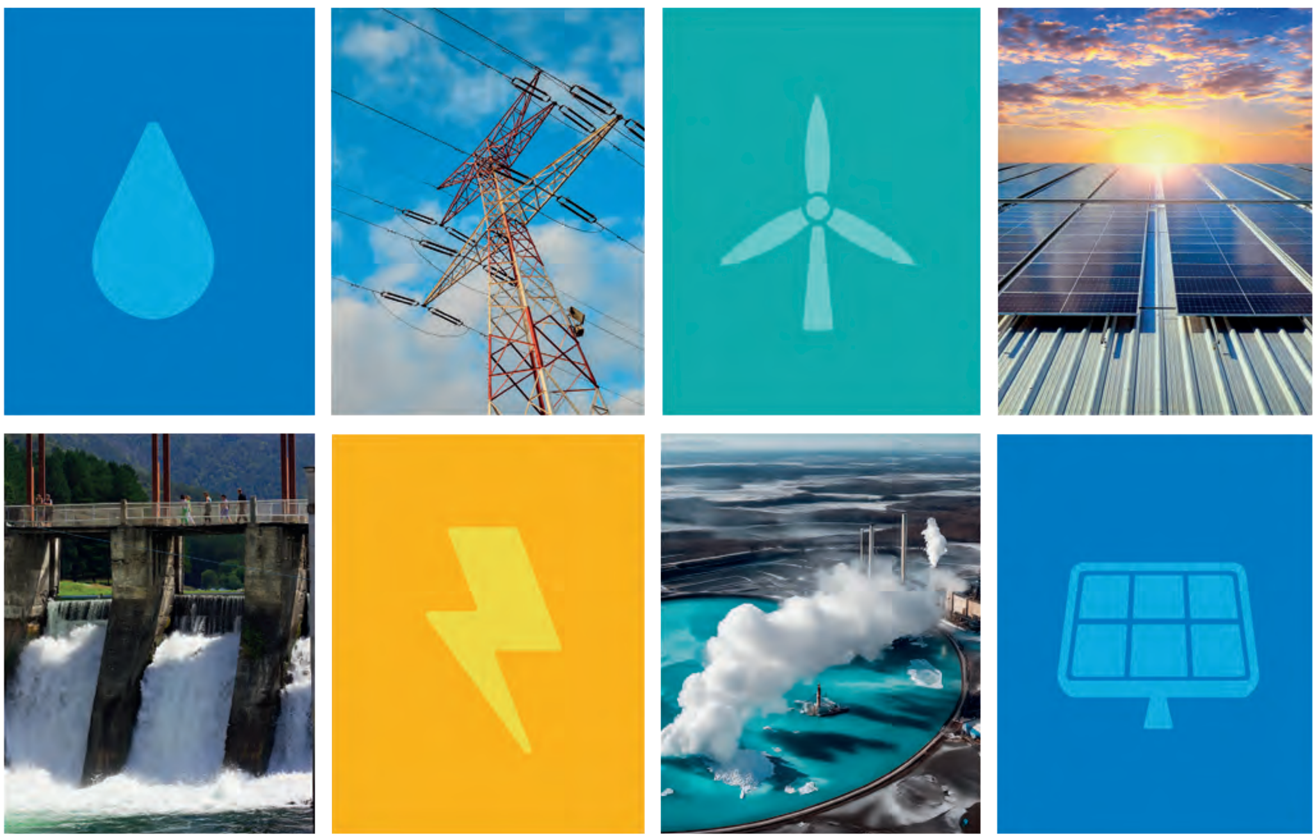
The Minimum Regulatory Function

For the Electricity Sector in Caribbean Countries



An Initiative of the Accelerated Sustainable Energy and Resilience Transition 2030 Framework

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Foreword

Advancing sustainable energy development in the Caribbean is a critical objective for Borrowing Member Countries (BMCs) of the Caribbean Development Bank (CDB) to meet energy security objectives and climate change targets, to achieve energy related SDGs (especially SDG-7), and to support resilience building. Sustainable energy is a sine qua non for sustainable development, as observed by Dr. Hyginus Leon, President of CDB: "there can be no sustainable development without sustainable energy." The observation, however, is that the pace of investment in renewable energy in our BMCs is much too slow for them to meet their 2030 RE targets.

CDB, therefore, seeks to assist these countries in changing that situation in the shortest possible time through the Accelerated Sustainable Energy and Resilience Transition (ASERT) 2030 framework of the Bank's Energy Sector Policy and Strategy, which aims to support BMCS to increase the scale and pace of RE investments rapidly. The Bank considers that it has a critical role to play in the coordination of regional funding strategies, given its position of having the largest set of borrowing members in the Caribbean when compared to other international financing institutions active in sustainable energy development in the Caribbean.

The critical importance of the enabling environment for increasing investment in renewable energy is well established. It is therefore considered appropriate that the Bank seeks to assist BMCs in strengthening or establishing suitable regulatory frameworks as a first intervention under its ASERT-2030 framework. This study identifies and articulates a set of key elements deemed to constitute a Minimum Regulatory Function which if implemented in BMCs will form a critical step in establishing fit-for-purpose regulatory frameworks. It is therefore considered to be a useful addition to the body of knowledge on the strengthening of the electricity sector regulatory frameworks in the Caribbean. This publication is the first in a series of ASERT-2030 Technical Notes, which will cover a variety of subject matters to be addressed in the context of implementation of the ASERT framework.

A major challenge for renewable energy investment is the mobilization of affordable finance for especially in the electricity transmission and distribution infrastructure, and for storage and resilience building - all of which are necessary to facilitate the required large-scale injection of RE generation over the next few years. By adopting the MRF, BMCs will better enable the Bank to target its resource mobilization efforts and to work strategically with partners to meet the financing requirements.

It is our hope that BMCs and partners will find this report useful as a tool in helping them to identify and address the deficits in the regulatory frameworks ina structured and expedited manner, thereby allowing them to accelerate renewable energy renewable energy investments towards achieving the energy sector objectives.

Isaac Solomon,
Vice-President Operations,
Caribbean Development Bank - October 2023

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Acronyms

ASERT	Accelerated Sustainable Energy and Resilience Transition
BL&P	Barbados Light and Power Company
BMC	Borrowing Member Countries
CARICOM	The Caribbean Community
CARILEC	Caribbean Electricity Services Limited
CCREEE	Caribbean Centre for Renewable Energy and Energy Efficiency
CDB	Caribbean Development Bank
DG	Distributed Generation
EPC	Engineering, Procurement, and Construction
ESPS	Energy Sector Policy and Strategy
EU	European Union
FIT	Feed-In-Tariff
FTC	Fair Trading Commission
GEED	Government Electrical Engineering Department
GHG	Greenhouse Gas
GIS	Geographic Information System
GT&D	Generation, transmission and distribution
IDB	Inter-American Development Bank
IESO	Independent Electricity System Operator
IPP	Independent Power Producer
IRP	Integrated Resource Plan
IRRP	Integrated Resource and Resilience Plan
JPS	Jamaica Public Service Company
kWh	Kilowatt hour
MOE	Ministry of Energy, Small Business and Entrepreneurship
MRF	Minimum Regulatory Function
MSETT	Ministry of Science, Energy, Telecommunications and Transport
MW	Megawatts
NEPA	National Environment and Planning Agency
NLA	National Land Agency
OECS	Organisation of Eastern Caribbean States
OOCUR	Organization of Caribbean Utility Regulators
OUR	Office of Utilities Regulation
PPA	Power Purchase Agreement
PV	Photovoltaic
RE	Renewable Energy
RER	Renewable Energy Rider
RESR	Regional electricity sector regulatory
SDGs	Sustainable Development Goals
SEU	Sustainable Energy Unit
SIDS	Small Island Developing States
T&D	Transmission and Distribution
VAT	Value Added Tax
VINLEC	St. Vincent Electricity Services Limited
VRE	Variable Renewable Energy

Background

Historical context: power sector reform

Traditionally, electricity utilities were established as statutory monopolies that were fully government-owned and operated. The market structures reflected the integration of generation, transmission, and distribution (GT&D), with the companies granted long-term exclusive licenses for operations and control of the sector. Over time, governments recognized that they could not provide the quantum of capital required to support operations and maintenance and to invest to meet growing demand in a timely manner. Also, as public sector entities in general, they became inefficient loss-making entities, accelerating the vicious downward spiral of poor capital investments, low reliability and customer satisfaction, leading to poor revenue performance. This was a key rationale for the electric sector reforms which begun in 1990s across the globe.

Following the experience in the telecommunications market, major economies started to liberalize power sectors in the 1990s. Governments used reforms to introduce privatization and private sector participation[1] while unbundling the integrated structures into separate generation, transmission, and distribution companies. Independent Power producers (IPPs) were introduced as another vehicle for providing investments in generation (through power purchase agreements). Autonomous utility regulators were established to regulate[2] the performance of private electric utilities (including their return on investments) in the context of balancing the interests of the government, consumers, and the electric utility company.

In general, the objectives of these reforms were to facilitate the injection of private capital and introduce competition to improve the technical and financial performance of the utilities, including customer satisfaction, while relieving governments of the burden of capital investment and other costs. The reforms often included changes to the primary legislation to allow for the removal of the exclusivity of the incumbent monopoly utility and the establishment of secondary legislations to establish rules and guidelines for IPPs, interconnection, pricing, and institutional arrangements (for example, the establishment of a regulator).

The World Bank and other multilateral development banks, under what was termed the 'Washington Consensus,' also promoted this model[3] globally to developing countries, including the Caribbean, with mixed results. Early experience, however, showed that total unbundling (separating the system into stand-alone generation, transmission, and distribution entities) of power systems in small markets (under 1,000MW) did not yield the benefits and may not be practical. This insight resulted in the World Bank subsequently recommending the single buyer-model for small markets[4]. This model separates generation from T&D[5] and allows for private sector competition for generation. In this context, it was considered that competition for the generation market was a more appropriate or practical approach than competition in the small market[6].

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[1] The experience was uneven and mixed across the globe however, especially in developing countries and small markets. For example, even today about half of the electric utilities in the Caribbean are government owned; some have even been privatized and reverted to government ownership revealing the challenges of implementation in small isolated markets.

[2] Focus is on economic regulation by promoting principles of independent regulator which include: independence, accountability, transparency and public participation, predictability, clarity of roles, clarity of rules, proportionality, etc.

[3] Reform model to promote economic efficiency through privatization and competition had the following features: liberalization/private sector participation; regulation, competition and re-structuring (not in any order)

[4] Robert Bacon, "Restructuring Power Sector: The Case of Small Markets", 1994. https://api.semanticscholar.org/CorpusID:150541400

[5] In the Caribbean 'unbundling' is generally understood as separation of generation from T&D.

Power sector reform critical for facilitating renewable energy development in the Caribbean

The need for power sector reforms has become even more urgent. Change is required to facilitate renewable energy[7] development, which is a critical option for improving energy security in energy-import-dependent countries (like most Caribbean countries) and to reduce carbon dioxide emissions to address climate change. It is also accepted that utility-scale RE projects would be deployed by the private sector under IPPs, with distributed generation projects being led by smaller developers utilizing a range of grid feed-in mechanisms. These options broaden the number of potential private sector market participants. In addition to assisting Caribbean countries in achieving the broad objectives of improving energy security and reducing carbon emissions, RE deployment offers policy-makers options to address multiple other objectives. These include the democratization of energy supply with greater participation of local private investors (with potential increased employment), addressing increased access to electricity, reduction of energy cost for consumers by their becoming prosumers, as well as the possibility of promoting technology and business model innovation.

Therefore, establishing the investment environment for private sector participation is now considered a necessity for scaling investment in renewable energy. In general, attracting private investment (local and foreign) in any country requires that important elements of the doing-business environment are in place. However, the electricity sector exhibits additional peculiarities and requires that additional specific and sometimes unique steps be taken in the area of sector governance. As one example, in many cases, primary legislation must be amended to remove exclusivity over generation by the incumbent utility and implementation of secondary legislation or regulations. It should be noted that the energy policy directions of the government, reforms of primary legislation, and establishment of relevant regulations and institutional arrangements are often referred to as the electricity sector 'regulatory framework.'

The overall conclusion, which may be derived from a recent World Bank study (Rethinking Power Sector Reform)[8] , which identified lessons from a review of electricity sector reforms globally over the past two and half decades, is that implementing electricity reform and establishing the investment environment is complex and difficult. In the case of Caribbean countries, this has resulted in long periods of slow progress in establishing appropriate regulatory frameworks. The authors noted that power sector reforms must take into consideration the "political and economic context of the host country," "should be driven and tailored towards desired policy outcomes," and that "alternative institutional pathways to achieving good power sector outcomes" are often employed by countries.

It is against the background of the difficult challenges experienced by Caribbean countries in pursuing and implementing appropriate regulatory frameworks, and also a recognition that innovative fit-for-purpose approaches need to be implemented, that this study was commissioned by the Caribbean Development Bank (CDB).

CDB's energy sector policy and strategy and electricity sector regulatory frameworks

As part of the process of reviewing and updating its Energy Sector Policy and Strategy (ESPS), the CDB in 2022, among other things, identified that despite ambitious renewable energy targets reflected in the national energy policies of its Borrowing Member Countries (BMCs) as well in their National Determined Contributions to climate change, the progress towards achievement of the targets was extremely slow. It was also identified that resilience features were not sufficiently catered for in the renewable energy investment projections. It was therefore concluded that based on their current renewable energy investment trajectories, most BMCs would miss their 2030 targets by wide margins unless very clear strategies are devised and implemented to scale up and speed up investment in renewable energy.

While several barriers to the scaling-up of renewable energy exist, the CDB's analyses suggest that weak electricity sector governance frameworks and, specifically, the absence of an appropriate regulatory framework represents the single biggest barrier standing in the way of rapid and scaled uptake of renewable energy across all BMCs. Among other things, this absence has reduced investor confidence, causing the market to perceive investment in renewable energy projects as highly risky.

The matter of the inadequacy of regulatory frameworks across BMCs has remained a recurring issue for more than two decades despite some of these BMCs making progress at reforms. This is because (as reflected in the aforementioned World Bank's global power sector reform review) establishing an appropriate electricity sector regulatory framework in small markets like those of BMCs is quite complex, requiring inter alia, many techno-economic elements to be addressed simultaneously, and a high level of coordination among these elements. Therefore, it is considered that existing weaknesses in the regulatory frameworks in many BMCs may emanate from one or a combination of deficits, including:

- Total absence or only partial presence of the key elements;
- Uncertainty about what constitutes key elements and which should be prioritized
- Inadequate coordination among key elements.
- Lack of clarity of roles of key actors and Inadequate coordination among actors/agencies which may be responsible for various elements.

CDB's Accelerated Sustainable Energy and Resilience Transition (ASERT) 2030 Framework

Given the slow progress of investment in renewable energy and the high likelihood that BMCs will miss their targets on the current investment trajectory, a key strategy that has been included in the CDB revised ESPS-2022 is an Accelerated Sustainable Energy and Resilience Transition (ASERT) 2030 framework [9] through which the Bank intends to encourage its BMCs to significantly increase the scale and pace of investment in renewable energy. ASERT-2030 focuses on transformative actions to unlock investments, including addressing binding energy sector constraints/barriers.

Against this background, CDB determined that addressing the regulatory framework in BMCs would be one of the priority areas to be addressed in the ASERT-2030 framework. To this end, a regional electricity sector regulatory (RESR) transformative initiative (referred to as ASERTive) would be developed to support countries to significantly change the situation and establish or strengthen the regulatory framework in each BMC. As a first step in developing the RESR ASERTive, a regional regulatory ASERT-2030 Dialogue was held in Barbados on February 28-March 1, with representatives from 11 BMC Governments, 12 regulatory bodies, the Organization of Caribbean Utility Regulators (OOCUR) and Caribbean Electric Utility Services Corporation (CARILEC) (representing the electric utilities) and 17 developing partners organizations, including the Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE) and the Caribbean Community (CARICOM) Secretariat.

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[6] As part of the ASERT-2030 Framework, the Bank seeks to identify (through structured consultations referred to as ASERT-2030 Dialogues) key barriers to rapid investments in RE and EE, and to develop/adopt relevant transformative initiatives (referred to as ASERTives), which can be implemented through strategic partnerships (referred to as Strategic ASERTive Partnerships) with BMCs, and regional and international Partners for mobilising the appropriate resources to facilitate the investments; while building on existing and ongoing initiatives/efforts at national and regional levels.
[7] More broadly, sustainable energy; however for this study the focus will be placed onrenewable energy; therefore this study will not focus on demand-side measures, and energy efficiency which in general will be encouraged under separate strategies as a first and necessary step before embarking on renewable energy investments. This would also be reflected in IRRPs.

A key outcome of this quite robust and broad-based consultation was a consensus recommendation for establishing the minimum regulatory function (MRF), which would capture the essential ingredients of a regulatory framework necessary for establishing investor confidence and encouraging private investment in renewable energy across any BMC. It was also recognized that the implementation of this MRF needs to be flexible, taking the specific context of the particular BMC into consideration. In this way, the implementation of the MRF would benefit from the lessons identified in the World Bank's global power sector reform review: that approaches should accommodate the political and economic context of the host country", and "should be driven and tailored towards desired policy outcomes" in its application, recognizing the importance of, "alternative institutional pathways to achieving good power sector outcomes."

A key objective of this study is to develop and articulate pathways for implementing the MRF. Inter alia, it is intended that as a next step, the MRF will be used as a benchmark for assessing deficits in the regulatory framework in BMCs. The outputs of this will be used to develop the comprehensive programme (RESR ASERTive) to reform and strengthen regulatory frameworks across BMCs. The final step will be a coordinated funding programme in the context of a CDB-led Strategic ASERT Partnership to implement the measures to bridge the gaps.

[8] ESMAP. "Rethinking Power Sector Reform," 2019. https://www.esmap.org/rethinking_power_sector_reform

[9] As part of the ASERT-2030 Framework, the Bank seeks to identify (through structured consultations referred to as ASERT-2030 Dialogues) key barriers to rapid investments in renewable energy and energy efficiency, and to develop/adopt relevant transformative initiatives (referred to as ASERTives), which can be implemented through strategic partnerships (referred to as Strategic ASERTive Partnerships) with BMCs, and regional and international Partners for mobilising the appropriate resources to facilitate the investments; while building on existing and ongoing initiatives/efforts at national and regional levels.

Executive Summary

The current state of renewable energy in the Caribbean has not met expectations, with most Borrowing Member Countries (BMCs) currently not on track to meet their renewable energy targets despite the low cost of renewable energy compared to conventional sources.

It is considered that one of the biggest barriers to developing renewable energy projects in the BMCs is the absence of certain features, lack of clarity as related to to aspects of their regulatory frameworks. This situation has served to reduce investor confidence, making them perceive investment in renewable energy projects as highly risky. To address this, the concept of a a minimum regulatory function (MRF), is proposed by CDB to serve as a threshold set of conditions deemed necessary for renewable energy investor confidence. The MRF includes the following components:

- **Integrated resource and resilience plans,** which define which resources need to be retired and which need to be added to the grid. The term "integrated" is used to communicate that both supply-side and demand-side options are considered, while the term "resource" is used rather than "generation" to indicate that energy storage and demand-side management are considered together with generation. In addition, the resilience dimension is critical to ensure that hazards and vulnerabilities of the energy systems are assessed and considered in both designing and locating (siting) the infrastructure.
- **Procurement and financing mechanisms for renewable energy,** which allow utility-scale projects defined under an IRRP to be selected, solicited, contracted, financed, and developed.
- **Mechanisms to access site and resource, and clear and non-onerous environmental permitting processes,** which would give utility-scale project developers clarity and predictability about how they can secure the rights to the resource, the site for a project, environmental permits, and the right to connect to the grid.
- **Cost-reflective tariffs,** which fully cover the cost of providing electricity services to customers, including a reasonable return on capital, and create efficient systems by signaling to consumers when they should become prosumers and provide elements of energy services themselves and when they should restrain their demand because when they use energy in a way that has a higher cost than benefit.
- **Creditworthy utilities,** which are necessary as financiers, will only lend to a utility if they are confident of repayment.
- **Frameworks for distributed generation (DG)**, which comprise the rules and regulations surrounding a small renewable or co-generation plant that supplies energy to the grid at the distribution level.

Implementing all the components of the MRF is highly likely to help BMCs increase investor confidence and increase renewable energy penetration. Many BMCs have some of these components present, though not all. Despite this partial progress, renewable energy penetration across the region remains low.

This report describes the MRF components in more detail, provides case studies to show how each component has already been implemented, and lists the tasks required to implement the MRF in BMCs.

CARIBBEAN DEVELOPMENT BANK

1 | Introduction

Caribbean countries are pursuing renewable energy development as part of the global energy transition and de-carbonization thrusts, as well as to address multiple development objectives. The latter includes:

(i) to increase their energy security and independence by displacing their over-reliance on imported fossil fuel, which inter alia, leaves them vulnerable to oil and gas markets vagaries and stresses their foreign exchange reserves;
(ii) to achieve their Nationally Determined Contributions to global carbon dioxide emissions as part of the Paris Climate change Agreement;
(iii) to achieve energy-related Sustainable Development Goals (SDGs); and
(iv) to improve their resilience in response to climate-related natural disasters.

Achieving these inter-linked objectives is critical to the achievement of a range of SDGs and to allow the Caribbean Small Island Developing States (SIDS) to lead by example as they advocate for global actions to fight climate change, which remains an existential issue for them.

The current state of renewable energy in the Caribbean has not met expectations. Virtually all Borrowing Member Countries[10] (BMCs) of the Caribbean Development Bank (CDB) are not currently on track to meet their renewable energy targets despite the low cost of renewable energy compared to conventional sources.

Against this background, CDB has established an Accelerated Sustainable Energy and Resilience (ASERT) 2030 framework[11] as a key part of the Bank's Energy Sector Policy and Strategy to encourage its BMCs to significantly increase the scale and pace of investment in renewable energy. ASERT-2030 focuses on transformative actions to unlock investments, including actions to address binding energy sector constraints/ barriers.

While several barriers to scaling renewable energy[12] exist, the CDB has indicated that, based on its analyses, the absence of an appropriate electricity sector governance framework and, specifically, suitable regulatory frameworks represents the single biggest barrier to rapid change and uptake of renewable energy in the region. Among other things, this absence has reduced investor confidence, making them perceive investment in renewable energy projects as highly risky. .

For more than two decades, the inadequacy of regulatory frameworks across CDB BMCs has remained a recurring issue despite many of these BMCs making some progress at reforms. This is so because establishing an electricity sector regulatory framework that is appropriate for a particular BMC is quite complex, requiring inter alia, many techno-economic elements to be addressed simultaneously and a high level of coordination among these elements. Therefore, it is considered that weaknesses in the regulatory frameworks in many BMCs may emanate from one or a combination of deficits, including:

- Total absence of, or only partial presence of the key elements;
- Inadequate development and implementation of key elements in a manner appropriate for the country; or
- Inadequate coordination among key elements.

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[10] CDB BMCs are: Anguilla, Antigua and Barbuda, Bahamas, Barbados, Belize, British Virgin Islands, Cayman Islands, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, and Turks and Caicos Islands

[11] As part of the ASERT-2030 Framework, the Bank seeks to identify (through structured consultations referred to as ASERT Dialogues) key barriers to rapid investments in renewable energy and energy efficiency, and to develop/adopt relevant transformative initiatives (referred to as ASERTives), which can be implemented through strategic partnerships (referred to as Strategic ASERTive Partnerships) with BMCs, and regional and international Partners for mobilising the appropriate resources to facilitate the investments; while building on existing and ongoing initiatives/efforts at national and regional levels

[12] More broadly this relates to sustainable energy, however, the focus of this study is on renewable energy . It is also accepted that as a precursor to renewable energy investment the relevant energy efficiency interventions must be prioritized.

CDB considers that an essential step necessary to address this persistent issue of inadequate regulatory frameworks is to identify and implement for the electricity sector, a set of critical elements to address deficits and establish investor confidence. This will then enable the development of a comprehensive regulatory strengthening and reform programme for CDB and other development partners to systematically provide funding and technical assistance to BMCs to implement to close the gaps. This set of critical elements or components must be based on a good understanding of the small electricity markets in SIDS' contexts and observations of what has worked well in these countries.

Together, these elements comprise the proposed MRF which is described and discussed in this report.

This report is organized as follows:

- Section 2 describes the status of renewable energy generation in BMCs and the benefits and costs of investing in renewable energy and resilience.
- Section 3 describes the MRF and its components and provides case studies showing where these components have been executed.
- Section 4 describes how countries can identify gaps based on the components of the MRF and the options to fill those gaps.

2 | Status and potential of renewable energy in Borrowing Member Countries

Progress in renewable energy penetration in BMCs has not met expectations despite the vast potential and benefits that could be harnessed through its development.

- BMCs' renewable energy penetration remains strikingly low, presenting a significant opportunity for growth and transformation.
- The clear benefits of embracing renewable energy, such as cost savings from reduced generation costs and increased resilience, enhanced energy security, and reductions in greenhouse gas (GHG) emissions, show how much the region can gain from increasing its renewable energy penetration.
- Section 2.1 describes BMCs' current progress toward renewable energy, while Section 2.2 describes the benefits that could be achieved by increasing renewable energy penetration.

2.1 Current status of renewable energy in BMCs

BMCs currently have more than 740 megawatts (MW) of renewable energy installed, accounting for approximately 12 percent of total installed capacity (over 6,020MW).[14,15,16]

BMCs set renewable energy targets in terms of generation. The average renewable energy generation target for all BMCs is 65 percent. Total installed renewable energy capacity has reached 12 percent, while renewable energy generation as a percentage of total generation is much lower. Across BMCs, limited progress has been made to achieve targets, and most BMCs appear offtrack. Figure 2.1 shows BMCs' progress against their targets.

Hydropower is the dominant source of renewable energy in the countries that have made the most progress toward renewable energy generation targets. Most of these hydropower projects began operations decades ago, and these countries have yet to take full advantage of the low cost of solar and wind power, which are ubiquitous renewable energy resources. The four countries with the highest percentage of renewable energy generation have achieved this mainly through hydropower, including:

- Belize (37 percent renewable energy generation)[17], which has 68 percent of its renewable generation capacity from hydropower.[18] The country has three hydropower plants (Mollejon, Chalillo, and Vaca), with the most recent plant (Vaca) built in 2010[19].
- Dominica (25 percent renewable energy generation)[20], which has 92 percent of its renewable generation capacity from hydropower.[21] The country has not made recent progress towards renewable energy generation, with its three hydroelectric plants (Laudat, Trafalgar, and Padu) operational since 1990[22].

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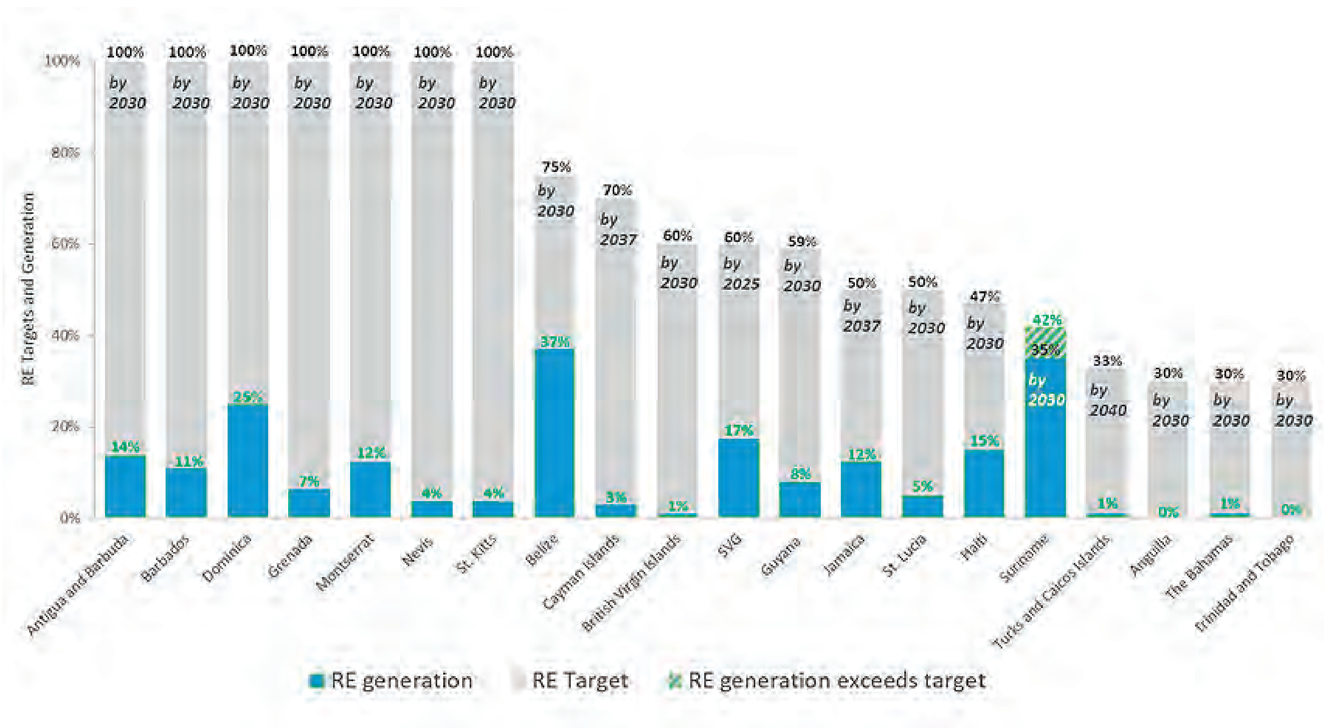
[14] CCREEE. "Energy Report Cards," 2021. https://www.ccreee.org/erc/
[15] Department of Energy. "Energy Transitions Initiative. Energy Snapshots," 2020. https://www.energy.gov/eere/island-energy-snapshots
[16] Castalia's Renewable Energy Islands Index
[17] Belize has 4.4MW of solar, 21.5MW of biomass, and 54.5MW of hydropower capacity installed. The country has 42MW of solar potential and 30MW of wind potential. CCREEE. "Energy Report Cards, Belize," 2021. https://www.ccreee.org/erc/
[18] Government of Belize Press Office. "Minister Ferguson Visits Chalillo Dam," 2021. https://www.pressoffice.gov.bz/minister-ferguson-visits-chalillo-dam/
[19] Fortis. "Belize Operations." https://www.fortisbelize.com/operations
[20] Dominica has 0.042MW of solar and 6.64MW of hydropower capacity installed. Dominica has 45MW of solar potential and 30MW of wind potential, and 1390MW of geothermal potential. CCREEE. "Energy Report Cards, Dominica," 2021. https://www.ccreee.org/erc/
[21] IRENA. "Dominica". https://www.irena.org/-/media/Files/IRENA/Agency/Statistics/Statistical_Profiles/Central%20America%20and%20the%20Caribbean/Dominica_Central%20America%20and%20the%20Caribbean_RE_SP.pdf
[22] DOMLEC. "Our History." https://www.domlec.dm/history/#:~:text=The%20company%20operates%20three%20run,and%20are%20unmanned%20by%20operators.

- St. Vincent and the Grenadines (17 percent renewable energy generation),[22] where hydropower accounts for 85 percent of the renewable installed capacity. The newest hydroelectric plant in the country began operations in 1987[23].
- Suriname (42 percent renewable energy generation),[24] which owes almost all its renewable energy generation capacity to the 189MW Afobaka hydropower plant, which began operations in 1965[25].

Even countries that have established some regulations to promote investment in renewable energy are far behind the renewable energy generation targets. Barbados has achieved 11 percent of renewable energy generation against a 100 percent target by 2030 despite developing and implementing renewable energy regulations and a DG framework. Jamaica was one of the first countries in the region to implement a competitive procurement framework for Independent Power Producers (IPPs).

It also has a clear environmental permitting system and an online land registry. Still, it has achieved only 12 percent renewable energy generation against a 50 percent target by 2037. The Cayman Islands have implemented a procurement framework for renewable energy IPPs and utility-scale battery storage yet have delivered only 3 percent of renewable energy generation against a 70 percent target.

Figure 2.1
BMCs progress against renewable generation targets



Source: *Castalia's Renewable Energy Islands Index*

[22]St. Vincent and the Grenadines has 3.68MW of solar and 5.71MW of hydropower capacity installed. The country also has 23MW of solar potential, 10MW of hydropower potential, 890MW of geothermal potential, 8MW of wind potential, and 4MW of biomass potential. CCREEE. "Energy Report Cards, St. Vincent and the Grenadines," 2021. https://www.ccreee.org/erc/
[23] VINLEC. "Our History." https://www.vinlec.com/contents/our-history
[24] Suriname has 7.9MW of solar, 1MW of battery storage, and 189MW of hydropower capacity installed. CCREEE. "Energy Report Cards, Suriname," 2021. https://www.ccreee.org/erc/
[25] The New York Times. "Dam In Surinam Near Completion; Project Being Developed by an Alcoa Subsidiary," 1964. https://www.nytimes.com/1964/12/25/archives/dam-in-surinam-near-completion-project-being-developed-by-an-alcoa.html

2.2 Benefits of implementing renewable energy projects

The benefits of renewable energy projects are clear and well understood, including cost savings, increased energy security, and reduced GHG emissions. In the Caribbean, the benefits BMCs can realize from renewable energy often exceed what countries with more diversified energy profiles can achieve on a per MW basis because of the region's heavy reliance on imported fossil fuels for generation, all else equal.

In dollar terms, it is estimated that CDB's BMCs could achieve more than US$2.5 billion[26] in present value terms, in fuel cost savings benefits, from reduced generation costs over the years 2022 to 2030 if they were to invest in renewable energy generation capacity to meet their targets in a timely manner. BMCs could, over the years to 2030, reduce CO2 emissions by more than 26 percent and reduce fuel imports by more than 100 million barrels[27], reducing exposure to fuel price volatility.

The projected increase in renewable energy can be achieved mainly through investments in variable renewable generation sources like wind and solar and grid stability investments like battery storage, as well as in firm capacity renewable energy technologies such as geothermal, biomass, and hydro.

More than US$12 billion in investment[28] will be needed by 2030 to install the renewable energy capacities to meet targets (when also accounting for the investments necessary for increased resilience of the generating systems as well as for critical T&D infrastructure to facilitate the new renewable generation capacities). Achieving a greater percentage of renewable energy would provide even higher net benefits to the region. Subsidies in the form of concessional funding will be necessary to address especially the additional costs arising from resilience building in the generation and T&D infrastructure, in the form of below-market-rate loans or viability gap funding.

[26] Source: : CDB's estimates
[27] Source: : CDB's estimates

3 | The Minimum Regulatory Function

As described earlier, the region has fallen short of its renewable energy development targets and as a result, has not been able to timely capture the significant available benefits of renewable energy. In order to achieve these benefits, change is needed to create an environment which reflects increased investor's confidence for renewable energy investments. This requires, among other things, significant changes in the electricity sector regulatory environment in BMCs, which, CDB's analysis[29] has identified as having the potential of yielding the single biggest impact for increasing investments in renewable energy.

The process of establishing an appropriate regulatory framework for each BMCs is complex, often with multiple actors at the national levels, and is characterized by uncertainty about what constitutes the right mix of measures to be implemented, or prioritized. The result is often inaction, or slow actions, or the adoption of a piece-meal approach to implementation, while potential investors remain generally unenchanted. *The concept*[30] *of an MRF has been identified and proposed by CDB (through a robust regional consultative process) as a tool to help simplify the complex, multi-actor context and to assist countries to address the challenge of uncertainty in relation to the right mix of regulatory measures to pursue. It is presented as a set of critical ingredients which, if fully present in a BMC, will constitute the minimum conditions or framework which can give private renewable energy investors sufficient confidence to invest.*

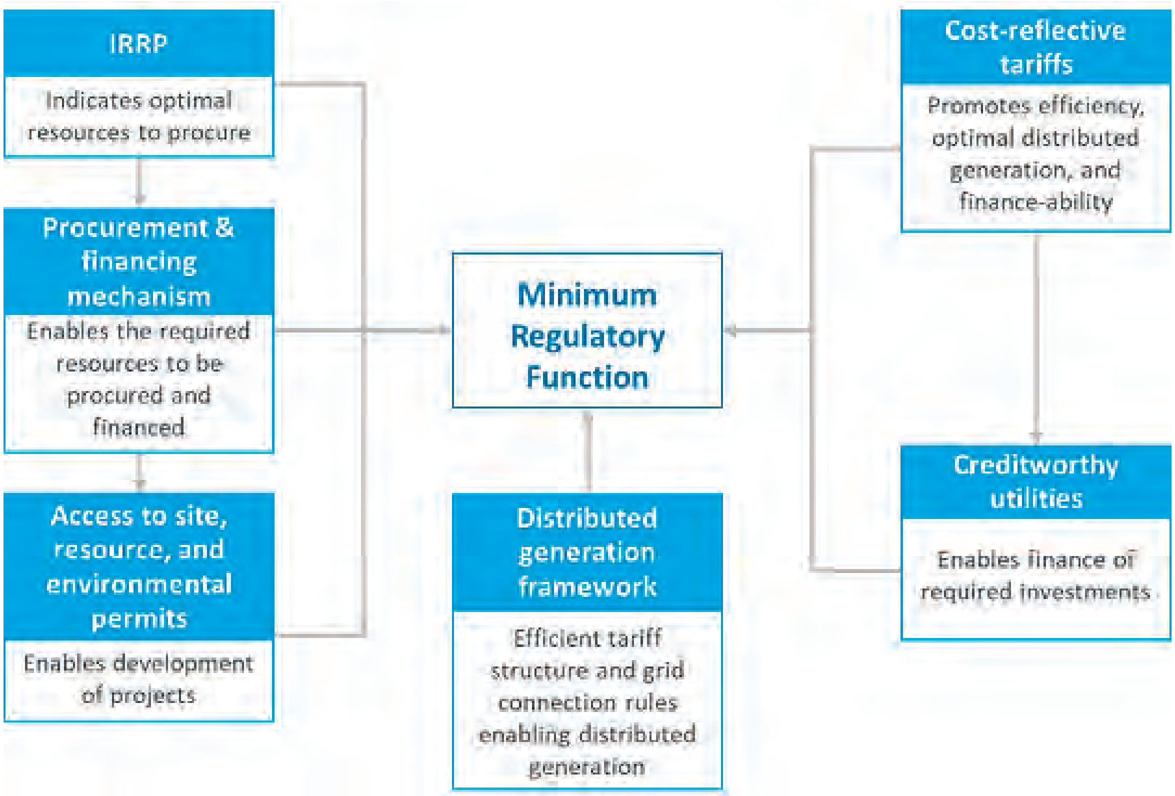
It is intended that the MRF will be applied as a benchmark in reviewing the situation in each BMC, thereby serving as a diagnostic instrument to identify deficiencies and gaps to facilitate subsequent targeted and coordinated interventions. These can then be pursued to assist BMCs to improve their regulatory frameworks to be more investment enabling.

The MRF covers the aspects necessary to enable the development of proven and commercial renewable energy technologies, such as renewable generation, storage, and demand-side response. Developing these technologies may also result in the use of more complex technologies such as smart grids, vehicle-to-grid systems, and virtual power plants. However, the MRF is not designed to focus on these more complex technologies, as these are "nice to have" but not essential for BMCs to significantly increase their share of renewable energy penetration.

The MRF consists of six complementary regulatory components needed to enable large-scale deployment of renewable energy in BMCs. The components support grid-scale and smaller distributed renewable energy development. Figure 3.1 illustrates the six components and describes each component's purpose.

[29] Source: CDB's estimates
[30] Based on experience in the Caribbean, and scan of global best practices for effective regulatory frameworks in developing country contexts.

Figure 3.1
The components of the MRF



Implementing the MRF will help BMCs eliminate barriers to investment and provide clarity to investors, send appropriate price signals to consumers, and enable investment in the region's renewable energy sector. It is intended that BMCs will use the MRF to identify regulatory gaps easily and fill them quickly. While the components are not one-size-fits-all, they can be easily adapted to fit each country's context. The components of the MRF have been selected based on aspects that have been effective in the Caribbean and global best practices.

The remainder of this section describes the six components of the MRF in more detail and provides case studies of BMC countries that have implemented one or a few of the MRF components. Each case study ends with a summary of key lessons learned. The case studies are followed by references to key international examples of jurisdictions where these components were implemented.

3.1 Integrated resource and resilience planning

An integrated resource and resilience plan (IRRP) defines which resources need to be retired and which need to be added to the grid. The term "integrated" is used to communicate that both supply-side and demand-side options are considered, while the term "resource" is used rather than "generation" to indicate that energy storage and demand-side management are considered together with generation. It is considered that for the Caribbean, resilience is a necessary dimension of all planning frameworks for sustainability. The integrated resource and resilience planning approach enables planners to select optimal paths to achieve targeted levels of reliability, renewable energy, and emissions reductions while considering both costs and environmental benefits. IRRPs incorporate resilience so that the power systems can resist or rapidly recover from extreme weather events like hurricanes and handle significant changes in demand, such as those seen during the COVID-19 pandemic.

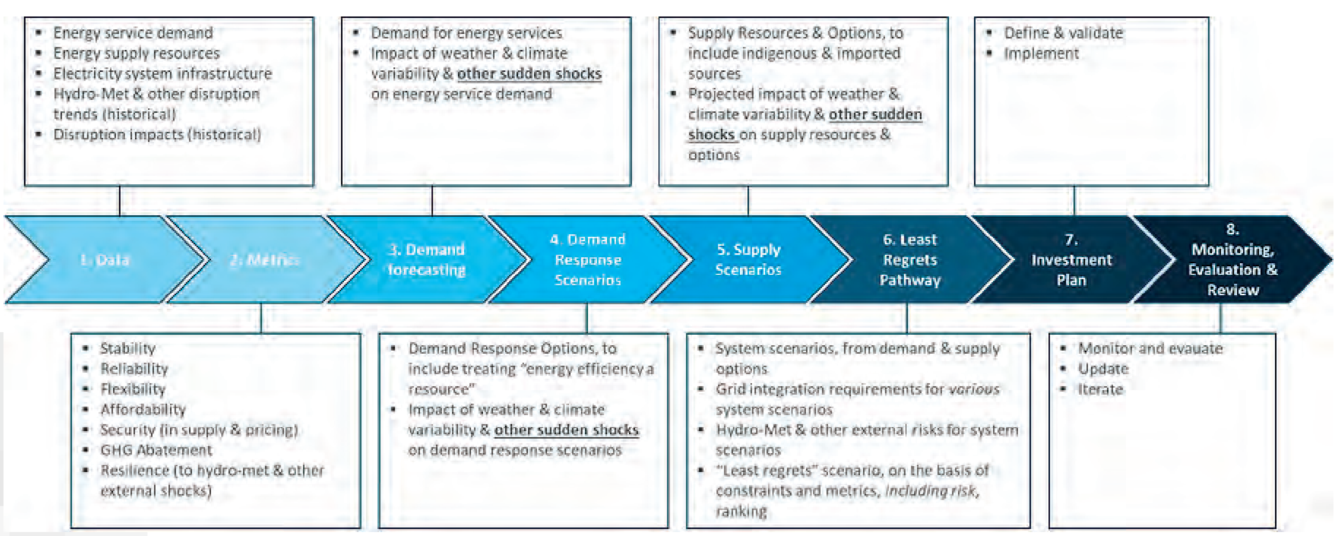
Countries in the Caribbean region are struggling to obtain the right mix of technical and financing support that can result in profitable, longer-term projects that are based on firm renewable sources, such as geothermal and hydropower. Countries should also be able to integrate cost-effective, shorter-term variable renewable energy supplies (as a means of reducing fossil fuel dependence) within their small markets. Countries are also struggling to understand and plan the evolution of the traditional electricity grid into a more diversified, flexible, and resilient distributed model.

Accordingly, many countries turned to Integrated Resource and Resilience Planning, which takes a holistic approach to meeting system needs and identifying the infrastructure and capital needed to support energy efficiency and grid-scale resource development. In particular, IRRPs are tasked with capturing the emergence of distributed energy resources, such as electric vehicles, variable renewable generation, and storage. These constitute a disruptive future energy system that seeks to accommodate the two-way flow of electricity and services between the customer and the electric system and elevates the importance of distribution system investments.

The CARICOM region established a programme to support countries in developing IRRPs . IRRPs are expected to provide the utility, independent power producers, and other key sector operatives with better intelligence to improve flexibility and allow them to accommodate a range of future uncertainties more effectively. IRRPs aim to allow systems to adapt more seamlessly to variabilities arising from weather, climate, and epidemiological events.

Figure 3.2

Provides an overview of the IRRP process.



Source: *Adapted from the Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE)*

Figure 3.2 provides an overview of the IRRP process. Without a well-structured, consultative, and transparent process, BMCs risk developing an incomplete and unrealistic IRRP and not completing it on time. To minimize this risk, key roles must be defined early in the process [31], including who will:

- Make decisions;
- Perform the technical forecasting and planning study; and
- Be consulted, though they may not be involved in day-to-day planning and development.

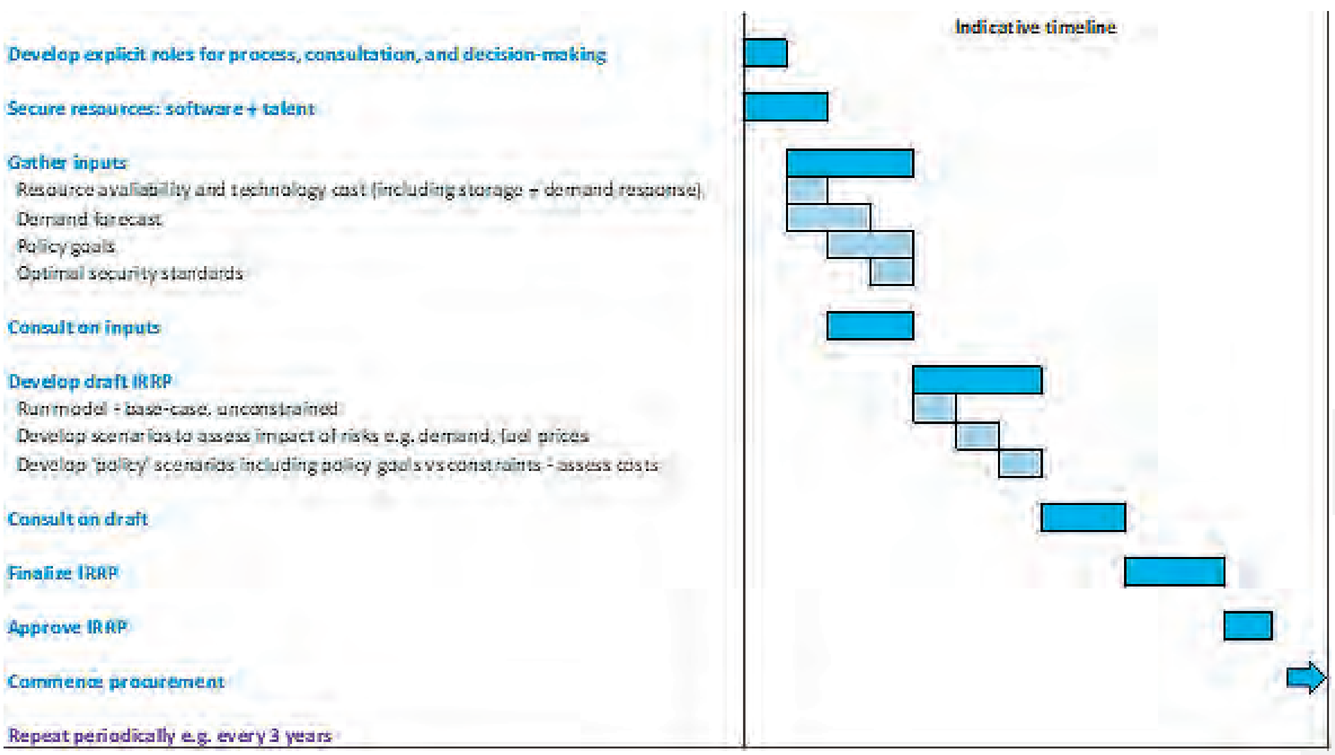
The team should consult with various stakeholders. They should consult with power project developers while gathering inputs to understand which resources are feasible and their costs. They should also consult with policymakers to understand the policy goals such as emissions reductions and security of supply. Once the team has developed a draft IRRP, it should release the draft to the public for comments to increase transparency and get buy-in from all stakeholders. At the start of the IRRP development, this consultation process should be communicated clearly to stakeholders.

Figure 3.3 shows an indicative work plan for the development of an IRRP. The process generally takes 12 to 24 months. Timelines can vary across countries based on factors such as ease of collecting data and the level of stakeholder engagement required.

Transmission and distribution plans form an essential part of an overall electricity supply plan, and should be included as part of the IRRP development. In some cases, however this is developed separately. In such cases, transmission and distribution expansion planning should be carried out in parallel or in tandem with the development of IRRP. This, as transmission and distribution expansion planning ensures that the necessary infrastructure is in place to connect renewable energy sites to load centers, reducing constraints and enabling efficient renewable energy transport to consumers.

Figure 3.3

shows an indicative work plan for the development of an IRRP. The process generally takes 12 to 24 months. Timelines can vary across countries based on factors such as ease of collecting data and the level of stakeholder engagement required.



[31] The project management tool referred to as the RASCI matrix could be applied here to ensure robust responsibility/roles assignment: RASCI is abbreviation for Responsible, Accountable, Support, Consulted, and Informed.

[32] Based on experience, it is considered useful that the entity with responsibility for planning in the country should release the draft. The draft should be agreed upon by the key stakeholders involved in the process, namely the utility, regulator and the Ministry with electricity portfolio.

3.1.1 Case study: Jamaica's Integrated Resource Plan

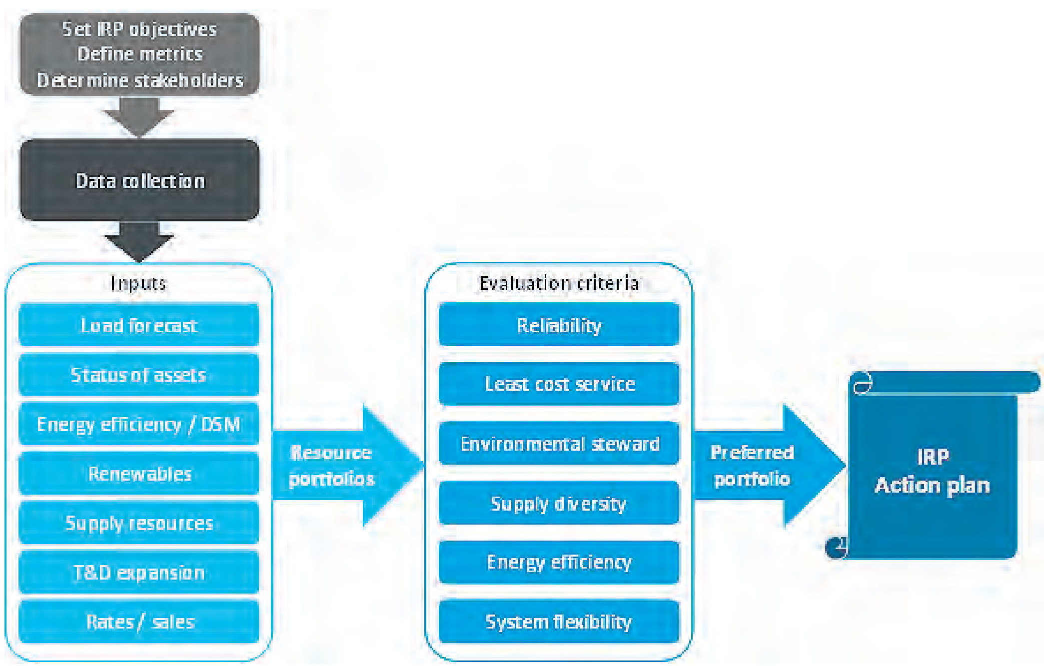
Jamaica provides an example of an IRRP development process with both aspects to replicate and areas for improvement. The 2020 publication of the Jamaica's Integrated Resource Plans (IRP) did not include a resilience component [33]. Except for this aspect, the development process essentially followed the same as that of an IRRP.

Jamaica's Office of Utilities Regulation (OUR)[34] started developing Least-Cost Expansion Plans (which have the same purpose as IRPs) after the government re-privatized the utility Jamaica Public Service Company Limited (JPS) in 2001. Like IRPs, these plans determined the amount and type of generation capacity to procure, which the OUR used to structure competitive tenders.

The Electricity Act 2015 ('the Act') transferred the planning responsibility from the OUR to the Ministry of Science, Energy, Telecommunications, and Transport[35] ('MSETT'). The Act defines integrated resource planning as "[planning] by the use of any standard, regulation, practice, or policy to undertake a systematic comparison between demand side management measures and the supply of electricity by an electricity generator to minimize the cost of adequate and reliable services to electricity consumers, taking into account necessary features for system operation such as diversity, reliability, despatchability, and other factors of risk; and treating demand and supply to electricity consumers on a consistent and integrated basis[36]."

MSETT started developing an IRP in 2017, the first since the enactment of the Act. MSETT aimed to publish it in 2018. The IRP was to define the preferred portfolio of electricity generation resources over the period 2018 – 2038. MSETT established and implemented the process illustrated in Figure 3.4 to develop the IRP[37].

Figure 3.4
IRP development process



Source: *Castalia based on MSETT*[35]

[33] Government of Jamaica proposed to strengthen the IRP to ensure the resilience dimension as catered for.
[34] The OUR had received the responsibility for developing IRPs in 2007 following an agreement between the Government of Jamaica and Marubeni Corporation, one of the majority shareholders of JPS. Source: OUR, 2010. "Generation Expansion Plan 2010." p.9. https://our.org.jm/wp-content/uploads/2021/04/generation_expansion_plan_2010_0.pdf
[35] At the time, this ministry was named the Ministry of Science, Energy, and Technology. The ministry was renamed in 2023.
[36] Government of Jamaica. The Electricity Act, 2015, section 2, page 4.
[37] MSETT. "Integrated Resource Plan A 20 Year Roadmap to Sustain and Enable Jamaica's Electricity Future," 2020. https://www.mset.gov.jm/wp-content/uploads/2020/03/2018-Jamaica-Integrated-Resource-Feb-21-2020.pdf

MSETT began the process by setting goals (e.g., 50 percent of electricity generation from renewable sources by 2030) and defining metrics for each goal. Then, MSETT collected and reviewed data. Based on the data, MSETT developed a model to forecast and compare the impacts of different scenarios. The model included demand forecasts and sensitivities (for example, on fuel prices) and assumptions on "potential capacity expansion" resources (for example, capital costs, fixed operating and maintenance costs, and variable costs of such resources). MSETT then evaluated each scenario according to the goals and metrics, assigning a weight to each goal according to policy objectives, running the scenarios unconstrained, and then comparing costs across various levels of renewable energy generation. MSETT identified the preferred investment portfolio for electricity generation based on that evaluation. MSETT then conducted a transmission analysis to determine the least-cost transmission plan. MSETT developed the IRP document and an action plan based on all the previous work.

MSETT hired consultants with funding from the Inter-American Development Bank (IDB), which had identified limited technical expertise, knowledge, and information and communications technology capacity within MSETT to implement and update the IRP.[39] The IDB funding paid for the following:

- A study to identify the most appropriate software required to implement and update the IRP;
- The purchase and installation of the software; and
- Training, coaching, and technical studies to support the implementation of the IRP.[40]

Despite IDB support, MSETT faced challenges keeping a key consultant involved throughout the assignment. The process dragged on, and the finalization of the IRP was delayed until 2020. However, MSETT was unsatisfied with the IRP, and as the COVID-19 pandemic intervened, MSETT never finalized it.

These delays have had consequences, such as JPS being unable to comply with its license requirements. JPS's license states that MSETT should publish the IRP at least 15 months before the rate review filling and that JPS's 5-year business plan shall incorporate the most recent IRP. JPS was supposed to use the IRP to inform its 2019 – 2024 business plan and form the basis for the 2019 – 2024 rate review process. However, the final IRP was not published when JPS had to prepare these documents. JPS had to proceed with the filling without the IRP and made adjustments in a subsequent extraordinary filling. Its business plan excluded projects and costs associated with the planning decisions to be informed by the IRP.[41] Delays may also limit the ability of IPPs to plan their investments.

In 2022, MSETT started redoing the IRP under the name IRP-2. IRP-2 reflects changes since 2020, notably the significantly lower demand due to the COVID-19 pandemic. MSETT has followed the same development process as for the IRP-2, using updated information.[42] It is expected to be approved in the second half of 2023.

MSETT has had effective consultations to develop the IRPs, but these consultations included a limited number of stakeholders. MSETT mostly consulted with the OUR and JPS and did not publish the draft IRP-2 for the public or organize broader consultations. For example, as of April 2023, some IPPs had still not seen the draft IRP-2 and were unaware of the technologies considered in it.[43] Others raised concerns that MSETT did not develop IRP-2 in coordination with other key electricity sector documents, such as the Electricity Act amendments and the updated National Energy Policy.[44]

Table 3.1 below summarizes the main lessons learned in this case study.

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[38] MSETT, op. cit.
[39] IDB. "Board of Executive Directors. Short Procedure. Expires on 13 October 2017," 2017. Page 4. https://www.gtai.de/resource/blob/40606/605e8622725a548566a2299ecd3a4bfc/pro201711085008-data.pdf
[40] IDB. "Jamaica, Energy Management and Efficiency Programme (JA-L1056), Loan Proposal," 2016. Page 10.
[41] JPS. "JPS 5 Year Business Plan 2019 – 2024," 2020. https://s26303.pcdn.co/wp-content/uploads/2020/01/JPS-5-Year-Business-Plan-Public-Version.pdf
[42] Confidential communication to Castalia
[43] Stakeholder consultations for the development of Jamaica's updated National Energy Policy, April 2023
[44] Stakeholder consultations for the development of Jamaica's updated National Energy Policy, April 2023

Table 3.1
Strengths, weaknesses, and opportunities for improvement

Strengths	MSETT: - Followed a robust planning approach; - Used realistic inputs; - Set realistic goals; and - Conducted effective consultations with stakeholders.
Weaknesses	- There were long delays in the IRP development process due to changes in personnel and resource constraints.
Opportunities for improvement	MSETT could implement a broader, better-structured consultation process by: - Consulting stakeholders on inputs rather than only a full draft stage; and - Publishing the draft IRP so that the general public may review and comment on it.

Table 3.10 describes selected international examples of jurisdictions that have developed IRRPs.

Table 3.2:
Key references: IRRPs

Reference	Description
IESO, "About Regional Planning. How the Process Works"	The state of Ontario (Canada) provides an example of a clear and well-defined IRRP process development. The reference provides an overview of the process, including the prior work done by the IESO to determine if an IRRP is needed and stakeholder engagement.
Xcel Energy, "Our Energy Future: Destination 2030. 2021 Electric Resource Plan and Clean Energy Plan", 2021	The state of Colorado (USA) provides an example of a clear and well-defined IRRP process development that integrates renewable energy and emissions reduction targets. The reference is the state's latest IRRP, which describes in detail the legal and regulatory basis for the IRRP, the planning framework, the resource need assessment, the portfolio development and selection process, the transmission planning, a resource acquisition plan, a workforce transition plan, a community assistance plan, and the stakeholder engagement process.

3.2 Procurement and financing mechanism

A procurement and financing mechanism allows utility-scale projects defined under an IRRP to be selected, solicited, contracted, financed, and developed. Such a mechanism includes:

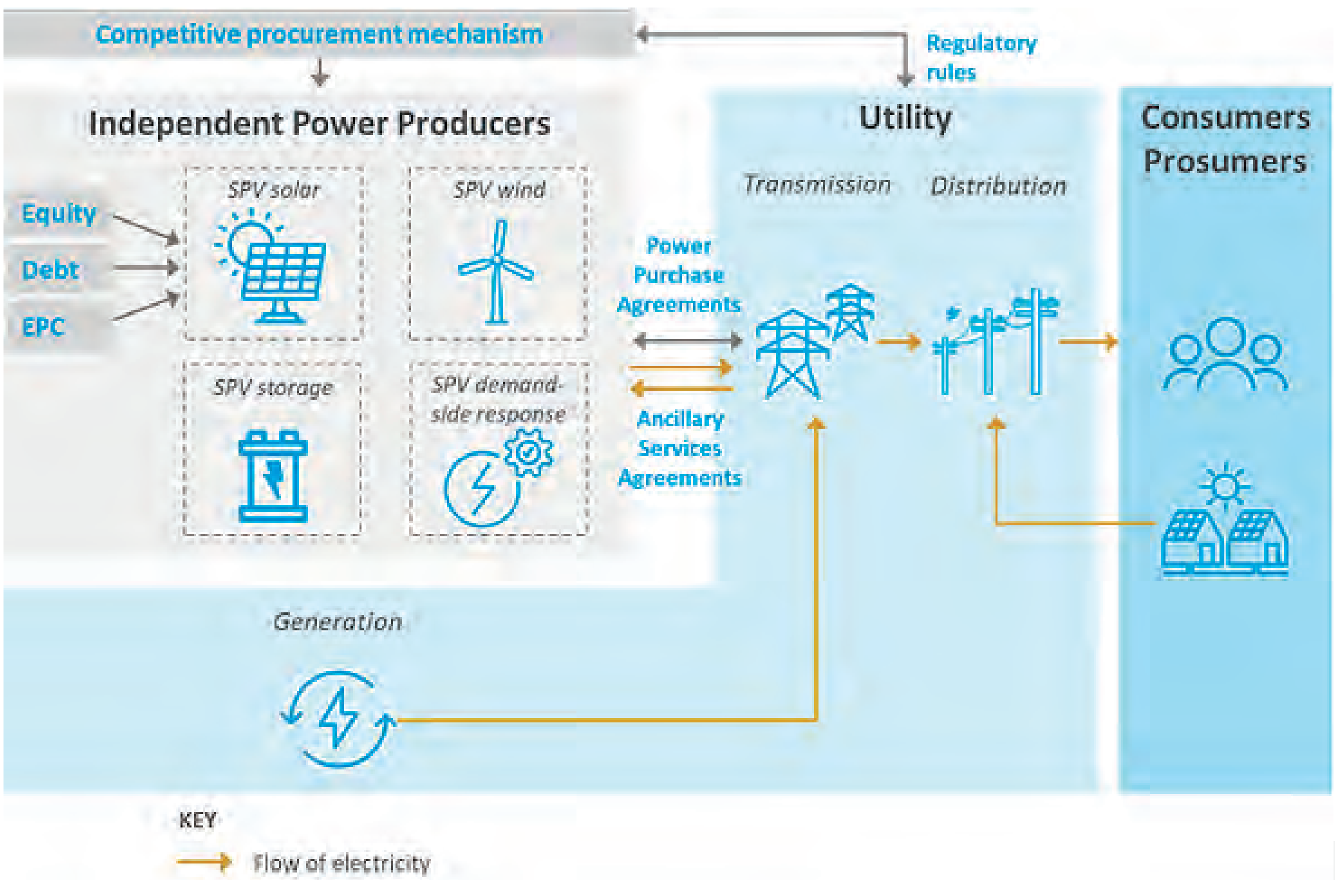
- An entity that decides when procurement should proceed and carries out the procurement, such as the regulator, utility, or special procurement entity;
- The use of competitive tenders to deliver the best value for customers;
- A source of financing, either private or public; and
- A developer, such as a private party or the utility itself.

The procurement and financing mechanism establishes a clear process and stakeholder responsibilities to develop the resources identified in the IRRP. The model should allow for the procurement of both generation and energy storage resources.

The main models of procurement and financing mechanisms center on IPPs and vertically integrated utilities, described as:

- **Model A** which uses competitive tenders for utility-scale projects that are owned and operated by IPPs that supply energy or capacity to the utility under Power Purchase Agreements (PPAs), where investments in transmission or grid resilience are largely financed by the utility. This model contributes to efficient development by reducing generation costs, which contribute to approximately 44 percent of the total cost of power.[45,46] Figure 3.5 shows the project structures for Model A.
- In **Model B**, projects are owned and operated by a utility. In this case, a utility owns all levels of the power supply chain. Engineering, Procurement, and Construction (EPC) contracts are used to develop resources. All investment goes onto the utility's balance sheet and is rate-based to allow a return on investment. This model avoids the transaction costs of project finance and IPP tenders. Figure 3.6 shows the project structures for Model B.

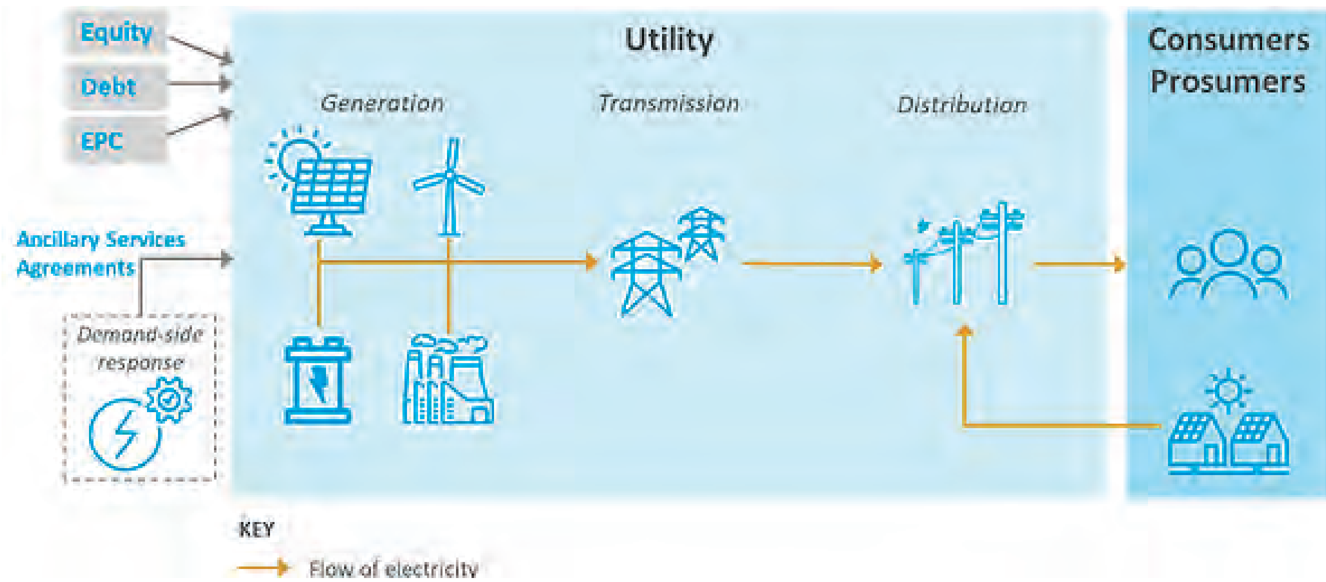
Figure 3.5
Model A: Independent Power Producers (IPPs)



Source: *Castalia based on MSETT*[35]

[45] This number is likely higher in the Caribbean due to the region's high dependence on expensive imported fossil fuels. Caribbean electricity prices, averaging around US$ 0.25 per kWh, are double those in the United States. Source: The World Bank. "AskWBCaribbean: Talking Energy, Finding Solutions," 2022. https://www.worldbank.org/en/events/2022/10/11/caribbean-talking-energy-finding-solutions#:~:text=Caribbean%20consumers%20face%20some%20of,over%20US%24%200.40%20per%20kWh.
[46] Forbes. "The Paradox of Declining Renewable Costs and Rising Electricity Prices," 2019. https://www.forbes.com/sites/brianmurray1/2019/06/17/the-paradox-of-declining-renewable-costs-and-rising-electricity-prices/?sh=23f65f4261d5

Figure 3.6
Model B: Vertically integrated utility



3.2.1 Case study: Jamaica's independent power producer model

Jamaica provides a regional example of a successful implementation of Model A—using competitive tenders to develop utility-scale IPP projects.

Jamaica pioneered the use of IPPs in the Caribbean in the 1990s, procuring the 60MW Rockfort project in 1994 [47] and the 74MW Doctor Bird Power Barges in 1995[48]. In 2001, when Jamaica Public Service Company Limited (JPS) was re-privatized, regulation was introduced to allow JPS to bid into tenders and compete with IPPs.

Under this regulatory framework, in 2008, Jamaica launched an all-source procurement and the country's first renewable energy tender. The all-source procurement resulted in the award of the 65MW Heavy Fuel Oil West Kingston Power Plant[49]. The renewable energy tender received five bids, three from JPS and two from private developers[50]. Of the four bids accepted, only one was ultimately developed – a 6MW hydro project developed by JPS[51].

Jamaica launched a second round of renewable energy auctions in 2012 and a third round in 2015. The 2012 tender resulted in the awards of three projects: BMR Energy's 36MW wind power project, WRB's 20MW Content Solar plant, and the Wigton Phase 3 24MW wind project. The 2015 tender awarded a 37MW solar project to Eight Rivers Energy.

Table 3.3 below summarizes the main lessons learned in this case study.

[47] The World Bank, "Financing Jamaica's Rockfort Independent Power Project," 1998. https://documents1.worldbank.org/curated/en/638571468752355698/pdf/multi-page.pdf
[48] Jamaica Gleaner, "Jamaica Energy Partners Celebrates 25 Years of Service," 2020. https://jamaica-gleaner.com/article/news/20201016/jamaica-energy-partners-celebrates-25-years-service.

Table 3.3

Strengths, improvements made over time, and opportunities for improvement

Strengths	- The procurement is based on an IRP or generation expansion plan. - The tender process run by the OUR was robust and competitive. - It had multiple procurement rounds, which allowed the Government to learn from its experience and improve in later rounds[52], leading to continued bidder interest. - Clear and firm qualification criteria ensure that bidders have the required financial and technical resources to execute bids.[53]
Improvements made over time	- Transmission was considered during the IRP development process based on the locations of renewable energy potential.
Opportunities for improvement	- Publish indicative timelines for rounds, around 5 years ahead of procurement, using an IRRP. - Establish realistic and clear timelines for each round. - Develop better interconnection arrangements specified ahead of time. - Develop a transmission rationing mechanism to accommodate future interconnection needs.

3.2.2 Case study: St. Vincent and the Grenadines' vertically integrated utility model

St. Vincent and the Grenadines provides an example of Model B, where a vertically integrated utility owns and operates projects.

St. Vincent Electricity Services Limited (VINLEC) has financed and developed renewable energy projects since 1952, using the own-and-operate model.[51] The Electricity Supply Act of 1973 grants VINLEC a universal license for generating, transmitting, and distributing electricity in St. Vincent and the Grenadines.[52] It owns and operates the Cumberland 3.4MW (1987), Richmond 1.1MW (1962), South Rivers 0.9MW (1952) hydro plants; and the Cane Hall Engineering Complex 0.2MW (2013), Lowmans Bay 0.3MW (2014), Union Island 0.6MW (2019), and Mayreau 0.1MW (2019) solar plants.[53]

VINLEC borrows on its balance sheet to finance projects. Commonwealth Development Corporation, as the majority owner of VINLEC in 1952, privately financed the South Rivers project. The Cumberland Hydro plant, commissioned in 1987, was financed through on-lent sovereign loans from the Caribbean Development Bank, European Investment Bank, International Development Association, and United States Agency for International Development.[54] The Canadian International Development Agency provided additional funding through a grant passed on to VINLEC by the Government and treated as equity.[55]

Table 3.4 below summarizes the main lessons learned in this case study.

[49] LACA, "Conduit Capital Announces Start Power Project In Jamaica," 2012. https://lavca.org/2012/07/31/conduit-capital-announces-start-power-project-in-jamaica/

[50] CBD, "Public-Private Partnerships in the Caribbean: Building on Early Lessons", 2014. Page 102. https://www.caribank.org/publications-and-resources/resource-library/thematic-papers/public-private-partnerships-caribbean-building-early-lessons

[51] CBD, "Public-Private Partnerships in the Caribbean: Building on Early Lessons", 2014. Page 102. https://www.caribank.org/publications-and-resources/resource-library/thematic-papers/public-private-partnerships-caribbean-building-early-lessons

[52] CBD, "Public-Private Partnerships in the Caribbean: Building on Early Lessons", 2014. Page 102. https://www.caribank.org/publications-and-resources/resource-library/thematic-papers/public-private-partnerships-caribbean-building-early-lessons

[53] CBD, "Public-Private Partnerships in the Caribbean: Building on Early Lessons", 2014. Page 102. https://www.caribank.org/publications-and-resour-

Table 3.4

Below summarizes the main lessons learned in this case study.

Strengths	• St. Vincent and the Grenadines has achieved the 4th highest renewable energy penetration among BMCs. • VINLEC is a stable, well-managed, publicly owned, vertically integrated utility. • This model avoids transaction costs of project finance and IPP tenders. • EPC contracts to build plants were competitively procured.
Weaknesses	• The Government took on fiscal risk by underwriting debt. • The utility took on risks of generation construction and operation.

Table 3.5 describes selected international examples of countries that have established effective procurement and financing mechanisms.

Table 3.5

Key references: procurement and financing mechanism

Reference	Description
Anton Eberhard, Joel Kolker, and James Leigland, "South Africa's Renewable Energy IPP Procurement Program: Success Factors and Lessons", World Bank, 2014	South Africa is an example of a country that reached the top ten ranked countries globally regarding renewable energy IPP investments. It achieved this by introducing a well-structured competitive tender program for IPPs. This paper describes the South African Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), designed to facilitate private sector investment into grid-connected renewable energy generation in South Africa. Since 2011, the program has brought in US$14 billion in investment committed to construct 3,922MW of renewable energy capacity.
IESO, "Resource Acquisition and Contracts"	Ontario is an example of a jurisdiction with an independent system operator that runs competitive procurements. This reference describes the Independent Electricity System Operator's (IESO) approach.

3.3 Access to site, resource, and environmental permits

Access to site, resource, and environmental permits refers to a set of rules that give utility-scale project developers clarity and predictability about securing the rights to the resource, the site for a project, environmental permits, and the right to connect to the grid. The various aspects of this component and requirements are described below:

- *Resources:* Legal rights to use the primary source for generation should be clearly defined, and the process to define those rights should be clear. For example, when developers can dam a stream for hydro or drill into the ground for geothermal. Where feasible, energy resource zones could also be established.

- *Sites*: Developers should be permitted to access land for projects through appropriate mechanisms or leases. Land titles should also be easily accessible. Rules should make clear how developers can get right-of-way to build a power line over private land to connect to the grid.

- *Environmental rules:* Developers should be clear on the environmental rules affecting their projects. For example, what the limits of noise pollution are or areas where project development is not allowed because of tourism. Countries must administer effective, timely license application reviews of developer applications.
- *Transmission / Distribution* and grid connections: The rules and rights for IPPs to connect to the grid should be clearly defined.

The absence of clarity around environmental rules and access to information has hindered renewable energy development. For example, in 2007 in Barbados, there was debate around whether wind farms' noise could harm human health.[59] There were no clear environmental rules regarding an acceptable decibel level. Without clarity on what was permitted, no wind farms were developed.[60] Further, some BMCs lack online land title databases, which makes it difficult for developers to identify and acquire land for projects.

Some best practices that should be followed are described in Table 3.6.

Table 3.6

Best practices for access to site, resource, and environmental permits

Aspect	Best practice
Resources	· Clear definition of relevant resource (e.g., geothermal, hydro) · Clear rules on how developers can gain access to a resource · Mechanism to grant developers a secure right to use a specified resource (protects against encroachment)
Sites	· Formal title system for land suitable for development · Publicly accessible electronic database of titles, available in geographic information system (GIS) view · Legal framework for granting easements for transmission lines
Environmental rules	· Clearly specified permitting process · Requirement for Environmental Impact Assessment and consultation for developments over some threshold · Clearly specified standards that each expected technology should comply with, e.g.: · Wind: 1) Noise level at property boundary in decibels 2) Excluded from specified areas of natural beauty · Waste-to-energy: 1) Flue emissions limits on particulates, NOx and SOx, and other harmful products of combustion. 2) Noise level at property boundaries
Transmission / Distribution and grid connections (in the case of IPPs)	· Grid Impact Study conducted · Establishment of the right of IPP to connect · Transmission owner to provide specified information · Process for applying for and granting connection rights · Technical standards to be met · Rules for which party bears which costs

[59] National Wind Watch, "Residents challenge wind farm", 2007. https://www.wind-watch.org/news/2007/02/27/residents-challenge-wind-farm/

[60] The first wind farm in Barbados was developed in 2021. https://barbadostoday.bb/2022/10/21/islands-first-wind-energy-farm-on-verge-of-completion/

3.3.1 Case study: Environmental permitting in Jamaica

Jamaica provides an example of a country with an environmental agency that has clear processes and conditions for environmental permits and licenses.

Jamaica's National Environment and Planning Agency (NEPA), established in 2001 as an Executive Agency under the Executive Agencies Act, is responsible for environmental protection, natural resource management, land use, and spatial planning in Jamaica.[61,62] It is the single entity that performs the functions under the Natural Resources Conservation Authority Act, 1991, Town and Country Planning Act, 1958, Land Development and Utilization Act, 1966, Watersheds Protection Act, 1963, Wild Life Protection Act, 1945, and other acts.[63] NEPA was formed to carry out technical and administrative mandates of three formerly separate statutory bodies: the Natural Resources Conservation Authority, the Town and Country Planning Authority, and the Land Development and Utilisation Commission.[64]

NEPA has established a clear process for environmental permits and licenses.[65] NEPA states requirements for the application process, such as company documents, project details, plans and drawings, and ownership details.[66] On its website, NEPA publishes technology-specific requirements for generation projects. As part of the licensing and permitting process, NEPA screens applications and determines whether Environmental Impact Assessments are required.

Figure 3.7 shows NEPA's process flow for environmental permits and licenses.

Figure 3.7
Process for environmental applications

Source: *NEPA*[64]

[61] NEPA. "Agency Profile". https://www.nepa.gov.jm/agency-profile
[62] NEPA. "Agency Profile". https://www.nepa.gov.jm/agency-profile
[63] NEPA. "About us. Legislation". https://www.nepa.gov.jm/legislation/acts
[64] NEPA. "History and Development." Agency Profile | National Environment & Planning Agency (nepa.gov.jm)
[65] NEPA. "Permits". https://www.nepa.gov.jm/permits
[66] NEPA. "Permits". https://www.nepa.gov.jm/permits

Table 3.7 below summarizes the main lessons learned in this case study.

Table 3.7
Strengths and opportunities for improvement

Strengths	- There is an integrated and comprehensive planning and environmental regulator. - Integration is achieved through policy decisions (avoiding lengthy statutory change). - Renewable energy developers know in advance what standards they must meet.
Opportunities for improvement	- Faster processing.

3.3.2 Case study: Jamaica's online, GIS-based land registry

Jamaica is an example of a country with a well-organized land management system that provides developers with clear information on who owns public and private land.

Jamaica's National Land Agency (NLA) was established in 2001 as an Executive Agency under the Ministry of Economic Growth and Job Creation[68]. It was established to speed up and improve the quality of land management services in response to consistent delays and poor coordination between agencies involved in land management[69]. By 2016, the NLA reduced administrative processing times, improved customer service, and used technology in the land management process[70]. The NLA is currently systematically registering all informally owned land in the country.

The NLA also developed a platform called eLandjamaica in 2003[71]. On the platform:

- All titles are available for viewing and can be accessed and searched through a browser from anywhere.
- Property information can be viewed on a map and overlaid (outside the system) with geographic information systems (GIS) onto resources, transmission/distribution lines, etc

Figure 3.8 shows eLandjamaica's map view in a browser with land parcels outlined in red.

[68]The Observer. "The National Land Agency — a driver of economic growth," 2022. https://www.jamaicaobserver.com/columns/the-national-land-agency-a-driver-of-economic-growth/
[69] Innovations for Successful Societies. "From the Ground Up: Developing Jamaica's National Land Agency, 2000-2016", 2017. https://successfulsocieties.princeton.edu/publications/ground-developing-jamaica-national-land-agency-2000-2016 Page 1.
[70] Innovations for Successful Societies. "From the Ground Up: Developing Jamaica's National Land Agency, 2000-2016", 2017. https://successfulsocieties.princeton.edu/publications/ground-developing-jamaica-national-land-agency-2000-2016 Page 1.
[71] Innovations for Successful Societies. "From the Ground Up: Developing Jamaica's National Land Agency, 2000-2016", 2017. https://successfulsocieties.princeton.edu/publications/ground-developing-jamaica-national-land-agency-2000-2016 Page 11.
[72] eLandJamaica. https://elandjamaica.nla.gov.jm/elandjamaica/interactivemap.aspx

Figure 3.8
eLandjamaica website

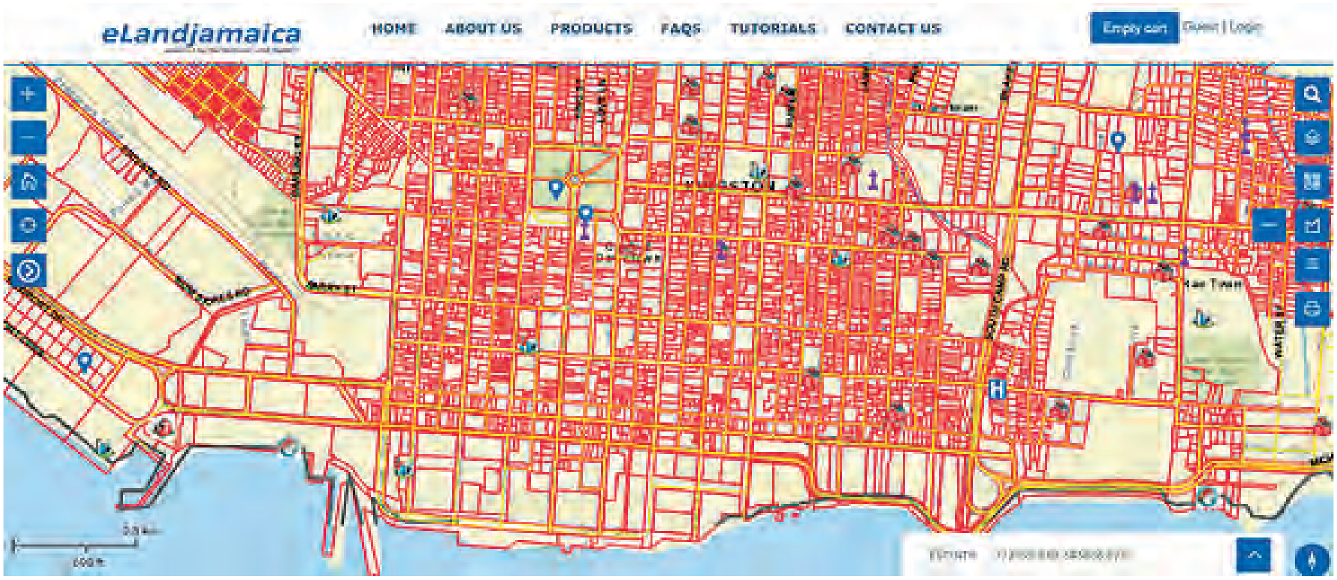


Table 3.8 below summarizes the main lessons learned in this case study.

Table 3.8
Strengths and opportunities for improvement

Strengths	· Enables developers to quickly identify suitable sites.
Opportunities for improvement	· Could provide more GIS layers, e.g., transmission and resource availability in the online system.

3.3.3 Case study: Dominica's geothermal law

Dominica's Geothermal Resources Development Act exemplifies how law can clearly establish the legal basis for exploring and using a primary resource.

In 2016, the Government of Dominica passed the Geothermal Resources Development Act, which defines geothermal resources and establishes the rights and prohibitions around their development, exploration, and use.[73] The Act asserts government ownership of the resource and clarifies the planning and permitting regime.

The Act sets out how private citizens can engage in geothermal exploration and the process and the agreements necessary to do so. Interested parties that wish to engage in geothermal exploration in Dominica must enter a Geothermal Exploration Agreement with the Ministry of Energy.[74] The Geothermal Exploration Agreement entitles the geothermal resource developer to the exclusive right to carry on exploration activities for a term not exceeding three years.[75] The term may

[73] Jacobs. "Dominica Geothermal Development - Environmental and Social Impact Assessment", 2018. Page 19.
[74] Geothermal Resources Development Act, 2016. Page 17. https://www.climate-laws.org/document/geothermal-resources-development-act-2016_8af3
[75] Geothermal Resources Development Act, 2016. Page 21-22. https://www.climate-laws.org/document/geothermal-resources-development-act-2016_8af3

be renewed for a term not exceeding two years.[76] The developer loses its exploration rights under the Agreement if there is no exploration for two years or more from the execution of the Agreement.[77]

The Act states that developers who wish to use geothermal resources in Dominica must enter a Geothermal Resources Concession with the Ministry of Energy. The law establishes two processes for the award of a Concession[78]:

- A competitive track that awards a concession to the bidder presenting the best option through a tender process.[79] Using this track requires enough information on the resource, which can involve costly and complex exploration.[80]
- A non-competitive track that awards a concession to developers that have funded exploration in zones where the Government was unwilling or unable to explore.[81]

The Act also provides for land acquisition and easements for geothermal development. The Act allows a developer the same powers and exemptions in installing geothermal equipment as licensed electricity companies, as defined in the Electricity Supply Act, 2006.[82] The developer, subject to other rules and restrictions, can install necessary equipment upon any land or property in a way that does not obstruct or hinder the development of the land or property.[83] The Act also allows the state to compulsorily purchase land required for a geothermal development or acquire an easement over the land.[84]

The Act allows for special geothermal zones to be established where exclusive rights may be competitively awarded. The Ministry of Energy may designate any surface or subsurface area as a special geothermal zone if it is likely to be a source of geothermal resources, and it is in the public interest to allocate the rights to the resource through a tender process. The designation prohibits other uses of the designated land, mandates that rights to use the resource are allocated through a competitive tender, and secures the area for geothermal use until the relevant geothermal development agreement is abandoned.

Table 3.9 below summarizes the main lessons learned in this case study.

Table 3.9
Strengths and opportunities for improvement

Strengths	The Act: - Allows rights to the resource to be awarded; - Allows the Government to protect and bid out the most promising areas; and - Provides a unified planning and permitting regime.
Opportunities for improvement	- It took 7 years to develop and pass the law. - Government-led geothermal development occurred before the law was passed.

[76] Geothermal Resources Development Act, 2016. Page 21-22. https://www.climate-laws.org/document/geothermal-resources-development-act-2016_8af3
[77] Geothermal Resources Development Act, 2016. Page 23. https://www.climate-laws.org/document/geothermal-resources-development-act-2016_8af3
[78] Geothermal Resources Development Act, 2016. Page 54. https://www.climate-laws.org/document/geothermal-resources-development-act-2016_8af3
[79] Geothermal Resources Development Act, 2016. Page 54. https://www.climate-laws.org/document/geothermal-resources-development-act-2016_8af3
[80] Geothermal Resources Development Act, 2016. Page 54. https://www.climate-laws.org/document/geothermal-resources-development-act-2016_8af3
[81] Geothermal Resources Development Act, 2016. Page 54. https://www.climate-laws.org/document/geothermal-resources-development-act-2016_8af3
[82] Geothermal Resources Development Act, 2016. Page 26. https://www.climate-laws.org/document/geothermal-resources-development-act-2016_8af3
[83] Electricity Supply Act, 2006. Page 164. https://www.ircdominica.org/files/downloads/2011/10/Electricity-_Supply_Act_10_of_2006.pdf
[84] Geothermal Resources Development Act, 2016. Page 25. https://www.climate-laws.org/document/geothermal-resources-development-act-2016_8af3

Table 3.10 describes selected international examples of countries that have implemented clear and predictable permitting frameworks.

Table 3.10
Key references: access to site, resource, and environmental permits

Reference	Description
IEA, "New Zealand 2023 Energy Policy Review," 2023	New Zealand is an example of a country with a comprehensive legal framework for permitting new utility-scale projects. This paper reviews New Zealand's progress with energy transition and describes the role of the Resource Management Act 1991, which covers permitting for all renewable energy technologies.
Kim Schumacher, "Approval procedures for large-scale renewable energy installations: Comparison of national legal frameworks in Japan, New Zealand, the EU and the US," Energy Policy, Volume 129, 2019	This paper analyzes the differences in permitting frameworks for large-scale renewable energy installation in four locations. The paper highlights New Zealand and the EU as best practice frameworks.

3.4 Cost-reflective tariffs

Cost-reflective tariffs fully cover the cost of providing electricity services to customers, including a reasonable return on capital, and create efficient systems by signaling to consumers when they should become prosumers and provide elements of energy services themselves and when they should restrain their demand because when they use energy in a way that has a higher cost than benefit.

Cost-reflective tariffs should:

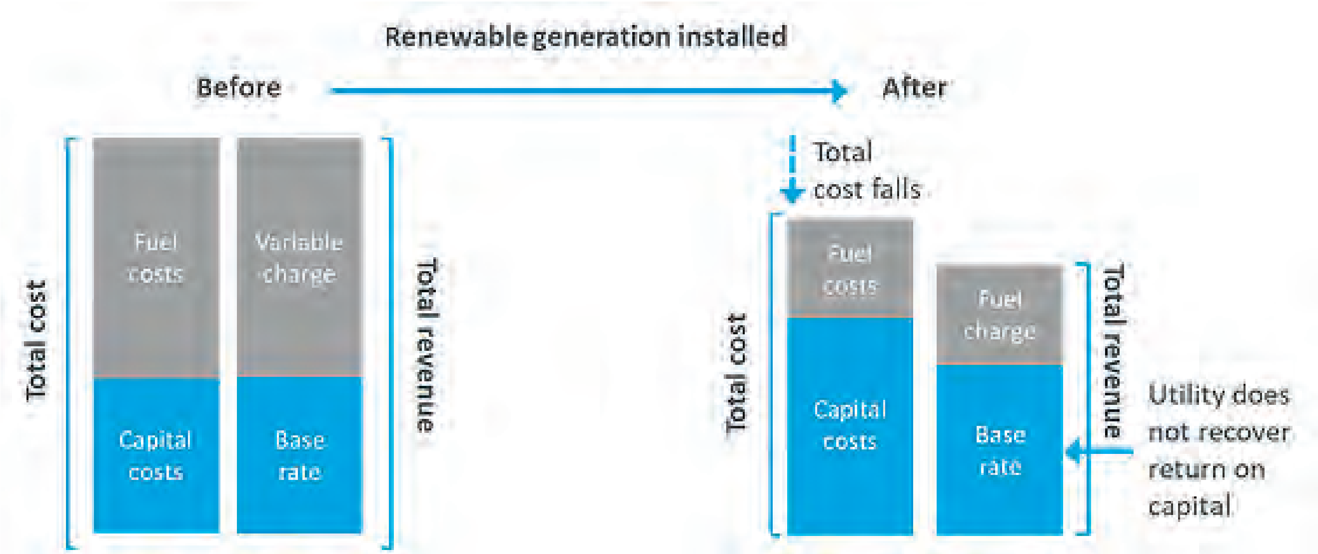
- Not deter renewable energy investment. Tariffs should ensure that renewable energy costs can be recovered either by allowing:
    - Pass-through of the cost of renewable energy purchased under PPAs or through feed-in tariffs; or
    - A tariff reset wherever significant renewable energy plants are commissioned.
- Allow full cost recovery. Tariffs should provide a clear and predictable mechanism to ensure tariffs cover all reasonable costs and a return on investment.
- Reflect marginal costs. Tariffs should:
    - Reflect system marginal costs by the time of day; and
    - Recover fixed costs largely through fixed charges.
- Include an optimal feed-in tariff. Tariffs should allow customers to sell energy to the grid at short-run system marginal costs.

Tariffs that are not cost-reflective can distort the market and discourage investment in new renewable energy projects. A key constraint of renewable energy development in some BMCs is the mechanism that allows utilities to automatically recover fossil-fuel costs (through a fuel charge adjustment) while not providing for recovery of renewable generation costs. When a utility invests in renewable energy, its cost of service usually falls, as the capital costs of a renewable energy plant annuitized over the project's life are usually less than the annual costs of the fuel previously incurred. However, despite the reduced cost of service, the utility still loses money. While the fuel charge to customers is reduced, there is no mechanism for the utility to recover the capital costs of the renewable energy plant. The inability to recover costs of renewable energy projects reduces a utility's incentive to invest in such projects.

Figure 3.9 shows the change in costs and revenues for utilities under this system.

Figure 3.9

Fuel cost recovery mechanism and its impact on renewable energy development



3.4.1 Dominica and Jamaica's purchased power pass-through mechanisms

Jamaica and Dominica provide examples of countries that allow for the recovery of renewable energy costs from IPPs in the tariff.

In Jamaica and Dominica, purchased fuel costs and payments under PPAs are added each month and divided by kWh sold to give an average pass-through cost. Customers' bills show a pass-through, calculated as energy consumed (kWh) X pass-through cost ($/kWh). The purchased power and fuel are shown separately in Jamaica, while in Dominica, they are a single charge.

Jamaica Public Service Company Limited's (JPS) tariffs include a fuel charge and an IPP charge. The fuel charge represents the cost of fuel required for producing and delivering electricity, while the IPP charge reflects the cost of the power that JPS buys from IPPs.[85] For some service categories, JPS charges the IPP charge as a variable monthly amount in $/kWh, representing the non-fuel costs allocated to each service category that JPS pays to IPPs for generation supply.[86] For other service categories, JPS charges a variable and a fixed charge, which is a monthly charge per kVA.[87] Figure 3.10 shows an example of a JPS bill with fuel and IPP variable charge.

Dominica Electricity Services (DOMLEC) calculates its fuel charge by adding the total cost of all diesel fuel and blended fuel oil as well as other sources of electricity.[88] The other sources of supply cover the cost of IPPs including, but not limited to, the cost of geothermal electricity.[89]

[85] JPS, "Rate Schedules 2022-23", Page 5. https://www.jpsco.com/jps-home/rates-schedules-and-tariffs/
[86] JPS, "Rate Schedules 2022-23", Page 3. https://www.jpsco.com/jps-home/rates-schedules-and-tariffs/
[87] JPS, "Rate Schedules 2022-23", Page 5. https://www.jpsco.com/jps-home/rates-schedules-and-tariffs/
[88] IRC, "Decision Document, Tariff Regime for Dominica Electricity Services Ltd." https://www.ircdominica.org/download/tariff-regime-for-dominica-electricity-services-ltd-2/
[89] IRC, "Decision Document, Tariff Regime for Dominica Electricity Services Ltd." https://www.ircdominica.org/download/tariff-regime-for-dominica-electricity-services-ltd-2/

Figure 3.10
JPS bill

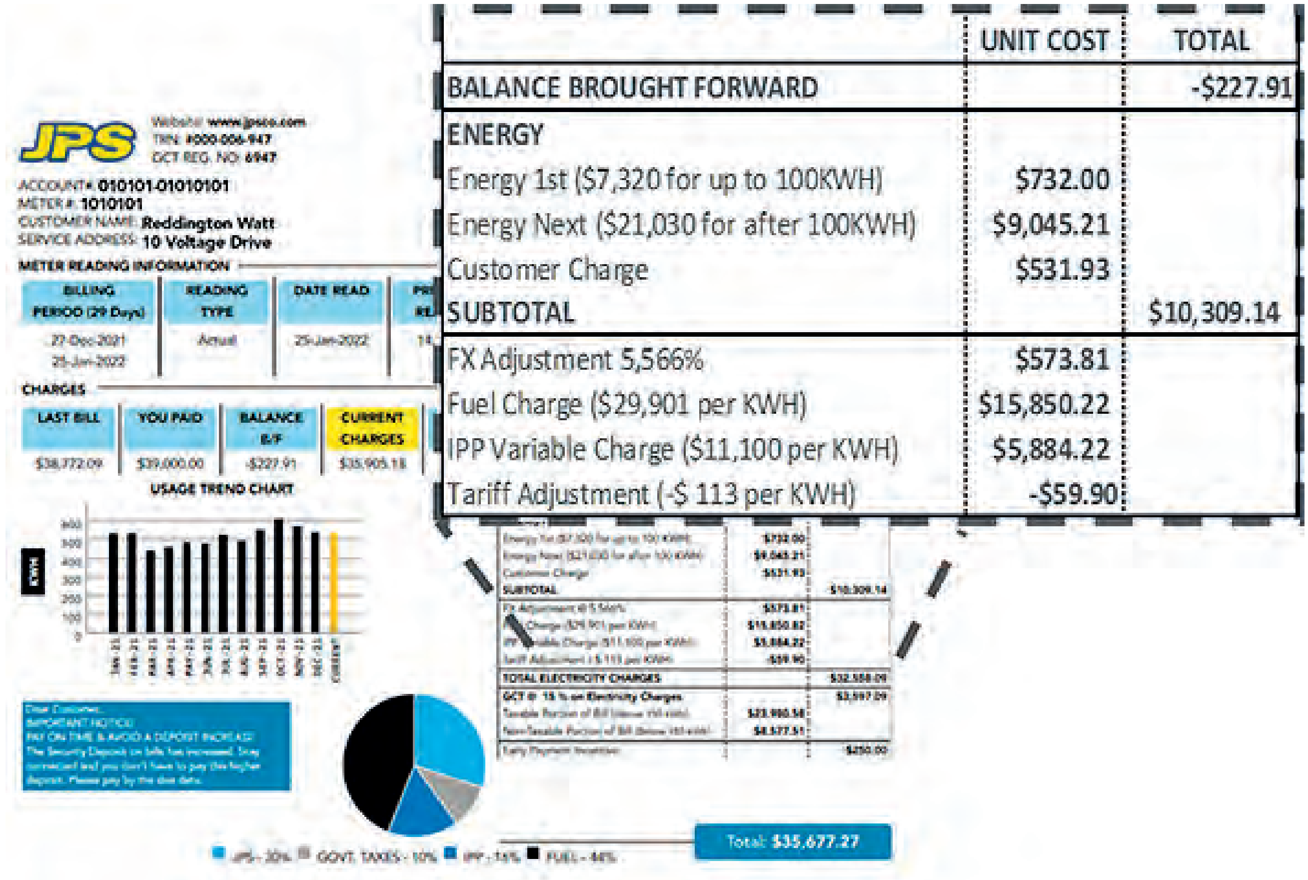


Table 3.11 below summarizes the main lessons learned in this case study.

Table 3.11
Strengths and weaknesses

Strengths	· Allows renewable energy costs to be recovered as soon as they are incurred. · Does not deter renewable energy investment. · Passes on fuel cost savings to customers.
Weaknesses	· The inclusion of fixed generation costs in energy charges could distort price signals.

Table 3.12 describes selected international examples of jurisdictions that have implemented reforms toward full cost recovery.

Table 3.12
Key references: cost-reflective tariffs

Reference	Description
National Association of Regulatory Utility Commissioners, "Primer On Rate Design For Cost-Reflective Tariffs", USAID, 2021	Brazil is an example of a country that has gradually transitioned towards a cost-reflective tariff structure. This primer outlines the fundamental principles of cost-reflective rate design, describes key rate design processes, and highlights the reforms undertaken in Brazil to promote cost-reflective rate design.
Joern Huenteler, Denzel Hankinson, Nicole Rosenthal, Ani Balabanyana, Arthur Kochnakyana, Tu Chi Nguyen, Anshul Ranac, Vivien Foster, "Cost Recovery and Financial Viability of the Power Sector in Developing Countries: Insights from 15 Case Studies," The World Bank, 2018	This paper analyzes reforms to improve financial viability and cost recovery in the power sectors of 15 jurisdictions worldwide. The paper finds that tariffs are usually not high enough to cover the full cost of recovery and offers suggestions on how to improve the situation.

3.5 Creditworthy utilities

Renewable generation and other resources must be financed by the utility or private developers selling to the utility under contract. Financiers will only lend to a utility if they are confident of repayment—that is if the utility is creditworthy. Equally, private developers will only invest if they are confident that the utility will pay out reliably on its contract.

Any BMC wishing to get the benefits of renewable energy must find a way for these investments to be financed either through direct government participation or private sector involvement. However, as governments usually do not have the capacity to finance projects on the required scale, utilities must raise finance elsewhere. Therefore, creditworthiness is key.

To be creditworthy without credit enhancement, a utility must at a minimum be able to generate revenues sufficient to cover its operating cost and provide for future capital replacement. In addition, the a utility must have a track record of at least three years of:

- Cost recovery, which means revenue generated from operations is greater than expenses incurred in providing services;
- Positive operating cash flows (with projections of this to continue); and
- A debt service cover ratio of at least 1.3.

Credit enhancements can help utilities reach creditworthiness and may take the form of:

- **Government guarantees:** The government could guarantee certain debts/payments, such as PPA payments, or certain risks. However, government guarantees are only useful on their own (without donor backstops) if the government is creditworthy.
- **Donor guarantees:** Donors can also provide guarantees for utility debt service or PPA payments. An example of a donor guarantee is the World Bank's partial risk guarantee. If a utility defaults on payments, the donor will make the payment. Usually, the government must then repay that amount to the donor organization. While this method of credit enhancement works, it creates fiscal risk for governments, which they prefer to avoid.
- **Revenue escrow accounts** (or Debt Service Reserve Account): Revenue from all customers or a particular class of customers can be paid into a bank account that is not controlled by the utility. The bank then acts as an escrow agent and pays out of the account. Generally, rules allow the bank to pay out toward debt service or PPA payments and then pay the remainder of the funds to the utility.

These enhancement methods are usually only effective if the utility is expected to recover costs and generate sufficient operating cash flows but lacks a track record of doing so. A utility without fully cost-reflective tariffs may be made creditworthy in the short term. However, without substantial change [90], the utility will likely arrive at a position where it must make choices on which payments to defer. In many cases, this may mean deferring maintenance.

In some regions, governments can make utilities creditworthy by providing subsidies. Subsidies can be effective where payments are made reliably and are expected to continue for the long term. Such reliable and long-term payments are feasible in countries like Oman and the United Arab Emirates but are impossible in most BMCs.

3.5.1 Case study: Jamaica Public Service Company (JPS), Jamaica's creditworthy utility

Jamaica's JPS provides an example of a Caribbean utility that has achieved creditworthiness through strong financial performance.

Jamaica's regulatory structure has supported JPS' profitability and creditworthiness. Jamaica's independent regulator, the OUR, was established by an Act of Parliament in 1995.[91] JPS, which was lossmaking and heavily indebted, was privatized in 2001. Its license contains detailed tariff-setting rules that the regulator must follow. An independent appeal panel can overturn the regulator's decision if it is inconsistent with the license.

JPS has been profitable since privatization and has successfully commissioned PPAs under this regulatory system. It has a debt-service coverage ratio of 2.12 over the 5-year period between 2017 and 2021.[92] It has commissioned 5 PPAs without any government support, including heavy fuel oil (65MW), wind (60MW), and solar (57MW).

Table 3.13 below summarizes the main lessons learned in this case study.

Table 3.13
Strengths and weaknesses

Strengths	The power sector: - Can self-finance renewables and resilience investments, and - Is not a fiscal cost or risk for the Government.
Weaknesses	- Inefficiencies, especially high system losses, are passed on to consumers in tariffs.

Table 3.14 describes selected international examples of how credit enhancements were used to support utilities entering into PPAs with IPPs.

Table 3.14
Strengths and weaknesses

Reference	Description
Fritz Florian Bachmair, Cigdem Aslan, and Mkhulu Maseko, "Managing South Africa's Exposure to Eskom: How to Evaluate the Credit Risk from the Sovereign Guarantees?," Policy Research Working Paper, World Bank, 2019	ESKOM is an example of a power utility that signed PPAs assisted by credit enhancements from the Government of South Africa. The paper describes the guarantees the Government offered and how it assesses associated risk.
Teal Emery, "Solar Can't Scale in the Dark Why lessons about subsidies and transparency from IFC's Scaling Solar Zambia can reignite progress toward deploying clean energy," Energy for Growth Hub, 2023	The Government of Zambia is an example of a country supported by international donor institutions, through the Scaling Solar program, in signing the PPAs with renewable energy IPPs. This review study describes the guarantees the World Bank Group provided to de-risk ZESCO, Zambia's power utility, and lessons learned from the program.

[90] It is noted that there are also other operational aspects which must be addressed by the utility, such as receivables management.
[91] OUR, "About Us" https://our.org.jm/about-us/
[92] JPS Annual Reports 2017-2021. https://www.jpsco.com/annual-reports/

3.6 Distributed generation framework

A DG framework comprises the rules and regulations surrounding a small renewable or co-generation plant that supplies energy to the grid at the distribution level. There are two main types of DG projects:

- **Behind-the-meter projects**, which supply power to the customer and sell the excess to the grid; and
- **Direct-to-the-grid projects**, which only sell electricity to the grid.

A DG framework is necessary to encourage optimal levels of investment in distributed generation while maintaining the grid's stability. On islands lacking land for large wind and solar farms, DG may be essential to increasing renewable generation and can promote resilience, especially when DG systems are behind the meter. Direct-to-the-grid projects can increase resilience if the grid is configured to island when part of the grid is damaged.

A level of investment in DG that is socially optimal is a level where the benefits of DG exceed its costs:

Avoided cost of generation + Reliability benefits + Reduction of GHG>Cost of installing PV

Where:

- Avoided cost of generation = the cost of fuel and other variable O&M costs that are incurred when generating an extra unit of electricity
- Reliability benefits = the economic value of having a reliable supply of electricity
- Reduction of GHG = the economic value of reducing GHG emissions
- Cost of installing and operating PV = the levelized cost of distributed solar PV.

Regulation of DG should discourage investment in DG when its installation and operating costs across its life exceed its lifecycle benefits. At the same time, the regulation of DG should ensure profits of utilities do not fall as customers switch to DG, compared to profits without DG, and ensure that the safety of the power system is maintained as a growing number of DG systems connect to the grid.

A DG framework should include the following:

- **Rules for connecting to the grid.** These rules would allow developers to physically connect to the grid and ensure the safety and quality of power sold to the grid. The rules should also state which aspects should be paid for by the utility and which should be paid for by developers. Applications should be reviewed in a timely manner to avoid licensing delays.
- **An efficient tariff structure.** The tariff structure is the tariff that the utility charges its customers. The tariff structure should contain one or several fixed charges to ensure prosumers pay their share of fixed costs, such as transmission and distribution firm generation capacity.
- **A feed-in tariff (FIT).** The FIT is the rate at which excess generation can be sold to the grid. The FIT should be set at the avoided cost of generation at the time of sale to ensure that total system costs do not increase as customers switch to DG.
- **Capacity caps.** These caps would ensure that grid stability is not threatened by faster than expected uptake of variable renewable energy. These caps would cover the following:
    - The largest single system size that could fall under the DG framework, and
    - The total capacity that can be developed under this framework for a given period of time.
- **Contracts with minimum tariff duration.** Such contracts would promote investment in DG by providing revenue predictability. This minimum duration should correspond to the expected life of DG systems.

Implementing distributed generation projects can have the following benefits:

- **Decreasing the cost of generation at the level of the power system**, as DG costs continue to decrease and make it competitive with the cost of grid power;[93]
- **Reducing the cost of having a reliable and quality power supply and improving energy security.** Where the avoided cost of thermal backup generation is higher than the levelized cost of DG with battery storage, DG with battery storage can reduce the cost of reliable and quality power; and
- **Providing price stability and certainty**, as the levelized cost of DG can be estimated before installation and stays constant over its lifetime.

[92] JPS Annual Reports 2017-2021. https://www.jpsco.com/annual-reports/

Utilities can support the implementation of DG in BMCs by using the Integrated Utility Services model. In this model:

- Customers apply to the utility for installing DG equipment.[94]
- The utility finances the cost of the DG assets and contracts qualified local service providers for procurement and installation. [95]
- The customer then repays the investment costs through a charge added to their regular utility bill.[96]

This model can increase the penetration of DG by reducing barriers like high up-front costs and limited access to financial services.[97]

3.6.1 Case study: Barbados' distributed generation framework

> Barbados provides a regional example of a country with a successfully implemented DG framework.

Barbados implemented its first commercial framework for DG in 2014 (the Renewable Energy Rider, RER),[98] following a 2-year pilot program in 2012.[99] The FIT program replaced the RER in October 2019.[100] Although the RER program also offered a FIT for the sale of excess energy, the difference is that the RER program aimed at reducing the electricity bill of customers installing DG for their own consumption and was not meant to be used by IPPs as a revenue-generating business.[101] The FIT program is open to IPPs and aims to help Barbados reach its target of 100 percent renewable energy generation by 2030.[102]

Grid interconnection rules are clearly explained and easily accessible on the Barbados Light and Power Company (BL&P)'s website. Customers must obtain BL&P's approval in writing before interconnecting to the grid. The application process consists of the following:[103]

- Submitting an application form to BL&P
- Obtaining a license from the Ministry of Energy, Small Business and Entrepreneurship (MOE) for all systems above 5kW for residential customers and above 25kW for commercial customers. Customers must make applications for licenses directly to the MOE
- Submitting to BL&P:
  - A single-line diagram to the Government Electrical Engineering Department (GEED) for approval, for those applications that require license approval;
  - A certificate of approval from the GEED;
  - A certificate for general liability insurance with a minimum coverage of B$100,000 for DG systems up to 10kW and B$500,000 for DG systems greater than 10kW;
  - A signed & witnessed feed-in tariff agreement; and
  - The voltage frequency-ride-through settings.

Interconnection costs do not apply to DG projects that are below 500kW. However, where a project may incur interconnection costs due to its location, the IPP must pay 25 percent of the full cost, and BL&P shall pay the remainder.[104]

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93 Despite decreasing costs, DG might not be competitive everywhere yet due to technical aspects such as average insolation, grid stability, and grid tariffs.

94 CDB, "Scaling Up The Deployment Of Integrated Utility Services To Support Energy Sector Transformation In The Caribbean Programme". https://www.caribank.org/scaling-deployment-integrated-utility-services-support-energy-sector-transformation-caribbean

95 CDB, "Scaling Up The Deployment Of Integrated Utility Services To Support Energy Sector Transformation In The Caribbean Programme". https://www.caribank.org/scaling-deployment-integrated-utility-services-support-energy-sector-transformation-caribbean

96 CDB, "Scaling Up The Deployment Of Integrated Utility Services To Support Energy Sector Transformation In The Caribbean Programme". https://www.caribank.org/scaling-deployment-integrated-utility-services-support-energy-sector-transformation-caribbean

97 CDB, "Scaling Up The Deployment Of Integrated Utility Services To Support Energy Sector Transformation In The Caribbean Programme". https://www.caribank.org/scaling-deployment-integrated-utility-services-support-energy-sector-transformation-caribbean

98 Fair Trading Commission. "Decision, Motion to review the Renewable Energy Rider," 2016. https://www.ftc.gov.bb/library/2016-07-25_commission_decision_motion_to_review_rer_revised.pdf

99 Fair Trading Commission. "Consultation Paper, Renewable Energy Rider," 2012. https://www.ftc.gov.bb/library/2012-11-23_rer_consultation_paper.pdf

100 Barbados Parliament. "Ministerial Statement Delivered by the Hon. Dwight Sutherland Minister of Small Business, Entrepreneurship and Commerce on Feed-in-Tariffs and Auctions for Renewable Energy Technologies". https://www.barbadosparliament.com/uploads/sittings/attachments/5678b1b5cd-77108ffafb6717c7f11d67.pdf

101 Fair Trading Commission. "Decision on the Barbados Light & Power Company Limited's Renewable Energy Rider," 2013. https://www.ftc.gov.bb/index.php?option=com_content&task=view&id=262

102 Barbados Government. "Barbados National Energy Policy (BNEP)." https://energy.gov.bb/publications/barbados-national-energy-policy-bnep/

The tariff structure of BL&P allows it to recover variable and fixed costs through three base rate components:[105]

- A customer charge, a fixed amount charged to customers regardless of consumption;
- A base energy charge, that recovers the variable non-fuel energy-related costs;
- A fuel charge, that recovers the variable fuel energy-related costs; and
- A demand charge, applied to recover costs associated with investment and expenses related to the demand on the power system.

Some limitations prevent this tariff structure from being fully cost-reflective:

- Time-of-use tariff is only available to customers who satisfy the criteria for the Large Power tariff[106](i.e., customers receiving supply at the primary voltage and owning their transformer).[107]
- The demand charge does not apply to residential and commercial general service customers.

However, the DG framework defines caps that address the tariff distortion and incentivize an optimal level of investment. The Fair Trading Commission (FTC, the regulator) defines the caps as follows:

- A **total annual capacity cap** reached on a first come, first serve basis. A maximum of 27.6MW (solar) and 5MW (wind) of DG systems of 1MW and below,[108] and a maximum of 40MW of DG systems between 1MW and 10MW[109] may benefit from the FIT each year; and
- An **individual system size cap** of 10MW and a cap to benefit from one or the other commercial arrangement, as explained below.

Customers who sell power to BL&P's grid are billed under the FIT program or the pre-existing RER.[110]Customers who entered the RER program before the FIT program was implemented must maintain their existing arrangements with BL&P for 20 years, with their systems' commission date used as the start date.

Customers can sell their excess energy to BL&P under one of the two arrangements:

- For systems above 3kW: Customers are billed under their regular electricity rate (inclusive of the value added tax, VAT) for all the energy consumed, regardless of the source. They then receive a credit on the bill for all the electricity generated from the DG system at the RER rate or FIT rate, which is based on the levelized cost of energy of the technology (solar or wind).[111]
- For systems of 3kW or smaller: Customers are billed under their regular electricity rate (inclusive of VAT) for what they use from the grid and receive a credit for the excess electricity sold to the grid.

The FIT is constant for 20 years when a DG owner enters a contract with BL&P. The FTC reviews the FIT after 36 months, then annually;[112] the reviewed FIT applies only to new contracts. The FIT increases by 10 percent for Community – Shared Renewable Energy Projects, that is, DG systems owned by a minimum of 25 residential customers, with no single customer owning more than 50 percent of the system.[113] The FTC last updated the FIT in January 2023.

Barbados' DG framework has been generating a high degree of interest. The capacity of solar DG increased from 10MW in 2015 to 27MW in 2017[114] and 73MW in 2023.[115] A firm is currently developing 40 sites ranging from 250kW to 5MW.[116]

Table 3.15 below summarizes the main lessons learned in this case study.

[103] BL&P. "Applying for Interconnection to the Grid," 2021. https://support.blpc.com.bb/support/solutions/articles/42000060831-applying-for-interconnection-to-the-grid
[104] Fair Trading Commission. "Decision on Feed-in tariffs for Renewable Energy Technologies up to and Including 1 MW," 2022 https://www.ftc.gov.bb/library/2022-12-30_fit_decision_under_1MW.pdf
[105] Fair Trading Commission. "Decision no. 01/2023," 2023. https://www.ftc.gov.bb/library/2023-02-15_commission_decision_BLPC_rate_review.pdf
[106] BL&P. "Time of Use Tariff," 2019. https://support.blpc.com.bb/support/solutions/articles/42000066756-time-of-use-tariff
[107] BL&P. "Large Power Tariff," 2022. https://support.blpc.com.bb/support/solutions/articles/42000066754-large-power-tariff
[108] Fair Trading Commission. "Decision on Feed-in tariffs for Renewable Energy Technologies up to and Including 1 MW," 2022. https://www.ftc.gov.bb/library/2022-12-30_fit_decision_under_1MW.pdf
[109] Fair Trading Commission. "Decision on Feed-in tariffs for Renewable Energy Technologies above 1MW and up to 10 MW," 2022. https://www.ftc.gov.bb/library/2022-12-31_fit_final_decision_1-10MW.pdf
[110] BL&P. "Billing Under the Renewable Energy Rider," 2021. https://blpc.freshdesk.com/support/solutions/articles/42000060966-billing-under-the-renewable-energy-rider

Table 3.15
Strengths and opportunities for improvement

Strengths	- The FIT is enough to attract investment, but not the point of threatening BL&P's financial sustainability. - The FIT is assured for a period of time close to the life of a typical DG system. - Direct-to-grid connection is allowed.
Opportunities for improvement	- Mechanisms to encourage banks to finance DG could be added to the framework. - There is a risk of increasing total system costs (relative to large-scale generation).

Table 3.10 describes select international examples of DG frameworks.

Table 3.16
Key references: distributed generation framework

Reference	Description
Government of Spain, "Real Decreto 244/2019, de 5 de abril, por el que se regulan las condiciones administrativas, técnicas y económicas del autoconsumo de energía eléctrica," Agencia Estatal Boletin Oficial del Estado, 2019	Spain has a clear and well-defined framework for DG. The Royal Decree defines: - The rules for registering and connecting to the grid; - A cap on individual system size of 100 kW to enter a net-billing contract (systems larger than 100 kW must sell their excess energy directly to the wholesale market) and a cap on the amount of excess generation that can be sold to the grid (a DG owner may not sell more than it consumes from the grid); - A FIT that varies whether the DG owner contracts with a "free" distribution company (that is free to set its tariffs and the FIT) or a regulated distribution company (whose tariffs and FIT are regulated; in that case, the FIT is set based on the average hourly wholesale market price); and - A minimum contract duration of 1 year that extends implicitly. Utilities' fixed costs are recovered through the fixed charges in their tariff structures.

4 | Implementing the Minimum Regulatory Function

Implementing the MRF is highly likely to help BMCs achieve the benefits of increased renewable energy penetration. Fortunately, there are well-defined ways to implement each of the components. Lessons can be drawn from existing solutions in the region and best practices elsewhere (identified in previous sections of this report) that can be copied, while ensuring flexibility when applied in each BMC. Section 4.1 describes how countries and donors can identify the gaps in BMCs' regulatory frameworks and provides options to fill those gaps, while Section 4.2 highlights how coordination between various actors will be key to implementing the MRF.

4.1 Tasks required to implement the MRF components

Table 4.1 below sets out how to do a gap analysis by comparing an existing regulatory framework to the MRF. The first question in the table addresses whether the component in question is in place. The second question goes into more detail to check that all the elements needed in a component are in place and well-designed. The third column sets out options open to governments to close any gaps identified, while the fourth column lists the resources that would be required to deploy those options.

Table 4.1: Implementation matrix

Component	Is the component in place?	Are the details right?	Options to close gaps	Resources required to close gaps
4.1.1. Integrated resource and resilience plan	Does the country have an IRRP under 4 years old and a system to refresh the IRRP periodically?	(a) Is there a law, policy or regulation which: • Requires periodic production of an IRRP? • Assigns responsibility for preparing the IRRP? • Requires that energy storage and demand-side management, or demand response are considered in addition to generation? • Requires that the disaster risks and resilience dimensions are adequately addressed? • Defines the consultation process for the IRRP?	• Establish IRRP roles and responsibilities through a new policy (if that is legally effective), or regulation issued under an existing sector or regulatory law (if that is *intra vires* the law), or by passing a new law.	• Ability to build a consensus in government on the new approach • Legal and policy drafting skills • Access to regional technical assistance resources through CCREEE and other partners
		(b) Is there an entity with responsibility for preparing the IRRP that has: • Adequate funding? • An adequate combination of skills and experience through in-house and contracted experts? • Access to appropriate software? • Adequate energy data and information curation by source?	• Assign responsibility to an existing entity (a regulator or Ministry of Energy is also possible). • Establish regular funding through the electricity tariff or a regular appropriation from the budget. • Ensure at least two people in the entity are trained in power system planning and contracting planning services. • Establish a framework contract with a consulting firm to develop the next two IRRPs while training in-country teams.	• Funding • Suitable personnel in-house (may need to be recruited and/or trained) • Framework contractor with skills in IRRP development • Regional level support through CCREEE

Component	Is the component in place?	Are the details right?	Options to close gaps	Resources required to close gaps
4.1.2. Procurement and financing mechanisms	Does the country have a clear and effective procurement and financing mechanism for utility-scale projects?	(a) Is there a law or policy which: • Makes an entity responsible for ensuring the security of supply? • Mandates that entity to procure resources (generation, storage, demand response)? • Requires that the resources procured are those indicated by the IRRP? • Requires competition in the procurement of resources? • Allows: (a) procurement by the utility, where it finances and operates the resources itself, or (b) procurement of IPPs that will build, finance, and operate resources, or (c) both?	Establish resource procurement roles and responsibilities through a new policy (if that is legally effective), or regulation issued under an existing sector or regulatory law (if that is *intra vires* the law), or by passing a new law.	• Ability to build a consensus in government on the new approach • Legal and policy drafting skills
		(b) Is there an entity with responsibility for procuring resources that has: • Adequate funding? • An adequate combination of skills and experience through in-house and contracted experts? • Suitable standard contracts and bidding documents?	• Assign responsibility to an existing entity (the utility is a good option; a regulator or Ministry of Energy is also possible). This responsibility should be linked to the country's oversight process for implementing nationally determined contributions (NDCs). • Establish regular funding through the electricity tariff or a regular appropriation from the budget. • Ensure that at least two people in the entity are trained in power resource procurement and in contracting advisory services. • Engage an experienced transaction advisor on a framework contract to	• Funding • Suitable personnel in-house (may need to be recruited and/or trained) • Transaction advisor under contract

Component	Is the component in place?	Are the details right?	Options to close gaps	Resources required to close gaps
			run the first [3] procurements while training in-country staff. • An alternate solution could be to have a regional fast-acting facility, such as CCREEE, manage these procurements through empaneled advisors. • Develop standard contracts, bidding documents, and a guide to carrying out procurements.	
4.1.3. Access to site, resource, and environmental permits	Are there clear rules and processes enabling developers of power plants to: • Gain rights to use relevant renewable energy resources? • Acquire land suitable for power plants? • Get environmental permits? • Interconnect with the grid?	• (a) Does the law define and create a system of legal rights for controlling and using renewable energy resources likely to be important in this jurisdiction (for example, water flowing in rivers, geothermal energy, solid waste)? • (b) Are these rights adequate for renewable energy generation, including: – Being of a duration at least as long as the life of a power plant using the resource? – Preventing others from infringing on or diminishing the resource? • (c) Is the process for acquiring the rights clearly defined and not unduly time-consuming or costly?	• Establish relevant legal rights through regulation issued under existing law, if possible, or by passing a new law. • Change laws, regulations, and administrative procedures to streamline and clarify the application process.	• Ability to build a consensus in government and the community on the new approach • Legal and policy drafting skills • Ability to improve administrative processes • Improved staffing, training, and a move to digital processing in granting resource rights
		(d) Can developers of RE-power plants: • Easily identify the owners of sites that may be suitable for renewable energy development? • Acquire legal control of these sites?	• Governments may wish to ensure that all titles are formalized and included in an online database with GIS capabilities, as Jamaica did.	• Ability to identify suitable sites • System to make information about location and ownership of suitable sites available to developers

Component	Is the component in place?	Are the details right?	Options to close gaps	Resources required to close gaps
			• If this is too time-consuming or expensive, governments may identify suitable sites and acquire them or make their owners known to developers. • Governments can also identify all suitable sites owned by the government (and by government-owned companies) and set out competitively neutral terms on which the sites will be made available to developers. • Governments can pre-approve suitable brownfield sites for RE development. For example, abandoned quarries, decommissioned power plants, and decommissioned landfills. The approach of sustainable energy site zoning could be pursued.	
		• (e) Does the law provide for the compulsory granting of easements for power lines? • (f) If IPPs are envisaged, can this power be exercised in a competitively neutral way so that all providers can benefit equally from it?	• If this power is not present in the law, a statutory amendment to a sector act, land act, or act governing compulsory acquisition will be needed. • If the power lies with the utility, the utility should be engaged to use it for interconnecting IPPs. • If all other approaches fail, as last resort appropriate regulations or laws may be necessary to facilitate this.	• Knowledge of property law • Knowledge of the laws regulating the utility or liscence • Ability to negotiate • Drafting of new regulations or statutory amendments

Component	Is the component in place?	Are the details right?	Options to close gaps	Resources required to close gaps
		• (g) Are there clear environmental rules which: – Define which environmental impacts are and are not prohibited? – Specify the permits power plants need and how to get them? • (h) Is the process (including all the agencies) for acquiring the rights clearly defined and not unduly time-consuming or costly?	• Establish environmental rules for power plants using existing environmental legislation if possible. • If necessary, pass a new law and establish detailed rules as subordinate legislation under that law. • Streamline and clarify the permitting process if necessary.	• Legal drafting skills • Knowledge of the environmental impacts of power plant development
		• (i) Are there clear rules allowing RE-power plants to connect to the grid and setting out: – How applications are to be made? – Criteria for how decisions on interconnection applications will be made? – How decisions will be made in case of competing applications? – How the costs of interconnection are to be borne? – Technical standards which must be complied with?	• Create or expand a Grid Code to cover these matters. The Grid Code can be a private law contract between the grid and those connected to it. • A regulator or government agency may need to approve the Grid Code to ensure it is not anti-competitive. • The utility should be invited to produce a reasonable Grid Code or set of interconnection arrangements; where this is not deemed feasible, regulatory intervention or legal amendments may be necessary.	• Technical and legal skills in drafting and reviewing Grid Codes or other Interconnection Agreements • Delineation of appeals process
4.1.4. Cost-reflective tariffs	Are tariffs cost-reflective and neutral between conventional and renewable resources, as far as recovery of generation costs is concerned?	(a) Is there a fuel-cost pass-through mechanism that: • Reduces revenue to the utility when renewable energy replaces fossil fuel; • Without simultaneously allowing pass-through of the costs of renewable energy generation?	• If IPPs are envisaged, add a 'cost of purchased renewable energy' to the pass-through mechanism (as Jamaica and Dominica have done). • Alternatively, allow for immediate rate-basing of the renewable resource and a specific uplift to the base revenue requirement and	• Power sector economics and finance • Regulatory drafting

Component	Is the component in place?	Are the details right?	Options to close gaps	Resources required to close gaps
			tariffs to cover depreciation and return on assets on that resource.	
		(b) Are the tariffs efficient and reflective of marginal costs in the sense that: • Variable charges mostly reflect system marginal cost and vary by time of day? • A feed-in tariff allows approved distributed facilities to sell power to the grid at a price that reflects system marginal cost (or levelized production cost, if lower)? • Fixed costs are largely recovered through fixed charges?	• Carry out a tariff study to arrive at a set of cost-reflective tariffs. • Utility or regulator (as the case may be) can then decide to adopt these tariffs.	• Power sector economics, finance, and regulation
		• (c) Are tariffs cost-reflective in the sense that total revenue covers the total reasonable cost of the system, including a reasonable return on capital invested?	• Carry out a tariff study to arrive at a set of cost-reflective tariffs. • Utility or regulator (as the case may be) then decides to adopt these tariffs.	• Power sector economics, finance, and regulation
		• (d) Is there a system for adjusting tariffs over time so that they remain cost-reflective, and do the utility and other investors have confidence that this system will remain stable and predictable over time?	Options to increase the stability and predictability of tariff setting include: • codifying detailed rules for how tariffs are to be set; • embodying these rules in a concession contract or license; • creating a regulatory body with a governance board that is genuinely independent of the political directorate; • establishing a binding appeals mechanism.	• Ability to build a consensus in government and the community on the new approach • Regulatory design • Legal drafting

Component	Is the component in place?	Are the details right?	Options to close gaps	Resources required to close gaps
4.1.5. Creditworthy utilities	Is the utility creditworthy?	A. Does the utility have: • Up-to-date, audited financial statements with an unqualified audit opinion; • A Debt Service Coverage Ratio > 1.3; • A long-term debt to long-term asset ratio of less than 60 percent; and • Three years of recent history of servicing a loan? B. If not, does the utility have: • Free cash flow from operations that are greater than its debt service; • A guarantee from a credit-worthy entity; or • A revenue escrow that can be used to secure debt?	• If the utility lacks anything in (A), the utility may still be able to borrow if it puts in place a financial improvement plan and credit support from a credit-worthy entity, provided it is making a profit and has free cash from operations in excess of its debt service. • A Utility Turnaround Plan should be developed and implemented if the utility's debt service coverage ratio is below 1.1. This would typically involve increasing efficiency, cutting costs, improving billing and collections, and seeking a tariff increase if tariffs are not cost-reflective.	• Utility financial management and turnaround experience • Experience in structuring guarantees or revenue escrow accounts
4.1.6. Distributed[117] generation framework	Is there a suitable framework for distributed generation?	(a) Are there rules allowing the sale of electricity from distributed generation to the grid that include: • Rights for both behind-the-meter and direct-sale generators to sell? • A reasonable Feed-in-Tariff (see Cost Reflective Tariffs Component)? • Assurance that the FiT will not be reduced for existing systems for a defined period of time long enough to allow the system to be financed?	• If these rules are lacking, regulations establishing such rules can be promulgated under an existing act, or adopted as a matter of policy by the utility. If necessary, statutory amendments can be passed to allow such secondary legislation to be promulgated.	• Creation of consensus among stakeholders • Knowledge of distributed generation technologies and interconnection • Technical drafting skills • Legal drafting skills

[117] The framework should include demand-side management

Component	Is the component in place?	Are the details right?	Options to close gaps	Resources required to close gaps
		• Clear and simple technical standards that must be met, including how connection to the grid may be made? • Supervision of the utility to reduce the risk of the utility delaying connection? • A reasonable cap on the size of any individual system? • A reasonable cap on the total capacity allowed under the scheme to ensure system stability? • A system for reviewing and increasing the total cap periodically while continuing to ensure system stability?		
		• (b) Are there effective capacity caps that ensure system stability and prevent the development of excess capacity? • (c) Is there a Variable Renewable Energy (vRE) Integration study?[118] • If yes, is it consistent with the IRRP/master plan?	• Engage consultants to conduct a vRE study and use the outputs to set the network cap and individual system cap.	• Power economics and finance • Power system modeling and vRE analysis
		• (d) Are there clear and effective rules for connecting to the grid that state what should be paid for by the utility and the developer?	• Develop rules for connecting to the grid.	• Power system planning • Power sector economics

[118] A variable renewable energy (VRE) study or grid integration study is an analytical framework for evaluating a power system with high levels of VRE resources, such as solar and wind. The study simulates the operation of the power system under different future VRE penetration scenarios, identifies reliability constraints, and determines the relative cost of actions to integrate VRE.

4.2 Coordinating implementation of the MRF

As noted before, it is intended that the MRF will be applied as a benchmark and a diagnostic instrument to identify deficiencies and gaps to facilitate subsequent targeted and coordinated interventions that can be pursued to assist BMCs to improve their regulatory frameworks to be investment enabling. Effectively implementing the MRF however, will require actions by many ministries of government, agencies, regulatory bodies, and electric utilities. Implementation may also be enhanced by a high degree of awareness among the civil society. Identification of a sponsor of the process at the national level to lead advocacy efforts will be an important step, as well as robust coordination of the technical assistance support to be provided by strategic ASERT partners.

While the development of the MRF was informed by experience in the region and globally, the effectiveness of the application to BMCs can only be assessed over time. Based on timely assessments (say within the next three years), it is considered that revision and updating of the MRF will be done to ensure that it remains a relevant tool for continuous improvement in the regulatory frameworks.

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