rate (e.g., 10 percent), charges for the guarantee product at a rate that will create a surplus fund that fully recoups the cost of establishing the guarantee facility and builds a surplus for future expansion purposes, and return the amount to the Fund. This would ensure the fund is self-sustaining and provides a revolving pot of money to pay for future guarantee products and its expansion or extension.
- Product is intended to cover political and regulatory risk (including credibility of utility as an off-taker of power produced). This must be well defined in the contract between the guarantee provider and the lender. Details on the risks to be covered will be country specific and thus should be determined separately for each country. In countries where this risk is primarily associated with project development, the product should be targeted as such.

Priority Countries

Given that private-sector financing of RE projects is nascent in the region, this action is suited across the Caribbean region. Risks vary across the region, so the cost of the guarantees supplied (i.e., the uptake) is likely to vary. Because the risk profile of a country influences the guarantee cost, the additional charges under a surplus fund guarantee approach are likely to be affordable and suited to low sovereign risk countries such as the DR and Trinidad and Tobago. and less suitable for high sovereign risk countries such as Barbados or Suriname.

Advantages and Disadvantages

A summary of advantages and disadvantages of credit guarantees is provided in Table 12 below.

Table 12. Advantages and disadvantages of credit guarantees

Advantages	Disadvantages
• An effective means to manage political and regulatory risks that are difficult for the commercial sector to influence • Potential to leverage private finance well above the face value of the USAID-provided facility • Constructing the facility to target a surplus fund creates a self-sustaining facility • Allows private FIs to develop expertise and skills in supporting RE in a reduced risk environment • Clear opportunity to remove support once market is established and regulatory risk is resolved • Lower transaction cost than direct equity or debt provision	• Higher cost of debt associated with a surplus fund product could affect project viability • Potential for the market to gain reliance on a risk-reduction facility rather than address fundamental causes of risk • Rationale that risks covered are better borne by guarantor must be clear

3. *Loan portfolio guarantees to support on-bill financing for EE:* EE remains underused in the Caribbean, despite several utilities stating that they would like to increase EE. On-bill financing is a mechanism through which repayments for capital investments are made by a consumer (or prosumer, if the scheme supports installation of household-level solar) through savings on energy bills that allow for energy measures to be utility-led. On-bill financing is typically targeted toward small-scale and shorter payoff time for EE investments, including lighting, insulation, boiler upgrades, heat pumps, air conditioning, rather than large-scale initiatives like building retrofits or industrial process upgrades. Additionally, the viability of on-bill financing is determined by the cost of electricity. High cost of power indicates that there can be significant savings from EE from avoided energy costs. In the Caribbean, power prices are high relative to global benchmarks in all countries outside of Trinidad and Tobago and Suriname. This offering is suitable for all other markets.

The scheme would function as follows:

- The utility finances and leads implementation of EE measures for customers.
- Cost of implementing these measures is repaid by the customers through a monthly payment included in customers' energy bills.
- The additional cost of the repayments is offset on the customers' energy payment by savings from avoided energy consumption.

Financing used for EE can be treated either as a loan or a service whereby it is considered part of the services offered by the utility and integrated into tariffs. Funds may come from the utility

(which may have access to low-cost financing) or third-party financing bodies, such as commercial banks. The loan may be attached to meter/property rather than an individual so that repayments are directly linked to the EE assets.

The viability of EE programs is typically determined by the ability to access sufficiently cheap debt and secure debt with a long enough tenor to match the long payback periods associated with EE investments. To support this kind of program, USAID could offer a credit guarantee product covering loans taken by utilities from private FIs for on-bill financing of EE investments. Such a system would support the utilities in accessing finance, while leveraging the utilities' natural ability to evaluate the creditworthiness of their regular customers and the collection system to manage repayment risk.

Market Barriers Addressed

On-bill financing can improve access to capital for low-income households unable to directly access loans if credit check criteria either (a) are not required due to treatment as a service, or (b) are lowered due to perception of lower default risk on energy bills.

- Linking the loan or service to the property can help deal with long repayment periods that may be shorter than typical tenancy lengths.
- The routine payment of power bills, and bulk procurement of EE through the utility can help to minimize transaction costs.
- This product aggregates financing to avoid high transaction cost of small-ticket RE investment.
- Utilities have the ability to evaluate credit worthiness of their regular customers and the collection system to manage any risks associated with repayment default.

Role for USAID

The viability of on-bill financing can often be determined by the ability of the utility to access affordable debt with appropriate tenor length. USAID could help support access to such debt by offering a guarantee product that will cover a utility's associated loan portfolio.

Product Characteristics

- USAID would establish a facility to provide credit guarantees to utilities to cover loans passed on to customers through on-bill financing of energy efficiency measures.
- Guaranteeing credit passed on to customers would give the providers of parent loans (likely financial institutions) with confidence that the risks of default from low-income households with limited collateral and the risks associated with long loan tenor are minimized.
- USAID would work with utilities to decide on the design of the product offered from utilities to end customers. A key consideration for product design is whether it should be a loan or a service. This will, ultimately, be reflected in the structure of the product offered by USAID:
    - If treated as a service, then the associated cost can be fully integrated into tariffs as part of the services offered by utilities.
    - If treated as a loan, then the utility must determine whether the loan is associated with an individual or attached to a property. If it is attached to an individual, then there

arise issues associated with property ownership and transfer. When associated with a property, the loan is transferred to a new owner when property ownership is transferred. This additional risk that arises from structuring on-bill financing as a loan can be mitigated by USAID providing a credit guarantee to mitigate the risk of such a loan being passed to a less creditworthy consumer.

- Product terms could be set to achieve a surplus fund, as outlined under Recommendation 2. Credit Guarantees.

Priority Countries

As an EE-oriented recommendation, this scheme could work well in any country across the region with relatively high power prices. All Caribbean countries except Suriname and Trinidad and Tobago have power prices that are high compared to global benchmarks.

Advantages and Disadvantages

A summary of the advantages and disadvantages of on-bill financing is provided in Table 13.

Table 13. Advantages and disadvantages of on-bill financing

Advantages	Disadvantages
• Improves access to capital for low-income households • Can address the principal agent problem common for EE measures if the loan is attached to the property • Low transaction costs due to the aggregation of customer financial requirements under utilities' loan and bundling of the transaction under customers' energy account and bill • Linking a loan to the property can help address issues associated with long repayment periods for some EE measures • Leverages utilities' systems to evaluate creditworthiness of customers and collect payments through regular electric bills • USAID could crowd in commercial credit financing, and ensure sustainability and scalability by providing a credit guarantee with a surplus fund	• Requires a good financial offer from USAID • Risk of market dependence on financial products provided by USAID implies the scheme may not be sustainable after USAID exits • Transfer of property inside the payback period of EE measures implemented can be a barrier

4. *Contingent subordinated equity-to-debt for project development:* Early-stage project development has been an insurmountable hurdle for many RE projects in the Caribbean. Equity for project development would allow USAID through a private-fund mechanism, to take on early-stage project development risk from private financial institutions to facilitate projects making it to final investment decision (FID), commercial operation date (COD), and/or through the first few years of operation. Equity for project development implies a private fund established with USAID's assistance to hold an equity stake in an RE investment during project development, which is converted to a debt financed through a loan from a commercial FI once a project achieves a specified threshold that indicates success, such as FID or COD. In the Caribbean, where financiers remain uncomfortable with the revenue streams from new RE project developers facing curtailment and price risks, success criteria could be extended to cover the first few years of operation with the financing occurring once the project has achieved robust revenues.

Market Barriers Addressed

Early-stage equity financing is intended to address risk associated with early stages of an RE project, including:

- High risks associated with project development investment
- Lack of finance for project development
- Addressing risk in uncertain environments, such as new markets and/or regulatory structure
- High risks associated with new RE technologies, such as curtailment and price risks

Product Characteristics

- The product is targeted toward utility-scale RE projects. Therefore, exact terms should be tailored to the unique project characteristics. The product may be packaged alongside other support products as appropriate.
- For early-stage RE projects, a fund would be established to supply credit guarantees and managed flexibly to allow the terms of guarantees provided to be project specific. The fund does not necessarily need to be established specifically for the purpose of providing guarantees and could be set up to offer several different products.
- The amount of equity provided by a fund must be sufficient to lower the debt–equity ratio to a point where lenders are comfortable providing debt during higher risk project development. Beneficiaries must provide sufficient equity so that when the fund equity is refinanced, the debt–equity ratio meets lenders' requirements for the remainder of the loan period.
- If USAID prefers to target a surplus fund, then expected return from the refinancing deal should be set so that the fund's total returns from successful projects are sufficient to offset losses from unsuccessful projects where equity is lost.
- Equity-to-debt conversion could be allocated to local FIs through a competitive process and awarded to those who offer the most competitive debt terms, including the lowest cost of debt and the longest loan term.

Role for USAID

USAID would create a fund to provide early-stage project equity to be converted to project debt once project success criteria are met. In providing project equity, USAID would be actively involved in the project development process, passing on expertise and knowledge to local FIs who provide the remainder of finance for the project and do not have the capacity to conduct their own creditworthiness assessments of RE projects.

Priority Countries

Barbados may be a candidate for this financial product. Respondents from Barbados mentioned that returns for international financiers, who expected returns in U.S. dollar, were in local

currency, which was problematic because the central bank tightly controlled quantities and rates of currency conversion (see also the next recommendation).[31]

Advantages and Disadvantages

A summary of the advantages and disadvantages of contingent equity-to-debt financing is provided in Table 14 below.

Table 14. Advantages and disadvantages of contingent equity-to-debt financing

Benefits	Costs
• Potential to leverage private finance well above the face value of the USAID-provided facility • Gives USAID the opportunity to directly provide project development expertise • Addresses early-stage project risk, which was identified as a critical constraint	• Relatively high transaction costs • Requires project of sufficient scale to justify transaction costs • There is a risk that expertise does not reach co-financiers, thereby creating dependence on the fund for project development • It could be difficult to achieve returns at debt conversion that would achieve a surplus for the fund

5. *Credit lines for local financial institutions:* The participation of local financial institutions is crucial for any country seeking to increase its investment in RE and EE development. However, many such institutions are unfamiliar with the nature of these potential investments and may be unwilling to allocate funds toward them. In many cases, even once institutions express interest and awareness, funding constraints may persist. Credit lines involve the allocation of a pool of funding to one or more local financial institutions to on-lend at a maximum margin to projects that meet predefined criteria. The lending may be provided to projects of various scales, from household financing of small-scale solar appliances and EE investments to large-scale RE projects. Recipient institutions are typically required to meet various qualification criteria to be eligible to manage lines of credit, including fiduciary management and human resource capacity.

Market Barriers Addressed

Credit lines address inadequacies of local financial institutions in supporting local RE and EE projects, including:

- Lack of finance for project development—nationally, within the private sector, and in local currency (mitigating currency risk)
- High transaction costs of supporting small investments, where transaction costs would be too high for an international donor or financier
- Capacity-building for the local institutions' understanding of RE and EE technologies

Role for USAID

Credit lines typically involve two aspects USAID can support:

- *A pool of funding that is available for local financial institutions.* USAID, through DFC's loan products, would allocate a certain value to one or more local institutions, absorbing any currency risk, to support projects that meet certain criteria determined by USAID.

[31] Issues relating to currency controls may also be relevant in other countries in the region, such as Dominica, Grenada, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines—members of the Eastern Caribbean Credit Union—but the topic did not come up in any other key informant interviews.

- *Capacity-building of the financial institutions to enable on-lending*. To be effective, the local financial institutions will require capacity-building from USAID. This may focus on their lending practices (e.g., loan processing, credit assessments, reporting) and RE and EE sector knowledge (e.g., technologies, payback, risks).

Product Characteristics

- USAID would arrange, through DFC, a credit facility that is available to local FIs alongside technical support.
- Local institutions would need to meet USAID-determined criteria to receive the funding support. These criteria might relate to their financial health and practices and/or their lending policies (e.g., margins and collateral requirements).
- Flexible terms, or right to renegotiate under certain circumstances, may be an important tool to include in the product to address FIs' concerns regarding the possibility of projects facing difficulties, such as delays or underperformance.
- The product must be designed so that the commercial FIs have a stake in the results. Not having a stake in the result could lead to poor risk assessment at the project level and negatively affect the potential learning created by the scheme.
- The product may be packaged alongside other support products as appropriate.

Priority Countries

Barbados is a prime candidate for this financial product. Respondents specifically mentioned that returns for international financiers, who expected returns in U.S. dollar, were in local currency, which was problematic because the central bank tightly controlled quantities and rates of currency conversion.

Advantages and Disadvantages

A summary of the advantages and disadvantages of credit lines is provided in Table 15 below.

Table 15. Advantages and disadvantages of credit lines

Advantages	Disadvantages
• Develops project assessment capacity in local FIs to enable support exit • Leverages existing capacity within FIs, including their customer relationships	• Focuses on already creditworthy and bankable customers and projects • USAID would likely have to offer very attractive terms to FIs to allow on-lending at a profit by commercial banks • USAID may have to further address FIs' concerns regarding risks related to project difficulties

Additionality: USAID's additionality is rooted in its unique ability to (1) de-risk investments that would otherwise not be financed and (2) leverage both financing and the collaboration of financial institutions; multi-lateral, bilateral, and regional donors; and organizations to catalyze the RE and EE sectors. For example, USAID may be able to have the largest impact by leading the formulation of a regional fund backed by commercial banks and donors to mobilize private and public finances, as well as priority setting, technical assistance, and coordination.

"…there is enough business for all but we need to coordinate more instead of competing for projects…We can actually manage instead of trying to be the one that brings a deal for the next solar plant in Jamaica, we can actually team up to go to the CARICOM and to say, well, we would like to create a regional fund where your governments and your private firms, would tap in to do solar projects in the region in the whole Caribbean… if you don't do it jointly, you cannot become more competitive than a larger market... A regional approach has never been tried in renewable energy in the Caribbean. Frankly, I don't know why. Because in the Pacific Islands have done that and it works. You know, that's another thing that the World Bank can provide is, you know, feedback from other island regions in the world where we have been trying stuff and it has worked, or not. African islands and Pacific islands that are far more advanced than Caribbean on this." —World Bank Energy Expert

C. Recommendations for Addressing Institutional Constraints

USAID can provide technical assistance in five specific areas to help alleviate institutional constraints:

1. *Well-defined pathway for RE expansion:* To meet an RE target, all countries require a well-defined RE target (quantity and timeline) and a well-defined pathway with clear steps along the way, including:

a) Required generation investment

b) Required storage investment, such as batteries, flywheels, and other storage

c) Required investment in the grid, including both physical upgrades to the grid and technological improvements, such as grid-management software

d) Technical aid, such as project/site identification and resource assessments

e) Energy efficiency improvements

A pathway to RE expansion is typically encapsulated in country energy master plans, such as an IRRP. CCREEE leads the development of IRRPs for all CARICOM countries, with a projected timeline of 5-years. USAID can potentially play a role in speeding up the process by providing quality assurance on the final products. With master plans in place, governments and those who intend to assist them, such as USAID and other donors, will have clarity on what is expected when and who owns specific parts of the process.

2. *Secondary legislation:* While many countries have in place primary legislation that sets RE targets and allows for RE electricity generation and procurement, many countries need enabling secondary legislation. The exact content of this secondary legislation will vary by country and depend on balancing regulatory rigor with capacity and what is practical to get the desired number of projects under way. Broadly, secondary legislation should clearly specify the:

a) Competitive procurement process (rules for RFPs and bidding)

b) Regulatory approvals, permitting, and licensing processes (rules on timelines and redress)

c) Structure and terms of PPAs, including availability of template PPAs. Without these specific institutional objects, private financiers will hesitate to invest

d) Grid code to accommodate uptake of RE (and updates where necessary)

e) Grid connection procedures, along with updates

f) RE electricity dispatch rules

The extent to which secondary legislation is implemented in each country will vary depending on the size and complexity of a countries' intake, approval, and regulatory system. For instance, a key informant in Jamaica suggested that on paper Jamaica's processes were "best practice" but, in reality, the system was complex and slow due to the technical capacity of their procurement body. On the other hand, in a smaller country, it might be sufficient for the primary legislation to allow IPPs along with a template PPA contract the utility is familiar with, and predeveloped non-legally binding grid connection guidelines.

3. *Capacity building*: USAID can assist local governments by building the capacity of their human resources in key ministries to enable processing approvals and other technical project requests. Providing a transaction advisor may be the most effective because a transaction advisor can aid the ministries as well as the regulator and the utility in creating the framework and supporting procurement processes. This has been a successful approach for Millennium Challenge Corporation projects in Sub-Saharan Africa. Moreover, activities carried out under "1. Well-defined pathway for RE expansion" and "2. Secondary legislation" should explicitly build local capacity to repeat these processes in the future. IRRPs should be updated frequently and grid codes periodically reviewed to ensure they remain fit for purpose. Additionally, local grids will require technical improvements, including improved storage, power control (the ability to switch on and shut off contributing sources of power in cases of emergency), and smart-metering and monitoring.

4. *Knowledge curation and dissemination*: USAID can play an active role in knowledge creation, curation, and dissemination. The availability of knowledge products that document the process and results of past and ongoing investments will greatly help interested private financiers and project implementers. This will also improve donor coordination in the RE space. USAID can also contribute to and augment existing knowledge hubs. For instance, CCREEE's CARICOM Energy Knowledge Hub acts as a repository for potential RE project implementers and financiers to consult to ensure they are better prepared as they enter the RE space in the Caribbean. Tools and resources on this hub (and others) could be better organized, labeled, advertised, and curated to be more readily accessible to potential investors and project implementers.

5. *Favorable general enabling environment for finance.* USAID can help improve the finance-enabling environment to reduce the risks associated with financial transactions. For example, USAID can support passing regulations on secured transactions; deepen credit information through credit registry, credit bureau, and movable asset registry; strengthen legal rights of borrowers and lenders; and improve insolvency framework. Such reforms can lower the cost of creditworthiness assessments and improve the credibility of their results, as well as increase the loan value of collateral assets.

D. Summary of Gaps and Recommendations by Type of Respondent

During our analysis, stakeholders in the Caribbean clarified both the gaps they perceived in RE and EE and the types of assistance they believed were necessary to make substantial improvements in RE and EE in the region. Several of their suggestions do not appear among the recommendations described above because USAID may not be able to provide these types of assistance. Nonetheless, for completeness' sake, we summarize the suggestions provided by energy sector stakeholders in the table below and the table in Annex 7.

Table 16 summarizes the problems or gaps in financing identified by respondents to the key informant interviews by respondent type—utilities, regulators, banks, project developers, multilateral institutions (including research institutions); their recommendations for solutions to these problems; and potential solutions USAID could consider implementing.

Table 16. Gaps in RE financing and recommendations, by key informant interview respondent type

Respondent Type	Gaps in Financing	Recommendation Offered by Respondent	Potential USAID Solution
Utilities	• High insurance premiums	• None	• None
Regulators	• High interest rates • Banks in the region are risk averse • Banks want high security from borrowers (especially small and medium projects) • Utility does not want to provide liquidity support • Difficult for new companies to get financing without payment history for risk assessment • Assisting uptake of EE	• Credit support • Support for developing PPA framework	• Credit line • Credit guarantees • Technical assistance for grid assessment • Technical assistance/sector-specific training to lenders • Technical assistance for developing secondary legislation • On-bill financing for EE
Ministries of energy	• Higher financing costs due to higher risk as island nations	• Low-cost financing and grants	• Credit line • Contingent grant financing • Credit guarantees
Banks	• Lack of sector-specific training among lenders • Lack of coordination in investment strategy among banks • Attracting investors to small region for technology with high initial costs and high risks • Reaching the most marginalized groups • Clients in countries with lower risk ratings need support of guarantees • Some banks lack specific fund for clean energy projects and cannot offer attractive credit conditions	• Grant funding for more marginalized populations • USAID to back financial guarantees, de-risking investment • Lines of credit specifically for green energy projects paired with technical assistance	• Credit line • Credit guarantees • Concessionary financing • Technical assistance/sector-specific training to lenders • Technical assistance for reaching marginalized groups • Equity for project development

Respondent Type	Gaps in Financing	Recommendation Offered by Respondent	Potential USAID Solution
Projects	• High interest rates • Length of loans • Multilaterals have too much bureaucracy and complicated covenants • High cost of storage • Municipal fees set arbitrarily and tend to be high	• None	• Credit line • Contingent grant financing • Credit guarantees
Multilaterals/ Energy organizations	• Developers do not want to fund project preparation • Difficulty in going from IRRP to investment pipeline of projects • Barriers in financial laws and systems (e.g., most banks cannot use project as collateral, developers must come with standardized collateral) • Financiers lack trust due to enabling environment • Countries are fiscally constrained • Climate donors prioritize countries moving away from coal, rather than fuel (as in Caribbean) • Caribbean countries cannot increase their debt, tight fiscal space, selective about where borrow and to which sectors • Utilities do not see change in risk profile regardless of resilience measures within investments • Missing collaboration between entities • Need to pay more attention to technical integration of new RE capacity • Utilities starved for cash	• Make sure there are synergies between focuses on carbon abatement, climate resilience, energy poverty reduction, energy access • Financing of project preparation • Help fund CCREEE to do third-party assessments of projects • Evaluate banking/financial regulations • Backstop CRAF through risk guarantees • Create parallel instrument to CRAF in countries that are not beneficiaries of the CDF (including the DR) • Leverage climate and concessional funding to help energy transition • Help finance the electrification of public transportation fleets • Risk sharing facilities and credit enhancements, like partial risk guarantees • Vulnerability analyses for what critical infrastructure needs the most immediate attention to be resilient • Help governments tap into more convenient insurance products • Help introduce efficient appliances, especially in countries like Jamaica with high commercial losses • Finance pilot projects to experiment with integrating systems and batteries into grid while maintaining stability • Fund initial exploratory studies for private investors interested in RE/EE devices	• Project preparation seed fund • Equity for project development • Credit line • Technical assistance to develop project pipeline, identify sites/projects, conduct feasibility studies, run auctions • Technical assistance to develop secondary legislation, including in banking • Technical assistance for grid assessment • Credit guarantees

Notes:⁺ While overall borrowing costs and interest rates may not necessarily be high across the region, factors like high transportation costs and risk of natural disasters contribute to increased financing costs for island countries in the Caribbean.

Annex 7 summarizes the problems or gaps in in the institutional, legislative, and regulatory space identified by respondents to the key informant interviews by respondent type—utilities, regulators, banks, project developers, multilateral institutions (including research institutions); their recommendations for solutions to these problems; and potential solutions USAID could consider implementing.

VI. Conclusion

Most of the Caribbean countries included in this study experience high fuel prices, the effects of climate change, and concern about greenhouse gas emissions. Their goals for increasing the share of RE in their overall energy mix are ambitious. Private financing and bankable projects are available in some countries, notably in the DR, Jamaica, and to some extent, Barbados. Other countries in the study have small markets or legislative and regulatory environments that might make them less attractive to private financing for large-scale RE projects. This study proposes several steps USAID could take to encourage more RE take up as well as increase investment in EE, an underdeveloped approach across the region for reducing reliance on fossil fuels. Coordination among donors and actors in the energy sector is crucial for the clean energy aspirations of Caribbean countries to come to fruition.

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ANNEX 1: SUGGESTED INDICATORS TO TRACK PROGRESS

#	Type	Indicator	Measure
1	Country-level indicators		
1.1	Legislation, regulation, and supports		
1.1.1		RE-specific legislation is in place including:	
1.1.1.1		Does the country have an Integrated Resource Plan (IRP) that was produced within the last three years?	Y/N
1.1.1.2		Are there clear and effective licensing processes and requirements in place for IPPs?	Y/N
1.1.1.3		Is there a standard arrangement in place for customers to sell electricity to the utility at a reasonable price, for a reasonable timeframe, and with a clear interconnection agreement?	Y/N
1.1.1.4		EE-specific legislation is in place	Y/N
1.1.2		Is there sufficient regulatory control over utilities to provide confidence in PPAs?	Subjective scale (Likert)
1.1.3		Pricing and tariff transparency	Y/N
1.1.4		RE auctions, Contracts for Difference, or FiT for utility scale RE in place	Y/N
1.1.5		Net metering or similar support for small scale RE in place	Y/N
1.1.6		Value of direct support to RE investment	USD/unit
1.1.7		Subsidy rate through tax breaks	%
1.2	Ongoing RE and EE projects		
1.2.1		Value of RE and EE projects (USD, USAID contribution and total)	USD
1.2.2		Value of new investment (USD, USAID contribution and total)	USD
1.2.3		Number of RE and EE projects	Count
1.2.4		Type of RE projects (PV, wind, geothermal, etc.) and EE projects (lighting, insulation, etc.)	
1.2.5		Size of RE and EE projects (MW of capacity, production or saved)	MW
1.2.6		RE share of total capacity	%
1.2.7		Emissions abated	MtCO2e
1.2.8		Installed RE capacity	MW
1.2.9		Ratio of installed capacity for FF to RE	Ratio
1.2.10		Cost by technology	USD/MW
1.2.11		Government endorsed schedule of planned investment in RE exists	Y/N
1.3	RE and EE prospects		
1.3.1		Planned capacity additions	MW
1.3.2		Potential RE capacity	MW
1.3.3		Required investments	USD

#	Type	Indicator	Measure
1.4	Tariff setting		
1.4.1		Tariffs are calculated based off a robust cost reflected methodology	Y/N
1.4.2		Tariff setting is overseen by a regulatory body	Y/N
1.4.3		Tariff value	USD/kWh
1.4.4		Tariff cost ratios, as merited: Retail price to cost at distribution	Ratio
1.5	Market		
1.5.1		Quoted PPA cost to generation cost	Ratio
1.5.2		Wholesale market clearing price to generation cost	Ratio
1.5.3		Operating cost (including capital replacement cost) recovery ratio (total revenue collected/ total operating cost)	Ratio
1.5.4		Electrification rate	%
1.5.5		Quality of electricity supply	Index
1.5.6		Expected supply gap	MW
1.6	Financial institutions		
1.6.1		Number of partnerships with local financial institutions for RE and EE projects	Count
1.6.2		Number of joint grants, loans, etc., for RE and EE projects with local financial institutions	Count
1.6.3		Size of RE and EE projects jointly supported with local financial institutions (capacity of production or saved)	MW
1.6.4		Value of grants, loans, etc. for RE and EE projects with local financial intuitions (USAID contribution and total)	USD
2	RE power generation	project-level indicators	
2.1	Specifications		
2.1.1		Is project operational?	Y/N
2.1.2		Was the project completed within the period intended for achieving country's RE goals? [intent: does the project contribute to the country's stated RE goals?]	Y/N
2.1.3		What is the installed capacity of project?	MW
2.1.4		Does the project contribute power to the grid?	Y/N
2.1.5		Does the project contribute power to a localized mini-grid?	Y/N
2.1.6		How much power does the project effectively produce annually?	MWh
2.1.7		[if applicable] How much power does the project effectively contribute to the grid annually?	MWh
2.2	Costs		
2.2.1		What was the total cost of installation?	USD
2.2.2		What is the cost of operations and maintenance? (average for period of operation) [If this is changing over time, document for all periods thus far and provide expected values for future years]	USD

#	Type	Indicator	Measure
2.2.3		What is the levelized cost of electricity produced by this project?	USD/kWh
2.3	Project financial sustainability		
2.3.1		What is the expected operational life of the project? (years)	Years
2.3.2		Is there a plan for financing operations and maintenance for the project that has passed scrutiny by technical experts? (Yes/No)	Y/N
2.3.3		Is the project able to sustain itself (does it meets its O&M expenditure needs and other financial obligations)? (Yes/No)	Y/N
2.3.4		Does the investment generate revenues from sales of electricity? (Yes/No)	Y/N
2.3.5		What percentage of project costs (O&M expenditure needs and other financial obligations) do revenues cover? [If this is changing over time, document for all periods thus far and provide expected values for future years]	%

ANNEX 2: WHERE TO FIND ANSWERS TO USAID'S 20 KEY QUESTIONS

Question from SOW	Short answer	Report page number
1. What obstacles and risks do the renewable energy and energy efficiency (RE/EE) sectors in the Caribbean face in terms of mobilizing investment?	Inadequate market size, geography and extreme weather events, unclear profitability of potential investments, lack of enabling environment, especially unstable legislative regime, and sound financial environment	Section II; Sub-section E of Section III; Section IV
2. What are the existing barriers for approving and implementing these projects?	Weak enabling environment and unstable legislative regime, including inadequate planning and coordination, underdeveloped policy, legislative legal, and regulatory frameworks, insufficient institutional and technical capacity, and a lack of knowledge curation and dissemination	Sections II and IV
3. What is the potential size of the RE/EE market?	At least $4 billion in financing is needed to achieve RE installed capacity goals. EE goals tend not stated and, as a result, cannot be characterized	Section II, particularly Table 2 and the discussion that follows
4. What types of technical assessments of RE/EE are needed to access sources of funding?	Project/site identification and resource assessments, as well as inputs to broader Integrated Resource and Resilience Plans and secondary legislation reviews	Sub-sections A-B of Section V
5. What limitations and preferences exist in terms of financing off-grid RE systems versus grid- connected systems?	Inadequate market size or project scale are highlighted as limitations for off-grid systems; institutional challenges are relevant for off-grid and grid-connected but the following are underscored for larger grid-connect systems; lack of enabling environment, especially unstable legislative regime, and sound financial environment	Section II; Sub-section E of Section III; Section IV
6. What limitations in terms of institutional capacities to implement small and medium size RE/EE projects exist?	Inadequate planning and coordination, underdeveloped policy, legislative legal, and regulator frameworks, insufficient institutional and technical capacity, and a lack of knowledge curation and dissemination	Section IV
7. What reforms can governments in the Caribbean region make to	1. Well-defined pathway for RE expansion including strong primary	Sub-section B of Section V

Question from SOW	Short answer	Report page number
create market openings and facilitate investment in clean, resilient energy sources?	legislation and Integrated Resource and Resilience Plan 2. Secondary legislation 3. Capacity building 4. Knowledge curation and dissemination	
8. What kind and level of assistance is required to attract investment into the energy subsectors (solar and wind power, hydropower, energy efficiency, geothermal, etc.?)	1. Concessionary financing for mini-grids 2. credit guarantees, and nonperforming debt buy outs 3. on-bill financing for energy efficiency 4. Contingent grant financing	Sub-section C of Section V
9. What mechanisms and capacities are required and available to deliver this assistance?	See response for 7 and 8	Sub-sections B-C of Section V
10. What is the additionality of implementing a USAID-supported investment fund or partnering with an existing one? Where is USAID's leverage point? What indicators can be used to collect this information?	Providing credit guarantees (and nonperforming debt buyouts) to reduce risk and incentivize financial institutions to offer financing that would otherwise not be extended. Providing contingent grants financing that leverage private investment by contracting with private financial institutions who agree to take on the associated debt once the grant is converted. Mobilizing a regional strategy, fund, and coordination is an option. De-risking is the leverage point. Indictors may include: Number of partnerships with local financial institutions for RE and EE projects; Number of joint grants, loans, etc., for RE and EE projects with local financial institutions; Size of RE and EE projects jointly supported with local financial institutions (MW of capacity, production or saved; Value of grants, loans, etc. for RE and EE projects with local financial intuitions (USD, USAID contribution and total)	Points 2 and 4 in sub-section C and the text box on additionality in Section V
11. What is the level of interest, capacity, and willingness of banks to participate in blended finance opportunities?	Financial institutions expressed a willingness to engage in blended finance opportunities and did not raise any associated capacity issues	For an overview of current private sector participation in the RE sector, see section III generally, and III.A.2., III.B.2. and III.E specifically.

Question from SOW	Short answer	Report page number
12. What non-bank investment and financing intermediaries are active in the Caribbean region?	Caribbean Climate-Smart Accelerator, Caribbean Project Preparation, and Investment Platform, CCREEE, CARICOM, Climate Chain, Technical Assistance Program for Sustainable Energy in the Caribbean, GET.Invest, NDC Financial Initiative, Credit Risk Abatement Facility, Global Green Growth Institute, Private Financing Advisory Network, Energy Transition Accelerator Platform	Sub-section D in Section III
13. What are the existing project/infrastructure insurance instruments available to support private investments in the region? Do these address climate-related risk?	Key informants did not provide detailed information about insurance instruments	
14. What is the profile and potential of the Caribbean diaspora? What are their interests and involvement in investing in the Caribbean region? What vehicles and instruments are available for mobilizing and intermediating Caribbean diaspora energy investments?	Key informants did not provide information about Caribbean diaspora	USAID could explore diaspora networks in other regions that are focusing on electricity access for ideas to support similar efforts in the Caribbean. One such effort is the African Diaspora Network: https://africandiasporanetwork.org/
15. What are the gaps and alternatives to close those gaps that women and other traditional marginalized groups face in order to access finance and investment opportunities in the energy sector. These marginalized groups include but are not limited to members of the lesbian, gay, transexual, intersex, and queer (LGBTIQ+) community, people with disabilities, migrants, Dominican of Haitian descent, elderly, youth, and women.	Key informants did not provide information about women and other traditional marginalized groups including lesbian, gay, transexual, intersex, and queer (LGBTIQ+) community, people with disabilities, migrants, Dominican or Haitian descent, elderly, or youth	
16. What is the level of influence of the advancement of new areas such as smart metering, service provision, or mandated quotas in the levels of public investment in energy?	There is a need for improvement of grid infrastructure, including improved storage, power control (the ability to switch on and shut off contributing sources of power in cases of	Section IV.D Section V.B

Question from SOW	Short answer	Report page number
	emergency), smart-metering, and monitoring	
17. What are the existing efforts to promote gender-sensitive procurement and investment frameworks for renewable energy and traditional energy projects linked to national and regional policy goals.	Key informants did not provide information about gender-sensitive procurement and investment frameworks for renewable energy and traditional energy projects linked to national and regional policy goals	
18. What energy sub-sectors and actors are potentially interested in foreign direct investment (FDI) in the Caribbean? What is the enabling environment for FDI in the Caribbean region? Who are the key public and private sector stakeholders?	PV and wind sub-sectors dominate. The enabling environment for FDI is weak and the key for FDI is de-risking through stable, long-term PPAs. Key public stakeholders are legislatures that will write enabling secondary legislation; and ministries and regulators that will implement these. Key private stakeholders are domestic and foreign financiers and project implementers who will take advantage of improved institutional environment	Section II (see "Private investors need to see market potential" within "What is needed for private financing to help close the gap for RE energy in the Caribbean?") Section IV.C Section V.B
19. What are the existing mechanisms for determining and reporting avoided greenhouse gas emissions as a result of RE project implementation?	Key informants did not supply information on this.	Regional energy knowledge hubs such as CCREEE and OLADE might document these.
20. What is the viability of a regional investment fund vs bilateral options? Could a single regional fund structure be able to support the full regional CEI context? RE Generation Capacity (MW)	Countries are diverse, each with unique circumstances, which merit a combination of regional and bilateral tools. Financial investments in EE and credit guarantees are regional, while grant making is country specific Investment in improving institutional and regulatory environments within each country along with the need for rich and accessible knowledge sharing is a cross-cutting theme for the region	Section V.C. suggests a range of regional and country specific options for financial tools. Section V.B. suggests a range of regional and country-specific legislative, regulatory, capacity-building and knowledge-sharing options.

ANNEX 3: ORGANIZATIONS PROVIDING POLITICAL ECONOMY AND POLICY REFORM TECHNICAL ASSISTANCE

Organization	Project(s)	Timeline	Country	Value ($USD millions)	Comment
USAID	Caribbean Energy Sector Reform Project	2022-	Multi-country: Dominican Republic, Jamaica, Barbados, Trinidad and Tobago, Dominica, Grenada, St. Kitts and Nevis, Haiti, Guyana, St. Lucia, St. Vincent and the Grenadines, and Suriname	Unavailable	Technical assistance for energy reform to utilities, ministries, and regulators in the host countries to develop policies, laws, regulations, tools, and processes to design and operate more resilient and modern energy systems; Via RTI, Intl.
USAID	Caribbean Energy Initiative	2019-2024	Multi-country: Dominican Republic, Jamaica, Barbados, Trinidad and Tobago, Dominica, Grenada, St. Kitts and Nevis, Haiti, Guyana, St. Lucia, St. Vincent and the Grenadines, and Suriname	$25.5	Promote local and U.S. private sector partnerships and investment in building energy Sector resilience by leveraging U.S. and international public finance resources to help energy project developers Mitigate technical and political risks; Project investments also provided
USAID	Jamaica Energy Resilience Alliance including workforce development	2021-2024	Jamaica	$4	In partnership with WRB Energy and Wigton Wind Farms Limited Sponsor equity and project finance also provided
World Bank	7MW Geothermal Power Plant and Expansion	2019-2023	Dominica	$27	In partnership with the Clean Technology Fund, UK DFID, and who are

Organization	Project(s)	Timeline	Country	Value ($USD millions)	Comment
					providing up to $27 million in funding; TA supported by Government of New Zealand and AFD (amount unclear) Loans and grants also provided
World Bank	30MW Geothermal Energy Project	2021-	St. Lucia	$22.380	In partnership with the Clean Technology Fund, UK DFID, and Government of New Zealand; Via the Small Island Developing States (SIDS-DOCK) Private financing and grants also provided
IDB	Sustainable Energy Facility for the Eastern Caribbean	2016-2024	Multi-country: Dominica, Grenada, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines	$192.4	In partnership with Green Climate Fund Concessional loans and reimbursable grants also provided
IDB	Supporting the Implementation of DR's EE Program	2020-2022	Dominican Republic	$0.465	
IDB	EE and Conservation Program	2019	Jamaica	$0.350	In partnership with Nordic Development Fund and Global Affairs Canada Project specific grants also provided
IDB	Energy Management and Efficiency Programme	2016-2022 2017-2023	Jamaica	$10 $30	In partnership with Japanese International Cooperation Agency (JICA Investment grants and loans also provided
IDB	Support for the Design of Carbon Neutral Strategies in the Context of Energy Transition	2021-2023	Barbados	$0.400	

Organization	Project(s)	Timeline	Country	Value ($USD millions)	Comment
IDB	Better Batteries- an Energy-as-a-Service Model to Accelerate the Hotel Industry's Access to RE, Utilizing a Battery Storage Solution Enabling External Control and Data Analytics	2021-2022	Barbados	$0.110	$390,000 in investment grants also provided
IDB	Supporting Energy Transition and Smart Energy Technology Expansion	2019-	Barbados	$0.550	
IDB	Deployment of Cleaner Fuels and Renewable Energies in Barbados including intuitional strengthening and capacity building	2016-2022	Barbados	$34	Loans including retroactive financing also provided
IDB	Decarbonization Initiatives in the Energy, Power, and Transport Sectors	2022-2024	Trinidad and Tobago	$0.350	
IDB	EcoMicro— Southern Commercial Bank— Green Finance for MSMEs and Low-Income Households	2021-	Trinidad and Tobago	$0.180	In partnership with Global Affairs Canada Loans for MSMEs and low-income households also provided
IDB	EcoMicro— Central Finance Facility—Green Finance to Build	2022-	Suriname	$0.300	In partnership with Global Affairs Canada

Organization	Project(s)	Timeline	Country	Value ($USD millions)	Comment
	Climate Resilience of Low-Income Households				Loans for MSMEs and low-income households also provided
IDB	Promotion of EE and Distributed Generation in Suriname	2021-2024	Suriname	$0.250	
IDB	Support the Development of Solar Floating PV Energy in Suriname	2021-2023	Suriname	$0.3	
IDB	Building the Regulatory Regime for the Development of Utility Scale RE Generation	2020-2021	Suriname	$0.250	
IDB	Consolidating a Sustainable Energy Sector	2020-	Suriname	$30	Loans also provided
IDB	Support to the Institutional and Operational Strengthening of the Energy Sector including institutional strengthening and capacity building	2016-2018	Suriname	$70	Loans also provided
IDB	Technical Support to Prep and Execution of "Consolidating Sustainable Energy Sector"	2020-2021	Suriname	$0.292	
IDB	RE Actions in the Energy Matrix	2021-	Guyana	$1.5	

Organization	Project(s)	Timeline	Country	Value ($USD millions)	Comment
Caribbean Center for Renewable Energy and Energy Efficiency (CCREEE)	Project Preparation Facility, Integrated Resources and Resilience Plan, CARICOM Energy Knowledge Hub, and Energy Report Cards	2015-	Multi-country: Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname and Trinidad and Tobago	Not available	In partnership with CARICOM and SIDS DOCK; Services to support the technical implementation of sustainable energy commitments on common SIDS sustainable energy issues and solutions
Caribbean Electric Utility Services Corporation (CARILEC)	Technical information, training, capacity building, knowledge sharing and coordination	1989-	Multi-country: Anguilla, Antigua, Curacao, Belize, Bermuda, Barbados, British Virgin Islands, Grand Cayman, Dominica, Turks and Caicos Island, Grand Bahama, Guyana, Grenada, Jamaica, St. Lucia, St. Kitts and Nevis, Suriname, St. Eustatius, Trinidad and Tobago,	Not available	In partnership with USAID, CARICOM, GIZ, and OECS Services related to disaster management, benchmark studies, and tariff surveys

Organization	Project(s)	Timeline	Country	Value ($USD millions)	Comment
			St Vincent and the Grenadines		
Guyana Reducing Emissions from Deforestation and Forest Degradation + Investment Fund	33MW Guyana Utility Scale Solar Photovoltaic Program (GUYSOL)	2022-	Guyana	$83	In partnership with the IDB Investment grants also provided
UNDP	Deployment of RE and Efficiency in the Public Sector	2016-	Jamaica	$12	In partnership with Global Environmental Facility Shared and/or guaranteed savings provided
UNDP	Caribbean EE Lighting Project	2014-2016	Barbados	$1	In partnership with the World Bank and the government of Denmark; Via the Small Island Developing States (SIDS-DOCK)
UNDP	Caribbean EE Lighting Project	2014-2016	Dominica	$1	In partnership with the World Bank and the government of Denmark; Via the Small Island Developing States (SIDS-DOCK)
UNDP	Caribbean EE Lighting Project	2014-2016	Grenada	$1	In partnership with the World Bank and the government of Denmark; Via the Small Island Developing States (SIDS-DOCK)
UNDP	Caribbean EE Lighting Project	2014-2016	St. Lucia	$1	In partnership with the World Bank and the government of Denmark; Via the Small Island Developing States (SIDS-DOCK)
UNDP	Caribbean EE Lighting Project	2014-2016	St. Vincent and the Grenadines	$1	In partnership with the World Bank and the government of Denmark;

Organization	Project(s)	Timeline	Country	Value ($USD millions)	Comment
					Via the Small Island Developing States (SIDS-DOCK)
UNDP	Installation of 12 Small-Scale Roof-Mounted, Off Grid Solar PV	2020-2022	Trinidad and Tobago	$4.170	In partnership with Global Climate Change Alliance +; Grants also provided
UNDP	3MW Utility-Scale Solar Farm	2017-2018	St. Lucia	$7.4	In partnership with Global Environment Facility, Norwegian Agency for Development Cooperation, Rocky Mountain Institute, and St. Lucia Electricity Services Limited Grants and loans also provided
Global Climate Change Alliance +	Construction of Solar Park at Piarco International Airport, Small Scale Systems in Public Utilities and Remote Communities, and Technical Assistance to Ministry of Energy	2019-2023	Trinidad and Tobago	$4.010	In partnership with the European Union Loans and grants also provided
Caribbean Development Bank	Energy Efficient Street Lights Program	2017-2020	Jamaica	$25	Loan also provided
Caribbean Development Bank	Residential EE Programme (REEF)	In planning	Barbados	$10	Grants and parallel financing also provided
Caribbean Development Bank	Sustainable Energy for the Eastern Caribbean (SEEC) EE Solar PV Project	2018-	St. Vincent and the Grenadines	$6.026	In partnership with Caribbean Investment Facility (EU-CIF) and UK-DFID Multiparter loans and grants, lines of credit for

Organization	Project(s)	Timeline	Country	Value ($USD millions)	Comment
					intermediaries and MSMEs, and guarantee facility also provided
Japan Caribbean Climate Change Project	Japan Caribbean Climate Change Project including capacity building	2020	Grenada	$3,182	
Canadian High Commission	Canada Funding for Local Initiatives	2019	Guyana	$0.012 - $0.039 per project	
UK Prosperity Fund	British High Commission through the UK Prosperity Fund	2018-	Guyana	Up to $0.036 per project	
Government of Italy	30kW Photovoltaic Systems at 2 Dominica Water and Sewerage Company Ltd. (DOWASCO) Water Pumping Stations	Announced 2020	Dominica	Unavailable	In partnership with CARICOM Implementation funding also provided
UAE-Caribbean Renewable Energy Fund	600kW Solar PV Hybrid/Battery Storage Plant in Limlair, Carriacou	2018-2020	Grenada	$3.2	Grants also provided
Abu Dhabi Fund for Development and International RE Agency	ADFD/IRENA Project Facility	2019	Guyana	$8	
UAE-Caribbean Renewable Energy Fund	350kW Bridgetown Solar PV Carport Power Plant and 500kW Bowmanston Solar PV Power Plant	2019-2020	Grenada	$3.2	Grants also provided

ANNEX 4: METHODS AND DATA COLLECTION

This assessment builds on a desk review report prepared for USAID that:

1. Summarizes sources of funding for renewable energy and energy efficiency projects in twelve Caribbean countries (Dominican Republic, Jamaica, Haiti, Barbados, Guyana, Trinidad and Tobago, Dominica, Grenada, St. Kitts and Nevis, St. Lucia, St. Vincent and The Grenadines, and Suriname);
2. Provides an initial assessment of the regulatory environments of these countries;
3. Documents current and projected energy supply; and,
4. Lists currently funded RE/EE efforts, access to electricity and the market conditions and financing landscape for RE and EE.

The Caribbean Clean Energy Financial Landscape Assessment (the present report) advances the desk review report by providing a deeper description of the supply of and need for energy-related private sector project financing resources in the Caribbean energy sector. In addition, the landscape assessment provides more detailed recommendations about where and how USAID should provide financial support to mobilize private sector investment and catalyze the RE and EE sectors in the region. The financial landscape assessment similarly articulates the types of technical assistance complementary to a USAID funding mechanism that would help foster the supportive policy, legislative, and regulatory frameworks necessary to fuel growing RE and EE sectors financed by private investment.

Several research activities contributed to this financial landscape assessment. First, we conducted a desk review by investigating publicly available information about sources of funding for RE and EE projects, currently funded efforts, snapshots of policy, legislative, and regulatory environments, current access to electricity, as well as projected energy supply and demand (market sizing). This review included reports from multilateral and research organizations, regulatory documents, national energy plans, and project documents. Based on the desk review, USAID proposed a narrower group of countries for deeper investigation in the landscape assessment report: Barbados, Dominica, the Dominican Republic, Guyana, and Jamaica.

Second, we conducted key informant interviews (KIIs) with expert stakeholders to deepen our understanding and fill in gaps from the desk review phase. Stakeholders included individuals in the ministries of energy, utilities, regulators, and project implementors as well as multilateral and bilateral donor organizations including USAID, private banks, and supporting regional energy institutions, among others. The interviews covered a wide variety of themes, such as market environment and enabling conditions; mobilizing investment; terms for lending; barriers and opportunities for small to medium grid-scale RE projects; regional or country-specific investment funds supporting RE and EE; market environment and enabling conditions; reform to encourage RE IPPs; barriers to project implementation; marginalized groups, and so forth, reflective of USAID's "key question." KIIs with expert stakeholders enable us to obtain information that is not publicly available, including data, and reflect the perceptions of experts.

Table 1. Participants in landscape assessment interviews

No.	Respondent(s)	Organization	Geography
1	Jannelle James	USAID	Jamaica
2	Josue Noel	USAID	Haiti
3	Mansfield Blackwood	USAID	Barbados
4	Roberto Aiello	IDB	Caribbean
5	Leighton Waterman	Caribbean Development Bank (Caribank)	Caribbean
6	Hector Baldivieso	IDB	Dominican Republic
7	Hugo Morales	Ministry of Energy and Mines	Dominican Republic
8	Stephen Worme	Barbados Renewable Energy Association	Barbados
9	Rick Case	Jamaica Public Service	Jamaica
10	Roberto Herrera	Consorcio Energetico Punta Cana-Macao	Dominican Republic
11	Gorka Capel, Luis Felipe Lerebours	Bas Corporation	Dominican Republic
12	Dr. Mahender Sharma	Guyana Energy Agency	Guyana
13	Courtney Francis, Andre Lindsay, Craig Rattray	Organization of Utilities Regulator	Jamaica
14	Dr. Marsha Ikechi, Kathyann Belle	Fair Trading Commission	Barbados
15	Justinn Kase	Independent Regulatory Commission	Dominica
16	Brian Richardson, Todd Johnson	Ministry Science, Energy, Technology	Jamaica
17	Dave Stamp, Daryl Dalrymple, Kurt Saverin	DOMLEC	Dominica
18	Adam Carter, Gillian Charles-Gollop	FirstCaribbean Bank	Barbados/CARICOM
19	Gerry Lindo	CCREEE	CARICOM

No.	Respondent(s)	Organization	Geography
20	Courtney Francis	CCREEE	CARICOM
21	Frederic Verdol	World Bank	Caribbean
22	David McGregor	Emera/BLPC	Barbados
23	Sovieski Naut, Rosanna Ruiz, Julio Lozano, Dalma Hernandez	ABA	Dominican Republic
24	Anthony Clerk, John Clarke	Barbados Bankers Association	Barbados
25	Thomas Mitschke	CARILEC	CARICOM

To complete these analyses, we reviewed documents and materials we obtain through USAID, public websites and material provided by key informants as well as information gathered directly through KIIs with RE stakeholders. This included a targeted market sounding to gauge, in detail, the obstacles stakeholders face in financing their projects and to inform the types of financial support or activities that might help crowd in private finance to these markets, including the types and range of necessary technical support to inform USAID technical assistance to these markets. We used all the sources of information described above to triangulate analyses and come to a more thorough understanding of the financing and technical assistance need of the RE and EE sectors in the Caribbean.

ANNEX 5: COUNTRY RAPID ASSESSMENTS

The Country Rapid Assessment section implements the study's conceptual framework for understanding clean energy investment for the twelve focus countries in the Caribbean region to answer the following questions:

1. What is the expected level of electricity demand over the next decade?
2. Is renewable energy technology cost competitive against fossil-fuel in the supply of electricity?
3. Are there policy and regulatory impediments that constrain investments in renewable energy (RE)?
4. What are the challenges faced by providers in accessing equity, credit, and grants to finance RE projects?
5. What potential opportunities exist in the country to attract finance-ready energy efficiency (EE) projects?

Each country chapter includes five sub-sections corresponding to the above key questions of interest:

- Regulatory risk
    - Is there an effective regulatory structure that allows for confident investment in RE and EE?
    - What direct support for investment in RE and EE is available?
- Market Scale, Competitiveness, and Maturity
    - How mature are the RE and EE markets for both large- and small-scale projects in the country?
    - Is RE cost competitive versus fossil fuel to gain a significant market share in filling the supply gaps?
    - What is the total investment required to develop the expected RE capacity in the next 5 to 10 years?
    - Is there a credible pipeline of RE/EE investment defined in targets and plans?
- Energy Sector Financial Health
    - Are tariffs cost reflective?
    - Are power companies in a good financial position
- Access to and Quality of Electricity
    - What share of the population has access to electricity?
    - What is the Quality of Electricity Supply (Index score)?
- Donor Activities in the County

Readers should note that information and data in the country rapid assessments is limited and varies by country (different countries have different levels of information and data availability). This is especially true for projections of future installed capacity and investment needed in RE. We have endeavored to be clear about assumptions and all sources of information used in the country assessments. In addition, where needed, we use available data (sometimes dated) to calculate critical numbers to make reasonable determinations (e.g., RE competitiveness) in the study.

Dominican Republic: Grouping 'Conducive to Market-Facilitated RE Investment'[32]

Regulatory Risk

Summary

The Dominican Republic has enabling legislation for RE investment, a regulatory structure that supports private investment of grid connected RE, and a financial support scheme that provides revenue security. However, the current system is out of date and DR plans reforms. There is a lack of clarity on the nature of future reform outlined in the Electricity Pact, therefore banks and other financial institutions may perceive an elevated level of risk associated with RE investment.[33] Supporting private investment in an environment of elevated perceived risk can be done through providing risk sharing arrangements, for example, through guarantees.

What is the status of RE enabling legislation/regulation?

In 2007, the Dominican Republic passed the RE Incentives Law (Law 57-07) that defined a regulatory framework for the promotion of renewable electricity generation in the country. The law defined a feed-in tariff (FiT)[34] for grid connected renewable generation (available until 2018) that included favorable conditions for market participation for RE, including priority interconnection and dispatch within the grid. The technologies allowed to access this regime are[35]:

- Wind power installations with a capacity of less than 50 MW.
- Hydropower installations with a capacity of less than 5 MW.
- Solar PV installations with no capacity limit.
- Concentrated solar power with capacity of less than 120 MW.
- Bioenergy power plants (bioenergy comprising at least 60 percent of main fuel supply) with a capacity of less than 80 MW.

Planned reform outlined in the Electricity Pact[36] aims to set new targets and prioritize generation from clean and renewable sources including solar photovoltaics (PV). The country is also

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[32] See Section 1 of the Desk Review Report for a description of country groupings.

[33] See chapter 3 in: IRENA (2016), 'Unlocking Renewable Energy Investment: The Role of Risk Mitigation and Structured Finance,' IRENA, Abu Dhabi.

[34] In addition to the direct incentive of the feed-in tariff, Law 57-07 also included a range of tax incentives for RE generation. These are covered in more detail in the subsequent subchapter covering incentives for RE/EE.

[35] IRENA, "RE Prospects: Dominican Republic," 2016.

[36] The Electricity Pact was signed in 2021 and outlines a range of activities aimed at improving the functioning of the Electricity Sector in the Dominican Republic.

introducing competitive award of concessions for large scale renewable generators after the expiry of the FiT scheme in 2018.[37]

For smaller scale RE generation facilities aimed at self-generation, legislation for net metering was introduced in 2011. Installations eligible for net metering are:

- Residential wind and solar installations of capacity less than 25 kW, and
- Commercial facilities of capacity less than 1 MW.

Reports indicate that this legislation has been successful in supporting the connection of a significant number of customers to the grid.[38]

DR places a 15 percent upper limit on the penetration that distributed renewable energy for each electric distribution circuit.[39]

At present, aside from a tax credit for solar thermal heating, there is no legislative or regulatory framework supporting the adoption of EE in the Dominican Republic. The Electricity Pact does however include a provision to enact an EE law to provide a legal framework to incentivize energy conservation investment and actions.

In summary, the existence of the provision for both utility scale and small-scale RE indicates that the legislative and regulatory environment in the Dominican Republic is broadly supportive of investment in RE. However, the legislation covering both these schemes are now old and given the rapid evolution of the RE industry likely require review to ensure they remain fit for purpose. Additionally, there is not yet a legal framework incentivizing EE in the country. **While activities included in the Electricity Pact are likely to alleviate these issues, there will be a significant level of regulatory risk until the Pact is implemented.**

Is there an effective regulatory structure that allows for confident investment in RE and EE?

The Dominican Republic has a liberalized power sector (wholesale market) with unbundled distribution, transmission, and generation. Generation by independent power producers (IPPs) who sell power on the wholesale market is allowed[40] along with regulation that requires IPPs to trade 20 percent through the spot market to avoid price variability. The wholesale market can mediate transactions either with long-term contracts or through the spot market. According to the present regulation, the spot market must handle at least 20 percent of total energy transactions to avoid excessive price fluctuation when the market is thin. This provision allows a market-based price discovery system that signals supply and demand outcomes and outlook that can guide private investment decisions. In addition, investment of RE within this system is supported by PPA minimum and maximum purchase prices specified by CNE resolution AD-0036-2022; e.g., for a 20-year contract, assuming a 12 percent IRR, a PV installation in Cibao Norte would be paid $80.47/MWh while onshore wind would be paid $78.62/MWh.

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[37] Lucas Morais, “Dominican Republic to tender renewable projects concessions,” 2018.

[38] McCall and Bracho. 2021. Dominican Republic Net Energy Metering Analysis. [Draft]

[39] Comision Nacional de Energia, “Reglamento Interconexion Generacion Distribuida,” July 2012.

[40] IRENA, “RE Prospects: Dominican Republic,” 2016.

A liberalized power sector with preferential treatment for RE indicates a conducive environment for investment in RE. **However, the way grid connection for RE generation works in practice should be examined by developers and IPPs to ensure that RE offtakers (the distribution companies) have been following the regulation as intended, especially considering that investment for on grid connection is borne by new RE projects.**

What direct support for investment in RE and EE is available?

As mentioned previously, Law 57-07 introduced a FiT scheme that provides RE generation with access to a subsidy over the wholesale electricity price. Law 51-07 further encouraged the development of RE with several tax incentives.[41] A move to competitive tendering of RE generation should maintain an environment where investors can be confident they will receive fair remuneration for power generated.

At present there are no financial support mechanisms available for EE in the Dominican Republic (other than donor-run programs).

We note that in the Dominican Republic, RE cost per unit production is lower than or competitive with FF based power production (Figure 4), therefore developers can justify RE investments based on their commercial merits independent of existing additional incentives. The government can choose to maintain the additional incentives to address the undersupply of RE due to its non-market benefits such as avoiding greenhouse gasses. As the IEA notes, "In most markets, solar PV or wind now represents the cheapest available source of new electricity generation."[42]

Market Scale, Competitiveness, and Maturity

Summary

RE is relatively mature in the Dominican Republic at both the large- and small-scale ends of the RE market, and, as a result, direct support through concessional loans or grants to address market failures associated with learnings and immature supply chains are unlikely to be justified. There is however a lack of concreteness associated with the pipeline of future capacity to be procured, risks associated with this may disincentivize some potential developers from entering the market and reduce competition.

Total installed generation capacity in the Dominican Republic is 4,870 MW of which renewables contribute 1,184 MW. The near-term target for RE generation is to contribute 25 percent of all electricity generated by 2025. The 1,184 MW of existing renewable capacity supplies around 15 percent of electricity consumed, implying that a further 800 MW of renewables (assuming the same mix of renewable technologies) are needed by 2025 to achieve the 25 percent target.

[41] IRENA, "RE Prospects: Dominican Republic," 2016.

[42] International Energy Agency (2021), World Energy Outlook 2021, IEA. License: Creative Commons Attribution CC BY-NC-SA 3.0 IGO

How mature are the RE and EE markets for both large- and small-scale projects in the country?

Legislation promoting the development of RE generation in the Dominican Republic has been in place for 15 years. As shown in Table 5.1, the installed capacity of RE has grown to a total 1,184 in 2019 (1,211 MW as of 2020; Table 5.1 allows us to see the breakdown of RE installed capacity). Installed capacities of hydropower, solar, and wind, indicate that these technologies are relatively mature in the Dominican Republic implying that developers are likely becoming familiar with delivering these projects in the local environment and that financial institutions in the country may be becoming comfortable with the risks and revenue streams that underpin their financing decisions.

Table 5.1. Installed RE capacity

Technology	Units	Capacity
Biomass	MW	30
Hydropower	MW	626
Solar	MW	163
Wind	MW	365
Renewables total	MW	1,184
Total generation capacity (incl. non-renewables)	MW	4,870
Renewables share of installed capacity	%	24.3
FF to RE installed capacity ratio	#	3.12

Source: NREL. 2020. Dominican Republic Energy Snapshot.

At the small-scale end of the market, the net metering (NM) framework has provided success in delivering solar PV systems with 146.6 MW installed across 5,541 customers as of 2020.

Growth in both utility scale and small-scale renewables imply that installers and supply chains are likely to have gained sufficient experience that learning externalities have been overcome and short-term capex premiums reduced.

Is RE cost competitive versus fossil fuel to gain a significant market share in filling the supply gaps?

Steadily improving technologies, economies of scale, competitive supply chains, and growing developer experience have driven renewable power generation costs to fall sharply worldwide over the past decade. In the case of the Dominican Republic, Figure 4 shows the range of cost estimates for solar, wind, and hydro RE technologies that have fallen below the point estimate of fossil-fuel generation cost of $0.19 per kWh.

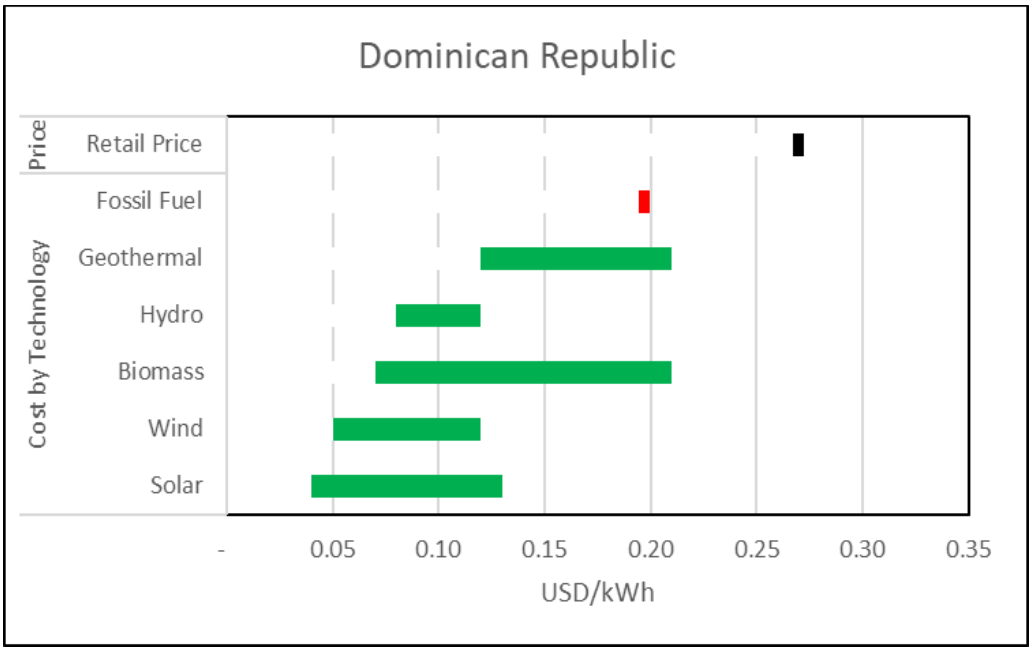

Figure 5.1. Cost competitiveness of RE technologies versus fossil fuel in electricity generation
Source: NREL, Masson, et. al., own calculations
Note: As a placeholder, Fossil Fuel cost is based on regional average estimate

What is the total investment required to develop the expected RE capacity in the next 5 to 10 years?

The International Renewable Energy Agency estimated that the country would need an additional 4,314 MW of generation capacity to meet the projected growth in electricity demand by 2030, for the high RE share scenario, REmap (Table 5.2).[43] The REmap scenario suggests a total RE capacity of 5,817 or 59 percent of total installed capacity by 2030.

Technologies and timetables for this RE pathway are not available, therefore estimating capital outlay is difficult. Using indicative figures for Utility Scale PV (Class 10 Advanced for lower bound and Class 1 Conservative for upper bound) from NREL "2021 Annual Technology Baseline (ATB)" the potential capital expenditure required for this expansion in RE is between $1,501 - $1,964 million between 2021-2030 (inclusive).

Table 5.2. Supply and demand projections and estimated investment requirement

	Current*	Projected 2030**	Change
Total Generation Capacity (MW)	4,921	9,193	4,314
RE Share (%)	25	30.0***	5

[43] IRENA (2016), Renewable Energy Prospects: Dominican Republic, REmap 2030, International Renewable Energy Agency (IRENA), Abu Dhabi, www.irena.org/remap.

Non-RE Generation Capacity (MW)	3,709	6,435	2,726
RE Generation Capacity (MW)	1,211	2758	1,547
Required Investment (Mil USD)****	.	.	$1,501 - $1,964

*"Panorama Energético de América Latina y el Caribe 2021". OLADE. November 2021.

**IRENA (2016), Renewable Energy Prospects: Dominican Republic, REmap 2030, International Renewable Energy Agency (IRENA)

***Plan Energético Nacional República Dominicana 2022 – 2036

****Based on NREL "2021 Annual Technology Baseline (ATB)" using Utility Scale PV (Class 10 Advanced for lower bound and Class 1 Conservative for upper bound)

Is there a credible pipeline of RE/EE investment defined in targets and plans?

The Plan Energético Nacional República Dominicana 2022 – 2036 suggests a 30 percent RE target share. While renewable generation capacity has reached 24.3 percent of installed generation capacity, lower capacity factors for RE imply that RE share of total generation had only reached 15 percent by 2018, implying a need for significant additional investment in renewable generation to reach targets by 2025.

While existing targets are not explicit in capacities and by technologies, the ambition to move towards competitive procurement of new capacity could lead to more clearly defined pipelines in the future.

The Dominican Republic has seen sufficiently robust growth in renewable generation capacity historically to lend credibility to further RE ambition. A shift towards competitive procurement could lead to more robust pipelines for investors to plan for.

Energy Sector Financial Health

Summary

Consumer tariffs are not cost reflective (based on anecdotal evidence in the World Bank Dominican Republic - Electricity Reform for Sustainable Growth Development Policy Financing Programme document) and distribution utilities are currently in a poor financial position. The wholesale spot market uses a market-clearing system to determine the price. However, retail electricity tariffs cover only 60 percent of the cost, which includes the 33.5 percent electricity distribution losses incurred by distribution companies. As a result, the government transferred more than $600 million per year to cover the distribution companies' financial losses and capital investment requirements. The poor position of the sector creates increased risk associated with the sector that will impact borrower's ability to meet lenders requirements (Note: Both RE and FF electricity providers face this risk, however REs cost profile is high capex and low opex vs FF which is dominated by fuel cost, therefore debt requirements are typically higher; and offtake risk is already higher for RE because of intermittency and the risk of curtailment, which may compound payment risk. As mentioned under regulatory risk, this elevated risk may justify support of RE investment via risk sharing arrangements such as provision of guarantees.

Are tariffs cost reflective?

According to the World Bank, retail electricity tariffs cover only 60 percent of the cost, which includes the 33.5 percent electricity distribution losses incurred by distribution companies. Regulation requires tariffs paid by customers to be indexed to fuel prices and tariffs were increased in 2021 for the first time in a decade. Nevertheless, tariffs have been persistently below cost preventing the utility to meet its revenue requirement. The World Bank includes a cost-reflective tariff reform as a key component in its current Electricity Reform Development Policy Financing in the country.

Net metering, as currently used to incentivize distributed renewables, typically implies an inbuilt subsidy for self-generators that could overcome the disincentive provided by below cost tariffs. The NM scheme is however under review, and a potential shift to a net billing scheme to remove the inbuilt subsidy associated with NM when combined with below cost tariffs could lead to a situation that disincentives self-generation. Similarly, below cost tariffs will serve as a disincentive for EE measures.

Are power companies in a good financial position?

Distribution companies, who serve as offtakers of power and suppliers to end customers have experienced chronic financial deficits as a result of non-cost reflective tariffs paid by customers and energy theft.[44] In fact, between 2016 to 2020, direct transfers to the electricity sector to cover financial losses and capital investment requirements averaged more than US$600 million per year, making support to the electricity sector one of the central government's most oversized current expenditure items. A poor financial position of the purchasers of RE will create an element of risk for financiers if they feel that there is a possibility of generators not being paid for power generated. **Such a payment risk would likely be priced into financing terms, and in extreme cases may present a hard barrier to securing finance.**

Access to Quality of Electricity

One hundred percent of the population in the Dominican Republic has had access to electricity since 2017. Therefore, the role of new capacity (renewables and thermal) will be to meet growth in demand. This is consistent with the U.S. Energy Information Administration's International Energy Outlook 2021 that projects renewables will be the primary source for new electricity generation, but natural gas, coal, and increasingly batteries will be used to help meet load and support grid stability. The Dominican Republic has a Quality of Electricity Supply Index score of 2.34 (2017).[45] By way of reference, the regional median score is about 5 while Norway has the highest score of 6.9.

[44] World Bank, "Dominican Republic Electricity Reform," 2022.

[45] Schwab, K. (2019). The Global Competitiveness Report 2019 (p. 666). World Economic Forum.

Donor Activities in Dominican Republic

In the Dominican Republic, the government has decided to promote the development of RE using a model based on private, not public, investment.[46] There are a variety of recent and ongoing support activities for both RE and EE projects in the Dominican Republic, primarily in the form of loans and other financial support that is increasingly leveraging private finance. These are complemented by high-level technical support projects to strengthen the national regulatory and legislative frameworks for energy, rather than project-level technical support which could facilitate project development and implementation.

Table 5.3. Recent and ongoing RE and EE projects

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
Electricity Reform for Sustainable Growth Development	Both	Policy loan	2022-2023	World Bank	$400,000,000
50MW Los Guzmancito II Project	RE	Loans	2021-	Banco Popular Dominicano	$100,000,000
34MW Matafongo Wind Farm Project	RE	Project finance	2021-	Banco Popular Dominicano, Banco Dominicano del Progreso	$71,000,000
Supporting the Implementation of DR's EE Program	EE	Technical cooperation	2020-2022	IDB	$465,000
50MW El Soco Solar Park	RE	-	2020-2022	BAS Corporation, Dominion	$90,000,000
30MW Monte Plata Solar Park Expansion Project	RE	Project financing	2020-2022	Dutch Development Bank (FMO), International Monetary Fund (IMF)	$40,000,000
Implementation of the EE (EE) Program of the Dominican Republic	EE	Loan	2019-Present	IDB	$39,000,000

[46] Jimenez, Carlos, and Alberto Veloz, "Financiamiento de Energías Renovables En Republica Dominicana," 2020.

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
25MW Canoa Solar Park	RE	Project financing	2019-2020	Banco Popular Dominicano and others	$40,000,000
50MW Pecasa Wind Park in Guanillo	RE	Project financing	2017-2019	International Finance Corporation (IFC), Dutch Development Bank (FMO), IFC-Canada Climate Change Program, Proparco, German Investment Corporation (DEG)	$80,000,000 (IFC: $18.5m, FMO : $18m, IFC-CCCP: $17m, Proparco: $15m, DEG : $11.5m)
58MW Montecristi Solar Park	RE	Project financing	2017-	Dutch Development Bank (FMO), SDR (IMF), Belgian Investment Company for Developing Countries (BIO Invest)	$87,700,000
50MW Agua Clara Wind Farm	RE	Corporate loan	-2019	Citibank	$110,000,000
97.8MW Larimar Wind Farm Project	RE	-	2016-2021	EGE Haina	$100,000,000

Source: Various sources

Jamaica: Grouping 'Conducive to Market-Facilitated RE Investment'

Findings from Key Informant Interviews (KIIs)

In our interview with a USAID Jamaica Mission Representative, we discussed ongoing and upcoming RE and EE projects in Jamaica, support mechanisms provided by the government to incentivize RE and EE, and the main barriers to RE/EE financial access. The Representative drew our attention to USAID's current Jamaica Energy Resilience Alliance project, which is bringing together private sector partners to increase the optic of the RE market in Jamaica. Through this activity, USAID is connecting Jamaica Hotel and Tourism Association (JHTA)

members with banks and installers to provide both technical and financial support for RE/EE projects. In terms of government support, we learned about the existing net billing program, which incentivizes RE activities, while lack of FiT structure and low rates of compensation for companies feeding into the grid disincentivize buy-in. At the time of writing in late 2022, the 2018 Integrated Resource Plan was being revised.

Regulatory Risk

Summary

Jamaica has implemented legislation that can underpin the successful delivery of utility scale renewable electricity. However, the lack of application of provisions within the legislature for the procurement of utility scale renewables implies that the potential of this structure is not being optimized and may inhibit developers' willingness to implement RE projects within the country. At the small-scale end of the market, the net billing scheme delivers generation for self-consumption, including for commercial properties.

What is the status of RE enabling legislation/regulation?

Jamaica's National Energy Policy 2009 to 2030 (The Policy) set the high-level agenda for development of the energy sector. The Policy includes a target of RE sources providing 20 percent of energy by 2030.[47] Jamaica's Vision 2030 updated this target for renewable sources to provide 30 percent of energy by 2030.[48]

The 2015 Electricity Act (the Act)[49] is the primary legislation regarding electricity generation, transmission, distribution, and supply in Jamaica and includes a provision giving the Minister of energy the right to prescribe RE targets including a feed in tariff for each RE technology. Electricity generated from renewable resources is to be granted to the grid and can only be denied grid access on technical grounds. The Act also includes provisions regarding procurement of electricity (not specific to RE) via independent power producers (IPPs) and requires competitive procurement.

While the act allows for a target to be set and a feed in tariff to be applied to achieve these targets, the responsible Ministry has not yet applied such a feed in tariff. On top of the feed in tariff, the Act allows for the establishment of a Generation Procurement Entity (GPE) to manage competitive procurement of new energy generation. This GPE has been established, and latest reports indicate that first procurement of new capacity will take place in the second quarter of the 2022/2023 financial year.[50] This procurement does not specifically target RE.

The Act also outlines rules governing self-generators of electricity and allows for these generators to access the electricity grid. Under this Jamaica has a net billing scheme (first

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[47] National RE Laboratory (NREL), "Jamaica Energy Snapshot," 2020.

[48] U.S. Agency for International Development, "Renewing the Mind Towards RE," 2022.

[49] Parliament of Jamaica, "Electricity Act of 2015," 2015.

[50] *Jamaica Observer.* 2022. GPE Mandated to undertake procurement of new generation capacity. Accessed: 25 August 2022.

introduced 2012) for installations under 10 kW for residential customers and <100 kW for commercial customers.[51]

Despite the frameworks supporting the development of RE, power wheeling has not yet been enacted in Jamaica, and no tenders have been held for large scale RE under the Act (successful tenders for wind energy have been conducted). The net billing program has seen robust uptake with around 800 connections as of 2019.[52]

Is there an effective regulatory structure that allows for confident investment in RE and EE?

The Jamaican electricity market operates under a sole buyer model. Utility Jamaica Public Service Company Limited (JPS) is the sole transmission operator, distribution operator, and supplier of electricity in the country. The private sector owns 80 percent of the company and the public sector owns the other 20 percent. JPS and IPPs provide generation. As of 2013, JPS generated 57 percent of electricity with the remainder provided by IPPs.

Electricity is either generated by Utility JPS or by IPPs with energy capacity and net energy contracts and therefore the electricity price is not determined on an open market. Details on individual PPA contracts are not publicly available. JPS's annual report indicates that some PPAs are structured as payments for available energy capacity plus operating costs and overheads. While specific details are not available, fuel cost and cost of power purchases are provided in JPS's annual statement allowing estimates of the average cost to JPS of utility generated power and purchased power.[53]

Jamaica's sole purchaser model and procurement requirements imply that RE developers will require a forward-looking pipeline of expected capacity procurement from JPS to confidently begin the project development process. The lack of procurement since the adoption of the Act is likely to weaken investor confidence.

What direct support for investment in RE and EE is available?

Jamaica has tax reduction/exemption and green public procurement. **Competitive procurement under the act can be delivered in a way that prioritizes renewable generation.**

The net-billing scheme provides an incentive for development of small-scale renewables for self-generation, and evidence suggests that this scheme has seen success.

We note that in Jamaica, RE cost per unit production is lower than or competitive with FF based power production (Figure 5), therefore developers can justify RE investments based on their commercial merits independent of existing additional incentives. The government can choose to maintain the additional incentives to address the undersupply of RE due to its non-market benefits such as avoiding greenhouse gasses. As the IEA notes, "In most markets, solar PV or wind now represents the cheapest available source of new electricity generation."[54]

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[51] Ministry of Science, Energy, and Technology, "Net Billing Fact Sheet."

[52] New Energy Events, "Jamaica's Net Billing Program Sees Continued Growth," 2019.

[53] Jamaica Public Services Company. 2021 Annual Report.

[54] International Energy Agency (2021), World Energy Outlook 2021, IEA, . License: Creative Commons Attribution CC BY-NC-SA 3.0 IGO

Market Scale, Competitiveness, and Maturity

Summary

Based on the IRP, Jamaica has a RE pipeline that indicates a market opportunity to 2037 of approximately 1.3 GW. Given updated RE targets, and an expected more ambitious IRP to be released in 2022, this market size can be considered to be a lower bound. Despite currently limited penetration, wind generation has a long history in Jamaica and is likely to demonstrate some aspects of market maturity. Utility scale solar is not present as of 2022.

How mature are the RE and EE markets for both large- and small-scale projects in the country?

RE remains a minor contributor of the generation mix in Jamaica despite a relatively long history of successful projects in the country. As shown in Table 5.4, renewables make up only 17 percent of installed generation. Wind generation has the largest installed capacity at over 100MW.

Wind generation has been operating in the country since 2004 when the first 21 MW of the 63 MW Wigton Windfarm were installed.[55] Notable growth in small scale solar has been seen since net billing was first introduced in 2012.

Table 5.4. Installed electricity generation capacity

Technology	Units	Capacity
Hydropower	MW	29
Solar	MW	57
Wind	MW	102
Renewables total	MW	188
Total generation capacity (incl. non-renewables)	MW	1,100
Renewables share of installed capacity	%	17
FF to RE installed capacity ratio	#	4.88

Source: CCREEE. 2020. Jamaica 2020 Energy Report Card.

Is RE cost competitive versus fossil fuel to gain a significant market share in filling the supply gaps?

Renewable power generation costs have fallen sharply worldwide over the past decade. In the case of Jamaica, Figure 5 shows the range of cost estimates for solar, wind, and hydro RE technologies that have fallen below the point estimate of fossil-fuel generation cost of $0.15 per

[55] Wigton Windfarm, "Wigton Windfarm – Wigton Windfarm Limited."

kWh. Electricity retail price of $0.25 covers RE generation cost and the distribution cost as evidenced by the Utility's sound financial position.

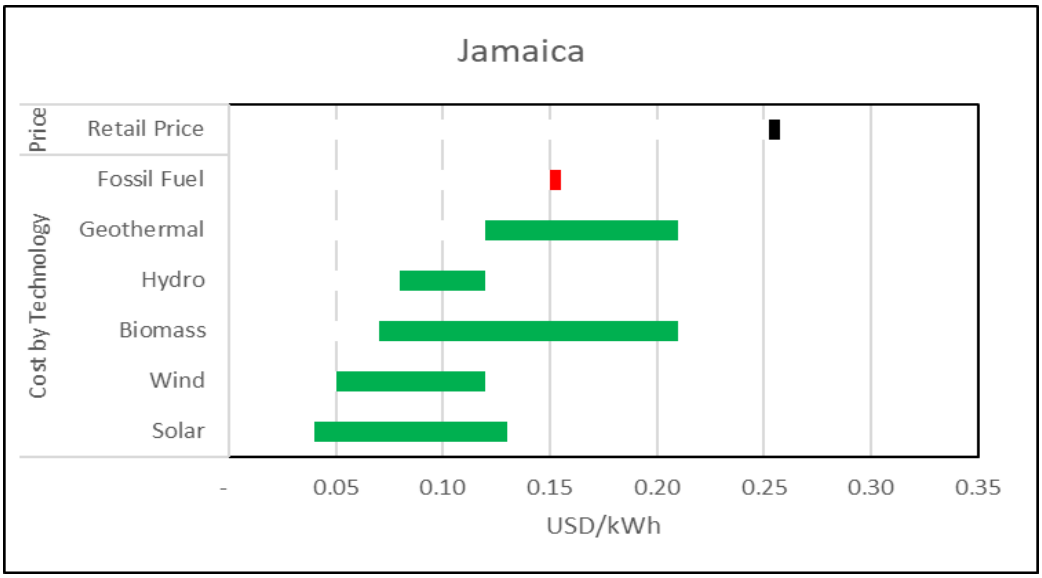

Figure 5.2. Cost competitiveness of RE technologies versus fossil fuel in electricity generation
Source: NREL, Masson, et. al., own calculations

What is the total investment required to develop the expected RE capacity in the next 5 to 10 years?

By 2030, we estimate that Jamaica will require 1,304.8 MW of installed capacity of which 652 MW will be RE (see Table 5.5 for calculation details). This is a derived estimate since a direct projection of future generation capacity is not available. The "Jamaica Integrated Resource Plan 2020" estimates peak load of 798 MW in 2030. From the "Energy Transitions Initiative Jamaica Country Snapshot" we note that the peak load to installed capacity ratio is 1,071 MW to 655 MW, or 1.64, and assume that this remains constant through 2030.

Technologies and timetables for this RE pathway are not available, therefore estimating capital outlay is difficult. Using indicative figures for Utility Scale PV (Class 10 Advanced for lower bound and Class 1 Conservative for upper bound) from NREL "2021 Annual Technology Baseline (ATB)" the potential capital expenditure required for this expansion in RE is between $457 – 598 million between 2021-2030 (inclusive).

Table 5.5. Supply and demand projections and estimated investment requirement

	Current	Projected 2030	Change
Total Generation Capacity (MW)	1,100*	1,305**	205
RE Share (%)	17	50	33
Non-RE Generation Capacity (MW)	889	652	-237

RE Generation Capacity (MW)	182	653	471
Required Investment (Mil USD)***	.	.	$457 - $598

* CCREEE. 2020. Jamaica 2020 Energy Report Card.

** This is a derived estimate since a direct projection of future generation capacity is not available. The "Jamaica Integrated Resource Plan" estimates peak load of 798MW in 2030. From the "Energy Transitions Initiative. 2020. Jamaica Country Snapshot" we note that the peak load to installed capacity ratio is 31,071 MW to 655 MW, or 1.64, and assume that this remains constant through 2030.

***Based on NREL "2021 Annual Technology Baseline (ATB)" using Utility Scale PV (Class 10 Advanced for lower bound and Class 1 Conservative for upper bound)

Is there a credible pipeline of RE/EE investment defined in targets and plans?

The 2018 Jamaica Integrated Resource Plan (JIRP)[56] provides a schedule of planned capacity by generation technology to be added to the system annually. An updated IRP is planned for release at the end of 2022. The updated plan is expected to increase planned renewables additions in line with the accelerated renewable target of 50 percent penetration by 2030.[57] Table 5.6 provides a schedule of planned capacity additions for Jamaica under the 2018 IRP.

Table 5.6. Planned capacity additions for Jamaica according to 2018 IRP

Year	Technology	Units	Capacity
2022	Solar / Wind	MW	147
2023	Hydro/Waste to energy / Biomass	MW	74
2024	Solar / Wind	MW	173
2025	Combined Cycle Gas Turbine	MW	120
2026	Combined Cycle Gas Turbine	MW	120
2027	Solar / Wind	MW	111
2028		MW	
2029		MW	
2030	Gas Turbine	MW	40
2031		MW	
2032	Solar / Wind	MW	122.5

[56] Wray, Rainford, and Ministry of Science, Energy, and Technology, "2018 Jamaica Integrated Resource Plan (Revised)," 2018.

[57] Ministry of Science, Energy and Technology, "Jamaica's Renewable Plan," 2022.

Year	Technology	Units	Capacity
2033	Solar / Wind	MW	60
2034	Solar / Wind	MW	37
2035	Solar / Wind	MW	20
2036	Solar / Wind, Gas Turbine	MW	50
2037	Solar / Wind	MW	589.5
Total Renewables	Renewables	MW	1384
Total	All	MW	1664

Source: Ministry of Science, Energy and Technology. 2018. Jamaica Integrated Resource Plan 2018.

Regularly updated integrated resource planning will provide potential RE investors with a clear idea of the future pipeline of opportunities within the countries as well as an indication of the expected total market size over the planning period.

Energy Sector Financial Health

Summary

JPS is in a strong financial position, driven by cost reflective tariffs, and the tariff structure should allow a changing cost structure that would come with growing renewable penetration to be accounted for going forward.

Are tariffs cost reflective?

Jamaica has regulated cost reflective electricity customer tariffs, calculated based on the revenue cap principle, with tariffs comprising two elements: the non-fuel rate, and the annually adjusted fuel rate. The tariffs cover the country's high transmission and distribution losses at 26.5%.

Cost reflective tariffs along with cost-competitive RE imply that JPS should be able to recover costs of planned renewable electricity investments, including IPPs, and are therefore unlikely to block or refuse connection to new renewable projects.

Are power companies in a good financial position?

Utility JPS posted positive profits in each year from 2013 to 2018 and is in good financial health.[58] There do not appear to be any indications of JPS creating issues with new IPPs or any issues with making PPA payments.

[58] Ministry of Science, Energy and Technology, "An Overview of Jamaica's Electricity Sector," 2019.

Access to Quality of Electricity

What share of the population has access to electricity?

Jamaica has reached 100 percent electricity access, therefore the role of new capacity (renewables and thermal) will be to meet growth in demand.

What is the Quality of Electricity Supply, Index score?

Jamaica has a Quality of Electricity Supply Index score of 4.79 (2017).[59] By way of reference, the regional median score is about 5 while Norway has the highest score of 6.9.

Donor Activities in Jamaica

In recent years, there have been a variety of financial and technical support activities for RE and EE projects in Jamaica. Most financial support is in the form of loans. Technical support activities occur at both the project level (i.e., workforce development for installation, facilitating financing) and sector level (i.e. increasing institutional capacity and expanding regulatory framework).

Table 5.7. Recent and ongoing RE/EE projects

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
Jamaica Energy Resilience Alliance	RE	Technical assistance, Workforce development (scholarships), Sponsor equity, Project finance	2021-2024	USAID, WRB Energy, Local banks	USAID: $4 million; WRB Energy and Wigton Wind Farms Limited: up to $50 million of combined sponsor equity and project finance
Solar Energy and EE in Schools	Both	Technical support, Energy savings performance contract (ESPC)	2020-2022	Government of Jamaica availability payments	$5,000,000
28.5MW Content Solar PV Park	RE	Loan (Senior term)	2020-2022	First Caribbean International Bank (CIBC)	$46,000,000

[59] Schwab, K. (2019). The Global Competitiveness Report 2019 (p. 666). World Economic Forum. http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
EE and Conservation Program	EE	Technical assistance	2019	IDB	$20,000,000
The EcoMicro Program (Eco Micro) --COK Sodality: Green Finance for Micro, Small and Medium Enterprises (MSMEs) and Low-Income Households	Both	Technical assistance, loans	2018-2022	IDB, Multilateral Investment Fund (MIF), co-financed by the Nordic Development Fund (NDF) and Global Affairs Canada (GAC) through Project Specific Grants (PSGs), and local counterpart funds	$350,000
Energy Management and Efficiency Programme	Both	Technical assistance, grants	2017-2023	IDB	$10,000,000 (investment grants)
Energy Efficient Street Lights Program	EE	Loan, Technical Assistance	2017-2020	Caribbean Development Bank (CDB)	$25,000,000
Energy Management and Efficiency Programme	Both	Technical assistance, loans	2016-2022	IDB, Japanese International Cooperation Agency (JICA)	$30,000,000 (loans)
Deployment of RE and Efficiency in the Public Sector	Both	Technical assistance, shared and/or guaranteed savings	Began in 2016	Global Environment Facility, UNDB	$12,000,000

Source: Various sources

Table 5.8. Financial institutions active in RE/EE lending

Commercial and Merchant Banks	Other Approved Financial Institutions and Agents	Micro Finance Institutions
▪ Bank of Nova Scotia (BNS) ▪ National Commercial Bank (NCB) ▪ Capital & Credit Merchant Bank (CCMB) ▪ Citibank N.A. ▪ First Caribbean International Bank (FCIB) ▪ First Global Bank (FGB) ▪ RBC Royal Bank (RBTT) ▪ Sagicor Bank (PCB)	▪ Jamaica Co-operative Credit Union League (JCCUL) – All Credit Unions ▪ Jamaica Money Market Brokers (JMMB) ▪ National People's Cooperative Bank (NPCB) ▪ National Export Import Bank (EXIM) ▪ AGENT: Jamaica Business Development Corporation (JBDC)	▪ Access Financial Services ▪ Jamaica National Small Business Loans ▪ Nation Growth Microfinance Limited ▪ Micro Credit Limited ▪ Churches Co-operative Credit Union ▪ St. Elizabeth Co-operative Credit Union ▪ St. Thomas Co-operative Credit Union ▪ McKayla Financial Services Limited ▪ First Union Financial Services Limited

Source: United Nations Development Programme, "Deployment of RE and Improvement of EE in the Public Sector Project Document," 2016.[60]

Barbados: Grouping 'Not Conducive to Market-Facilitated RE Investment'

Findings from Key Informant Interviews (KIIs)

In our interview with a USAID Barbados Mission Representative, we discussed the Government of Barbados' ambitious initiative to reach 100 percent RE by 2030, per their National Energy Policy. To achieve this goal, Barbados will expand on its mature distributed renewable activities, such as solar water heating, focusing on utility-scale solar farms that show promise both in Barbados and in other OESC states. While there is a feed-in-tariffs program in Barbados and capital is available, challenges relating to a lack of suitable government legislation and knowledge remain. In particular, there is insufficient knowledge regarding designing and packaging RE and EE projects to maximize access to financing from potential investors. In other OESCs state, issues associated with monopolistic electricity utilities pose additional challenges to catalyzing RE, however the Barbados Light & Power Company Limited (BLPC) is interested in entering the RE market.

[60] Table reproduced from United Nations Development Programme, "Deployment of RE and Improvement of EE in the Public Sector Project Document," 2016.

Regulatory Risk

Summary

Barbados has the fundamental legislative and regulatory structures in place to facilitate growth in RE. While distributed renewable generation is relatively mature in the country, utility scale renewable generation remains in its infancy. Essential for attracting investment will be developing a PPA structure that IPPs can make bankable decisions with. EE is also nascent, however, recent energy policy includes development of relevant legislation and regulation.

What is the status of RE enabling legislation/regulation?

Enabling legislation for the supporting the growth of grid connected RE in Barbados has been introduced with the Electric Light and Power Act 2013[61] and the Electric Light and Power (Amendment) Act 2015 (the Act).[62] The Act allows for the connection of electricity from renewable generation sources, provides the Minister with the power to set targets for renewable electricity delivered to the grid, and allows for electricity generation to be provided by Independent Power Producers (IPPs).

In addition to the Act, Barbados supports the development of distributed renewable generation for the primary purpose of self-consumption under the recently introduced Feed-in Tariff (FiT) scheme and the pre-existing RE Rider.[63]

Legislation and regulation regarding the promotion of EE has yet to be developed, however the 2019 RE Policy includes plans for their development.

Barbados has introduced legislation and regulation that provides a framework that sets up development and investment in RE with more legislation needed to encourage IPPs. Additionally, energy efficiency standards, tax credits, tax reduction or exemption, public demonstration, restrictions on incandescent bulbs, appliance labeling standards offer a preliminary framework for incentivizing EE.

Is there an effective regulatory structure that allows for confident investment in RE and EE?

The Barbados Light & Power Company Limited (BLPC) is the monopoly provider of electricity generation, transmission, distribution, and supply. The Fair Trading Commission regulates the sector and approves tariffs.

While the Electric Light and Power Act introduced the possibility of IPPs, none have been implemented. However, the intention is to encourage the proliferation of IPPs and move to a model of competition in generation with BLPC as a single buyer through adjustment of BLPCs licenses.[64]

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[61] Barbados Parliament, "Electric Light and Power Act, 2013-21." 2013.

[62] Barbados Parliament, "Electric Light and Power (Amendment) Act , 2015," 2015.

[63] The Barbados Light and Power Company Limited, "Billing Under the RE Rider," 2021.

[64] Ministry of Energy and Water Resources, "Barbados National Energy Policy (BNEP) 2019-2030," 2019.

All power is currently generated in house by BLPC therefore no wholesale price of electricity is set on a market. BLPC provides fuel and generation operating and maintenance costs in their annual report allowing for the average marginal cost of electricity generated (the price paid for power by the utility) to be estimated[65].

The process of opening electricity generation to competition remains ongoing, and it will take time once everything is in place for project sponsors and financiers to become sufficiently comfortable with RE projects in Barbados and develop trust in the system.

What direct support for investment in RE and EE is available?

As outlined above, the FiT and previous RE Rider provide direct incentives for the development of renewable generation for the primary purpose of self-consumption. The Government of Barbados provides tax credits, tax reductions or exemptions, and public loans or grants to businesses investing in renewable energy and energy efficiency.

We note that in Barbados, RE cost per unit production is lower than FF based power production (Figure 6), therefore developers can justify RE investments based on their commercial merits independent of existing additional incentives. The government can choose to maintain the additional incentives to address the undersupply of RE due to its non-market benefits such as avoiding greenhouse gasses. As the IEA notes, "In most markets, solar PV or wind now represents the cheapest available source of new electricity generation."[66]

Market Scale, Competitiveness, and Maturity

Summary

Utility scale RE is relatively mature, and there is no clearly defined program of planned capacity additions to guide investors. However, Barbados has set an ambitious target of 100 percent renewable electricity by 2030. **This target implies a minimum market size of 352.8 MW of new renewables by 2030 (to meet a total target of 404.6 MW).**

How mature are the RE and EE markets for both large- and small-scale projects in the country?

At present there is utility scale RE generation connected to the Barbados grid totals 10 MW. Distributed RE, developed under the FiT and RE Rider total 41.78 MW. Taken together, RE makes up 17 percent of grid connected capacity (see Table 5.9).

Table 5.9. Installed electricity generation capacity

Technology	Units	Capacity
Utility owned diesel	MW	45.5
Utility owned aviation fuel	MW	73

[65] Barbados Light and Power Company Limited. 2019. Non-consolidated Financial Statement.

[66] International Energy Agency (2021), World Energy Outlook 2021, IEA. Licence: Creative Commons Attribution CC BY-NC-SA 3.0 IGO.

Technology	Units	Capacity
Utility owned heavy fuel oil	MW	129.4
Utility owned renewable	MW	10
Distributed renewable	MW	41.78
Total renewable generation capacity	MW	51.78
Total generation capacity (incl. non-renewables)	MW	299.68
Renewables share of installed capacity	%	17
FF to RE installed capacity ratio	#	4.88

Source: CCREEE. 2020. Energy Report Card: Barbados.

Distributed RE make up a significant share of total grid connected capacity indicating that this segment of the RE market is likely to be mature. Utility scale renewable generation remains limited, and the details of the PPA structure intended to support future growth will be important for ensuring financial institutions are comfortable with investing in the market.

Is RE cost competitive versus fossil fuel to gain a significant market share in filling the supply gaps?

Renewable power generation costs have fallen sharply worldwide over the past decade. In the case of Barbados, Figure 6 shows the range of cost estimates for solar, wind, and hydro RE technologies that have fallen below the point estimate of fossil-fuel generation cost of $0.21 per kWh. Electricity retail price of $0.26 covers RE generation cost and the distribution cost as evidenced by the Utility's sound financial position.

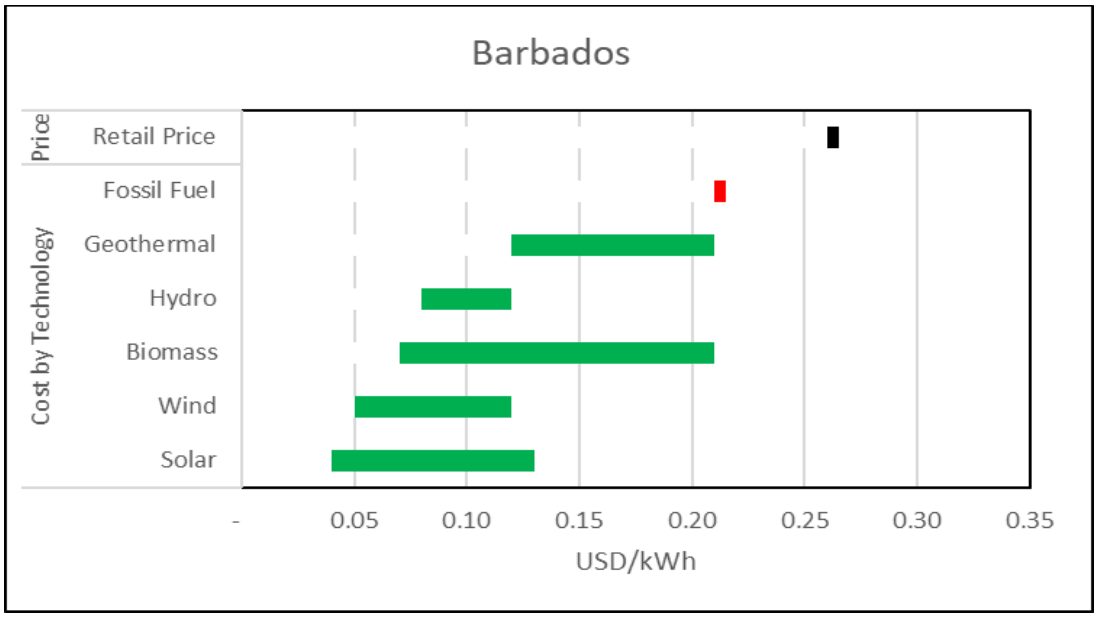

Figure 3. Cost competitiveness of RE technologies versus fossil fuel in electricity generation
Source: NREL, Masson, et. al., own calculations

What is the total investment required to develop the expected RE capacity in the next 5 to 10 years?

The Integrated Resource and Resiliency Plan for Barbados[67] suggests a 35 percent increase in demand by 2030. Assuming a similar increase in generation capacity suggests the need for 404.6 MW of total generation capacity by 2030 (Table 5.10). Given the cost competitiveness of RE versus fossil fuel, RE could meet the stated goal of 100 percent by 2030.

Technologies and timetables for this RE pathway are not available, therefore estimating capital outlay is difficult. Using indicative figures for Utility Scale PV (Class 10 Advanced for lower bound and Class 1 Conservative for upper bound) from NREL "2021 Annual Technology Baseline (ATB)" the potential capital expenditure required for this expansion in RE is between $342 - $448 million between 2021-2030 (inclusive).

Table 5.10. Supply and demand projections and estimated investment requirement

	Current*	Projected 2030	Change
Total Generation Capacity (MW)	300*	405**	105
RE Share (%)	17	100	83
Non-RE Generation Capacity (MW)	248	0	-100

[67] Ministry of Energy, Small Business, and Entrepreneurship (MESBE) and Mott McDonald, "Integrated Resource and Resiliency Plan for Barbados," June 22, 2021.

RE Generation Capacity (MW)	52	405	353
Required Investment (Mil USD)***	.	.	$342 - $448

*CCREEE. 2020. Energy Report Card: Barbados.

**This is a derived figure. The Integrated Resource and Resiliency Plan for Barbados suggests a 35 percent increase in demand by 2030, so we assume a similar increase in generation capacity.

***Based on NREL "2021 Annual Technology Baseline (ATB)" using Utility Scale PV (Class 10 Advanced for lower bound and Class 1 Conservative for upper bound)

Is there a credible pipeline of RE/EE investment defined in targets and plans?

Barbados does not have a schedule of planned RE capacity additions or capacity targets by technology but has set a target of achieving 100 percent RE generation by 2030.[68] Replacing all current fossil fuel generation capacity with renewable generation suggests the need for 353 MW of new renewable capacity by 2030, implying replacement of existing non-renewable production capacity. Considering lower load factors of renewable generation compared with fossil generation and expected demand growth due to GDP growth and other factors this market sizing serves as a lower bound.

Energy Sector Financial Health

Summary

The electricity sector in Barbados is in good financial health and **this is not expected to be a notable source of concern for potential investors.**

Are tariffs cost reflective?

BLPC sets the tariffs paid by customers, which are approved by the Fair Trading Commission. BLPC most recently applied to the Fair Trading Commission for an 11 percent increase in 2021 after tariffs were held constant for 11 years. While tariffs are not calculated using a rigorous cost reflective methodology, they do appear to be managed in a manner that roughly covers costs.[69]

Are power companies in a good financial position?

In the financial years 2018 and 2019 utility BLPC demonstrated positive cash flows, had a solid balance sheet, and held positive cash reserves.[70]

[68] Ministry of Energy and Business Development of Barbados, "Change Coming to Electricity Market – Ministry of Energy and Business Development of Barbados," 2021.

[69] Tariffs by customer category (small, medium and large) are provided on the BLPC website: https://www.blpc.com.bb/index.php/business/tariffs-and-riders-business.

[70] Ministry of Energy and Water Resources, "Barbados National Energy Policy (BNEP) 2019-2030," 2019.

Access to Quality of Electricity

Barbados has reached 100 percent electricity access, therefore the role of new renewable capacity will be to meet growth in demand.

What share of the population has access to electricity?

One hundred percent of the population in Barbados has access to electricity,[71] therefore the role of new capacity (renewables and thermal) will be to meet growth in demand.

What is the Quality of Electricity Supply, Index score?

Barbados has a Quality of Electricity Supply Index score of 6.04 (2016).[72] By way of reference, the regional median score is about 5 while Norway has the highest score of 6.9.

Donor Activities in Barbados

Donor activities in Barbados include grants, loans, and technical assistance (at the project and institutional level). Technical assistance projects continue to support Barbados' efforts to create and maintain a strong framework for development and investment in RE. Based on the publicly available data used for this report, financial support does not appear to be leveraging private finance.

Table 5.11. Recent and ongoing RE/EE projects and Funding Sources

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
Residential EE Programme (REEF)	EE	Technical assistance, Grants, Parallel financing	In planning phase	Caribbean Development Bank (CDB)	$10,000,000
Support for the Design of Carbon Neutral Strategies in the Context of Energy Transition	Both	Technical cooperation	2021-2023	IDB	$400,000
Better Batteries- an Energy-as-a-Service Model to Accelerate the Hotel Industry's	RE	Grants, Technical cooperation	2021-2022	IDB	$390,000 (Investment grants) $110,000 (Technical cooperation)

[71] Barbados Light and Power Company Limited, "Barbados Light and Power Company Limited Non-Consolidated Financial Statements 2019," 2020.

[72] Schwab, K. (2019). The Global Competitiveness Report 2019 (p. 666). World Economic Forum.

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
Access to RE, Utilizing a Battery Storage Solution Enabling External Control and Data Analytics					
Sustainable Energy Investment Program (Smart Fund II)	Both	Subsidized loans at interest rate of 3.75% up to max. 10 years	2019-Current	IDB	$30,000,000 (loans) Loans of up to $990,000 for larger EE and RE projects Loans of up to $74,000 for SMEs
Sustainable Energy Investment Program (Smart Fund II)	Both	Grants	2019-Current	IDB	$15,463,142 (investment grants) Technical assistance grants of $25,000
Supporting Energy Transition and Smart Energy Technology Expansion	Both	Technical cooperation	2019-	IDB	$550,000
Deployment of Cleaner Fuels and Renewable Energies in Barbados	RE	Institutional strengthening and capacity building, Technical assistance, Loans (including retroactive financing)	2016-2022	IDB	$34,000,000
Caribbean EE Lighting Project	EE	Technical support	2014-2016	Government of Denmark, SIDS DOCK Support Program	$1,000,000

Source: Various sources

Trinidad and Tobago: Grouping `Not Conducive to Market-Facilitated RE Investment'

Regulatory Risk

Summary

Trinidad and Tobago does not have legislation and or regulation specifically targeting the development of RE and EE. However, activities to develop these are currently under way including proposals for tax credits and tax reduction or exemption for RE, along with initiatives for EE. Even though there is no direct legislation for RE, the current regulatory structure of the market appears to function in a manner that is conducive to investment in electricity generation for IPPs and the regulator, Regulated Industries Commission (RIC), appears to operate efficiently.

What is the status of RE enabling legislation/regulation?

The generation of electricity in Trinidad and Tobago is currently governed by The Trinidad and Tobago Electricity Commission act and The Regulated Industries Commission Act. These acts make no provision for generation of RE by IPPs.[73] Previously a Feed-in-Tariff Policy was drafted with the purpose of supporting the development of RE generation and connection to the grid. However, this policy has not been implemented and is under review.[74]

Reports suggest that Trinidad and Tobago is undertaking activities to create a supportive framework for developing RE including the preparation of:

- Draft license for non-utility scale power generation.
- License framework for utility scale power generation including renewable generation.
- Amendments to The Trinidad and Tobago Electricity Commission Act and The Regulated Industries Commission Act.
- EE Act.
- Energy Conservation and EE Policy and Action Plan.

Is there an effective regulatory structure that allows for confident investment in RE and EE?

The Trinidad and Tobago Electricity Commission (T&TEC) is the monopoly provider of electricity transmission, distribution, and supply and is a minor player in generation. Oversight is provided by the RIC which is responsible for price review and tariff approval. IPPs are allowed and are the dominant providers of electricity generation, owning approximately 95 percent of currently installed generation capacity.

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[73] Ministry of Energy and Energy Industries, "RE Electricity Generation in Trinidad and Tobago," 2021.

[74] Regulated Industries Commission, "Towards RE Deployment in the Electricity Sector of Trinidad," 2019.

T&TEC purchases bulk electricity from three IPPs. Publicly available information on the structure of the contracts held between T&TEC and the IPPs is limited. T&TECs annual performance indicator report provides data on electricity purchases in kWh but does not provide the associated costs preventing calculation of an average price paid by the utility for power.[75]

What direct support for investment in RE and EE is available?

In 2022, there are no direct support mechanisms for RE.[76]

Fiscal incentives are available for EE in Trinidad and Tobago, these include:

- A 25 percent rebate on electricity bills that are TT$ 300 or less (targeting low-income households)
- Zero percent VAT added to solar water heaters, solar PV panels, and wind turbines.
- Tax credit of 25 percent for solar water heating equipment, up to a maximum of TT$ 2,500 in credit.

Market Scale, Competitiveness, and Maturity

Summary

RE remains immature in Trinidad and Tobago and there is no clear pipeline of planned capacity additions. The total capacity of installed generation capacity in Trinidad and Tobago is relatively large on a Caribbean scale at 2119 MW, indicating that if Trinidad and Tobago transitions existing fossil fuel generation to renewables, there will be a significant market opportunity.

How mature are the RE and EE markets for both large- and small-scale projects in the country?

RE remains very immature in Trinidad and Tobago with just 0.05 MW of distributed generation installed across the country. Generation is dominated by IPP-owned and operated natural gas plants (See Table 5.12).

Table 5.12. Installed electricity generation capacity

Technology	Units	Capacity
Utility owned diesel	MW	11
Utility owned liquefied natural gas	MW	88
IPP's (HFO)	MW	2019
Distributed renewable	MW	0.05
Total renewable generation capacity	MW	0.05

[75] Regulated Industries Commission. 2022. T&TEC's Annual Performance Indicator Report for the Year 2020.

[76] Indar, Delena "National EE Monitoring Report of Trinidad and Tobago," 2019.

Technology	Units	Capacity
Total generation capacity (incl. non-renewables)	MW	2118.05
Renewables share of installed capacity	%	0.000024%
FF to RE installed capacity ratio	#	4166665.67

Source: CCREEE. 2020. Energy Report Card: Trinidad and Tobago.

Despite fiscal incentives, there is limited evidence of uptake of EE in Trinidad and Tobago. Low power prices driven by access to cheap natural gas (discussed in further detail below) is likely disincentivizing investment in EE particularly in the Industrial sector.[77]

Is RE cost competitive versus fossil fuel to gain a significant market share in filling the supply gaps?

Renewable power generation costs have fallen sharply worldwide over the past decade. In the case of Trinidad and Tobago, the country's resource endowment grants it access to abundant LNG resources. For this reason, Figure 7 shows the cost estimates for solar, wind, and hydro RE technologies still exceed the point estimate of fossil-fuel generation cost of $0.05 per kWh. In addition, the electricity retail price of $0.05 does not cover RE generation cost.

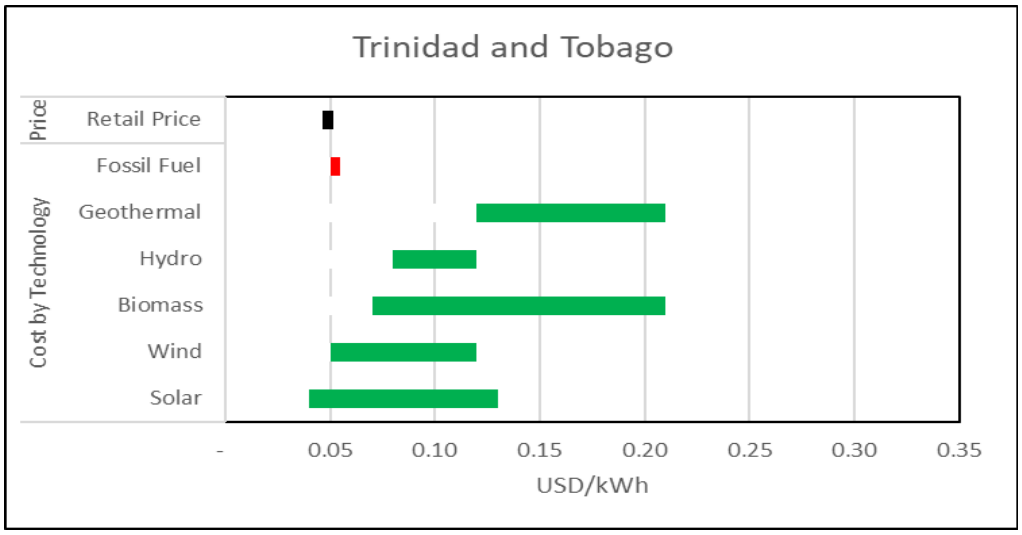

Figure 4. Cost competitiveness of RE technologies versus fossil fuel in electricity generation
Source: NREL, Masson, et. al., own calculations

[77] Indar, Delena "National EE Monitoring Report of Trinidad and Tobago," 2019.

What is the total investment required to develop the expected RE capacity in the next 5 to 10 years?

The IDB's "A Unique Approach for Sustainable Energy in Trinidad and Tobago"[78] suggests a high RE electricity scenario for 2032 of 16.8 TWh with 16 percent RE share. Assuming that the proportionality between installed capacity and total generation stays the same as in 2018, i.e., 2114 MW of installed capacity to 9,324 GWh of total generation or 0.00023,[79] 16.8 TWh suggests an installed capacity of 3,809 MW.

Technologies and timetables for this RE pathway are not available, therefore estimating capital outlay is difficult. Using indicative figures for Utility Scale PV (Class 10 Advanced for lower bound and Class 1 Conservative for upper bound) from NREL "2021 Annual Technology Baseline (ATB)" the potential capital expenditure required for this expansion in RE is between $591 - $774 million between 2021-2030 (inclusive).

Table 5.13. Supply and demand projections and estimated investment requirement

	Current*	Projected 2032**	Change
Total Generation Capacity (MW)	2,118	3,809	1,691
RE Share (%)	0	16	16
Non-RE Generation Capacity (MW)	2,118	3,200	1,082
RE Generation Capacity (MW)	0	609	609
Required Investment (Mil USD)***	.	.	$591 - $774

*CCREEE. 2020. Energy Report Card: Trinidad and Tobago.

** Marzolf, N. C., Cañeque, F. C., Klein, J., and Loy, D. (2015). A unique approach for sustainable energy in Trinidad and Tobago. Inter-American Development Bank.

***Based on NREL "2021 Annual Technology Baseline (ATB)" using Utility Scale PV (Class 10 Advanced for lower bound and Class 1 Conservative for upper bound)

Is there a credible pipeline of RE/EE investment defined in targets and plans?

Trinidad and Tobago does not have a published plan for generation capacity additions (or similar document or program) to provide a credible pipeline of potential projects. The country has set a target of 10 percent of generated power to come from RE by 2021, this target has already been missed. IDB has separately worked out plausible scenarios for RE share by 2032, one of which suggests up to 16 percent RE share.

Energy Sector Financial Health

Summary

While tariffs are controlled following a price-cap regulatory approach by the RIC, artificially low fuel costs will reduce competitiveness of RE and disincentivize EE. Furthermore, T&TEC appears to have issues with collection of bills which is driving annual deficits and could lead to

[78] Natacha C Marzolf et al., "A Unique Approach for Sustainable Energy in Trinidad and Tobago" (Inter-American Development Bank, n.d.).

[79] Energy Transitions Initiative. 2020. Trinidad and Tobago Country Snapshot

reluctance from developers and financiers to enter into generation agreements with the utility going forward.

Are tariffs cost reflective?

Tariffs paid by customers are set by the RIC using a price-cap regulatory approach and utilizing the building blocks method.[80] Determining tariffs in this manner should ensure that tariffs are cost reflective. However, costs associated with generation of electricity are artificially low because the price for fuel is set below the market price in long-term contracts between T&TEC and the National Gas Company.[81] **A result of the artificially low generation component of T&TEC's cost base will be a reduction in the relative competitiveness of new RE against existing fossil fuel generation.**

An artificially low fuel component of tariffs drives a low overall tariff relative to regional comparators. A low tariff will disincentivize investment in EE by reducing the value of avoided electricity expenditure.

Are power companies in a good financial position?

T&TEC operated at a deficit in all years in the period 2016 to 2019. A key driver of this deficit is the growing value of receivables, which increased by over TT$ 700 million in the period. Total sales remained stable at approximately TT$ 2,900 million per year. Publicly available information does not explicitly state how this is managed, but losses look like they are covered through a combination of debt and through delayed payments to the national gas supplier (the delay of payments is government guaranteed). It is also worth noting that most uncollected bills (a significant source of the revenue shortfall) sit with public customers (such as hospitals)

Access to Quality Electricity

Trinidad and Tobago has reached 100 percent electricity access,[82] therefore the role of new renewable capacity will be to meet growth in demand. Barbados has a Quality of Electricity Supply Index score of 4.99 (2017).[83] By way of reference, the regional median score is about 5 while Norway has the highest score of 6.9.

Donor Activities in Trinidad and Tobago

There are a variety of technical assistance support activities in Trinidad and Tobago, but most are higher-level. Higher-level technical assistance activities focus on strengthening the RE/EE project pipeline using technical and pre-feasibility studies, understanding, and closing gender access gaps in the sector, building capacity, strengthening the legislative and regulatory frameworks for developing RE, and support to lenders in analyzing the market.

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[80] Regulated Industries Commission, "Framework and Approach for the Price Review for the Electricity Transmission and Distribution Sector (TandTEC) (2021-2026 Regulatory Control Period)," 2020.

[81] Regulated Industries Commission, "Review of the Status of Trinidad and Tobago Electricity Commission 2016-2019," 2021.

[82] World Bank, "Sustainable Energy for All," 2016.

[83] Schwab, K. (2019). The Global Competitiveness Report 2019 (p. 666). World Economic Forum.

Financial support for RE/EE projects in Trinidad and Tobago comes in the form of loans and grants but does not appear to be leveraging private financing based on the publicly available information we reviewed.

Table 5.14. Recent and ongoing RE and EE projects

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
Decarbonization Initiatives in the Energy, Power, and Transport Sectors	RE	Technical cooperation	2022-2024	IDB	$350,000
EcoMicro—Central Finance Facility—Green Finance to Build Climate Resilience of Low-Income Households	Both	Technical cooperation, Loans for MSMEs and low-income households	2022-	IDB and Global Affairs Canada (GAC)	$300,000
2 Solar Plants at Brechin Castle and Orange Grove, total 112.2MW	RE		2021-2023		
Energy Dynamics Limited (ESCo)	Both	Loan	2020-2022	IDB	$100,000 (de-risked loans, solutions on performance contract model, generating revenue from shared or guaranteed energy savings, over max. 10 years)
Building the Regulatory Regime for the Development of Utility Scale RE Generation	RE	Technical cooperation	2020-2021	IDB	$250,000
Installation of 12 Small-Scale Roof-Mounted, Off Grid Solar PV	RE	Technical cooperation, Grants	2020-2022	Global Climate Change Alliance Plus (GCCA+), United Nations	$ 4,170,100

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
				Development Programme	
Construction of Solar Park at Piarco International Airport, Small Scale Systems in Public Utilities and Remote Communities, and Technical Assistance to Ministry of Energy	RE	Technical assistance, Loans, Grants	2019-2023	European Union's Global Climate Change Alliance Plus Initiative (GCCA+)	$4,010,000
Construction of 770KW Solar PV Carport at the Queens Park Savannah	RE	Grant	2019	United Arab Emirates Caribbean RE Fund (UAE-CREF)	$3,000,000

Source: Various sources

Dominica: Grouping `Not Conducive to Market-Facilitated RE Investment'

Regulatory Risk

Summary

While Dominica does not have specific legislation targeting the development of RE in the country, the existing framework is likely to be sufficient to support development. Current legislation allows IPPs, and given the small scale of the market, preparing bespoke contracts and arrangements is likely to be more efficient than preparing legislation. Additionally, a framework is already in place to enable small scale distributed RE generation.

What is the status of RE enabling legislation/regulation?

The 2006 Electricity Supply Act (ESA) governs Dominica's electricity system. While the ESA does not specifically address supporting the growth of RE, developing a new law on RE may be inefficient, given the scale and structure of Dominica's electricity system.

At present all generation capacity is owned and operated by vertically integrated utility Dominica Electricity Services (DOMLEC). The ESA allows for the granting of separate generation licenses, implying the possibility of IPPs.

The Distributed RE Generation Policy formalizes rules for installation of distributed RE generation..[84] This includes a provision for payment of electricity provided to the grid at the cost of avoided generation (effectively a net billing scheme).[85]

Self-generation is allowed under the ESA, with non-grid connected installations of capacity over 20 kW.

The Draft Energy Policy (DEP), [86] prepared in 2014 and published in 2018, includes the promotion of various renewable generation technologies but does not provide specifics on how this could be achieved. Similarly, the DEP includes measures to promote EE, these are largely through programs rather than development of regulation, which given the scale of Dominica is likely an efficient approach. There is also a stated intention to prepare building standards.

Is there an effective regulatory structure that allows for confident investment in RE and EE?

DOMLEC is the sole provider of electricity generation, transmission, distribution, and supply in Dominica. The ESA established the Independent Regulatory Commission (IRC) to provide regulatory oversight of DOMLEC including approval of tariffs.

At present all generation is owned and operated by DOMLEC and therefore there is no wholesale power market setting a power price. DOMLEC's annual report provides disaggregated cost information that can provide an indication of the average cost (the price paid for power by the utility) of generation[87].

What direct support for investment in RE and EE is available?

Given all grid connected RE is owned and operated by DOMLEC there is no direct support incentivizing generation of RE by third party generators.

We note that in Dominica, RE cost per unit production is lower than or competitive with FF based power production (Figure 8), therefore developers can justify RE investments based on their commercial merits independent of existing additional incentives. The government can choose to maintain the additional incentives to address the undersupply of RE due to its non-market benefits such as avoiding greenhouse gasses. As the IEA notes, "In most markets, solar PV or wind now represents the cheapest available source of new electricity generation."[88]

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[84] Dominica Electricity Services Ltd (DOMLEC), "Distributed RE Generation Policy," 2016.

[85] Independent Regulatory Commission, "Avoided Costs for Intermittent RE Distributed Generation," 2010.

[86] Government of Dominica, "Draft National Energy Policy of the Commonwealth of Dominica," 2014.

[87] Dominica Electricity Services. 2020 Annual Report.

[88] International Energy Agency (2021), World Energy Outlook 2021, IEA. License: Creative Commons Attribution CC BY-NC-SA 3.0 IGO.

Market Scale, Competitiveness, and Maturity

Summary

Dominica does not currently have a clear pipeline of planned capacity additions. However, the scale of the system implies that only a small number of projects will be needed to achieve full RE, particularly considering the strong possibility of geothermal generation.

The total current installed generation capacity is only 27.44 MW, and there is the potential for all this capacity to be replaced like for like with firm hydro or geothermal generation. While consumption per capita may grow and increase the capacity required to cover peak demand, the total market size will remain small.

How mature are the RE and EE markets for both large- and small-scale projects in the country?

RE makes up 27 percent of installed capacity in Dominica, with the majority hydro. Small amounts of wind and solar have been developed under the provision allowing for generation for self-consumption.

Table 5.15. Estimated potential RE capacity

Technology	Units	Installed capacity	Additional potential capacity
Wind	MW	0.26	30
Solar	MW	0.44	45
Hydro	MW	6.64	17
Geothermal	MW	-	300
Total RE potential	MW	7.34	1217.5
Total generation capacity (incl. non-renewables)	MW	27	.
Potential RE share of installed capacity	%	27.2	.
FF installed capacity to RE potential capacity ratio	#	2.68	.

Source: CREEE. 2020. Energy Report Card: Dominica.

Is RE cost competitive versus fossil fuel to gain a significant market share in filling the supply gaps?

Renewable power generation costs have fallen sharply worldwide over the past decade. In the case of Dominica, Figure 8 shows the range of cost estimates for solar, wind, and hydro RE technologies that have fallen below the point estimate of fossil-fuel generation cost of $0.16 per

kWh. Electricity retail price of $0.25 covers RE generation cost and distribution cost as evidenced by the Utility's sound financial position.

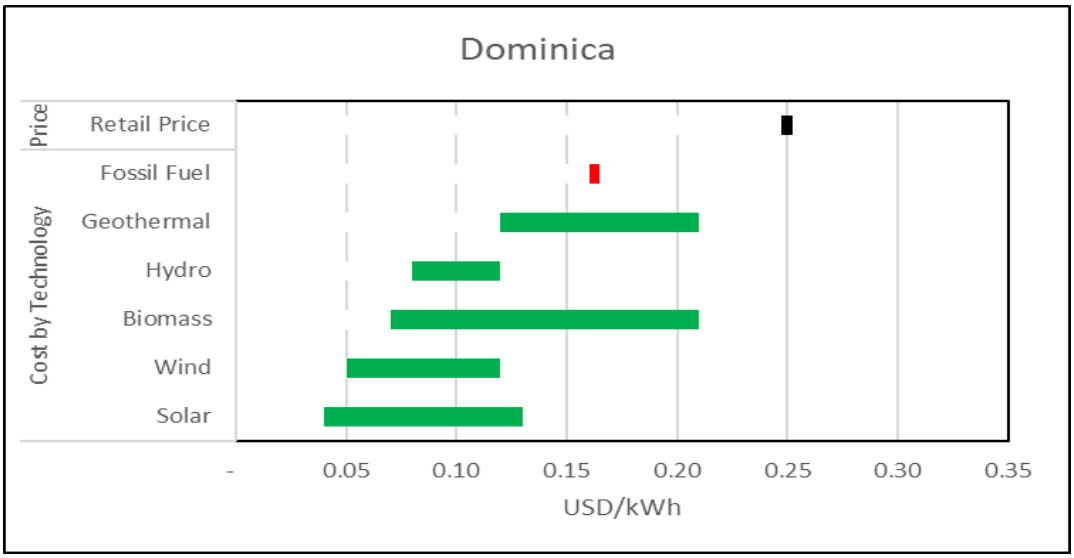

Figure 5. Cost competitiveness of RE technologies versus fossil fuel in electricity generation
Source: NREL, Masson, et. al., own calculations

What is the total investment required to develop the expected RE capacity in the next 5 to 10 years?

Based on the base case estimate from "DOMLEC's Integrated Resource Plan and Related Five Year Plan and Related Five Year Investment Plan", Dominica will see an increase in generation capacity of 2 MW by 2030 (Table 5.16). Additionally, Table 10 in "DOMLEC's Integrated Resource Plan and Related Five Year Investment Plan", suggests that a total of 16 MW of solar and geothermal will be added by 2030, or 56 percent of total generation capacity. Table 11 in "DOMLEC's Integrated Resource Plan and Related Five Year Investment Plan" suggests a total expenditure of $233 million (up to 2030; total nominal spending upfront, not the NPV of a phased rollout). This figure seems disproportionately high, given installation costs in other parts of the Caribbean; therefore, we will not insert it in Table 5.16. Instead, using indicative figures for Utility Scale PV (Class 10 Advanced for lower bound and Class 1 Conservative for upper bound) from NREL "2021 Annual Technology Baseline (ATB)" the potential capital expenditure required for this expansion in RE is between $8 - $11 million between 2021-2030 (inclusive).

Table 5.16. Supply and demand projections and estimated investment requirement

	Current	Projected 2030	Change
Total Generation Capacity (MW)	27*	29**	2
RE Share (%)	27	56***	29
Non-RE Generation Capacity (MW)	20	13	-7

	Current	Projected 2030	Change
RE Generation Capacity (MW)	7	16	8
Required Investment (Mil USD)****	.	.	$8 - $11

* Energy Transitions Initiative. 2015. Dominica Country Snapshot.

** This is the base case estimate from Independent Regulatory Commission, "Domlec's Integrated Resource Plan and Related Five Year Investment Plan," March 2015.

*** This is derived from Table 10 in "DOMLEC's Integrated Resource Plan and Related Five Year Plan and Related Five Year Investment Plan", which suggests that a total of 16 MW of solar and geothermal will be added by 2030.

****Based on NREL "2021 Annual Technology Baseline (ATB)" using Utility Scale PV (Class 10 Advanced for lower bound and Class 1 Conservative for upper bound)

Is there a credible pipeline of RE/EE investment defined in targets and plans?

Dominica does not have a recent published schedule of planned generation capacity additions. The Sustainable and Resilient Energy Plan for Dominica (S-REP) [89] and 2014 DOMLEC Integrated Resource Plan (IRP) [90] include several scenarios for capacity additions but does not include a recommended scenario and corresponding investment plan. The IRC decision on the IRP included an investment schedule for generation capacity, however this was only for the five-year period 2019 and is now out of date. [91]

As shown in Table 5.16, the country has large potential capacity relative to currently installed capacity. Furthermore, hydro and geothermal make up a significant share of the available resource. These RE sources are dispatchable and therefore can provide a like for like replacement for existing fossil generation (unlike intermittent wind and solar). In the DEP, geothermal and hydro generation are earmarked for prioritization. Project development of a first geothermal plant has begun with funding contributions from multiple foreign governments. The Dominica Geothermal Development Company (DGDC) was established to develop, own, and operate the facility and might be a vehicle for delivery of future projects.

Energy Sector Financial Health

Summary

End user tariffs in Dominica are appropriately regulated, roughly cost reflective, and are allowing utility DOMLEC to cover required revenues.

Are tariffs cost reflective?

The ECA allocated responsibility for IRC to approve tariffs proposed by DOMLEC to be charged to end customers. These tariffs are calculated to cover required revenues and are

[89] Coulam, Teelucksingh, Tubb, et al., "The Sustainable and Resilient Energy Plan (S-REP) for Dominica," 2019.

[90] Dominica Electricity Services Ltd (DOMLEC), "DOMLEC Generation Expansion Assessment 2014-2033," 2014.

[91] Independent Regulatory Commission, "Integrated Resource Plan and Related Five-Year Investment Plan," 2015.

therefore cost reflective. However, based on the latest published decisions on tariffs, it appears that regular review and updating of tariffs does not take place regularly.

Are power companies in a good financial position?

According to the DOMLEC 2020 Annual Report the utility achieved a surplus in both 2019 and 2020 and held positive cash reserves in each year. Financial results indicate that although tariff reviews may not be conducted regularly, tariffs are currently appropriately set to meet required revenues.[92]

Access to Quality Electricity

Dominica has reached 100 percent electricity access[93] therefore the role of new renewable capacity will be to meet growth in demand. Dominica does not have Quality of Electricity Supply Index score available.

Donor Activities in Dominica

While there appear to be many ongoing RE/EE projects in the planning stages, detailed information about donor-provided financial support of these projects was difficult to locate among publicly available data in Dominica, as it was in most OECS countries.

In terms of technical assistance, both project level and higher-level support appear to be accessible.

Table 5.17. Recent and ongoing RE efficiency projects

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
30kW Photovoltaic Systems at 2 Dominica Water and Sewerage Company Ltd. (DOWASCO) Water Pumping Stations	RE	Technical assistance, Funding	Announced 2020	Government of Italy, CARICOM	Unavailable
Hurricane Resistant Energy Storage System	RE		Approved 2020, Start date undetermined	United Arab Emirates Caribbean RE Fund (UAE-CREF) through the Abu Dhabi Fund for	$50,000,000

[92] Dominica Electricity Services Ltd (DOMLEC), "DOMLEC 2020 Annual Report," 2021.

[93] International RE Agency (IRENA), "Dominica Energy Profile," 2021.

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
				Development (ADFD)	
7MW Geothermal Power Plant and Expansion	RE	Loans, Grants, Technical Assistance	2019-2023	World Bank (WB)/International Development Association (IDA), UK Department for Int'l Development (DFID), Government of New Zealand, French Agency for Development (AFD)	$27,000,000 ($17,000,000 credit from IDA, $9,950,000 from Clean Technology Fund, $12,000,000 grants from UK DFID, Technical assistance from Government of New Zealand and AFD)
Sustainable Energy Facility for the Eastern Caribbean	RE (geothermal)	Technical assistance, Concessional loans, Reimbursable Grants	2016-2024	IDB, Green Climate Fund (GCF)	$192,400,000
Caribbean EE Lighting Project	EE	Technical support	2014-2016	Government of Denmark, SIDS DOCK Support Program	$1,000,000
1MW expansion of Padu Hydro Power Plant	RE		TBD	TBD	TBD
Renewable Powered Microgrids as part of Master Plan for Resilient Energy Systems	RE		TBD	TBD	$7,500,000
Grid Modernization	EE		TBD	TBD	TBD

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
Resilient Upgrade of System Transmission and Distribution	EE		TBD	TBD	TBD
Master Plan for Resilient Electrical System	RE		TBD	TBD	Estimated $17,300,000
3-5MW Solar Farm at Layou	RE		TBD	TBD	$425,000
PV Cooling of Agricultural Storage Facility	RE		TBD	TBD	TBD
10kW Wind and Solar at Central Livestock Farm	RE		TBD	TBD	TBD

Source: Various sources

Grenada: Grouping 'Not Conducive to Market-Facilitated RE Investment'

Regulatory Risk

Summary

Grenada has recently undergone significant reform in the electricity sector that puts in place the fundamental framework required to support the development of RE generation. However, the handover of control of utility Grenlec has only recently taken place (as of 2022) and therefore creates uncertainty around the effectiveness of this new market structure.

What is the status of RE enabling legislation/regulation?

Grenada's electricity sector has undergone a significant change in the past six years with the nationalization of previously-monopolist, vertically integrated utility Grenlec. The utility was nationalized because significant changes to the structure of the electricity system with the Electricity Supply Act 2016 (ESA)[94] and the Public Utilities Regulatory Commission Act 2016 (PURCA) triggered a "Repurchasing Event" that required the government of Grenada to

[94] Parliament of Grenada, "Electricity Supply (Electricity Safety) Regulations, 2016," 2016.

purchase the 75 percent controlling share of the utility from the private holders (this transaction took place in 2020). [95]

The ESA includes a framework for accelerating the supply of electricity from renewable sources. Key elements of the framework include:

- Prioritization for issuing electricity generation licenses to generators of RE.
- Updating the legislative and regulatory framework to support RE generation.
- Enhanced regional cooperation in various aspects of RE to build knowledge.

A National Electricity Strategy is to be initiated under the ESA and may include as objectives

- Attracting new domestic and foreign investment in RE.
- Identifying potential RE projects.
- Encouraging and supporting the self-generation using RE.

A major change made by the ESA was to allow generation from independent power producers (IPPs) and allow self-generation, including guidance on procedures for contracting and grid connection and outlines the process for licensing of generators.

Published in 2022 are the Electricity (Generation Expansion Planning and Competitive Procurement) Regulations. These regulations place a requirement on the network license to undertake expansion planning including the identification of new generation. The regulations also govern the structure of PPAs including a competitive process for procurement.

Is there an effective regulatory structure that allows for confident investment in RE and EE?

The changes introduced by the ESA addressed major issues blocking renewables development presented by the previous private ownership of Grenlec, who faced no obligation to pursue objectives outside of financial profitability, and therefore did not pursue RE development. The new market structure comprising Grenlec as the network provider and supplier and with generation provided by both Grenlec and IPPs should create a structure that allows for the integration of RE.

The Public Utilities Regulatory Commission Bill 2016[96] established the Public Utilities Regulatory Commission (PURC). The ESA appoints a commission to set and review rates chargeable by customers. The Electricity Regulations (Tariff-Setting Methodology) was published in 2022 to define the methodology for tariff setting.

As of 2022, all commercial generation (excluding from customer-owned grid connected distributed generation) is owned and operated by Grenlec and therefore there is no wholesale power market setting a power price. Grenlec's annual report provides disaggregated cost

[95] Grenada Electricity Services Limited, "2020 Annual Report," 2021.

[96] Parliament of Grenada, "Public Utilities Regulatory Commission Bill, 2016," 2016.

information that can provide an indication of the average cost (the price paid for power by the utility) of generation[97].

What direct support for investment in RE and EE is available?

Grenada has the Customer Renewable Energy Interconnection Programme (CREIP) which allows customers to install grid connected solar generation for self-consumption and sell excess power to the grid. The scheme effectively operates as a net-billing scheme with excess power sold to Grenlec at the cost of avoided fuel.

There are no direct support mechanisms for large scale RE or EE. We note that in Grenada, RE cost per unit production is lower than or competitive with FF-based power production (Figure 9), therefore developers can justify RE investments based on their commercial merits independent of existing additional incentives. The government can choose to maintain the additional incentives to address the undersupply of RE due to its non-market benefits such as avoiding greenhouse gasses. As the IEA notes, "in most markets, solar PV or wind now represents the cheapest available source of new electricity generation."

Market Scale, Competitiveness, and Maturity

Summary

Grenada has a relatively small electricity market, and total market size for RE generation is likely to be limited to the resource potential of 79.5 MW. While there is no plan outlining a pipeline of investable projects as of 2022, Grenlec is now required to produce such a plan which would provide more certainty for investors going forward.

How mature are the RE and EE markets for both large- and small-scale projects in the country?

RE makes up just 6 percent of installed generation capacity in Grenada, all of which is solar split between grid connected Grenlec owned (1.12 MW) or customer owner distributed (2.48 MW). The success of the CREIP indicates that the market for small scale solar generation is relatively mature in Grenada. However other RE technologies and EE remain nascent.

Table 5.18. Installed RE generation capacity

Technology	Units	Installed capacity
Solar (Grenlec)	MW	1.12
Solar (Distributed)	MW	2.48
Diesel	MW	52.0
Total Renewable	MW	3.60

[97] Grenlec. Annual Report 2020.

Technology	Units	Installed capacity
Total (Incl. non-renewable)	MW	55.60
Renewable share of capacity	%	6.5
FF to RE installed capacity ratio	#	14.38

Source: CREEE, Energy Report Card: Grenada, 2020; Grenada Electricity Services Limited, "2020 Annual Report," 2021.

Is RE cost competitive versus fossil fuel to gain a significant market share in filling the supply gaps?

Renewable power generation costs have fallen sharply worldwide over the past decade. In the case of Grenada, with the exception of geothermal, hydro, and biomass, Figure 9 shows the range of cost estimates for solar and wind that have fallen below the point estimate of fossil-fuel generation cost of $0.10 per kWh. Electricity retail price of $0.31 covers RE generation and distribution cost for all types of RE technology as evidenced by the utility's sound financial position.

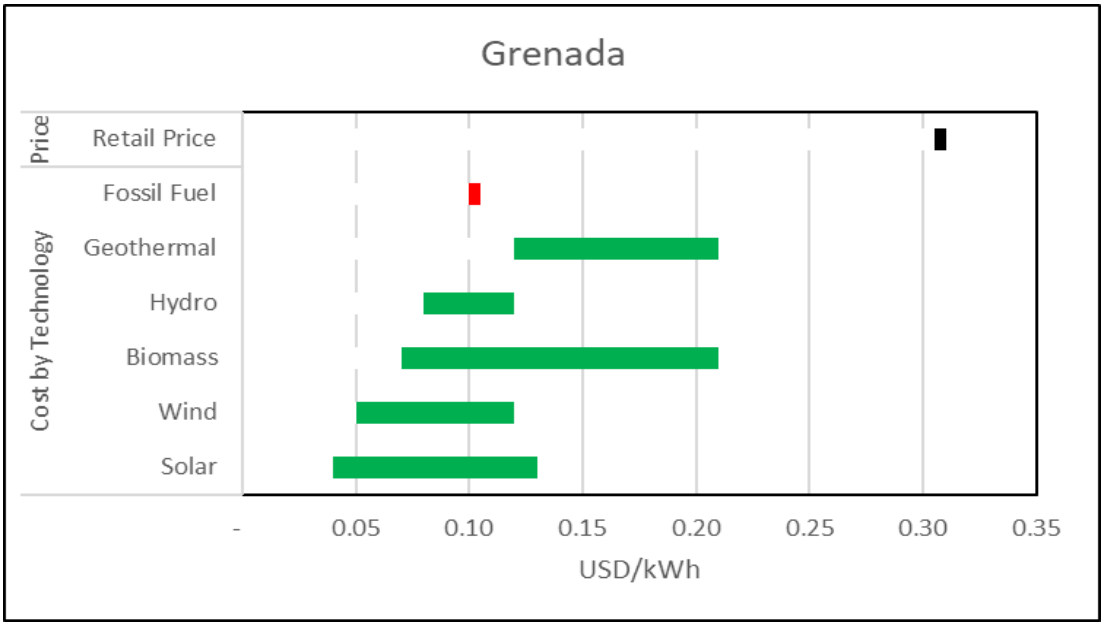

Figure 6. Cost competitiveness of RE technologies versus fossil fuel in electricity generation
Source: NREL, Masson, et. al., own calculations

What is the total investment required to develop the expected RE capacity in the next 5 to 10 years?

Unfortunately, there is no readily available information to suggest the scale of future electricity demand, renewable energy share, and required investment.

Is there a credible pipeline of RE/EE investment defined in targets and plans?

At present, no master plan or similar document outlining planned capacity additions exists for Grenada. However, the requirement to develop such a plan and identify possible projects was placed on Grenlec by the Electricity Regulations (Generation Expansion Planning and Competitive Procurement) and can therefore be expected in the future.

As of 2022, the total installed capacity in Grenada is small (55.6 MW) and, considering the population of the country, even envisioning a considerable growth in demand, is likely to remain relatively small. Total RE potential is also relatively limited in the country at 79.5 MW, and—regardless of demand growth—may be insufficient to reliably supply even current peak demand. The total resource potential can therefore be taken to be a maximum market size for RE in Grenada.

Table 5.19. Estimated potential RE capacity

Technology	Units	Additional potential capacity
Wind	MW	20
Solar	MW	37.5
Hydro	MW	0.5
Geothermal	MW	20
Biomass/Waste to Energy	MW	1.5
Total potential	MW	79.5

Source: CREEE. 2020. Energy Report Card: Grenada.

Energy Sector Financial Health

Summary

Utility Grenlec is in good financial health, however, the recent public takeover creates some uncertainty. Similarly, while the structure for cost reflective pricing has recently been put in place, there is also uncertainty in how effectively these regulations will be implemented.

Are tariffs cost reflective?

The recently published Electricity (Tariff-Setting Methodology) Regulations outline a methodology for ensuring that tariffs paid by customers are cost reflective. Additionally, the recently introduced regulations requiring competitive tendering of generation should ensure least cost provision of generation.[98]

[98] Competitive procurement should also ensure that generators will be paid for a price that will cover costs without earning outsized profits.

Are power companies in a good financial position?

Grenlec's 2020 annual report indicates that the utility generated positive net revenue in both 2020 and 2019 and held a positive cash balance in both years.[99]

Access to Quality Electricity

Electricity access in Grenada is close to 100 percent and demand growth from increased access is likely to be limited. Electricity access in Grenada stood at 95 percent as of 2020 and was at roughly equal levels for both urban (93 percent) and rural (96 percent) populations,[100] therefore the role of new capacity (renewables and thermal) will be to meet growth in demand. Grenada does not have a Quality of Electricity Supply Index score available.

Donor Activities in Grenada

Donor assistance in Grenada includes both project level technical assistance, and project level grant funding and concessional loans targeting both RE and EE. Higher-level technical assistance is likely not necessary in Grenada with the recently RE implemented legislation and regulation.

Table 5.2. Recent and ongoing RE and EE projects

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
200 kW Grid-Tied PV System at Windward, Carriacou	RE	Grant	2020-	Government of Italy (Italy-CARICOM project)	TBD
Japan Caribbean Climate Change Project	Both	Technical assistance and Capacity building	2020	Japan Caribbean Climate Change Project (JCCCP)	$3,182,180
350kW Bridgetown Solar PV Carport Power Plant and 500kW Bowmanston Solar PV Power Plant	RE	Grants, Technical assistance	2019- 2020	UAE-Caribbean RE Fund (UAE-CREF)	$3,200,000
580-Panel Solar PV System at TA Marryshow	RE	Grant	2019	Support for Small Island Developing States (SIDS-	$600,000

[99] Grenada Electricity Services Limited, "2020 Annual Report," 2021.

[100] National RE Laboratory (NREL), "Energy Snapshot: Grenada," 2020.

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
Community College				DOCK) Support Programme through International Bank for Reconstruction Development (IBRD) World Bank	
600kW Solar PV Hybrid/Battery Storage Plant in Limlair, Carriacou	RE	Grant, Technical assistance	2018-2022	UAE-Caribbean RE Fund (UAE-CREF)	$3,200,000
Sustainable Energy Facility for the Eastern Caribbean	RE (geothermal)	Technical assistance, Concessional loans, Reimbursable Grants	2016-2024	IDB, Green Climate Fund (GCF)	$192,400,000
11 Solar PV Installations at Grand Anse, Queen's Park and Plains (Total 937 kW)	RE				$6,400,000
113.4kW Solar PV Plant at Limlair Carriacou		Grants, Loans	2015	Grenlec's Community Partnership Initiative (GCPI), Caribbean Climate Change Center, UK Agency for Int'l Development (UKAID), EU Global Climate Change Alliance Programme, Government of Grenada	
Caribbean EE Lighting Project	EE	Technical support	2014-2016	Government of Denmark, SIDS	$1,000,000

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
				DOCK Support Program	

Source: Various sources

St. Kitts and Nevis: Grouping `Not Conducive to Market-Facilitated RE Investment'

Regulatory Risk

Summary

St. Kitts and Nevis has the basic legislative framework in place to enable growth in both large- and small-scale RE. There remains however a need to introduce additional legislation to operationalize key aspects of the original legislative framework, for instance clear and effective licensing processes and requirements for IPPs.

What is the status of RE enabling legislation/regulation?

Electricity supply in St. Kitts and Nevis is governed by the Saint Christopher Electricity Supply Act (SCESA), first published 2011 and most recently amended 2017.[101] Under the act, licensing for generation is separate from licensing for transmission, distribution, and supply of electricity and allows for IPPs, including ensuring their connection to the grid (n.b.: allowing for IPPs is not the same as having clear and effective licensing processes and requirements for IPPs). The act supports the development of small scale RE and RE for self-generation through several exemptions from generation licensing requirements. Exemptions can be granted to:

- Wind and solar generation installed for the sole purpose of supplying electricity on a person's own premises.
- IPPs if the generation is from RE sources and of limited capacity.

The act places a requirement on utility St. Kitts Electricity Company Limited (SKELEC) to develop connection agreement models for IPPs and self-generators, thereby streamlining the process for RE to connect to the grid. Rates paid to consumers selling power to the grid from grid connection distributed generation are to be paid for that power at a rate determined by the regulator.

Part IX of the act specifically targets the promotion of RE. Key elements are:

- Requiring the Ministry to prepare a National Energy Policy that includes promotion of RE and EE as one of its objectives.

[101] Government of Saint Christopher and Nevis, "Saint Christopher Electricity Supply Act and Subsidiary Legislation, Revised Edition, 31 December 2017," 2019.

- Allows for the making of regulations to support RE through one of the following mechanisms: net metering, feed-in tariffs, premium tariffs, renewable portfolio standard obligations, and any other scheme of promotion of electricity produced from RE sources.
- Assigning regulator Public Utilities Commission with several responsibilities regarding the promotion of RE.
- A requirement for SKELEC to make net metering available to customers.
- The option for the minister to launch a competitive tender for RE generation capacity.

Additionally, there are also tax credits and tax reductions or exemptions for RE.

Is there an effective regulatory structure that allows for confident investment in RE and EE?

SKELEC is the sole provider of transmission, distribution, and supply in St. Kitts, and also provides generation. IPPs and self-generation are allowed under legislation. The Saint Christopher Electricity Supply Act assigned the Publicity Utilities Commission with the responsibility to regulate and oversee the use and supply of electricity[102] in St. Kitts.[103]

As of 2022, all commercial generation is owned and operated by SKELEC and Nevis Electricity Compan. Therefore, there is no wholesale power market setting a power price. Annual reports for these utilities are not readily available and there is limited publicly available information on costs, preventing an estimate of the average price paid for power by the utilities.

What direct support for investment in RE and EE is available?

While the SCESA allows for a range of support mechanisms for RE, none of these have been operationalized.

We note that in St. Kitts and Nevis, RE cost per unit production is lower than FF based power production (Figure 10), therefore developers can justify RE investments based on their commercial merits independent of existing additional incentives. The government can choose to maintain the additional incentives to address the undersupply of RE due to its non-market benefits such as avoiding greenhouse gasses. As the IEA notes, "In most markets, solar PV or wind now represents the cheapest available source of new electricity generation."[104]

Market Scale, Competitiveness, and Maturity

Summary

St. Kitts and Nevis's Nationally Determined Contributions (NDC) indicates a market opportunity to 2030 of 67 MW with total cost US$ 275 million.

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[102] Government of Saint Christopher and Nevis, "Saint Christopher Electricity Supply," 2019.

[103] Vertically integrated utility Nevis Electricity Company Limited is the sole provider of electricity in Nevis. This rapid review focuses on electricity in St. Kitts. The very small size of Nevis implies that issues faced with regard to financing of RE will be unique in the Caribbean and solutions are likely to be simple measures aimed at lowering capex and financing costs.

[104] International Energy Agency (2021), World Energy Outlook 2021, IEA. License: Creative Commons Attribution CC BY-NC-SA 3.0 IGO.

How mature are the RE and EE markets for both large- and small-scale projects in the country?

Generation currently connected to the utility managed grids in St. Kitts and Nevis remains 100 percent thermal generation. However, exemptions from licensing for distributed generation has allowed growth in such RE generation now making up approximately 6 percent of generation.

Table 5.21. Installed electricity generation capacity

Technology	Units	Capacity
SKELEC diesel	MW	43
NEVLEC thermal	MW	23
Distributed renewable	MW	4
Total generation capacity (incl. non-renewables)	MW	70
Renewables share of installed capacity	%	6%
FF to RE installed capacity ratio	#	15.67

Source: CCREEE. 2020. Energy Report Card: St. Kitts and Nevis; SKELEC, "System Overview – The St. Kitts Electricity Company (SKELEC); IRENA, "Saint Kitts and Nevis Energy Profile," 2021.

Is RE cost competitive versus fossil fuel to gain a significant market share in filling the supply gaps?

Renewable power generation costs have fallen sharply worldwide over the past decade. In the case of St Kitts and Nevis, Figure 10 shows the range of cost estimates for solar, wind, and hydro RE technologies that have fallen below the point estimate of fossil-fuel generation cost of $0.21 per kWh. Electricity retail price of $0.27 covers RE generation cost and distribution cost as evidenced by cost-reflective tariff regime.

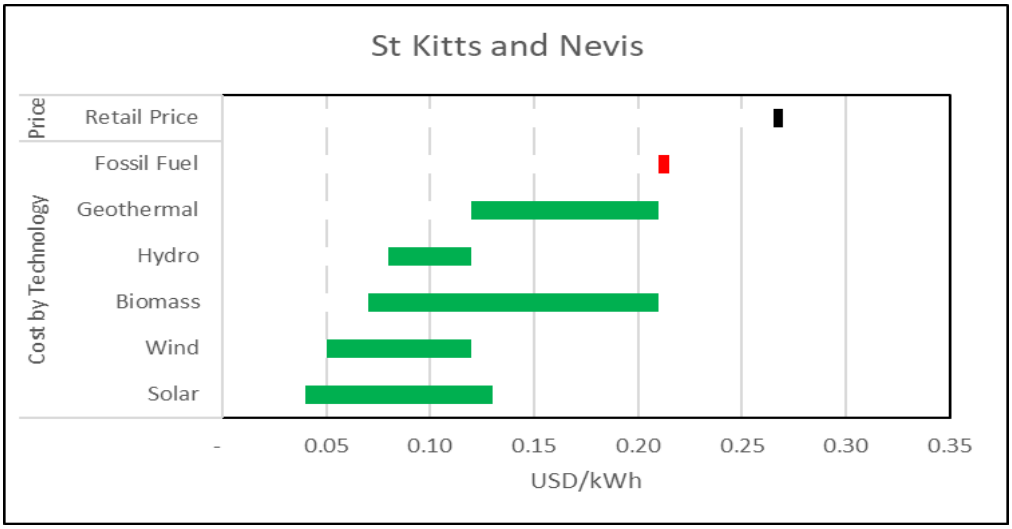

Figure 7. Cost competitiveness of RE technologies versus fossil fuel in electricity generation
Source: NREL, Masson, et. al., own calculations

What is the total investment required to develop the expected RE capacity in the next 5 to 10 years?

Unfortunately, there is no readily available information to suggest the scale of future electricity demand, renewable energy share and required investment. The next section outlines one possible RE trajectory and the funding required for it.

Is there a credible pipeline of RE/EE investment defined in targets and plans?

There is no publicly available master plan or similar for electricity in St. Kitts and Nevis to provide a schedule of planned capacity additions (as of mid-2022). The country's NDC submitted to the United Nations Framework Convention on Climate Change (UNFCCC) identified required renewable capacity additions including estimated budgets to 2030 to meet emissions mitigation targets. A total of 67.3 MW of RE generation at a cost of US$ 275 million is required. A full breakdown is shown in Table 5.22.

Table 5.22. Required capacity additions to 2030 to meet NDC targets

Technology	Capacity (MW)	Budget (USD)
Solar PV	35.7	70,000,000
Wind	6.6	19,000,000
Geothermal	25	186,000,000
Total	67.3	275,000,000

Source: Federation of St. Kitts and Nevis, "St. Kitts and Nevis Revised Nationally Determined Contribution for the UNFCCC," October 2021.

Energy Sector Financial Health

Summary

While information is limited, both utilities appear to be managed in a financially sustainable manner. As generation shifts from thermal to RE, existing methodologies for tariff setting may no longer be appropriate.

Are tariffs cost reflective?

Details of the full methodology for tariff calculation are not publicly available. However, the regulator oversees tariff setting and there exists a fuel adjustment mechanism to ensure revenues are correlated with fuel costs. This fuel cost adjustment does not align tariffs with costs associated with RE, and whether the methodology is fit for purpose in a high RE system may need to be considered for any transition to Re. In addition, tariffs should consider the country's high transmission and distribution losses, estimated at 20%.

Are power companies in a good financial position?

Publicly available information on the financial position of both utilities in St. Kitts and Nevis is limited.

Access to Quality Electricity

One hundred percent of the population in St Kitts and Nevis has access to electricity,[105] therefore the role of new capacity (renewables and thermal) will be to meet growth in demand. St. Kitts and Nevis does not have a Quality of Electricity Supply Index score available.

Donor Activities in St. Kitts and Nevis

Publicly available information on donor support for RE/EE projects in the OECS, including St. Kitts and Nevis, was relatively limited. From the donor activities we identified, a mix of grants, loans, and technical support are present.

The Sustainable Energy Facility for the Eastern Caribbean's financial support includes helping to de-risk geothermal projects to facilitate greater private investment.

Swiss renewables developer Leclanché is developing a 35.7MW solar field plus 45.7MWh lithium-ion battery energy storage system (BESS) at a cost of $70,000,000. This is being delivered under a PPA with SKELEC (20 years at a flat rate over the entire period).[106]

Table 5.23. Recent and ongoing RE and EE projects

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
35.7MW Solar Field w/ 45.7MWh Storage System Project	RE		2019-2023	MPC Energy Solutions, Leclanché, CIBC	$70,000,000
6.6 MW Wind Energy Project	RE		Unclear	IPP	Unavailable
30 MW (Nevis) 15-20 MW (St. Kitts) Geothermal Energy Project	RE	IPP (Nevis), Combination of Grants, Loans, Equity (St. Kitts)			
2 Desalination Plants – Solar Project	RE	Grants	2021-2022	UAE-CREF	Unavailable
Sustainable Energy Facility for the Eastern Caribbean	RE (geothermal)	Technical assistance, Concessional loans,	2016-2024	IDB, Green Climate Fund (GCF)	$192,400,000

[105] National RE Laboratory (NREL), "St. Kitts and Nevis Energy Snapshot," 2020.

[106] Leclanche, "Government of St. Kitts and Nevis, SKELEC and Leclanché Commence Construction of Caribbean's Largest Solar Generation and Storage System," 2020.

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
		Reimbursable Grants			
Caribbean EE Lighting Project	EE	Technical support	2014-2016	Government of Denmark, SIDS DOCK Support Program	$1,000,000

Source: Various sources

Haiti: Grouping `Not Conducive to Market-Facilitated RE Investment'

Findings from Key Informant Interviews (KIIs)

Our informants suggested that despite the challenges facing RE development in Haiti, including political uncertainty, there is an increasing use of RE as a solution to lack of electricity access, unreliable electricity service, and rising fuel prices (increasing the cost to use generators). There are a variety of ongoing RE projects (primarily solar mini-grid projects) with the financial and technical support of USAID, IDB, World Bank, and private investors. The Haitian Government is currently developing a new energy master plan with the support of USAID, NREL, and IDB. In addition, the self-generation market for off-grid energy has been growing exponentially. Customs data shows a growth in imports of self-generating equipment from $50M in 2016 to more than $300M in 2020.

Regulatory Risk

Summary

The legislature and regulation governing RE in Haiti is underdeveloped and poorly enforced. This will create a large amount of regulatory risk with RE projects. Furthermore, recent political change has created significant uncertainty regarding the future use of PPAs. However, The Government of Haiti (GOH)'s Energy Sector National Regulatory Authority (ANARSE, in French "Autorité Nationale de Régulation du Secteur de l'Energie") is developing a regulatory framework for RE mini grids with the support of USAID-NREL. These regulations are being used in the framework of the GOH's PHARES project being implemented with funding support from IDB and the WB. The PHARES project aims to provide technical and financial support for private investors and developers of RE energy mini-grids around the country for cities not connected to installed state utility electricity grids.

The Government of Haiti has been working with Autorité Nationale de Régulation du Secteur de l'Energie (ANARSE) to improve the legislative and regulatory structures in place. They tentatively tried to reform the state electricity utility by allowing private investors to operate state utility regional grids under a 20-year concession program. Although the program has failed due to lack of preparation, ANARSE has proven its willingness to improve and relaunch a more robust privatization concession program soon. ANARSE is open to technical assistance in

support of privatization as well as to implement appropriate regulations to create a strong environment for private investment in the Haiti energy sector.

What is the status of RE enabling legislation/regulation?

Haiti has not introduced legislation for the specific purpose of enabling RE. With the support of USAID-NREL, ANARSE has developed a regulatory framework for RE mini-grids (2.5 MW) for isolated cities. ANARSE has not yet developed a regulatory framework for private investments in regional grids. However, from recent tenders for privatization of regional grids, it was found that there is willingness from ANARSE to develop a regulatory framework for regional grids above 2.5 MW.

Is there an effective regulatory structure that allows for confident investment in RE and EE?

While legislation was passed in 2016 to introduce a regulator with the purpose of overseeing utility EDH, no such regulator has been created and EDH effectively regulates itself. This has created transparency issues regarding EDH's financial position, cost of generation and tariff setting, and EDH has performed poorly financially and operationally.[107]

Additionally recent political changes have created additional risk associated with PPAs as the new government has moved to nationalize previously private PPAs.

What direct support for investment in RE and EE is available?

Haiti provides tax exemptions and/or reductions exist for RE and EE projects. At least three local Haitian Banks (Unibank, Sogebank, and BNC) offer special loans for off-grid solutions at rates between 15 to 20 percent in local currency which is much lower than personal loans with rates of around 28 percent.

We note that in Haiti, RE cost per unit production is lower than or competitive with FF based power production (Figure 11). As the IEA notes, "In most markets, solar PV or wind now represents the cheapest available source of new electricity generation."

Market Scale, Competitiveness, and Maturity

Summary

Haiti has immature and small RE markets. While an upcoming Master Plan may develop a pipeline of planned capacity additions, and potential resource is large relative to current total generation capacity, the total resource potential and therefore future market size for RE in the country is limited.

Table 5.24. Estimated potential market size

	Units	Capacity
Potential new renewable capacity	MW	825.5

[107] Stuebi, Richard, and Jennifer Hatch, "Assessment of Haiti's Electricity Sector." 2018.

	Units	Capacity
Potential total renewable capacity (incl. already installed)	MW	890

Source: CREEE. 2020. Energy Report Card: Haiti.

How mature are the RE and EE markets for both large- and small-scale projects in the country?

The electricity system in Haiti is underdeveloped and total installed grid connected capacity is just 296 MW, there is a further 185 MW of non-grid connected conventional generation capacity. Renewables make up 22 percent of grid connected generation. As seen in Table 5.25, the majority of this is hydro (60.5 MW of capacity) with solar and wind contributing only 3 MW and 1 MW respectively, implying that the **wind and solar generation markets in Haiti are immature.**

Table 5.25 Installed RE capacity

Technology	Units	Capacity
Hydropower	MW	60.5
Solar	MW	3
Wind	MW	1
Renewables total	MW	63.5
Total generation capacity (incl. non-renewables)	MW	296
Renewables share of capacity	%	22%
FF to RE installed capacity ratio	#	3.55

Source: CREEE. 2020. Energy Report Card: Haiti.

Is RE cost competitive versus fossil fuel to gain a significant market share in filling the supply gaps?

Renewable power generation costs have fallen sharply worldwide over the past decade. In the case of Haiti, Figure 11 shows the range of cost estimates for solar, wind, and hydro RE technologies that have fallen below the point estimate of fossil-fuel generation cost of $0.19 per kWh. Electricity retail price of $0.14 covers RE generation cost with the exception of geothermal and biomass technologies.

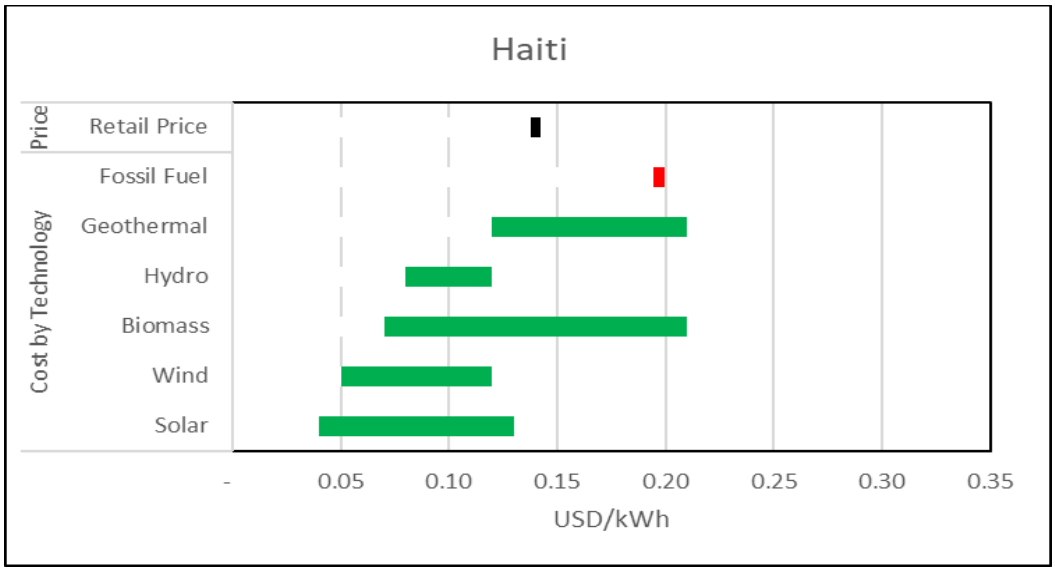

Figure 8. Cost competitiveness of RE technologies versus fossil fuel in electricity generation
Source: NREL, Masson, et. al., own calculations

What is the total investment required to develop the expected RE capacity in the next 5 to 10 years?

Unfortunately, there is no readily available information to suggest the scale of future electricity demand, renewable energy share and required investment.

Is there a credible pipeline of RE/EE investment defined in targets and plans?

The Government of Haiti is working with ANARSE to prepare a ten-year master plan that should provide a schedule of generation investment over that period. In 2022, there is an estimated 550 MW of unmet demand in the country[108] implying significant growth in generation capacity is required. It is estimated that there is a total of 825.5 MW of additional RE capacity available in Haiti (a breakdown by technology is provided in Table 5.26). **While this represents a notable increase relative to current installed capacity, it implies that the total potential market size is relatively small.**

Table 5.26. Estimated potential RE capacity

Technology	Units	Installed capacity	Additional potential capacity
Hydropower	MW	60.5	189.5
Solar	MW	3	297
Wind	MW	1	99

[108] International Trade Administration, "Haiti - Country Commercial Guide," 2021.

Technology	Units	Installed capacity	Additional potential capacity
Geothermal Energy	MW	-	40
Biomass / Waste to energy	MW	-	200
Total potential	MW	64.5	825.5

Source: CREEE. 2020. Energy Report Card: Haiti.

Energy Sector Financial Health

Are tariffs cost reflective? Are power companies in a good financial position?

The lack of regulatory oversight has created a situation where there is very limited transparency regarding tariff setting and the financial position EDH. According to various reports, EDH does not collect sufficient revenues to cover costs and it is supported through subsidies from the Government of Haiti.[109] In addition, the subsidies are necessary to cover the country's remarkably high transmission and distribution losses, which are estimated at 60%.

Access to Quality Electricity

Haiti currently has low energy access implying an opportunity for development of new build RE to help deliver this access. **Supporting growth in energy access might be achieved using non-grid connected solutions to circumvent the problems experienced by EDH.** Generation for self-consumption is already common for industrial and commercial consumers within the country as evidenced by the 185 MW of non-grid connected generation currently installed in the country.

USAID/Haiti has already begun a study through the Haiti INVEST activity to understand conditions and identify investment opportunities for off-grid renewable energy solutions in Haiti. The study will be completed by February 2023.

What share of the population has access to electricity?

Access to electricity is low in Haiti at only 46.6 percent. Therefore, the role of new capacity (renewables and thermal) will be both closing the access gap and to meet growth in demand.

What is the Quality of Electricity Supply Index score?

Haiti has a Quality of Electricity Supply Index score of 1.43 (2017).[110] By way of reference, the regional median score is about 5 while Norway has the highest score of 6.9.

[109] Stuebi, Richard, and Jennifer Hatch, "Assessment of Haiti's Electricity Sector." 2018.

[110] Schwab, K. (2019). The Global Competitiveness Report 2019 (p. 666). World Economic Forum.

Donor Activities in Haiti

Donor support in Haiti is currently almost entirely in the form of grant funding supporting RE and energy access programs. The World Bank supported off-grid electricity fund does provide a range of financial products which will support investment.

Table 5.27. Recent and ongoing RE and EE projects

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
Solar Power Plant at Caracol Industrial Park	RE	Grants	2021-2022	USAID, IDB	$6,500,000
Battery Energy Storage System to Maximize the Use of Surplus Energy from Solar PV Plant in Caracol Industrial Park	RE	Grants	2021-	IDB	$2,650,000 (investment grants)
Off-Grid Electricity Fund (OGEF)	RE	Grants (using Results Based Funding), Debts, Equity funds, Working capital, Mid- and Long-term loans,	2019-	Launched by Government of Haiti, supported by WB	$230,000
Haiti Modern Energy Services for All	RE	Grants	2017-2028	WB (Climate Investment Fund)	$15,620,000 (grants)
RE for All	RE	Grants	2017-2024	WB (Climate Investment Fund)	$19,620,000 (grants)

Source: Various sources

Guyana: Grouping `Not Conducive to Market-Facilitated RE Investment'

Regulatory Risk

Summary

Guyana's electricity sector has an effective regulatory structure and regulatory oversight and allows for IPPs to provide generation. There is however no supporting framework in place to facilitate growth in RE or EE and no direct support or incentives for RE. Regulatory risk is likely to be a significant concern for RE developers and financiers because of the lack of a repeatable structure for sale of electricity to Guyana Power and Light Inc. (GPL). Any IPP will have to be bespoke and developing these contracts could be time and resource intensive.

What is the status of RE enabling legislation/regulation?

The Hydro Electric Power Act 1956 allows for the granting of licenses and principally applies to State hydropower plants.[111] Outside of the HEPA Guyana has no overarching legislation governing the development of RE, and no regulation aimed at supporting the development of renewable generation.

While there is no legislation specifically facilitating IPPs for RE, IPPs do currently operate some fossil fuel-based generation. A solar IPP is also planned to become operational in 2023.[112]

Guyana reports the following EE incentives: tax reduction or exemption, auctions or reverse auctions, and green public procurement. Additionally, a review of the grid code with the objective of incorporating EE construction and design has been included as a strategic action in the Guyana Energy Agency Strategic Plan 2019 – 2020.[113]

Is there an effective regulatory structure that allows for confident investment in RE and EE?

Utility GPL is the sole provider of transmission, distribution, and supply of electricity in Guyana and a major player in generation. GPL is regulated by the Guyana Energy Agency (GEA) who provide oversight and strategic direction to the sector as well as approving tariffs.

Most generation is provided by diesel and heavy fuel oil generating units owned by both GPL and IPPs. Information on the structure of payments made to IPPs is not easily available. GPLs financial statements do not disaggregate generation costs in a manner that allows for average cost of GPL generation and IPP generation to be calculated, therefore preventing an estimate of the average price paid by the utility for power[114].

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[111] Parliament of Guyana, "Hydro-Electric Power Act," 1956.

[112] Guyana Power and Light, Inc., "Development and Expansion Programme 2022-2026," 2021.

[113] Guyana Energy Agency, "GEA Strategic Plan 2016-2020," 2017.

[114] Parmesar Chartered Accountants. 2021. Audited Financial Statements of the Guyana Power and Light Incorporated.

What direct support for investment in RE and EE is available?

At present there are no direct incentive mechanisms available for RE in Guyana. While there are no long-term EE incentive mechanisms, the GEA has run the Hinterland LED Lighting Programme which supported the replacement of inefficient lighting in 3,490 households and businesses in hinterland communities.

We note that in Guyana, RE cost per unit production is lower than FF based power production (Figure 12), therefore developers can justify RE investments based on their commercial merits independent of existing additional incentives. The government can choose to maintain the additional incentives to address the undersupply of RE due to its non-market benefits such as avoiding greenhouse gasses. As the IEA notes, "In most markets, solar PV or wind now represents the cheapest available source of new electricity generation."[115]

Market Scale, Competitiveness, and Maturity

Summary

While RE is currently immature in Guyana, there are plans to significantly grow capacity in both small scale and utility scale generation. Clear plans and intended capacity additions provide investors with certainty regarding investment opportunities.

How mature are the RE and EE markets for both large- and small-scale projects in the country?

GPL operate one main grid (with total available capacity of approximately 228 MW) and four isolated grids (total available capacity of 19 MW) which rely almost entirely on fuel oil generation.[116] Across the country there is a total of 58.46 MW of RE capacity installed, most of which is rooftop solar for self-consumption with a subset of this grid connected.[117] A summary of the total installed capacity in Guyana is provided in Table 5.28.

Table 5.28. Installed generation capacity

Technology	Units	Capacity
GPL diesel	MW	56
GPL heavy fuel oil	MW	117.6
IPP heavy fuel oil	MW	116.5
RE	MW	58.46
Total	MW	348.6

[115] International Energy Agency (2021), World Energy Outlook 2021, IEA. Licence: Creative Commons Attribution CC BY-NC-SA 3.0 IGO.

[116] Guyana Power and Light, Inc., "Development and Expansion Programme 2022-2026," 2021.

[117] Guyana Energy Agency, "2019 Annual Report," 2019.

Technology	Units	Capacity
Renewable share of total	%	17
FF to RE installed capacity ratio	#	4.88

Source: CCREEE. 2020. Guyana Energy Report Card 2020.

Existing RE capacity in Guyana is mostly rooftop solar that has been deployed on 287 government buildings through multiple programs between 2012 and 2019.[118] Small scale hydro has also been developed, with a summary of projects provided in Table 5.29. Some larger scale hydro projects are in the assessment phase.

Table 5.29. Small hydropower initiatives in Guyana

Site	Size (kW)	Cost ($US)	Status
Hosororo	20	145,509	Construction completed 2018 Transmission line completed 2019
Kato	150	2,251,880	Construction contract signed Completion expected 2021
Moco-Moco	700		Expected to be tendered 2020
Kumu	1,500		Expected to be tendered 2020
Ikuribisi	1,000		Expected to be tendered 2020
Tumatumari	2,200		Private developer, to secure financing

Source: Guyana Energy Agency. 2019. Annual Report.

Is RE cost competitive versus fossil fuel to gain a significant market share in filling the supply gaps?

Renewable power generation costs have fallen sharply worldwide over the past decade. In the case of Guyana, Figure 12 shows the range of cost estimates for solar, wind, and hydro RE technologies that have fallen below the point estimate of fossil-fuel generation cost of $0.22 per kWh. Electricity retail price of $0.23 covers RE generation cost and distribution cost as evidenced by the Utility's sound financial position.

[118] Guyana Energy Agency, "2019 Annual Report," 2019.

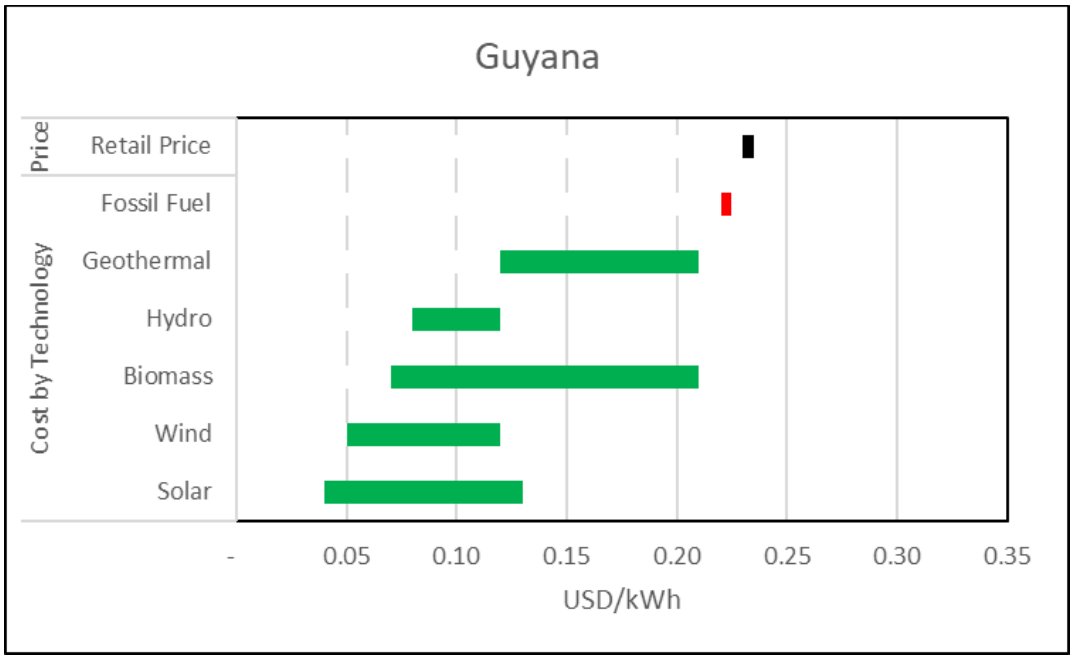

Figure 9. Cost competitiveness of RE technologies versus fossil fuel in electricity generation
Source: NREL, Masson, et. al., own calculations

What is the total investment required to develop the expected RE capacity in the next 5 to 10 years?

By 2030, we estimate that Guyana will require an additional 1,559 MW of installed capacity of which 512 MW will be RE (see Table 5.3 for calculation details). This is a derived estimate, since a direct projection of future generation capacity is not available. The Guyana Low Carbon Development Strategy 2030[119] estimates peak load of 685 MW in 2030. From the "Energy Transitions Initiative Guyana Country Snapshot" we note that the peak load to installed capacity ratio is 348 MW to 125 MW, or 2.78, and assume that this remains constant through 2030.

Technologies and timetables for this RE pathway are not available, therefore estimating capital outlay is difficult. Using indicative figures for Utility Scale PV (Class 10 Advanced for lower bound and Class 1 Conservative for upper bound) from NREL "2021 Annual Technology Baseline (ATB)" the potential capital expenditure required for this expansion in RE is between $497 - $650 million between 2021-2030 (inclusive).

Table 5.3. Supply and demand projections and estimated investment requirement

	Current	Projected 2030	Change
Total Generation Capacity (MW)	348*	1,907**	1,559
RE Share (%)	1***	27***	26

[119] Cooperative Republic of Guyana, "Guyana's Low Carbon Development Strategy 2030 (Draft for Consultation)," November 2021, 110.

	Current	Projected 2030	Change
Non-RE Generation Capacity (MW)	345	1,392	1,047
RE Generation Capacity (MW)	3	515	512
Required Investment (Mil USD)	.	.	$497 - $650

* Energy Transitions Initiative. 2020. Guyana Country Snapshot.

** This is a derived estimate since a direct projection of future generation capacity is not available. The "Guyana Low Carbon Development Strategy 2030" estimates peak load of 685 MW in 2030. From the Energy Transitions Initiative, 2020, Guyana. We note that the peak load to installed capacity ratio is 348 MW to 125 MW or 2.78 and assume that this remains constant through 2030.

*** Cooperative Republic of Guyana, "Guyana's Low Carbon Development Strategy 2030 (Draft for Consultation)," November 2021, 110. Pg. 54.

****Based on NREL "2021 Annual Technology Baseline (ATB)" using Utility Scale PV (Class 10 Advanced for lower bound and Class 1 Conservative for upper bound)

Is there a credible pipeline of RE/EE investment defined in targets and plans?

GPL regularly publishes a Development and Expansion Programme (latest 2022) that outlines planned capacity additions in the upcoming five years. Table 5.31 provides a summary of planned RE capacity additions to 2026. The total planned capacity additions of 566 MW include 165 MW of hydro in (29 percent) and 55 MW (or 10 percent) of solar PV, the remainder is fossil fuel-based generation. The planned capacity additions indicate a large, planned increase relative to currently installed 350 MW total capacity.

Table 5.31. Planned generation capacity additions in Guyana

Name	Type	Year	Capacity (MW)
100MW NG (Advanced Capacity - N/Sophia)	Natural gas	2023	100
Hybrid Power Generation Facility - HFO	Fuel oil	2023	30.6
Hybrid Power Generation Facility - Solar PV	Solar PV	2023	30
Guysol	Solar PV	2023	10
Linden (Existing Capacity)	Fuel oil	2024	15.8
Linden Solar PV	Solar PV	2024	15
300MW NG (Wales) – Balance 200MW	Natural gas	2025	200

Name	Type	Year	Capacity (MW)
AFHP	Hydro	2026	165

Source: Guyana Power and Light, Inc., "Development and Expansion Programme 2022-2026," 2021

Energy Sector Financial Health

Summary

As of 2020 GPL was in a good financial position with tariffs set at a reasonable level. Concerns about the utilities inability to pay for power delivered are therefore unlikely to be significant.

Are tariffs cost reflective?

Customer tariff setting in Guyana is not done following a formal cost reflective framework. GEA oversees the process and approves GPL tariffs. The rates appear to be set at a level that covers costs for GPL without allowing excessive profits.

Are power companies in a good financial position?

According to GPL's 2020 Audited Financial Statement utility earned a positive return in both 2020 and 2019 and held positive cash balances in both years.[120]

Access to Quality Electricity

Guyana has not yet reached full access to electricity indicating there is potential for growth through improved access. This is in line with current plans for significant increases in total generation capacity.

What share of the population has access to electricity?

Electricity access in Guyana stood at 92.5 percent as of 2020.[121] Therefore the role of new capacity (renewables and thermal) will be both closing the access gap and to meet growth in demand.

What is the Quality of Electricity Supply, Index score?

Guyana has a Quality of Electricity Supply Index score of 3.01 (2015).[122] By way of reference, the regional median score is about 5 while Norway has the highest score of 6.9.

Donor Activities in Guyana

Donor activities are currently focused on technical cooperation, mostly at the project level. The Islamic Development Bank has installment sale financed two hydro projects. IDB and NORAD

[120] Parmesar Chartered Accountants and Audit Office of Guyana, "Audited Financial Statements of the Guyana Power and Light Incorporated (For the Year Ended 31 December 2020)," 2021.

[121] World Bank, "Access to Electricity (percent of Population) – Guyana," 2020.

[122] Schwab, K. (2019). The Global Competitiveness Report 2019 (p. 666). World Economic Forum.

recently announced an $83.3 million grant to support the construction of the 33 MW Guyana Utility Scale Solar Photovoltaic Program (GUYSOL).

Table 5.32. Recent and ongoing RE and EE projects

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
33MW Guyana Utility Scale Solar Photovoltaic Program (GUYSOL)	RE	Investment grants, Technical cooperation	2022-	Guyana REDD+ Investment Fund (GRIF), IDB	$83,300,000
RE Actions in the Energy Matrix	Both	Technical cooperation	2021-	IDB	$1,500,000
Canada Funding for Local Initiatives	Both	Technical assistance	2019	Canadian High Commission	$11,629-$38,765 per project
Rehabilitation of Moco Hydro-Power Station and Construction of New Hydropower at Kumu and Ikuribisi	RE	Installment sale financing	2019-2022	Islamic Development Bank (IsDB), Government of Guyana	$14,630,000 from the IsDB
Abu Dhabi Fund for Development (ADFD) and International RE Agency	RE	Technical assistance	2019	IRENA/ADFD Project Facility	$8,000,000
British High Commission through the UK Prosperity Fund	Both	Technical assistance	2018-Current	UK Prosperity Fund	Up to $36,252 per project

Source: Various sources

St. Lucia: Grouping `Not Conducive to Market-Facilitated RE Investment'

Regulatory Risk

Summary

Policy and regulation relating to supporting the development of RE remains underdeveloped in St Lucia. This is likely to be a source of perceived risk for developers and financiers.

What is the status of RE enabling legislation/regulation?

The electricity sector is governed by the Electricity Supply Act, first enacted 1994 and most recently amended 2016. The 2016 amendments removed the generation monopoly from

vertically integrated utility St. Lucia Electricity Services Limited (LUCELEC), allowed generation to be provided by IPPs, and introduced licensing for RE generation.[123]

Is there an effective regulatory structure that allows for confident investment in RE and EE?

The National Utilities Regulatory Commission (NURC) provides oversight and economic regulation of the electricity sector in St. Lucia. LUCELEC is an integrated utility and the sole provider of supply, transmission, and distribution; and remains a major player in generation; IPPs have been allowed since 2016.

As of 2022, all generation is owned and operated by LUCELEC and therefore there is no wholesale power market setting a power price. LUCELEC's annual report provides disaggregated cost information that can provide an indication of the average cost (the price paid for power by the utility) of generation[124].

What direct support for investment in RE and EE is available?

In May 1999, the Government passed Cabinet Conclusion No. 464 eliminating all import duties and consumption taxes on renewable energy equipment and materials. Further, in April 2001, it decided to make the purchase of solar water heaters tax deductible.[125]

We note that in St. Lucia, RE cost per unit production is lower than FF based power production (Figure 13), therefore developers can justify RE investments based on their commercial merits independent of existing additional incentives. The government can choose to maintain the additional incentives to address the undersupply of RE due to its non-market benefits such as avoiding greenhouse gasses. As the IEA notes, "In most markets, solar PV or wind now represents the cheapest available source of new electricity generation."[126]

Market Scale, Competitiveness, and Maturity

Summary

While RE remains a relatively small component of St. Lucia's generation mix at present, the National Energy Transition Strategy (NETS) foresees potential for 100 – 110 MW of new renewables by 2035.

How mature are the RE and EE markets for both large- and small-scale projects in the country?

RE makes up just 7 percent of installed capacity, with the existing 6.3 MW of solar generation roughly split between LUCELEC assets (3 MW) and distributed generation (3.3 MW). There is no evidence of any facilities being delivered by IPPs despite this being made available.

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[123] Parliament of Saint Lucia, "Electricity Supply (Amendment) Act: No. 2 of 2016," 2016.

[124] St Lucia Electricity Services Limited. Annual Report 2021.

[125] St. Lucia National Energy Policy (2010).

[126] International Energy Agency (2021), World Energy Outlook 2021, IEA, . License: Creative Commons Attribution CC BY-NC-SA 3.0 IGO

Table 5.33. Installed energy generation capacity

Technology	Units	Installed capacity
Diesel	MW	88.4
Utility solar	MW	3
Distributed solar	MW	3.3
Total renewable	MW	6.3
Total capacity	MW	94.7
Renewables share of capacity	MW	7%
FF to RE installed capacity ratio	#	13.29

Source: CREEE, "Energy Report Card: St. Lucia," 2020; LUCELEC, "Annual Report 2021," 2022.

Is RE cost competitive versus fossil fuel to gain a significant market share in filling the supply gaps?

Renewable power generation costs have fallen sharply worldwide over the past decade. In the case of St Lucia, Figure 13 shows the range of cost estimates for solar, wind, and hydro RE technologies that have fallen below the point estimate of fossil-fuel generation cost of $0.21 per kWh. Electricity retail price of $0.32 covers RE generation cost.

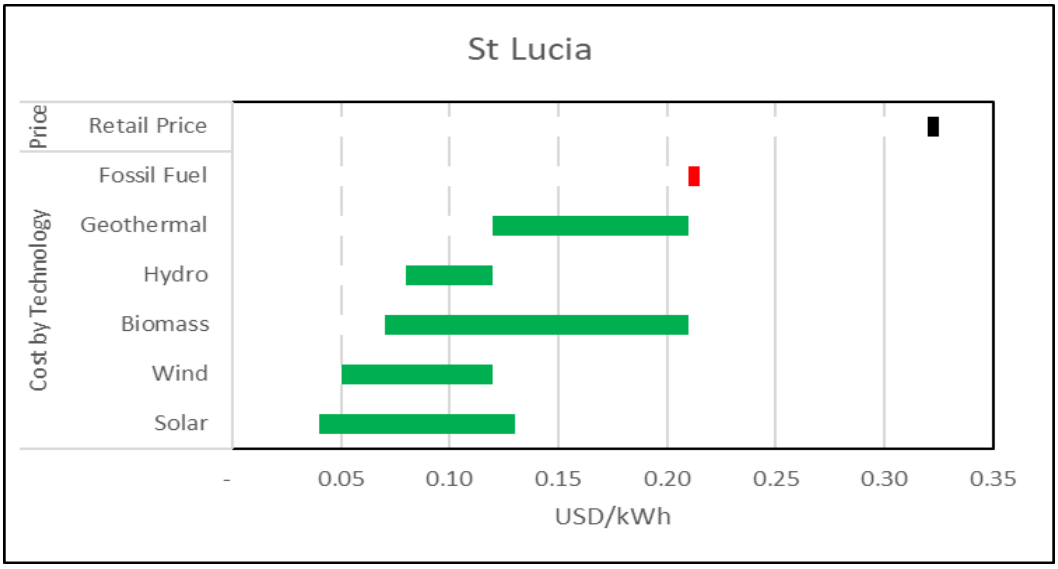

Figure 10. Cost competitiveness of RE technologies versus fossil fuel in electricity generation
Source : NREL, Masson, et. Al., own calculations

What is the total investment required to develop the expected RE capacity in the next 5 to 10 years?

The St. Lucia National Energy Transition Strategy specifies an increase in total installed capacity from 94.7 MW to 173.7 MW in 2035 for the recommended scenario (see Table 45). The proportion of RE is projected to increase from 6.7 percent to 61 percent, through a mixture of wind and solar, through a present discounted capital investment of approximately $500 million.

Technologies and timetables for this RE pathway are not available, therefore estimating capital outlay is difficult. Using indicative figures for Utility Scale PV (Class 10 Advanced for lower bound and Class 1 Conservative for upper bound) from NREL "2021 Annual Technology Baseline (ATB)" the potential capital expenditure required for this expansion in RE is between $97 - $127 million between 2021-2030 (inclusive).

Table 5.34. Supply and demand projections and estimated investment requirement

	Current	Projected 2035	Change
Total Generation Capacity (MW)	95	174	79
RE Share (%)	7	61	54
Non-RE Generation Capacity (MW)	88	39	49
RE Generation Capacity (MW)	6	106	100
Required Investment (Mil USD)*	.	.	$97 - $127

Source: Kaitlyn Bunker et al., "Saint Lucia National Energy Transition Strategy and Integrated Resource Plan" (Rocky Mountain Institute, 2017). NOTE: projected values are to 2035, unlike other country projections which were available till 2030. *Approximate, present discounted value.

*Based on NREL "2021 Annual Technology Baseline (ATB)" using Utility Scale PV (Class 10 Advanced for lower bound and Class 1 Conservative for upper bound).

Is there a credible pipeline of RE/EE investment defined in targets and plans?

St. Lucia does not have a publicly available schedule of planned capacity additions to provide investors with a forward-looking view on opportunities. The country has however published a NETS with several scenarios of possible capacity requirements to 2035. Across scenarios included in the NETS capacity additions of up to 86.8 MW for solar PV, 18.0 MW for wind, 45 MWh for storage, and 30 MW for geothermal generation are foreseen. Scenarios project a total of between 100-110 MW of renewable capacity being needed by 2035.[127]

[127] Bunker et al., "Saint Lucia National Energy Transition Strategy and Integrated Resource Plan," 2017.

Energy Sector Financial Health

Summary

At present tariffs are covering costs and utility LUCELEC is in good financial health without achieving outsized profits. Tariff reform may be needed to match revenues with a changing cost profile as RE capacity grows.

Are tariffs cost reflective?

Consumer tariffs are set with the oversight and approval of NURC. At present tariffs are comprised of a fixed base rate, fixed fuel pass through, and a fuel adjustment.[128] The presence of a fuel adjustment implies tariffs roughly track costs, however there is little publicly available information on how the base rate and fuel passthrough are determined. Furthermore, the fuel cost adjustment will not necessarily align tariffs with costs associated with RE, and St. Lucia may need to consider whether the methodology is fit for purpose in a high RE system in the future.

Are power companies in a good financial position?

Utility LUCELEC has recorded positive retained earnings for the year in each of the previous 10 years.[129]

Access to Quality Electricity

Ninety-nine percent of the population in St. Lucia has access to electricity as of 2018,[130] therefore the role of new capacity (renewables and thermal) will be predominantly to meet growth in demand with some limited growth due to increased access. St. Lucia does not have a Quality of Electricity Supply Index score available.

Donor Activities in St. Lucia

There are currently multiple technical support activities ongoing in St. Lucia. These activities tend to be project level support rather than technical support aimed at filling the identified gaps in the legal and regulatory framework for enabling RE and EE growth.

Financial support is in the form of grants and does not appear to be targeting leveraging additional finances from private sources, however the 30 MW geothermal energy project has accessed private finance.

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[128] Bunker et al., "Saint Lucia National Energy Transition Strategy and Integrated Resource Plan," 2017.

[129] St. Lucia Electricity Services Limited (LUCELEC), "Annual Report 2021," 2022.

[130] International RE Agency (IRENA), "Saint Lucia Energy Profile," 2021.

Table 5.35. Recent and ongoing RE and EE projects

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
30MW Geothermal Energy Project	RE	Grants, Technical support, Private financing	2021-	World Bank Clean Technology Fund, IDF, UK Department for International Development, SIDS Dock Support Program, New Zealand	$22,380,000
0.75MW Solar PV, Solar Carport at Hewanorra International Airport, Vieux Fort	RE	Grant	2019-	UAE-Caribbean RE Funds (UAE-CREF)	$2,300,000
10MW Solar PV Farm at Troumassee, Micoud w/ 6.5 MW Battery Storage	RE		In planning stages	Abu Dhabi Fund for Development (ADFD)	$31,200,000
3MW Utility-Scale Solar Farm	RE	Technical assistance (Rocky Mountain Institute), Grants, Loans	2017-2018	St. Lucia Electricity Services Limited (LUCELEC), UNDP, Global Environment Facility, Norwegian Agency for Development Cooperation	$7,400,000
Sustainable Energy Facility for the Eastern Caribbean	RE (geothermal)	Technical assistance, Concessional loans, Reimbursable Rants	2016-2024	IDB, Green Climate Fund (GCF)	$192,400,000
Caribbean EE Lighting Project	EE	Technical support	2014-2016	Government of Denmark, SIDS	$1,000,000

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
				DOCK Support Program	

Source: Various sources

St. Vincent and the Grenadines: Grouping `Not Conducive to Market-Facilitated RE Investment'

Regulatory Risk

Summary

While St Vincent and the Grenadines (SVG) has incentives for RE development, the enabling regulatory and legislative framework is underdeveloped. This is likely to increase perceived risk for FIs.

What is the status of RE enabling legislation/regulation?

The Electricity Supply Agreement Act that governs the electricity sector in SVG was introduced in 2009. SVG allows for generation from RE by IPPs under a FiT and distributed small scale renewables under a net billing scheme. There are no standardized interconnection policies or procedures, there is indication that such procedures are under preparation.

Is there an effective regulatory structure that allows for confident investment in RE and EE?

St Vincent Electricity Services Ltd (VINLEC) provides generation, transmission, distribution, and supply of electricity on St Vincent and several of the Grenadine islands (the remaining two Grenadine islands are supplied by privately owned systems).

In 2022, all generation is owned and operated by VINLEC and therefore there is no wholesale power market setting a power price. VINLEC's annual report provides disaggregated cost information that can provide an indication of the average cost (the price paid for power by the utility) of generation[131].

What direct support for investment in RE and EE is available?

Utility scale solar is supported through a FiT and distributed small solar through a net billing scheme.[132] The country also provides the following incentives in the RE space: tax reduction or exemption, public loans or grants, and green public procurement.

[131] St Vincent Electricity Services Limited. 2018 Annual Report.

[132] National RE Laboratory (NREL), "St. Vincent and the Grenadines Energy Snapshot," 2015.

We note that in St. Vincent and the Grenadines, RE cost per unit production is lower than or competitive with FF based power production (Figure 14), therefore developers can justify RE investments based on their commercial merits independent of existing additional incentives. The government can choose to maintain the additional incentives to address the undersupply of RE due to its non-market benefits such as avoiding greenhouse gasses. As the IEA notes, "In most markets, solar PV or wind now represents the cheapest available source of new electricity generation."[133]

Market Scale, Competitiveness, and Maturity

Summary

Hydro generation is relatively mature in SVG and remaining hydro-resources are limited. Solar has seen some growth and is a major source of future RE potential. Geothermal presents a major opportunity but is a nascent technology in SVG.

How mature are the RE and EE markets for both large- and small-scale projects in the country?

RE makes up close to 15 percent of total installed generation capacity in SVG, the majority of which is hydro (5.6 MW) with the remainder made up of utility and distributed solar.

Table 5.36. Installed energy generation capacity

Technology	Units	Installed capacity
Hydro	MW	5.6
Solar (Utility)	MW	1.8
Solar (Distributed)	MW	0.24
Diesel	MW	44.41
Total renewable	MW	7.64
Total (incl. non-renewable)	MW	52.05
Renewable share of capacity	MW	15%
FF to RE installed capacity ratio	#	5.67

Source: CREEE, "Energy Report Card: St. Vincent and the Grenadines," 2020; Energy Transition Initiative, "St. Vincent and the Grenadines Energy Snapshot," 2020.

[133] International Energy Agency (2021), World Energy Outlook 2021, IEA. Licence: Creative Commons Attribution CC BY-NC-SA 3.0 IGO

Is RE cost competitive versus fossil fuel to gain a significant market share in filling the supply gaps?

Renewable power generation costs have fallen sharply worldwide over the past decade. In the case of St Vincent and Grenadines, Figure 14 shows the range of cost estimates for solar, wind, and hydro RE technologies that have fallen below the point estimate of fossil-fuel generation cost of $0.21 per kWh. Electricity retail price of $0.19 does not cover fossil fuel generation cost but can cover RE generation cost.

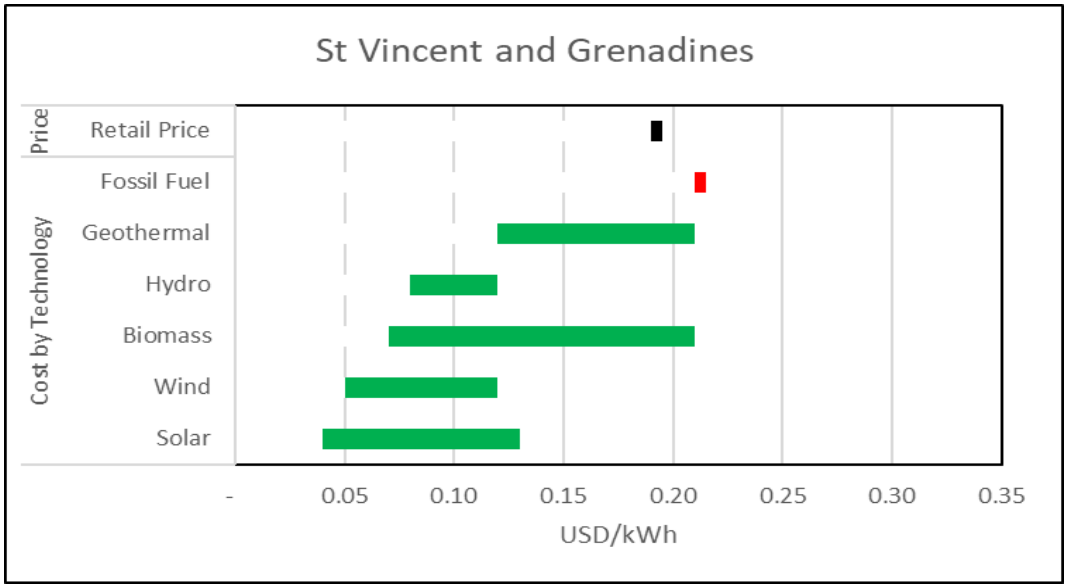

Figure 11. Cost competitiveness of RE technologies versus fossil fuel in electricity generation
Source: NREL, Masson, et. al., own calculations.

What is the total investment required to develop the expected RE capacity in the next 5 to 10 years?

By 2030, we estimate that St Vincent and the Grenadines will require 98.1 MW of installed capacity of which 58.8 MW will be RE (see Table 5.37 for calculation details). This is a derived estimate since a direct projection of future generation capacity is not available. The Energy Action Plan for St. Vincent and the Grenadines[134] suggests that peak load has been growing at a rate of five percent annually. The "Energy Transitions Initiative. 2020. St. Vincent and the Grenadines Country Snapshot" suggests an installed capacity to peak load ratio of 52 MW to 21 MW or 2.48 in 2017. At five percent growth annually from 2017 to 2030 (13 years), peak load grows to 37 MW suggesting an installed capacity of 98 MW. Existing documents from St. Vincent and the Grenadines do not provide any indication of future RE targets. Instead, assuming that all growth in installed capacity can be filled with RE, we estimate future installed RE capacity at 58.8 MW.

Technologies and timetables for this RE pathway are not available, therefore estimating capital outlay is difficult. Using indicative figures for Utility Scale PV (Class 10 Advanced for lower

[134] St. Vincent and the Grenadines, "Energy Action Plan for St. Vincent and the Grenadines," January 2010, 54.

bound and Class 1 Conservative for upper bound) from NREL "2021 Annual Technology Baseline (ATB)" the potential capital expenditure required for this expansion in RE is between $49 - $65 million between 2021-2030 (inclusive).

Table 5.37. Supply and demand projections and estimated investment requirement

	Current*	Projected 2030**	Change
Total Generation Capacity (MW)	52	98	46
RE Share (%)	15	60	45
Non-RE Generation Capacity (MW)	44	39.2	-4.8
RE Generation Capacity (MW)	8	58.8	50.8
Required Investment (Mil USD)***	.	.	$49 - $65

*Energy Transitions Initiative. 2020. St. Vincent and the Grenadines Country Snapshot.

** Figures in this column are derived. The "Energy Action Plan for St. Vincent and the Grenadines" suggests that peak load has been growing at a rate of five percent annually. The "Energy Transitions Initiative. 2020. St. Vincent and the Grenadines Country Snapshot" suggests an installed capacity to peak load ratio of 52 MW to 21 MW or 2.48 in 2017. At five percent growth annually from 2017 to 2030 (13 years), peak load grows to 39.6 MW suggesting an installed capacity of 98.1 MW.

****Based on NREL "2021 Annual Technology Baseline (ATB)" using Utility Scale PV (Class 10 Advanced for lower bound and Class 1 Conservative for upper bound).

Is there a credible pipeline of RE/EE investment defined in targets and plans?

There is currently no publicly published schedule of planned capacity additions, and all published RE targets are out of date. The country does however have significant RE potential, particularly solar and geothermal. It is therefore feasible that SVG could reach 100 percent renewables in the future and replace the existing 44 MW of diesel generation. Considering lower load factors of RE generation and future demand growth it is likely that this 44MW can be taken as a lower bound for the future market opportunity in the country.

Table 5.38. Estimated potential RE capacity

Technology	Units	Additional potential capacity
Wind	MW	4.5
Solar	MW	1038.08
Hydro	MW	0.5
Geothermal	MW	900
Biomass/Waste to Energy	MW	3.5

Technology	Units	Additional potential capacity
Total potential	MW	1946.58

Source: CREEE. 2020. Energy Report Card: St. Vincent and the Grenadines

Energy Sector Financial Health

Summary

Tariff setting in SVG has a lack of transparency and accountability, and the financial position of utility VINLEC appears volatile. These will likely be a significant source of risk for developers and financiers.

Are tariffs cost reflective?

Figure 14 shows that tariffs at the retail level do not cover the fossil fuel generation cost. Tariff setting in SVG is not overseen by a regulator. Customer tariffs are comprised of a minimum base charge, a demand charge, and a unit cost per kWh which includes a variable fuel surcharge. The fuel surcharge implies a degree of cost reflexivity, however there is little transparency on how the other elements are calculated. Additionally, the fuel cost adjustment will not necessarily align tariffs with costs associated with RE, and whether the methodology is fit for purpose in a high RE system should be considered for the future.

Are power companies in a good financial position?

Utility VINLEC posted a loss in 2017 but rebounded with a profit in 2018.[135] The financial position of the utility therefore appears volatile.

Access to Quality Electricity

100 percent of the population in SVG has access to electricity,[136] therefore the role of new capacity (renewables and thermal) will be to meet growth in demand. St. Vincent and the Grenadines does not have a Quality of Electricity Supply Index score available.

Donor Activities in St. Vincent and the Grenadines

Donor support in SVG include project level technical assistance, project level loans and grants, as well as program supporting access to wider sources of financing. The Sustainable Energy for the Eastern Caribbean (SEEC) program includes providing lines of credit to financial intermediaries as well as a guarantee facility, both of which will encourage financiers to participate in the market and therefore increasing the pool of available finance.

[135] St. Vincent Electricity Services Limited (VINLEC), "2018 Annual Report," 2019.

[136] National RE Laboratory (NREL), "St. Vincent and the Grenadines Energy Snapshot," 2020.

Table 5.39. Recent and ongoing RE and EE projects

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
10KW Geothermal Project	RE		In research stages	Government of SVG and Reykjavik Geothermal	$92,000,000
Sustainable Energy for the Eastern Caribbean (SEEC) EE Solar PV Project	Both	Multi-partner Loans and Grants, Technical assistance grants, Lines of credit to selected financial intermediaries for MSMEs, Guarantee facility	2018-	Caribbean Development Bank (CDB), EUCIF, Department for International Development (DFID), EIB, OCR	$6,026,000
Supply and Installation of Solar PV Systems near Argyle International Airport, Battery Storage System at Cane Hall			2020-	CDB	$8,600,000
7MW Bequia Microgrid Project	RE		2020	Abu Dhabi Fund for Development (ADFD), IRENA	$20,000,000 ($10,000,000 from ADFD, $10,000,000 from IRENA)
580kW PV and Battery Energy Storage System on Union Island	RE	Grant	2019-	Government of United Arab Emirates	$3,000,000
100kW Mayreau Solar Microgrid Project	RE		2018-Present	Vinlec, Ray and Tye Noorda Foundation, UNDP-GEF	
Sustainable Energy Facility	RE (geothermal)	Technical assistance, Concessional	2016-2024	IDB, Green Climate Fund (GCF)	$192,400,000

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
for the Eastern Caribbean		loans, Reimbursable Grants			
Street Light Retrofitting	EE	Funding	2016-	Caribbean Development Bank	$6,410,000
Caribbean EE Lighting Project	EE	Technical support	2014-2016	Government of Denmark, SIDS DOCK Support Program	$1,000,000
SVG Geothermal Development Project	RE		2013-2020	IRENA/ADFD, DFID, CDB, EU-CIF, IDB (CTF, GEF), Government of SVG, Government of New Zealand	Unavailable

Source: Various sources

Suriname: Ungrouped

A lack of publicly accessible information has prevented a complete assessment of Suriname. Suriname is uniquely positioned with RE supplying approximately 60 percent of generated electricity and comprising 36 percent of installed generation capacity. This implies that the FF to RE installed generation capacity ratio is 1.78. Hydro makes up the majority of this installed capacity, contributing 180 MW of 189 MW of installed RE.[137] Suriname updated primary legislation governing the electricity sector in 2016. This has included developing a framework for the deployment of further RE including solar and wind.[138]

Current donor activities include both project level and higher-level technical assistance as well as provision of grants and soft loans.

[137] National RE Laboratory (NREL), "St. Vincent and the Grenadines Energy Snapshot," 2020.

[138] Abadal Colomina, "Consolidating a Sustainable Energy Sector in Suriname," 2021.

Table 5.4. Recent and ongoing RE and EE projects

Project Name	Type of Project (RE, EE)	Type of Support	Timeline	Source of Financing	Amount of Financing (USD)
5MW Solar Development (Centralized and on Individual Houses) to Increase Interior Electricity Access	RE	Loan (4% interest rate, 15-year term)	In early planning stages	TBD	$17,000,000
The EcoMicro Program (Eco Micro)—Southern Commercial Bank: Green Finance for Micro, Small and Medium Enterprises (MSMEs) and Low-Income Households	Both	Technical cooperation, loans for MSMEs and low-income households	2021-	IDB (Canada Cooperation Frame)	$180,000
Promotion of EE and Distributed Generation in Suriname	Both	Technical cooperation	2021-2024	IDB (OC Strategic Development Program for Infrastructure)	$250,000
Support the Development of Solar Floating PV Energy in Suriname	RE	Technical cooperation	2021-2023	IDB (Japan Special Fund)	$300,000
Consolidating a Sustainable Energy Sector	Both	Loan, Technical cooperation	2020-	IDB	$30,000,000
Technical Support to Prep and Execution of "Consolidating Sustainable Energy Sector"	Both	Technical cooperation	2020-2021	IDB	$292,000
Support to the Institutional and Operational Strengthening of the Energy Sector	Both	Institutional Strengthening and Capacity Building, Loan	2016-2018	IDB	$70,000,000

Source: Various sources

Is RE cost competitive versus fossil fuel to gain a significant market share in filling the supply gaps?

Renewable power generation costs have fallen sharply worldwide over the past decade. In the case of Suriname, Figure 15 shows the range of cost estimates for solar, wind, and hydro RE technologies that have fallen below the point estimate of fossil-fuel generation cost of $0.17 per kWh. However, the electricity retail price of $0.06 does cover RE generation cost for Geothermal, Hydro, and Biomass.

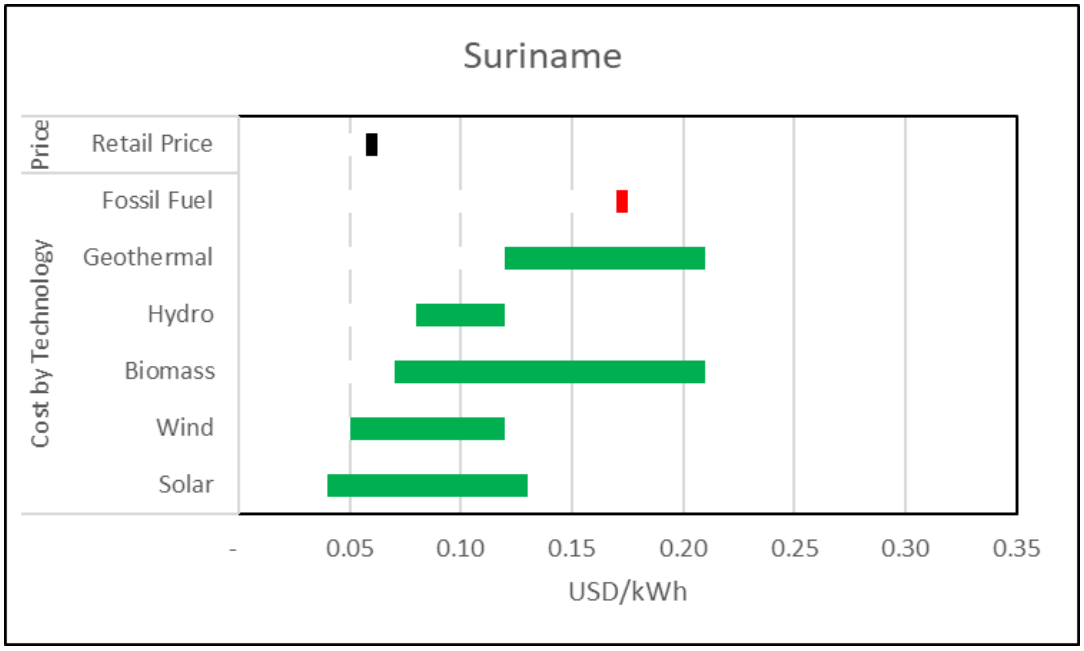

Figure 12. Cost competitiveness of RE technologies versus fossil fuel in electricity generation
Source: NREL, Masson, et. al., own calculations

What is the total investment required to develop the expected RE capacity in the next 5 to 10 years?

Unfortunately, there is no readily available information to suggest the scale of future electricity demand, renewable energy share and required investment.

ANNEX 6: INCENTIVES FOR SMALL-SCALE RE GENERATORS

Average feed-in tariffs for Caribbean countries

Band	Tariff (cents per kWh)
Residential <10kW	*23.04*
Residential >10kW	*27.33*
Commercial <100kW	*26.09*
Commercial >100kW	*27.33*

ANNEX 7: GAPS IN INSTITUTIONAL, LEGISLATIVE, AND REGULATORY REGIMES AND RECOMMENDATIONS, BY RESPONDENT TYPE

Gaps in institutional, legislative, and regulatory regimes and recommendations, by respondent type

Respondent Type	Gaps in Institutional, Legislative and Regulatory Regimes	Recommendation Offered by Respondent	Potential USAID Solution
Utilities	• Need more capacity internally (technical, administrative) • Slow regulatory processes • Regulator and ministry of energy need more capacity • Lack PPA framework • Political problems: status quo works for many, and key beneficiaries will lose out from a transition to RE (e.g., government gets revenue from oil taxes, key electorate in FF-dependent jobs) • Ministry of energy lacks grid monitoring systems	• Want training around new technologies (e.g., integrating and operating geothermal plants) • Capacity-building (e.g., training around operations and maintenance of battery storage system) • Assistance with feasibility studies and other studies that de-risk a project • Assist ministry in building capacity to monitor grid and new capacity coming online	• Capacity-building • Technical assistance to develop secondary legislation • Technical assistance for grid assessment
Regulators	• Storage rates still in infancy • Competitive procurement processes under development • Projects need PPA templates • Need for grid modernization • Have limited budget and, therefore, capacity of the regulator		• Technical assistance to develop secondary legislation, including procurement processes and PPA templates
Ministries of energy	• Bottlenecks in developing competitive procurement process, difficulties finding best process • Determining how to integrate new capacity (as a technical engineering challenge)		• Technical assistance to develop secondary legislation, including procurement processes • Technical assistance for grid assessment
Banks	• Insufficient legislative and regulatory framework • Long wait times/standstills due to bureaucracy	• Support the flow of projects • Funding to hire right resources • Put monitoring process and milestones around development of regulation	• Technical assistance to develop secondary legislation

	• Unpredictable timeframes for licensing, approvals, PPAs • Need expensive foreign consultants to assess risks of certain technologies (e.g., elevated PV panels)	• Technical support for bank employees and customers (paired with lines of credit) • Sector-specific local capacity building (i.e., train local consultants for risk assessment of RE/EE projects)	• Credit line • Local capacity building (bank staff and technical consultants)
Projects	• Slow permitting process • Regulation needed for the incorporation of batteries for solar and wind • Complicated, time-consuming bureaucracy	• Help streamline the processes and make them clearer to projects	• Technical assistance to develop secondary legislation • Capacity-building
Multilaterals/ Energy organizations	• Slow progress is leading projects to go to other jurisdictions • Sediments building up on Port-Au-Prince's mini-grid • 1000 MW of private diesel generators in Haiti • Lack of coordination between countries of region and entities in region • Need PPA framework • Need further understanding of interconnection from technical and financial perspective • Need for concrete plans to accompany RE targets	• Technical assistance to Suriname and Dominica for hydropower plant rehabilitation • Facilitate private sector sedimentary removal in Haiti power plant • Help replace diesel gensets with solar and battery in Haiti • Multilaterals, bilaterals, climate funds to coordinate and cooperate (e.g., regional trust fund or fund backed by commercial banks, for governments and private firms to do solar projects) • Tariff reform to reflect cost of future grid investments • Help identify how countries can develop procurement in manageable way appropriate to system size and complexity, especially in smaller countries like St. Lucia, where relatively small RE project could supply 20–30% electricity soon • Help develop integrated utility services approach for RE/EE projects at the household, SME level • Helping integrated planning processes to move more quickly	• Technical assistance to develop secondary legislation, including procurement and PPA template • Technical assistance for grid assessment • Knowledge creation, curation, and dissemination • Assist with production of IRRPs