

# **Renewable energy development in Jamaica**

“One hand can’t clap”

A perspective on partnership for overcoming the barriers to the implementation of renewable electricity production

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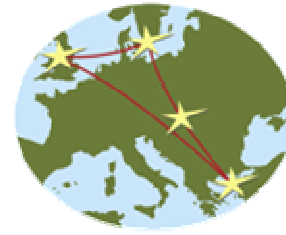
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## **Abstract**

This thesis provides an insight into Jamaica's energy situation and its electricity sector through the barriers that prevent the implementation of renewable energy. In both the energy sector and electricity sub-sector the need to incorporate alternative energy sources, it has revealed, is becoming more apparent with increasing oil prices, widening debt burdens and rising unemployment, among others. The use of renewable energy as an alternative to the conventional energy system provides the opportunity for improvement in Jamaica's economy, society and environment. The research examines the status of renewable energy in Jamaica, taking into account the legislative and regulatory framework, the main actors within the energy and electricity sub-sector, along with public-private partnership for renewable energy. The research establishes how a good policy and supporting system can address the barriers to the implementation of renewable energy, and how public-private partnership can be used as a tool for overcoming these. The results suggest that partnership is a driver for long term commitment, and that good governance between the public sector and private entities and renewable energy policy is necessary for its implementation.

**Key words:** policy, barriers, partnership, renewable energy







## **Executive Summary**

Fossil fuels have continued to be the dominant energy source used throughout the world, despite their impact on the environment – both as contributing factor to air pollution and because of the means of extraction – and rising oil prices. However, renewable energy use, though identified as being critical for the environment and having social and economic benefits, pales in comparison to its counterpart – conventional fuel – in terms of use. In the literature, it is established that there are obstacles to renewable energy's implementation, and that these may be similar in both developed and developing countries. Nonetheless, literature indicates that having a good policy structure for renewable energy encourages its implementation. Jamaica, like most tropical countries, has an abundant supply of both clean and not so clean renewable energy sources, yet this accounts for approximately 6% of the country's total energy mix and approximately 4% of its electricity mix. At the same time, Jamaica imports approximately 92% of petroleum and petroleum-based products in order to satisfy its energy needs, which in 2004 accounted for 66% of export merchandise earnings, and which is the second highest debt for the country in terms of debt servicing.

The research therefore sets out to find; “What are the barriers to renewable energy implementation in Jamaica?” “Does a disparity exist?” and “How can public-private partnership aid in its implementation in the electricity sector?”

The approach taken to answer the questions is through literature review. This enables the establishment of a theoretical framework regarding the barriers to renewable energy implementation and the opportunities through specific policies to encourage public-private partnership. It also establishes a framework for the selection of public-private partnership types for use depending on the scale of the plant, accessibility to the resource(s) and technology being used. The findings from the literature review were analysed in light of the case of Jamaica's energy sector and electricity sub-sector by using a descriptive approach to arrive at answers for the research questions.

The case study took a descriptive approach to the status of renewable energy in Jamaica, by looking at the energy sector and electricity sub-sector, undertaking a historical review of renewable energy use and potential, and by reviewing the legislative and regulatory framework and the actors within the sectors. It was revealed from the study that the barriers to renewable energy are policy, planning, implementation and operation. Those identified for Jamaica were policy, financial, human resource and institutional capacity, awareness and information. The scholars in renewable energy implementation endorse the need for promulgation of policies for renewable energy, with key areas deemed necessary to be addressed within the policy mechanism. These are (1) having equal ground with conventional fuel, (2) eliminating subsidies from mature conventional electricity providers, (3) developing long term policy as guidelines for planning and strategy, (4) developing innovative approaches to promote successful renewable energy technology, and (5) the need for clear goals, objectives and targets within policy reform and structure. Additionally, policy structure should be guided by drivers such as transparency and well defined and appropriately applied resources. It should also be guided by a policy framework, namely a contextual framework, energy and land-use planning reform, and community buy-in, which speak to equalising community risk and cost benefit distribution.

Additional barriers were identified from the case study conducted. These are: (1) renewable energy not being a political priority despite political commitment, (2) fragmentation of roles and responsibilities, including overlapping functions for actors within the energy sector and

electricity sub-sector. This overlapping is a result of the Acts that govern the sectors; these have made it difficult for any one organisation to take full responsibility for the implementation of renewable energy. Finally, the third barrier (3) is that legislation within itself is also limited. Of note, the Energy Policy being used currently is dated from 1995, with the new Energy Policy (a Green Paper) dated 2006-2020, and a power and electricity policy dated 2004 still in draft stage.

To overcome the barriers to renewable energy, public-private partnerships and financial policy schemes were examined. These included for public-private partnership traditional partnership types, with focus on 'build own and operate', and newer types, such as joint venture/equity share and production share agreements. A comparison of the three types of partnership was made to ascertain which would provide the best fulfilment in the implementation of renewable energy. The results revealed that all three partnership types selected can be used. This is based on the renewable energy to be implemented, accessibility, size and technology used. The criteria developed for the selection process are the ability of the scheme to meet renewable energy targets, the economic benefits to be derived from it, and political feasibility. This was weighted against the least economic cost to construct and operate the plant, the degree of difficulty to access the resource, distance from the national grid, level of investment required and the size of the facility.

The financial schemes examined were tendering, net metering, quotas and feed-in-tariffs. At present, Jamaica uses a tariff system with net metering for petroleum use in electricity generation, and net billing for private residences and commercial entities that use renewable energy and sell the excess to the Jamaica Public Service Company Limited. Additionally, avoidance cost is recommended by the Petroleum Corporation of Jamaica for bulk supply of renewable energy to the Jamaica Public Service Company Limited.

The recommendations issuing from the research are:

The Government of Jamaica must adapt one of three public-private partnerships or use a combination of all public-private partnerships presented within the research (i.e. Build Own Operate, Joint Venture/ Equity Share and Production Share Agreement) to affect renewable energy implementation within the electricity sector.

That the Centre of Excellence for Renewable Energy, a subsidiary of the Petroleum Corporation of Jamaica, be given the task or mandate to look at guarantees to attract private partners and coordinate RE activities between agencies. Moreover, that it research guarantees for partnership agreement, and that it be the independent body with oversight function of the processing of Least Cost Expansion Plan (under the All-Island Electric Licence) bids, as well as other responsibilities which they are now assigned.

While there are merits to the use of tariff schemes and net metering for petroleum-based electricity generation, net billing, avoided cost and feed-in-tariffs must be used to drive financial incentives, along with other non-economic guarantees for renewable energy implementation in Jamaica.



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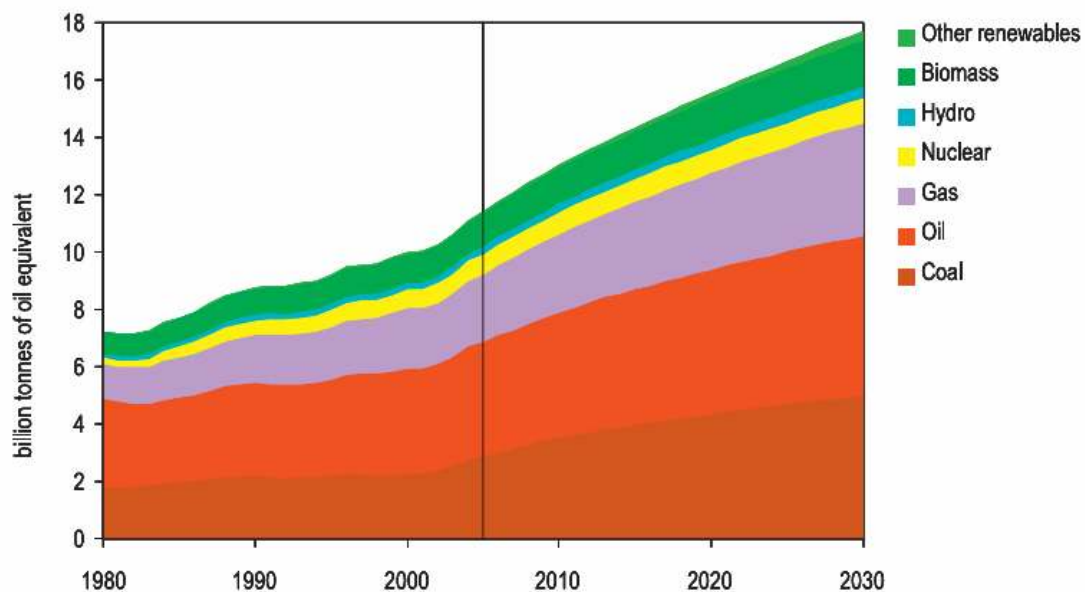
# 1. Introduction

“In the absence of radical intervention by government, fossil fuel will remain the dominant energy source”. UNEP (2008)

## 1.1 Background

At present, fossil fuel is the world’s predominant energy source (Figure 1-1 provides an overview of the world energy resources and use) its extraction production and use are not considered to be efficient regardless of the new technologies available to improve its use and extraction. In one of its article, (UNEP, 2008) has stated that governments need to intervene to and implement alternative energy sources to achieve sustainable development and further diversify their economies. If not, fossil fuel will continue to be the world’s chief energy supply which will later affect energy security and national security. It was further added by UNEP among other authors, that energy is essential as it underpin the three dimensions of sustainable development. It has been further expressed that the main objective of a sustainable energy is its system. The energy system should provide energy service that is socially acceptable, economically viable and environmentally sound. As such, emphasis is placed on an improved energy system that is efficient throughout especially at the end use.

Figure 1-1: World Predominant Energy Supply



Source: International Energy Agency, *World Energy Outlook 2007*.

The demand for energy and in particular cheap energy lead to fossil fuel being utilised over the years. It has been used for example in electricity generation and transport sector and its use has been growing. Importantly, although fossil fuel has enabled the growth of electricity access, with its use and supply being expanded worldwide, still an estimated 1.6 billion people in the world are without access to electricity; and an estimated 2 billion still rely on traditional fuel for cooking and heating (UNEP, 2008). Jamaica, (area of focus for the paper) is heavily dependent on fossil fuel (approximately 92%). Altomonte, Coviello and Cuevas (2004) and

Saunders (2005). Fossil fuel use within Jamaica has no doubted created jobs but at the same time impacted on social and environmental health. The use of renewable energy can and would decrease the impact on social and environmental health and at the same time create addition jobs. In studies for example Akella, Saini and Sharma (2008) point to the potential of additional jobs creation with the implementation of RE during the short, medium and long term. This they continue to state would cause the multiplier effect which will build the social and economic structure of a country.

The economic implication of continued fossil fuel use within Jamaica has resulted in more export earning going to finance the importation of fuel. As such, financial resources that could be used in other sector are withdrawn to service import oil bill. Nilsson & Johansson (1994) confirm that heavy dependence on oil imports will stress and increase the foreign exchange burden as well as the capital investments needs for the energy sector. While their work is 15 years ago, the finding it even more relevant today. As such, financial resources that could be used in other sectors are withdrawn to service the import oil bill. In the report on Economic Commission for Latin America and the Caribbean (ECLAC) (Altomonte et al., 2004) had indicated that approximately 50% of many Caribbean state's earnings from other sector go to finance oil import while for Jamaica in 2004, 66% of merchandise sale went to service oil import bill (Government of Jamaica, 2007a). As a result, Jamaica needs to diversify its energy source; in doing so this will strengthen the overall economy of the country and considering cost effective applications will allow for savings in the energy bill.

Jamaica's conventional fuel use are mainly petroleum and petroleum base products (e.g. heavy fuel oil, bunker C, liquid petroleum gas, asphalt, kerosene, automotive diesel oil, jet fuel) and coal. The environmental implication of fossil fuel use contribute to air pollution, acid rain, poor urban air quality, climate change, deforestation, land degradation and biodiversity loss. Indirectly there is also impact from oil spills and the resultant coastal and marine degradation; it further causes water pollution which includes detrimental alteration of surface waters, underground water or the marine environment. Therefore, in the electricity sector the use of petroleum to produce electricity contributes to the impact on the nation's biodiversity. (Akella et al., 2008; Altomonte et al., 2004; Nilsson & Johansson, 1994; UNEP, 2008).

In general renewable energy sources have been promoted within the twenty first century as sustainable resource. As defined by Elliott (1997) renewable energy namely solar, wind, wave and geothermal resources are clean, safe and reliable. The natural energy flow of these resources continuously replenishes and is infinite. When used, on a large scale renewable energy (RE) can replace fossil fuel for electricity generation and effect savings for national budget.

In accounting for the Caribbean contribution to greenhouse gases, Loy & Coviello (2005) and Haraksingh (2001) indicates that approximately 21 million tons of carbon dioxide (CO<sub>2</sub>) is produce per year within the Caribbean from 98% fossil fuel use. In Jamaica, this account for approximately 54% CO<sub>2</sub> from 92% imported crude oil use. To reduce the Caribbean states contribution, (though minimal in comparison to develop and emerging countries like Brazil, India and China) to greenhouse gases Fevrier (?) and Haraksingh (2001) indicate that the an annual reduction of approximately 1.2 million tons of CO<sub>2</sub> emissions should be avoided based on 1997 figures.

Jamaica has an abundant supply of renewable resources for example average wind speed estimated 8m/s, irradiation rate has been estimated as 5KWh/m<sup>2</sup> or 1,800KWh/m<sup>2</sup> per annum (RECIPE, 2006), hydropower i.e. mini hydro can produce 94MW and biomass of

which only 2% is presently being utilised within the energy mix of the Jamaica (Altomonte et al., 2004; Government of Jamaica, 2007a; Haraksingh, 2001; Wright, 2001). As such, the potential in Jamaica for less dependency on the use of imported crude oil and natural gas is high; as well it contribute to meeting the Millennium Development Goals and global climate change goals. However, effort to tap into these resources has proven to be slow. In 2004, the Latin America and the Caribbean governments have committed themselves through the Economic Commission for Latin America and the Caribbean (ECLAC) project to achieve a goal of 10% RE sources in the energy mix by 2010. Nonetheless, the Caribbean Community lack a regional renewable energy policy to guide its implementation within the region and Jamaica does not have a national renewable energy policy to drive its implementation on a local level. The legal commitment and guidance from a renewable policy has prevented the development of renewable energy by international, regional and local private investors. At present, it appears that the target projected under the ECLAC is not likely to be achieved.

The adoption of a good renewable energy policy can support economic development of a state and enable them to further achieve sustainable development. However, it is important therefore, that government is committed to the implementation of renewable energy and strong support established through its policy system. Importantly, policies need to be well structured and attractive to the private sector, as poorly structured policy although aim at encouraging renewable energy will fail to achieve the desired outcome (Mallon, 2006; Mendonca, 2007). There are obstacles to the implementation of renewable energy within the energy and electricity mix in Jamaica. Policy for renewable energy has been argued by renewable energy scholars as an important field for addressing the barriers. However, in Jamaica the need for renewable energy policy is one topic that is heavily debated but its promulgation seems far from being achieved. Additionally, it has been further argued that a comprehensive national policy can cover the needs of renewable energy (Petroleum Corporation of Jamaica, 2009). At present, all legislative and regulatory frameworks in Jamaica for energy and electricity sector support petroleum fuel source with little or no direct indication to the use of renewable energy. Given the target set by ECLAC, in order for Jamaica, to meet and even exceed the target of 10% renewable energy sources in the energy mix action must be taken now. A proposal to meet the target and overcome the barriers to renewable energy implementation in Jamaica is undertaking public-private partnership. Using just an insight, government has the legal means by which to attract and encourage private sector investment into renewable energy and the private sector has the financial and human resource by which to achieve the objective. Overall, the benefits to be derived for both the public and private sectors is good and worth the investment.

## **1.2 Problem statement**

Jamaica lack policy and regulation for the implementation of renewable energy. Drafts policy for Power and electricity 2004 and Green Paper for Jamaica Energy 2006-2020 exists with no indication on the timeframe for completion. The present energy and electricity sector is governed by several legislative and regulatory framework including diverse actors. The Government of Jamaica has set as its target in the policies the goal of 10% use of renewable energy by 2010 as agreed upon in the ELAC agreement and a further increase of 15% by 2015 and 20% by 2020. For this to be achieved in Jamaica fast action is imperative; nonetheless there are barriers to be overcome. One way forward, is through a good policy system and public-private partnership mechanism.

In back-tracking, the Caribbean heads of government had commenced discussion since the early 1980's on the need for alternative energy source and the need to tap into the abundant

energy source the region has. They had subsequently established focal points to coordinate and augment collection of energy information<sup>1</sup>. Following this, several renewable energy initiatives were implemented up to early 2000. Most have been successful while others were unsuccessful. Reasons identified for failure of projects ranged from a lack of support after implementation and economic reasons. Overall, the pace of implementing substantial renewable energy has been slow. In assessing the slow pace in 2001, focus groups led by the Caribbean Energy Information System (CEIS) and the Caribbean Renewable Energy Development Programme (CREDP) identified barriers. The barriers identified included policy, finance, human and institutional capacity and awareness<sup>2</sup>. These barriers identified also impact renewable energy implementation in Jamaica. Nonetheless, without addressing the barriers and even having a renewable energy policy to guide its implementation, Jamaica to date, has commissioned a small wind plants with a capacity of 20.7MW and several mini hydro plants with a total capacity of 23.8MW. Jamaica’s petroleum use by sector is broken down in Table 1-1 petroleum consumption by activity. Further, indication have been made by Government of Jamaica to expand renewable but steps in bridging the identified barriers and extending/ implementing additional renewal energy capacity have been slow. In signalling commitment to conventional fuel use, in 2007 Government of Jamaica (through the Petroleum Corporation of Jamaica) has signed an agreement with the Jamaica Public Service Company to build and operate a cogeneration plant for petroleum coke use and further partnerships have been forged for oil exploration. However, no similar agreement has been signed for renewable energy implementation despite the desire to add to hydropower and wind use in the country.

Table 1-1: Petroleum consumption by activity 2003 and 2007 (barrels of oil)

Activity	Consumption by barrels of oil 2003	Consumption by barrels of oil 2007
Road & rail transportation	6,037,168	6,079,884
Shipping	414,424	3,972,826
Aviation	1,620,143	1,931,222
Cement manufacturing	51,124	28,477
Electricity Generation	6,471,480	6,654,238
Bauxite/ Alumina processing	9,545,660	8,810,650
Sugar manufacturing	112,154	61,491
Cooking and lighting	905,626	912,116
Petroleum refinery	259,405	362,947
Other manufacturing	142,290	198,995
Other	226,325	80,332
<b>SUM</b>	<b>25,785,799</b>	<b>29,093,178</b>

Source: (Planning Institute of Jamaica, 2007)

In overcoming the barriers and meeting the renewable energy needs for Jamaica, public-private partnerships have been identified as a potential solution. The merits of this type of partnership include stemming: shortfalls in effecting renewable energy policy, slow or no investments and slow or no networking that is brought about by the identified barriers.

<sup>1</sup> See the Caribbean Energy Information System [http://www.idrc.ca/en/ev-114970-201-1-DO\\_TOPIC.html](http://www.idrc.ca/en/ev-114970-201-1-DO_TOPIC.html)

<sup>2</sup> See the Caribbean Renewable Energy Development Programme

Public-private partnerships allows for addressing inadequate planning and development of long term policies and meeting the necessary regulatory measures that can support renewable energy as well as financing and networking that are also obstacles to sustainable energy development. As such, public- private partnerships provide the bridge to achieving the transformation and the creation of attractive investment environment and achieve national economic growth. It further allows for leveraging additional resources and enhancing capacity building for both the private and public sectors. It builds on inter-partnership collaboration that would strengthen and ensure the most appropriate use of public funding and that replication is better achieved. The building of partnerships for the implementation of renewable energy is important, as it break divides, builds trust and creates buy-in by investors and local communities that barriers had served to prohibit.

To further understand the issues surrounding renewable energy within Jamaica and the measures available to the governments; there is therefore a need to analyse the existing situation and what the barriers are and why they remain and how public-private partnerships can be used as a pathway for overcoming the barriers.

## **1.3 Research Focus**

### **1.3.1 Objective**

The overarching objective is to contribute to an improved understanding of the present petroleum use in Jamaica and the opportunities that are available to facilitate renewable energy implementation. The main objective of this paper is to identify and discuss the barriers and opportunities to renewable energy implementation for use in the electricity sector. More specifically, examine public- private partnership as a tool for fostering and implementing renewable in the electricity sector. The thesis approached different management schemes and compared the potential partnership schemes to effect renewable energy implementation. In order to achieve the objectives the roles of the actors and the legislation guiding renewable energy is reviewed to understand how partnership can bridge the gap in implementing renewable energy and the role (if any) to be taken by government as initiator, facilitator and/or guarantor in achieving and meeting this objective.

### **1.3.2 Research Question**

In order to address the overall objective the following research question has been devised:

Why is there a disparity in policy processes for renewable energy sources and implementation of renewable energy plants within Jamaica?

How can partnership between public sector and private sector contribute to the implementation of renewable energy utilisation in the electricity sector in Jamaica?

### **1.3.3 Target Audience**

The following form the main target audience for the thesis. The thesis can be of value to the private sector as well although they were not listed.

- Government of Jamaica (Petroleum Corporation of Jamaica; Ministry of Energy and Commerce; Office of Utilities Regulation; and the Cabinet Office) – This group form the key body in Jamaica that have direct responsibility to direct and or implement

renewable energy within Jamaica's energy and electricity sector. They also have the power to regulate the sectors and are the decisions making body for energy and electricity regulation.

- Academia – form the body that may conduct further research to fulfil the gaps identify to ensure that all relevant questions relating to the field of renewable energy can be answered.

## **1.4 Scope of Thesis**

The research seek to examine the barriers to renewable energy implementation for energy and electricity sectors in Jamaica with a view to sustainable development from the perspective of Government of Jamaica. This is as a result of the need for Government of Jamaica's commitment to renewable energy and them being the states decision making body with the power to mandate and lead the charge for the implementation of renewable energy.

The focus of the thesis is how a good renewable energy policy structure and public- private partnerships can help in moving the agenda forward. The thesis examines Jamaica's energy situation including the key stakeholders in the energy sector and electricity sub-sector. The reason of doing so is to understand and know how to contribute and or influence the decision making arena for the electricity sector. The research mainly looks at the barriers to renewable energy implementation the challenges the Government of Jamaica faces and the opportunities that exist for implementing renewable energy in the electricity sector.

## **1.5 Research Approach and Limitation**

The research was motivated by the need for greater environmental protection of Jamaica's fragile ecosystem as it relate to the use of petroleum in the energy and electricity sector. Secondly, Jamaica's oil bill is too high, it has been reported to be second to debit servicing for Jamaica's government's annual expenditure. Thirdly, electricity bill for both the average and not so average Jamaican (residential and commercial) is also too high; overall, impacting on sustainable development and poverty alleviation for Jamaica. Fourthly, Jamaica has an abundant supply of clean and not so clean renewable energy sources that has been minimally tapped. Fifthly, Government of Jamaica alone does not have the resources to implement renewable energy sector and electricity sub-sector. As such, the research approach partnership through public private agreements as a good means for transforming and creating an attractive investment environment for renewable energy projects while ensuring the most appropriate use of public fund and effecting the improvement of Jamaicans standard of living while contributing to the environmental protection.

The thesis serve as an analysis of data gathered primarily from secondary sources. The limitation in gathering data is as a result of the slow and or no response to request for information and further limited access to primary data from the authorities in Jamaica. Additionally, in trying to overcome the obstacles to acquiring the relevant information from the key organisations, the author tried to obtain as much information as possible from contact persons through other Ministries and organisations as well as sourcing project documents from other relevant actors to energy sector and electricity sub-sector in Jamaica. Information obtained from Government of Jamaica included official documents and these were provided within hours before final submission of the thesis. Additionally, the time frame allotted to write this paper does not allow for in-depth analysis.

## **1.6 Methodology**

The approach taken for the thesis is in the form of a case study. It is a qualitative analysis of the energy sector and electricity sub-sector in Jamaica regarding the use of renewable energy to decrease the dependency on petroleum and petroleum base product in namely the electricity sector. In the case study, the approach taken is to examine Jamaica's renewable energy status through the energy and electricity situation, history and potential for renewable energy use, legislative and regulatory framework and the key actors in the sector. Additionally, an examination of public-private partnership was made with a comparison matrix developed for the selection of the most suitable type of public-private partnerships to be used in Jamaica's electricity sector for renewable energy implementation.

Information to address the research questions was gathered over a three months period, the result of the research design is as follows:

### **1.6.1 Research step 1: Development of conceptual framework**

The first phase of the study conducted i.e. preparatory stage was carried out by way of collecting information from secondary sources books, articles, academic literature, publications and internet searches. This allowed for the development of a conceptual framework. Through the literature study an understanding of the barriers and a list developed along with and assessment of the recommendation for overcoming them. This was followed by understanding the main managers in the field of renewable energy i.e. government and private sector and how each entity is managed. This preliminary assessment also allows for the setting in context of public-private partnerships, the type most applicable for renewable energy implementation in the electricity sector and how and why they can bring about the necessary commitment for renewable energy implementation.

### **1.6.2 Research step 2: Information collection**

The second phase of the research entailed further secondary data collection (library/ desk tops searches), this time on Jamaica's energy and electricity sector, namely, status, history, potentials, legislative and regulatory framework and the actors within the sector. This was done to gain an insight into the energy and electricity sector, through the understanding of the areas researched as well as what could allow for the barriers to continue and where the opportunities lie to overcome the barriers. Further, it was imperative to know what are the policies that governs the electricity sector and the main decision making body for its regulation and directive. Additionally, it was import to know from the data collected who or how this body(ies) could be encouraged to develop a public-private partnership scheme as an incentive for implementing renewable.

### **1.6.3 Research step 3: Analysis**

Finally the study entail an analysis of the information gathered from secondary sources. This phase involve the development of an analysis criteria for selecting viable public-private partnership types for use within the electricity sector with a weighted method to give directive on the financial guarantee to be applied. As well as, specific policies necessary to make public-private partnership work i.e. renewable energy schemes and the actors that should lead the charge for renewable energy in the electricity sector in Jamaica. Overall, the information

gathered from secondary data was an analysis using a descriptive approach to arrive at answer for the research question.

## 1.7 Thesis Outline

This report is structured as follows:

Chapter 1: Set the paper in context allowing for an understanding into the issue, why this topic is important and the method for way forward.

Chapter 2: This chapter is based on a review of relevant literature in the field of renewable energy barriers and partnership. The chapter will seek to describe the challenges posed by barriers and the opportunities available that do impact renewable energy implementation in an effort to understand:

1. What are the means for overcoming them; and
2. What are the benefits to be derived once overcome;

Chapter 3: Renewable energy implementation has been a goal of the Jamaican government for years, however, steps to bring the renewable energy resources as viable mix to the energy sector has been slow. In this chapter the Jamaican energy and electricity situation will be examined to ascertain how renewable energy can be implemented within the electricity sector. Consideration from the Caribbean Community initiative will briefly be looked at for setting the Jamaican renewable energy stage. Several areas will be examined these are:

- Energy and electricity sector;
- Present situation within the electricity sector;
- Guiding principles based on legislative and regulatory framework of Jamaica electricity and energy sectors; and
- The main stakeholders/ actors within the sector

Chapter 4: This chapter seek to discuss the type of public-private partnership used in Jamaica to facilitate infrastructure development and in particular electricity generation. The chapter further seek to compare the noted public-private partnership against selected renewable schemes for electricity generation and further discuss and recommend based on the social, financial and resource/ environmental need the most appropriate public-private partnership to be used.

Chapter 5: Following the literature review, case study and findings, this chapter seek to summarise all the findings and provide an overview on renewable energy implementation in Jamaica the challenges, opportunities, address the research questions and way forward for the electricity sector.



## 2. Literature Review – Barriers and Partnership to renewable energy

This chapter is based on a review of relevant literature in the field of renewable energy barriers and partnership. The chapter will seek to describe the challenges posed by barriers and the opportunities available that do impact renewable energy implementation in an effort to understand:

1. What are the means for overcoming them; and
2. What are the benefits of public- private partnership for renewable energy implementation to be derived once overcome;

### 2.1 Barriers:

The benefits derived from renewable energy use no doubt include, reduction in greenhouse gases and climate change, diversification of energy sources and reduction on supply dependency, reduction in vulnerability to international fuel price, energy security, political instability and resource constraint and ancillary benefits to human and environmental health (Neuhoff, 2005). To achieve sustainable energy in the future it is essential that importance is placed on the efficient use of resources along with political importance being given to renewable resources. Challenges through barriers exist to the development and commissioning of renewable energy (RE) resources and thereby to attain energy efficiency and sustainable energy future. These challenges need to be identified and addressed in order to be overcome. Barriers can be defined as “obstacles that restrains or obstruct progress, access, etc”<sup>3</sup>. Barriers to the implementation of RE has been identified by Modi, Mcdade, Lallement and Saghir (2006) and UNDP (2009) to include financial, policy/ legal structure, capacity, lack of long term vision, limited infrastructure, in some instance political commitment. Mirza, Ahmad, Harijan & Majeed (2007) Reddy & Painuly (2003) Sovacool (2008) identified among addition market barriers, financial and economic constraints, poor strategic planning, poor support for the development and utilisation of indigenous resources, insufficient knowledge and awareness and lack of promotion of proven renewable energy technology. To address these challenges it is essential to understand them, as such, an attempt will be made to define and bring clarification. Research to date does not point to a list of main barriers that are generic to develop, developing and emerging economics. The below indicate barriers from (Mirza et al., 2007; Modi et al., 2006; Reddy & Painuly, 2003; Sovacool, 2008; UNDP, 2009).

#### *Policy and economic structure...*

Policy/legal structure: In most case there is a lack of or insufficient support for policy mechanism to support RE through specific targets and guidelines, inconsistencies or lack thereof in incentive programmes, high level of bureaucracy that create delay in planning and implementing policy structure, poorly structured policy and unwieldy regulatory mechanism;

Political commitment: RE viewed as political suicide, the importance of RE is been established but the necessary steps for development and commissioning is outcompeted but conventional energy sources;

*... economic policies*

Financial/ economic: States lack the financial capacity to build and operate effectively RE facilities, for the private sector, the strain to finance without sufficient guarantee and ad-hoc cost prevent access and development and lack of financing resource and lending channels;

Marketing: Lack of market infrastructure inhibits penetration, environmental cost is not reflected in market prices and insufficient supply tariff and tax base tend to discourage RE implementation;

*Planning level...*

Strategic planning: RE has not been considered in the State's strategic land use policy and development which is at most linked to costly delays while spatial planning is adjusted to incorporate RE;

Long-term vision: RE is address on a piece-meal basis without consideration of the whole planning process and impact on society, economic and environment;

*Implementation and operation...*

Capacity: inadequate or lack of trained personnel and facilities to develop, manage and maintain, the development of technical support for RE, insufficient networking with local entities to build credit flow and knowledge base limited to a few demonstrated projects;

Limited infrastructure: limited or no infrastructure to support RE;

Poor support for the development and utilisation of renewable resources: public apathy expressed preference for familiar energy system, antagonism towards utilising true cost of conventional energy use and perception of quality and efficient versus traditional know-how for conventional energy technology;

Promotion of proven renewable: Limited promotion of RE on local/ domestic level also impacted by cost; and

Knowledge and awareness: Inadequate information available on local level to generate proper understanding and buy-in and decision making and limited access to information locally.

The challenge to overcome the defined barriers does not rest on one policy instrument but it has been argued by several energy scholars that a combination of policy methods is critical to policy development needs in order to drive RE. Importantly, policies need to be well structured and attractive to private investors as poorly structured policy although aim at encouraging RE will fail to achieve the desired outcome. In the literature review conducted most researcher argued for multiple policies that were specific policy for development to address barriers in order to encourage the implementation of RE. Importantly to note, the barriers identified previously were taken into consideration while reviewing the literature and argument tabled by the researchers. Policy measures put forward are:

Neuhoff (2005) argued for economic policies which include a level playing field for RE to compete on equal grounds with conventional fuel sources and technology regarding electricity generation. As this will satisfy energy demand and is a valuable future supply source. An

additional argument put forward was for the absorption of regulatory risk that provide for legally enforceable long-term guarantee.

Sovacool (2008) argued for what he considered four most favoured policy mechanism. He indicated that the myriad of policy mechanisms presently instituted only leave questions on their sufficiency to overcome the impediments faced. The four most favoured policy he argued for are: eliminating subsidies for conventional mature electricity, pricing electricity accurately, instituting feed-in-tariff and implementing a system benefit fund for public awareness, protecting lower income household and administering demand side management.

Atabi (2004) argued like Sovacool (2008) for outright removal of subsidies and Dinica (2008) argued for supporting policy to drive RE implementation. Atabi's main concern is based on subsidies being granted to conventional power providers and the true cost including environmental cost is not reflected in the price to consumers *inter alia*. Atabi argued that policy need to be implemented to end subsidies being granted to conventional energy producers as this creates unfair competition which results in the discouragement of RE investment and market penetration. UNEP (2008) in its writing discussed the harm caused by subsidies indicating that through the benefits derived from lower energy price consumer are not conservative in the consumption of fossil fuel which contributes more to poor environment and human health through the emission of greenhouse gases. Atabi charged that at most governments may have policy to encourage RE but competing subsidies are seen as obstacles to RE development as such, strategies and long-term policies are needed to guide its implementation.

Mirza (2007); Sebitosi & Pillay (2008) argued for long-term policy and guidelines, better planning and strategy, the development of indigenous resources and the promotion of commercially proven RET. Sebitosi's main concern was the ad-hoc RE measures by governments in most case to combat rising fuel price and reduction in state's greenhouse gases. While it is right to reduce State spending on fuel cost and to contribute to greenhouse gas reduction, taking a piece-meal approach only creates additional barriers to RE implementation. Mirza like most energy scholar as well as the United Nation contented that through the development of RE resources states especially developing ones, will make significant contribution to economic growth, improve standard of living and human and environmental health.

Reddy & Painuly (2003) argued for innovative policy approaches to realise RE's potential as present efforts by government have failed in RE promotion. Reddy argued overall for economic policy that will encourage market efficiency and a competitive energy industry. This he maintained will reduce the cost of RE production, enable a market based approaches encourage the successful development and diffusion of RE and the political will to effect environmental cost along with other externalities for conventional energy sources.

Dinica (2008); Mallon (2006) unlike Mallon who focused mainly on the content of policy structure; Dinica based his study on the need for multiple RE policy (economic and non-market base instrument) documents as structured policy to drive RE development. He argued that failure to do so will result in poorly structured policy that will not meet the desired outcome. Some RE policy mechanism Dinica added are unattractive because they fail to have economic guarantees as this pose a big economic risk. Feed-In- Tariff an example of Dinica is a good mechanism and can be an attractive policy to encourage the development and implementation of RE technology and grid connection. However this can fail and did fail to meet the desired outcome in Spain because policy developers had ignored diffusion and they

pay no attention to non-economic policy instrument and strategies of public authorities for RE technology and market support.

Mallon (2006) like the other authors identified the need for policy to drive RE. He argued for policy and policy reform to enable a successful RE implementation. However, the main challenge to this he stressed is a well structured policy. RE policy he added is robbed by the poor knowledge base of policy makers to draft instruments that will drive investment from private sector and solve the other causes of an ineffective RE system. As such, he identified several myths, pitfalls and oversight that he associated with the poor knowledge base of policy practitioners summarised in Table 2. Understandings of what is to be achieved; when it should be; how and why they are important questions that should underline policy makers concerns before drafting policy instruments.

Additional to the policy mechanism another mean for overcoming the barriers will be addressed. The literature did allow for the identification of policy and structured policy to drive RE; the next focus is to introduce the players that are critical to the implementation of RE given that the two principal themes which arise i.e. multiple policies to support RE and clearly defined policies are dealt with.

Table 2-1: Policy and political barriers to renewable energy implementation

Poor Policy Characteristic	Interpretation
<i>Myths</i>	
Technical	the belief that new RE innovation will revolutionise the energy market making it affordable and clean;
Righteous	significant innovation need no supervision; it only need to be fast track by government especially when benefit is non-commercial or significant commercial value;
Hands-off	government intervention only undermines market workings;
Money	RE is more expensive than conventional energy as such it is best government keep investing in conventional energy;
<i>Pitfalls</i>	
Under-define objectives	agreement and roles must be clearly defined to achieve the effective end. As such, intermediary steps within the process must not be taken as the end. Clear objectives must be set and embedded within the policies legislated.
Cross-cutting objectives	balance must exist among economic, industrial, social and environment interest and policies and should not be confrontational. This should be backed up by specific timeframe for each policy object to avoid ad hoc implementation;
Inadequate resources	technology neutrality is practise giving rise to multiple competitions where some innovation are fruitless. Instead government should clearly define within policy the technology they support;
Incorrect target measures	focus if on reducing capital burdens instead on performance requirement;
Opaque incentives	policy to draw potential investors must be clear and open;
Boom and bust	lack of policy and market stability;
Inadequacy/excessive fiscal constraint	under mining cost structure or over pricing cost structure is a problem for investors and government. As such, a balance needs to be made;
<i>Oversight</i>	
Absence of contextual framework	the present policy system do not support renewable energy and as such framework RE need to be realised;
Energy market reform and access	renewable system having to fit within a policy system that was not design for it;
Poor risk/cost-benefit distribution	inadequate or no consideration made for citizens needs arising from the demand for economic development. Government need to weigh the benefits to citizens and investors and integrate same in the policy for RE as well as being transparent to local because the are the one who are ultimately affected
Absence of commensurate planning and planning reform	policy for renewable energy without planning policy amendment will pose a huge barrier to the implementation of renewable energy.

Source: (Mallon, 2006)

### **2.1.1 Means for overcoming barriers**

Addressing barriers to RE is similar to the chicken and egg situation i.e. which came first. In this situation it is which method that will create the avenue to drive RE and overcome the obstacles that are impacting RE implementation. A number of literature argues for the promulgating of policy for RE to address the other barriers to RE. Thereby garnering: capacity building, raised awareness, building financial support etc. The principal framework that underpin a successful RE policy for implementation are within three fields first, drivers; second, context and third, society as indicated by Mallon (2006) and UNEP (2008). They further indicated that drivers are: transparency, defined objectives and defined resources and technology, appropriately applied incentives, adequacy and stability; context are: contextual frameworks, energy market reform and land-use planning reform; society is: equalising the community risk and cost-benefit distribution. Before defining the content<sup>4</sup> of a good policy for RE it is also important to point out the next step after policy development i.e. the vehicles public sector or private sector to implement RE or a combination should be considered as the best option to materialise/ realise full implementation. This will be discussed later.

#### ***Context put the policy in perspective***

This provides for government commitment through national policy and policy objectives to guide the development of RE policy thereby ensuring that legislation are promulgated and are conducive to the development and implementation of RE. The policy should not be obstructive rather, policy tiers are consistent and reinforcing especially for energy and planning requirements and are also appropriate for RE implementation, ensuring access to guaranteed markets; and the system allows for fair pricing for RE.

Contextual framework: Governments commitment is established to direct RE policy along with supporting and complimenting legislation from partner agencies and an examination of directive international, regional to local legislation. This is to establish consistency and avoid any contradicting policy legislation to RE development and implementation.

Energy market reform: This call for licensing and permit systems to adjust or reformed to allow the incorporation of RE within the existing energy market as opposed to short term waiver that seeks in the interim to allow RE injection as well as accession cost and associated cost to the grid regardless of RE facility size.

Land-use planning reform: Permitting, licensing and the planning process should change to meet RE. Planning procedure and land use prior to new electricity generation did not incorporate RE in spatial planning design and the development guidance legislation. As such, allows for planning practitioners and associated decision making body to make informed decision.

#### ***Drivers set the policy***

It allows for unified ground between RE proponents and conventional fuel proponents. It calls for the elimination of defined time frame and unequal competition amongst proponents. It establishes achievable goals and outcome by setting priority for achievement; enabling individual policy for RE resources/ technology; leveraging private sector investment and

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<sup>4</sup> Content adopted mainly from Karl Mallon Renewable Energy Policy and Politics.

gaining required return on equity. Finally it provides for long-term guarantees for both financial and manufacturing capacity/ project risks while avoiding boom and bust cycles.

Transparency: support must be clear, accessible and open to all proponents thereby minimising uncertainty of project risk. This includes rights related to property location, market access, taxes and surcharge and tariff for produced electricity.

Well-defined objectives: generating targets for achieving sustainable energy through RE and mapping and prioritising specific desired outcomes and potential benefits to be derived.

Well-defined resources and technology: specific policy for each RE resources that will drive and or open markets for electricity industry. It allows for the development of the technology and focusing of resources and will prevent the unsustainable/ over-exploitation of the RE resource and negative economic, socio-environmental losses.

Appropriately applied incentives: Policy should allow for an appropriate mix of technologies to develop and be implemented as well as, for maturity to be reached thereby leaving room for support and future needs to be met. Within the policy, incentives should be applied to both new and mature RE technologies thereby allowing them to evolve and develop and rather not only support mature/ older technologies.

Adequacy: Policy design should ensure attractive investment profile to bring in private investors to RE development. It should be competitive enough to generate interest away from conventional fuel investment and other alternative financial projects. It is important that consideration is taken on project life and the cost of energy as disparity in RE costs in the long-term will make it uncompetitive and the true cost distorted by higher prices which would be passed onto the consumers or tax-payer.

Stability: policy should speak to the direction in which RE should go taking in long-term support, build-up and exit strategies. Of importance, the policy to drive incentives should create a balance for renewable industry development while the wise use of the resources i.e. RE is available for the wider economy and government.

### ***Society allow for community buy-in***

The knowledge base and awareness of stakeholders including communities is key to the success of RE development. As such, there should be timely information release, consultations and all queries addressed to clarify any negative premise that may exist.

Equalising the community risk and cost-benefit distribution: The community share within the RE policy development is significant. To achieve this, the key facets would be to minimise all negative impacts and maximise all potential positive impacts through information sharing. This would allow for the community buy-in. The community would then know that they too can and will benefit from RE implementation. Two avenues to indicate to them are one tax base i.e. tariff and the other, through employment of both unskilled and skilled workers at the RE company. Further ancillary benefits to be derived include environmental and human health of the immediate community comparing this to conventional power supply being installed, and the ability to own shares within the RE company provided, this is made available to the local community and the policy provide the mean for incentives.

## **2.2 Ownership Management and Schemes**

It is important to address by what means RE implementation will be fulfilled. To this several questions may arise of which are can this be done by government only? Or, can the private sector undertake the implementation of RE alone. To be discussed are these vehicles government run entities and private sector entities to ascertain if it is practical to implement RE separately or a combination of resources public-private partnership would enable targets to be met and the overarching objective of both entities achieved.

### **2.2.1 Government sector ownership and management**

In the liberalised world that we live in government's role has been greatly reduced from the state run entities for all public goods i.e. post wars of the 20<sup>th</sup> century and political ideology (UN/ECE, 2000) to some or most services being out sourced to the private sector. In some cases, governments may form agreements with the private sector to manage finance and operate these entities or they are semi- government own like quasi government. This has been for example (e.g.) as a result of national and local budget insufficiency to finance the desired facilities. As such, in the 1980's and 1990's as reported by Martimont & Pouyet (2006) government from both developed and developing states embarked on liberalising public entities. The focus of the discussion now will be on government as a vehicle to RE implementation. Two main roles are apparent one RE by state run entities or two government only as regulator of RE.

State run entities:

As the representative of the people, the State is entrusted to provide public goods and services to meet public needs. As defined by UN/ECE (2000) the State's main role is to represent the people and manage the public entities that cannot be transferred to the private sector. Although this can be interpreted that management and operation is not solely vested in government but can be outsourced by the government. The point is government has a responsibility to manage and operate goods and services for public benefit. The management of public goods as discussed by Abiraj (2001) is to enable better distribution to meet the poor as well as favouring some entities above others sometimes based on political priority. As such, government need to oversee the management and operation of the public goods in an effort to make available to the public. This may be financed through user fee or tax mechanism. Secondly, state run entities are finance limited due to the number of sectors in need of finance. Government suffer from large budget deficits that prevents the adequate development of each sector e.g. the encouragement of research and development in other sectors to bring about technology advancement or new medical invention may not be undertaken or is yet to be established. As a result, the entities suffer from poor development of capacity building, knowledge base of staff rest on personal development, research and development are generally limited or at most outsourced and investment in growth and development limited. Notwithstanding, sectors that generate income are at most not spent within that sector but put within the government consolidated fund to support the governments purse. Overall, growth and development are further limited and the need to outsource and or reform becomes apparent for some sectors. Another aspect of state run entities is heavy taxation; it has been argued by UN/ECE (2000) as being part of government effort to manage public goods which is believed to put great strain on the public purse and tax payers.

Thirdly, state run entities are victims of high levels of bureaucracy. This meaning, the chain of command and control inhibit the free decision making of senior and junior management to



the improvement and growth of the sectors. Thereby, create disincentives for advancement/growth and development. Additionally, state run entities by virtue do not have market discipline resulting in very poor performance according to Wint (1998) as they are sheltered from competitions. Governments are therefore viewed as poor managers of some resources as public entities and are therefore encouraged to divest those entities that can be more efficiently managed by the private sector.

Government as regulator: Although not seen as a good business developer government do hold the power to direct business etiquettes to the fulfilment of their mandate to represent the people and manage public good. State's also have the responsibility to enhance competitiveness of their economics and thereby provide a regulatory role. States may act as defined by Wint (1998) and Abiraj (2001) as providing functional intervention<sup>5</sup> that is affecting the economy by neutrally providing a level playing field for investors thereby improving the functional market and secondly, through selective intervention thereby favouring discrimination against other sectors or firms within the economy. In light of RE government as regulator they may act to provide avenue to engender development and implementation through structured policy mechanism and promote efficiency in energy use through both methods of intervention. State operated RE electricity plants would be exposed to the issues mandate of public responsibilities, financial constraint and level of bureaucracy.

In Jamaica in the 1970's the Jamaican government started to acquire and manage some entities for example the electricity generation plant, this like many other of the entities run by the government had little success. Wint (1998) indicated that the problems faced were inappropriate, inadequate incentives and limited investment. The electricity sector was also driven by subsidies and in the 1990's it was sold (80% private -20% government) to an overseas company who with government intervention invested and expanded the plant and service.

### **2.2.2 Private Sector ownership and management**

The main objective of business is to maximize profit. However in order to meet this objective business have to consider other groups that have an impact on the business in one way or the other. These groups include employees, customers, the community and society on a whole. With these groups in mind, the objectives of business can be summarized as economic, human and social objectives (Unknown).

The economic objective of business looks not just as maximizing profit but also on the driving factors necessary to maximize profit. These factors include maintaining existing and engaging new customers, examining business processes and finding more efficient and productive ways of meeting end results, using available resources in the most efficient way possible by taking advantages of economies of scale.

The human objective of business looks at what the business needs to provide for employees in order to foster employee satisfaction which in turn will facilitate meeting the overall objective of the business. Business needs to ensure that employees are properly compensated for the labour provided, the work should be interesting and challenging for employees, there should also exists the scope for growth and development through training (Unknown).

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<sup>5</sup> See role of government in competitiveness of developing economies (Wint, 1998).

The social objectives of the business involve the community as well as customer satisfaction. Business should ensure that they give back to the community whether through financial or humanitarian assistance. Business also has a responsibility to ensure that the community environment is not damaged by any action of the business. The social responsibility of the business also includes charging a fair price for the goods or services that the business provides, upholding the law and paying taxes, providing employment, and providing a product or service that will contribute positively to the national development of the country (Unknown).

The role of the private sector generally falls on the guideline of meeting the business objective through the incorporation of various stakeholders. These stakeholders include the investors, employees, government and community. The private sector is the main engine for economic growth that leads to sustainable development and reduce poverty in the society. The private sector contributions to economic development comes through the creation of jobs, providing tax revenue, generating foreign exchange, providing finance, creating technology and developing skills (Eade & Sayer, 2006).

The essential feature of the private sector is to make business of business. They are defined by two features one the drive for investment and market share which entail investment in research and capacity building, knowledge building, management and finance. This allows them to meet the competitive market that they operate in thereby enabling them to meet the demand to satisfy market needs regardless of the market. Two they are profit driven thereby customer oriented which allows them to operate within a niche; as such and by nature public interest is not essential to their decision making which leads to the public being exploited. RE implementation can be undertaken by them, however, they would need to be regulated to meet public need and as well, would require guarantee to invest in RE as it is considered high risk.

### **2.2.3 Public- private partnerships**

The government and the private sectors are interdependent. They cannot undertake building an efficient economic sector and drive economic competitiveness individually. In light of RE implementation, both sectors need to foster the required growth necessary for its development and implementation. As such, the next vehicle to be examined is partnership. Fostering partnership i.e. public-private will allow the development of long-term relationships to be established, understanding of the objectives to be achieved and meeting the required targets thereby produces dynamic growth for RE implementation.

Agreement between parties requires an effective framework that will ensure each party's fulfilment. As such, coordinating efforts for public-private relationships would demand a great level of flexibility from parties in order to achieve above all coordination, responsible acceptable principles and demand that will ensure reaction/ implementation in a timely manner. UN/ECE (2007) interprets public-private partnership (PPP) as accountability for the delivery of public service is retained by the public sector. As a result, the management of public service is construed in government ownership and accountability within a long-term agreement with the private sector. Therefore, for this section it provides a description of partnership for public-private intervention. This is undertaken to assess the viability for implementing RE within electricity power generation as an alternative source of energy. Partnership can be defined as "the state or condition of being a partner; participation; association; joint interest" as defined by (Oxford dictionary, 2009).

### 2.2.3.1 Types of Public-Private Partnership

There are several types of partnership models for public utilities in the energy sector for example traditional design bid build, contract fee services, operating and maintenance, build operate transfer, design build finance, operate, build own operate and build buy operate (UN/ECE, 2007) and (Grasman, Faulin, & Lera-Lopez, 2008). These PPP types will be highlighted using interpretation from UN/ECE and Grasman.

- *Traditional design bid build* (TDBB): private entity builds to per-design, cost and specification. Grasman indicate that this is not generally considered a PPP e.g. schools;
- *Contract fee services*(CFS): planning, design or construction contracts are transferred on a fee for service basis e.g. franchises;
- *Operating and maintenance* (O & M): publicly owned assets are transferred to a private entity for management and operation; this is generally on a contract fee basis unless otherwise stipulated to be a lease or purchase agreement. UN/ECE 2007 indicates that this type of agreement is not accepted by all as PPP but rather service contracts e.g. water control facilities;
- *Build operate transfer* (BOT/ BOOT/ BLOT): private entity design, finance, build and transfers the goods and services after a fixed period. Grasman indicates that this principle also applied to Build Own Operate Transfer and Build Lease Operate Transfer Agreements the difference is that user fees are charged for BOOT and BLOT and ownership is on a concessionary contract for BOT. Examples of this type are government offices, schools, stadium and hospitals;
- *Design build finance operate* (DBFO): private entity operates under a long-term lease agreement where it also designs, finances builds and operates and then transferred after the lease expires. The contractual arrangement generally include specific actions that must be adhered to by the private sector e.g. includes maintenance of the infrastructure, or reconstruction of the facility example of this type of partnership is highway (toll) and public passenger rail projects;
- *Build own operate* (BOO): this is a project that is administered under perpetuity where the private entity designs, finances, builds and operates the project. Ownership is solely private sector partner. They retain profit from operation as well as all associated risks. Public constraints are specified within the original agreement and the regulatory authority is on-going an example of this partnership type includes electricity generating.
  - With the risks and benefits of ownership going to the private partner it is noted according to Donaghue (2002) that all shortcomings are the owner's responsibility while there is no great impact on the government. However the shortfall is reflected in the cost in the long – term. Some aspects of risk sharing for the government may take the form of guarantees, restriction on competing infrastructure and or exclusive contracts; and
  - Further, it is not a totally hand off approach to BOO in fact there is continual government involvement through e.g. the power of coercion to get the project

going through land acquisition or the type of guarantees provided as stated by (Dinica, 2008).

- *Buy build operate* (BBO): public assets to be upgraded and operated for specific period with public control being exercised throughout the contract this asset can either be transferred to a private entity or quasi-public e.g. recreational parks.

UN/ECE and Grasman in recognising that PPPs is dynamic indicated that there are other innovative PPPs types that do not fall within the categories highlighted; these are Joint Venture/ Equity Share and Production Sharing Agreement

- Joint venture/equity share – is partnering in the case of government and the private sector where complementary abilities and resources are shared. The private entity is entrusted to design, build and operate the goods or services and share the profits and losses of the project between the owners. This may be for a specific time frame after which one partner may relinquish his rights. The venture offers the opportunity of gaining new capacity and expertise, technical knowledge, greater risk sharing and promotion transparency. However, differences in organisational culture and management style generally results in poor integration of the entities. As such, to solve this shortfall the agreement would specify the primary corporate purpose, mandate of the government entity and as well not crowd over the private sector initiative in that industry (Ramos). Overall, both parties have the right to withdraw from the agreement with no barriers existing. Should the government agree to withdraw the private sector would then be allowed to take full control of the entity. As stated by (Ramos), it is a win-win for both parties on one hand the government enjoys the freedom to enter this type of agreement to accomplish national development goals and objectives while benefiting from returns on its investments without being compelled to remain in the agreement. The private sector on the other hand maximise profit and is free to control the direction of the project upon the government withdrawal (Ramos).

Overall, this type of PPP enable modernisation and diversification of some public service e.g. electricity.

- Production Share Agreement – this type of partnership public- private is based mainly on resource extraction. The basic set up of this agreement is the awarding of right to the private entity to explore for oil or other minerals within a confined subsoil area. The arrangement is for a specific period during which the investor is obligated to operate at its own expense (Paliashvili, 1998). The private entity bears the risks namely explores, develop and produces the field as required. The state does not bear any expenses or risk. The main subject of the agreement is the investor must fulfil its obligation in favour of the state. However, benefit to the investor arise if the exploration is successful and the initial investment is recovered then the remaining sum i.e. profit is share between the state and investor. The state generally set the term of profit sharing e.g. 50/50 or 80/20 in favour of the government. Should the exploration be economically unprofitable, the investor would still bear the burden of loss alone (Paliashvili, 1998).

### 2.2.3.2 Why there is a need for PPP?

There is a need to undertake PPPs as a result of the fact that no one sector can undertake the task alone. RE require resources that span both public and private sectors for its success. Reiterating the three issues from the vehicles identified government, as discussed has three challenges that inhibits the implementation of RE. Let's reflect, the overall role to represent the public interest and manage public good, this has the potential to affect political decisions and priority, government financial and capacity constraint and a high level of bureaucracy that prevent the timely decision making and delivery of service. Secondly the private sector is unable to manage by themselves the high risks involved in RE and they need to have financial support/ guarantee and ensure that they meet stakeholders interest. Thirdly, there is a need from both government and the private sector to ensure energy security, reduce the cost for the nation's oil bill and to build ancillary benefits i.e. increase employment, reduce crime, and increase environment and human health. Overall, to successfully implement RE PPP is seen as the most favoured vehicle to meet and exceed all expectations.

### 2.2.3.3 Application area and benefits/ merits of PPP?

In the past government and private sectors forged agreement to accomplished projects that otherwise could not be financed solely through tax revenue. As such, these entities undertook the challenged both legal and financial to leverage services that otherwise may not have been feasible (Grasman et al., 2008; UN/ECE, 2007). Historically and presently, PPPs are used to cover public services infrastructure deficits for health, recreation, public works amenities, services and transportation [Table 2-2]. This has allowed for the greater productivity and increased economic competitiveness of States.

Adapting PPPs to implement RE projects has been considered a good venture because it provides the funding capacity building and good governance needed to manage the risk associated. Atabi (2004) indicates that the main objective of RE project PPPs is to build mutual learning thereby allowing parties to be familiar with the country's technologies and practices, failure and successes of these technologies and chart ways forward. Atabi added that the advantage of PPPs venture is, it offers comprehensive project capabilities allowing partners to work closely together to bring RE to the potential beneficiaries for sustainable development. Thereby clearly define role of each partner is required within the partnership.

Table 2-2: Traditional PPP Application

Sector	Infrastructure/ amenities examples
Health	Hospitals, Assisted living facilities
Recreation	Parks and recreation sports complexes
Public Works	Housing, Schools and Science Centres, Energy-Related Services, Water & Waste Treatment, Recycling
Services	Hotels, Information Systems, Shopping Malls
Transportation	Airports, Light/Heavy Railways, Ports, Highways, Bridges, Tunnels

Source: Grasman S. E., Faulin J. and Lera – López F. 2008. *Public-private partnership for technology growth in public sector and UN/ECE 2007. Guidebook on promoting good governance in public-private partnerships*

PPPs are designed to build the capacity of parties thereby increasing the level of expertise within the pool, improving the knowledge base through negotiation, management skill and successful project implantation and promoting good governance. Figure 2 and Table 4

indicate the interface between the principles of PPPs UNEP (2008) and Grasman *et al.* (2008) and how parties should relate for the successful implementation of the agreement. The merits of PPPs overall includes providing stronger value in management and risk reduction for projects generally with lower costs, overcoming significant financial constraint, clear accountability of public fund and ecosystem benefits (Grasman *et al.*, 2008; UN/ECE, 2007; UNEP, 2008).

The more defined benefits derived are better valued through the delivery of lower cost, higher levels of service and reduced risk; the ability to access capital through private sources thereby enabling government to meet projected needs; a surety of outcome allows for the timely delivery of the projects thereby preventing cost overrun and enabling a return on investment; an off balance sheet borrowing whereby debit financing is covered without affecting balance of payment; and innovation the combination of state run management and creativity with that of the private sector allow for innovative approaches to project delivery (Grasman *et al.*, 2008; UN/ECE, 2007).

This interface illustrates the foundation necessary for a successful PPPs agreement as explained in Table 2-3.

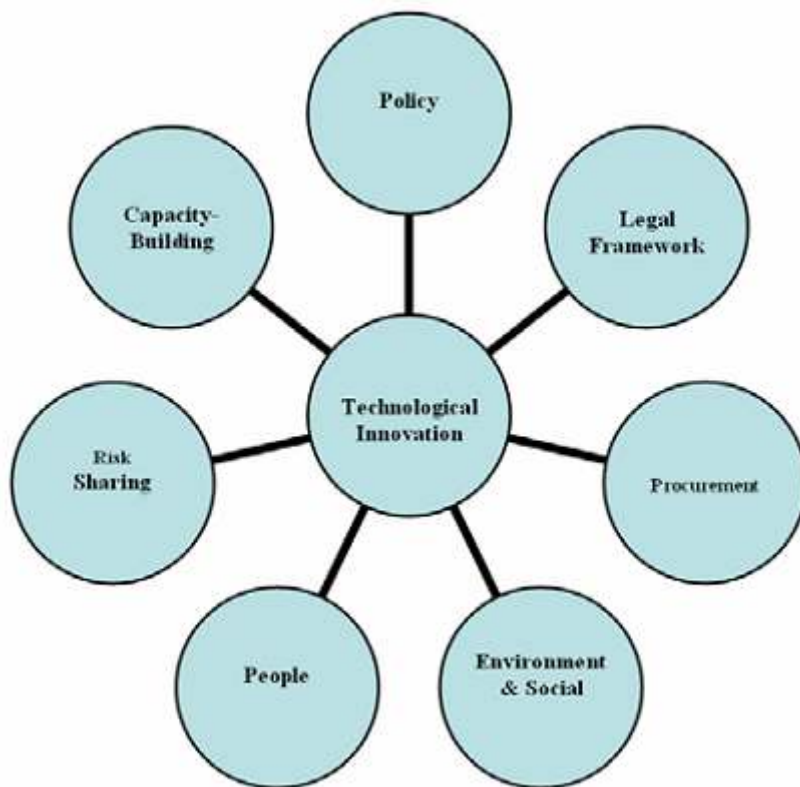


Figure 2-1: Interface between the principles of Public-Private Partnership for technological innovation

Source: Grasman *et al.* 2008. *Public-Private Partnership for Technology Growth in the Public Sector*

Table 2-3: Interface between the principles of Public-Private Partnership

PPPs Mechanism	Principles
Policy	Linking policies to clearly defined goals and political responsibility to society for action taken.
Capacity-Building	Providing the support and collaboration at local, national, regional and global levels with the limited resources available.
Legal Framework	Allowing flexibility in legal process.
Risk Sharing	Allocating suitable risk burdens.
PPP Procurement	Ensuring clear and transparent processes in decision making by rule application.
Putting People First	Considering the benefits to and impacts on all shareholder and the degree of the involvement..
Environment and Social Concern	Balancing sustainability and responsibility through good stewardship without causing grievance.

Source: Grasman et al. 2008. *Public-Private Partnership for Technology Growth in the Public Sector*

PPP mechanism and principles remain as greater transparency and governance is required especially of public fund and more so for fair competition. Additionally, the growing needs of society, the environment and economic development require more interdependencies and co-ordination across the sectors.

Of focus for this paper the level of partnership to be assessed is between government and investors where government (limited partner) is part owner within the entity. This reflects a joint venture agreement where government input financial or in-kind support along with the private entity. This level of agreement between a public sector agency and a private sector entity allows for greater participation amongst the sectors. This will be facilitated through the expansion of roles, the sharing of technical management and financial expertise and improved performance technology application and access of private capital thereby providing the opportunity for more efficient project management and proficient risk management (Grasman et al., 2008).

#### 2.2.3.4 Risk allocation in public-private projects

So far the research have looked at the barriers to RE and the means for overcoming them through RE policy mechanism, as well as the vehicles for implementing RE and putting the mandate forward in particular through PPPs; now a discussion the dynamics of PPPs through the associated financial risk.

##### **Associated financing risk to PPPs....**

PPPs agreements are not without risk taking and sharing; essentially though the core guiding principle is getting value for money. To establish value for money both service and financing mechanisms of PPP allows and attract transfer of risks with the most complex involve the greater the risk. Jin & Dolo (2008) and Daube, Vollrath, & Alfen (2008) interpret it as the transfer of risk to the most appropriate party who should be capable of managing the risk better. Risk can be interpreted as the possibility of unplanned circumstance that impact the project. As such, Jin & Dolo (2008) indicated that this can be mitigated provided that the core manager is adept to identify, measure, understand, report, communicate and allocate to

the appropriate party for the success of the project; given there is no record that this successfully happened. Therefore it is imperative that government understand the importance of not taking on all risks but to transfer inappropriate risks (Jin & Doloi, 2008). As this is highly sensitive for the project and will impact on the core value resulting in government either raising tax to offset cost or service will be reduced to cover the cost. Notwithstanding, if private sector take on inappropriate risk this will also be past onto government as premium or directly to end user (Daube et al., 2008; Jin & Doloi, 2008). The literature has pointed to investigating categories of risks and the suitability of parties to undertake the required risk as they are able to manage them. Thereby the proportion of risk to be transferred from one party to the next will be agreed upon to reduce transaction cost. As well, parties will be motivated to fulfil the required obligation in the PPP (Daube et al., 2008; Jin & Doloi, 2008).

In order to achieve the success desired for PPPs government need to institute strong policies and measures along with adapting to local/ national condition that will engendered this success within the policies drafted. Notwithstanding, it should also protect public welfare thereby creating oligopolies and fair open competition with market discipline at the same time not being too bureaucratic in unrealistic control. UNEP (2008) and Pongsiri (2001) argued that policy measures for PPPs by government need to include regulation and market-based interventions adapting to local conditions the structures based on energy: sector, patterns and use; institutional characteristics and changing circumstances.

### ***Criticism...***

Sceptics of PPP have argued that private sectors main aim remain to make profits without much consideration to product, service, employment and other social and environmental distribution. Pongsiri (2001) argued that public sector also desire to make a profit as many projects undertaken by government is subjected to cost-benefit analysis prior to execution and are not aligned to social or environmental benefits. Overall, the relationship remain private sector is not willing to undertake certain risks and the government need certain projects to be undertaken; as such, the government bear the risk (generally guarantor) to enable the fulfilment of a project.

## **2.3 Renewable Energy Schemes**

RE schemes to attract private sector to PPPs and RE implementation

It is important to look at funding sources when undertaking PPP agreements for projects especially for developing countries hereon for Jamaica. Funding can be considered sustainable or unsustainable by virtue of its source, composition, condition and timeframe. As a result of economic development and national policy most developing countries and specifically Jamaica tend to rely on bilateral and multilateral funding to support large projects; understandably as a result of the country's financial challenge.

Generally, donor type of funding aid/source is not guaranteed therefore the term "unsustainable funding" as well as the conditions attached may not be the best method in fulfilling the need of the state awarded. The reliance on donor funding source should not be the main avenue to support RE projects but it can be used as a catalysis to push RE or compliment aspect within the RE objective. It is best to look within the country or devise other ways (Atabi, 2004). This will allow the country to move forward through the formulation of strategies that stimulate RE development. One example is to encourage RE



development through legal and fiscal instruments. This would contribute to financial resources such as direct funding or subsidies and encourage partnership between local industries and RE companies in developed countries. Literature search has revealed that this funding type through PPP noting RE schemes that have attracted investment to implement RE electricity.

Another form of funding found is through international agreements. This comprise at most Multinational Environmental Agreements (MEAs) where funding can be attained through ratifying an Agreements. In light of RE, funding can be attained through the Kyoto Protocol (1997), Clean Development Mechanism (CDM). CDM provide for industrialised countries to offset greenhouse gas emission in developing countries by investing in emission reduced plants and thereby acquiring a 'certified emission reductions' (CER); this is towards the developed country's compliance with emission limitation under the Kyoto Protocol (Akella et al., 2008; Lidula, Mithulanathan, Widjaya, & Henson, 2006). However, for states like Jamaica i.e. Small Island with limited greenhouse gases contribution in comparison to larger emerging states; acquiring funding through CDM is feasible and can be recommended as a viable avenue to raise funds for RE implementation.

The RE schemes are considered favourable options when compare to donor funding. However, researchers have discussed and compare the merits of RE schemes and tabled their preferred scheme. As such, four schemes will be discussed with recommendation made for further study to meet Jamaica's need and capability. There is no single scheme that may work but a combination base on the size/ energy being sold to the grid.

**Tendering Scheme:** Developers through a competitive bidding process bid for power purchase agreement or access to government administered fund. The government who administer the process sets the specific amount of total electricity capacity share to be achieved and the maximum price per kWh along with the desired level of generation and growth rate required. The selection criteria entail pre- round evaluation per bid; acceptance of bid start from the lowest bid until the required target/ capacity is achieved. Liked RE competes against each other i.e. wind to wind and solar to solar. The electricity provider is obliged to purchase at the winning bid with government support and at a premium price. The winning bids are then guaranteed sale at their price under for a contractual period. The disadvantage with this system is the uncertainty of tendering period; low bids as a result of government tendering process; poor commitment of funds from incomplete projects; and the complexity of the bidding process.

**Net metering:** allows for excess electricity from small installed capacity at homes or businesses to be sold at wholesale to electric utility. The producers are paid for every kWh feed into the grid and or where production equals consumption. This system helps the electric utility especially during system load by offsetting the need for new peak load generating plants (Mendonca, 2007). This scheme attractiveness is based on limits set at participation i.e. capacity caps, number of customer or share peak demand; price paid i.e. net excess generation; existence of grid connection standards; and enforcement mechanism. Financial incentives plays a great part in advancing net metering market penetration (Mendonca, 2007).

**Quota:** This scheme sets the capacity for grid generation with specific target and end- dates from RE then the price that is agreed upon. This scheme also binds producers, distributors and even consumers (Mendonca, 2007). The quota system is known by two main types, one obligation/ certificate and the tendering system. The obligation/ certificate allows for set target for minimum capacity generation from RE and the intended increase over time. From this, investors and generators decide on the RE technology type to be used. The system is set

up that producers receive credit known as green certificate for electricity generated from RE. They then use the credit as proof that they met their legal obligation. A merit to this system is that producers are allowed to trade or sell the credit (excess) to earn additional income. On the other hand when producers do not meet their target they can then purchase electricity from other RE utilities or build their own renewable capacity or purchase the credit. Following the end of target period electricity generators have a responsibility to report through ownership of credit their compliance with the system in order to avoid paying penalties. Mendonca (2007) argued that this system although appearing to contribute to increased RE the amount inputted is significantly less in comparison to the feed-in-tariff and is flawed and biased in a number of ways namely: financial support system, there is uncertainty about the future value of the certificates and electricity itself; which leads to higher prices for the certificates and unfulfilled quotas. Any adjustment to this will most certainly add to the complexity of the system and unattractiveness of the quota system and pricing of quota consideration did not take in technologies based on location e.g. wind farm on land is much cheaper to produce than off-shore wind farm.

**Feed-In-Tariff (FIT):** considered also a pricing law because the rate being paid is set within the law; producers are paid a defined rate for their electricity based on the RE technology used and the size of the installation generally set above market rates (Sovacool, 2008). Additionally, the rate is calculated to ensure operation profit guarantee. The guarantee also spans the installation working life of the RE providing for as well, long-term investment certainty. Of note, operators are required to give RE priority access to the grid and additional cost incurred are paid by the supplier based on the sales volume which is then passed to the power consumer as premium on kWh end – user price. According to Mendonca (2007) and Sovacool (2008) FIT also allow for fixed premium mechanism i.e. government bonus set to pay above normal or spot electricity on RE generators.

## 2.4 Findings from Literature Review

The below set the stage for the main findings from the literatures that were reviewed.

### 2.4.1 Barriers

Barriers to RE implementation occur across a recurring theme that of are policy, financial, human resource and institutional capacity and awareness and information. However, most researchers indicate that RE barriers need an overarching RE policy with a combination of policy support mechanism to effect the implementation of RE. The areas that were deemed necessary to be addressed within the policy mechanism for RE implementation are and should entail:

- Level playing field for RE to compete on equal ground with conventional fuel;
- Eliminating subsidies from mature conventional electricity providers, electricity price should reflect correct price and institute a feed-in-tariff scheme;
- Development of long-term policy guidelines, better planning and strategy;
- Innovative policy approach, promotion of successful RE technology and end ad hoc RE measures; and
- Policy reform and structure must be clear goal and objective oriented.

The policy should be guided by:

- Drivers – transparency, well defined objectives,, well defined resources, appropriately applied resources, adequacy and stability;
- Policy framework – contextual framework, energy market reform and land use planning reform; and
- Community buy-in – equalising the community risk and cost benefit distribution.

#### **2.4.2 Ownership, management and schemes**

Public- private partnership can be considered for RE implementation. A combination of the type use can create the avenue for RE implementation. Overall, government and the private investor sectors possess unique skills that are required to drive RE implementation in the electricity sector. Arising from the literature are various types of partnership that can be undertaken, these are:

- Traditional – traditional design bid build, operating and maintenance, build operate transfer, build own operate transfer, build lease operate transfer, design build finance operate, build own operate and buy build operate; and
- Newer innovative – joint venture/ equity share and production sharing agreement

There are several benefits to be derived through public- private partnership for both parties of which are:

- Profit sharing;
- Risk sharing and reduction;
- Skill sharing
- Capacity building

The interchange also includes:

- Linking policies to clearly defined goals and political responsibility to society for action taken;
- Providing the support and collaboration at local, national, regional and global levels with the limited resources available;
- Allowing flexibility in legal process;
- Allocating suitable risk burdens;
- Ensuring clear and transparent processes in decision making by rule application;
- Considering the benefits to and impacts on all shareholders and the degree of the involvement; and

- Balancing sustainability and responsibility through good stewardship without causing grievance.

It became apparent as well that sustainable financial schemes should be utilised *vis-à-vis* only donor support for developing and emerging economics. As such renewable schemes should be utilised, e.g.

- Tendering scheme;
- Net metering;
- Quota; and
- Feed- in- tariff

It also became apparent that no one scheme may satisfy one or a particular economy and as such states need to apply what best suite their state and would drive RE implementation and economic growth.

### 3. Renewable Energy Status in Jamaica

Renewable energy implementation has been a goal of the Jamaican government for years, however, steps to bring the RE resources as viable mix to the energy sector has been slow. In this chapter the Jamaican energy and electricity situation will be examined to ascertain how RE can be implemented within the electricity sector. Consideration from the Caribbean Community initiative will briefly be looked at for setting the Jamaican RE stage. Several areas will be examined these are:

- Present situation within the electricity sector;
- Legislative and regulatory framework of Jamaica electricity and energy sectors; and
- The main stakeholders/ actors within the sector

#### 3.1 Renewable Energy in the Caribbean

The Caribbean heads of government in the 1980's (with exception to Trinidad and Tobago) were heavily dependent on the importation of fossil fuel. At that time, the Caribbean heads of government recognised the need for alternative energy source adopted the Regional Energy Action Plan in 1983 and as such established the Caribbean Energy Information Service (CEIS) to coordinate and augment existing collections of energy information<sup>6</sup>. The data based has been established. Not much has been done in the region regarding decreasing oil importation or implementing alternative energy. However, under CEIS, in 1998 the Caribbean Renewable Energy Programme (CREDP) was formed to change the region's energy market for environment and RE. CREDP's goal is "to reduce barriers to the increased use of renewable energy thus reducing the dependence on fossil fuels while contributing to the reduction of greenhouse gas emissions"<sup>7</sup>. CREDP has broken it work programme into parts, part one they have identified barriers to RE exploitation (1998-2000) the barriers identified are policy, financial, capacity building and awareness discussed below; part two 2002 they focused work on developing financial mechanism to promote RE projects along with starter projects. This would entail according to (Fevrier) "Supporting the implementation of policies, legislation and regulation that create an enabling environment for renewable energy development, demonstrating innovative financing mechanism for renewable energy products and projects and build capacity of selected players in the renewable energy field". In 2004 they commenced implementation of the project. A draft out line of a regional RE policy has been done with no indication on the date of completion.

Barriers identified by CREDP:

*Policy:* Within the Caribbean Community it has been identified that there is no clear policy structure for RE. This has been hampered by governmental commitment, uneven playing field i.e. tax discrimination on RE products along with other financial disincentive for RE technologies. Additionally, it has been identified that there is minimal interest and commitment exist from national utilities towards RE as well as limited human resources to meet RE needs.

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<sup>6</sup>See CEIS for additional information at [http://www.idrc.ca/en/ev-114970-201-1-DO\\_TOPIC.html](http://www.idrc.ca/en/ev-114970-201-1-DO_TOPIC.html)

<sup>7</sup> See CREDP for additional information at <http://www.caricom.org/jsp/projects/credp.jsp>

*Financial:* There is insufficient acceptance of RE to generate the necessary financial support and to drive project development.

*Human resource and institutional capacity:* There are three main issues that relate to this barrier and affect RE implementation. First, scattered and fragmented capacity-building opportunities within the Caribbean; second, lack of and poor integration, regional co-ordination and continuation of existing opportunities; and thirdly, limited training opportunities available for decision makers i.e. technicians of ministries, utilities and local industry. This is further complicated by training opportunities that are donor driven where priority needs for RE within the Caribbean are not address indicated as energy policy, project development and formulating bankable projects and viewed as unsustainable capacity building.

*Awareness and information:* The Caribbean does not have sufficient information on RE to build confidence in RE technology including accessible data on energy itself which further complicate matters. As such, critical key persons needed to draft strategies and policies tend to discriminate against information provided as such affecting the ripple effect of society's knowledge base. As well, investors sceptics has voiced there preference to see functioning demonstration of RE projects before investing in its implementation within the Caribbean. The success of information and building awareness is further affected by the lack of systematic RE resource assessment and the insufficient management of energy data available.

Prior to CREDP and the programme's goal, in 1998 RE demonstration projects using wind resource were undertaken in the Caribbean under the US and CDB funding. Through the project two wind turbines were installed in Antigua and Montserrat 120kW vertical axis wind turbine and 85kW horizontal wind turbine respectively. Curacao installed under the project a 3MW wind farm and later established a 12 MW wind plant still functioning. Barbados also implemented wind farms but they are no longer in operation as a result of lack of support after implementation; Grand Turks plan for installation has been shelved as a result of economic reasons while Antigua Barbuda closure include financial, legislation and capacity; Montserrat wind farm was later put out of commission as a result of the volcanic activity on the island (Wright, 2001).

In more recent years, the CARICOM heads of states have committed to increase RE use within their states by 10% of total energy by 2010 under the Latin America and the Caribbean Initiative for Sustainable Development (Altomonte et al., 2004; Loy & Coviello, 2005). To date, not much has been achieved in reaching this goal especially in the case of Jamaica despite efforts in developing The Jamaica Energy Policy 2006-2020 (Green Paper) and soliciting bids for RE electricity generation by the Office of Utilities Regulation (OUR) and the Petroleum Corporation of Jamaica.

### 3.2 Description of Energy and Electricity Sector in Jamaica

Jamaica is highly dependent on the importation of oil/ petroleum products to service the country's energy need. It has the highest energy import rates accounting for approximately 90% of total fuel needs Table 4 and is the second largest user of foreign exchange after debt servicing. This is due mainly to the use of energy in the bauxite and alumina sector. The implication overall is serious for the country's balance of payment and exchange rate stability not to mention influence on the economic growth and sustainability (Government of Jamaica, 2007a, 2007b; International Energy Agency, 2006; Loy & Coviello, 2005). According to Government of Jamaica (2007a) the oil bill has increased to 66% of merchandise export in 2004 (Figure 3) a significant increase between 1998 at 25% to 66% in 2004. Electricity

generation account for 24.7% of the oil bill and is proposed to increase by 3% to 4% per annum over the medium term (Government of Jamaica, 2007a). Table 5 show the energy consumption mix for petroleum. In 2007 the Planning Institute of Jamaica (2007) reported that petroleum demand for electricity generation went up by 264,075 barrels of oil to 6,654,238 barrels from 2006 to 2007 to produce total electricity generation of 4,075.5GWh.

Table 3-1: Net Energy Supply by Source

Energy resource	Total energy by average % 2003	Total energy by average % 2006
Oil/ petroleum base	91.10%	93.7%
Coal	1.70%	1.2%
Renewable:	7.14%	5.0%
Hydro: 0.7% - 0.3%		
Wind: 0 - 0.1%		
Charcoal: 0.8% - 0.6%		
Fuelwood: 2.4% - 1.8%		
Bagasse: 3.3% - 2.2%		

Source: adapted from *The Jamaica Energy Policy 2006- 2020, Renewable energies potential in Jamaica, Vision 2030 Jamaica National Development Plan and IEA Energy Statistics*

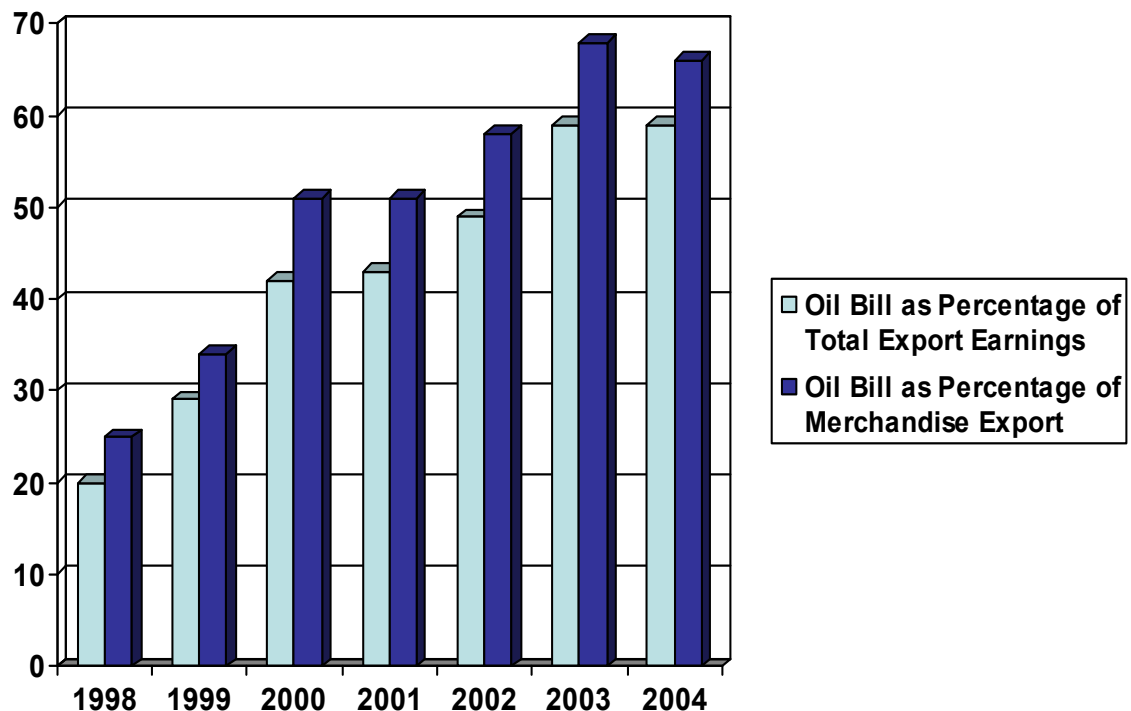


Figure 3-1: Jamaica's Oil Bill Compared to its Export Earnings

Source: Petroleum Corporation of Jamaica - Constructed from PIOJ and MCST Energy Division Data Base

Table 3-2: Jamaica Energy Sector by Petroleum Use

Sector	Total energy consumption by average % 2006	Total energy consumption by average % 2009
Bauxite alumina	36.6%	30%
Electricity generation	24.7%	23%
Road transportation	23.5%	21%
Shipping and aviation	7.7%	21%
Cooking and lighting		5%

Source: *The Jamaica Energy 2006-2020 Green Paper and Energy and Energy Planning, Methodology and Approaches: Jamaica's Experience*

### 3.2.1 Energy security

In meeting the energy demand for oil, Jamaica import from Venezuela, Mexico, Trinidad and Tobago, Ecuador, Nigeria and open market (Watson, 2009). Given uncertainties in petroleum supplies based on unrest in major oil producing region, unstable oil prices and market speculation, uncertainty in supplies, changes in production strategies and influence of global economy namely the emerging markets; action need to be taken by Government of Jamaica to protect energy needs (Government of Jamaica, 2007a; Watson, 2009). The Jamaican government has undertaken an energy security strategy to meet energy uncertainty and need this fall under four main headings.

First bilateral agreement for conventional fuel; to date, Jamaica holds several government to government agreements including the PETROCARIBE Agreement between the government of Venezuela and the Caribbean heads of government. The agreement includes the extension of credit facilities on the basis of bilateral fixed quota and no price concessions. Jamaica's quota under the agreement is 21,000 barrels of oil per day where the unit price per barrel is US\$40 or greater of which 60% of the cost must be paid within 90 days of receipt with an interest rate at 2% for the first 60-90 days (Government of Jamaica, 2007a).

Secondly, domestic sourcing of fossil fuel, the government of Jamaica has engaged in oil prospecting as a mean of reducing the country's oil bill. The first phase spans 1955-1973 by a private company and 1978 – 1982 by the Petroleum Corporation of Jamaica (PCJ). The second phase 2005 entail exploration rights being granted to several international companies to conduct the survey both on land and offshore<sup>8</sup> (Petroleum Corporation of Jamaica). The survey (seismic data) has resulted in positive results where prospectors are now seeking to drill to ascertain if formations are capped to prevent oil from escaping (Bellanfante).

Thirdly, the use of short term energy conservation measure, this is also geared toward reducing the oil bill. The government has targeted its approach to the private sector in particular household, industrial, commercial and tourism; and the public sector to reduce the use of electricity usage e.g. through the reduction in use of incandescent bulbs, by replacing them with fluorescent bulbs and the provision of energy efficiency awards to commercial, industrial and tourism sector. The initiative to date has included a draft Energy Conservation Efficiency (ECE) Policy that identifies strategies for public awareness, financial schemes for institutional framework development and for overcoming barriers to the implementation of

<sup>8</sup> See Petroleum Corporation of Jamaica Oil and Gas Exploration Activities and Summary of Production Sharing Contracts for Offshore Oil and Gas Exploration, Jamaica



ECE; public awareness campaign, and encouraging the National Housing Trust introduce ECE initiatives as a conditions for home improvement loans at preferential rate (Government of Jamaica, 2008; Government of Jamaica, 2007a). Long- term strategy includes energy building code to drive energy efficiency and conservation in building design and energy finance project geared towards household and companies to implement energy saving measures and more so solar-thermal installation (Loy, Futterer, Juttemann, & Reiche, 2004).

Fourthly, use of RE resource to diversify the states energy mix. The government of Jamaica have committed itself to the use of indigenous resources along with energy security also to cut the oil bill of the state. Within the Energy Policy 2006-2020, the ECE and Vision 2030 renewable energy form a key part of the growth and development of the state. In fact, Government of Jamaica (2007a) has indicated the tangible and intangible benefits to be derive which include lessen dependence on fossil fuel especially importation and collateral benefits. So far the initiative commissioned has been a few and notably small scale renewable energy solutions. These include ethanol mainly mixed with petroleum i.e. 10% ethanol blended gasoline (E10) for transportation sector, hydroelectric plants, bagasse for electricity generation and a wind farm also, Wigton Wind Farm that account for 20.7MW of electricity installed capacity.

### **3.2.2 Electricity Sector**

The JPSCo has been the main supplier of electricity since 1923; in 1978 it received an all island exclusive licence for 39 years (Government of Jamaica, 2007b) to supply, transmit and distribute electricity to the public. During the late 1990s under the government aim at liberalising the economy the JPSCo was privatised. Through the liberalisation the electricity access by customer has increased from 50% in 1970 to 92% in 2005 (Saunders, 2005). This resulted in the sale being offered to Mirant an US based Energy Company in 2001, where Mirant hold 80% and the Government of Jamaica and other small shareholder hold the remaining shares. The sale agreement resulted in a new licence that allowed the JPSCo to operate under a 20 years licence with the right to be the sole buyer of electricity from external producer as well as sole owner of transmission and distribution lines. However, in 2006 Mirant sold their share to Marubeni Caribbean Power Holding a subsidiary of the Japanese base Marubeni Corporation. This sale resulted in a further agreement where sole ownership as buyer, and transmission and distributor was extended by and additional 6 years on the current licence to Mirant to allow return on investment (Government of Jamaica). Nonetheless the JPSCo operates under the All Island Electricity Licence that allows the liberalisation of the electricity sector in 2004. And though JPSCo has a monopoly on transmission and distribution in keeping with the Licence several independent power producers now supply electricity to the national grid Table 6 all holding 20 years licence for installed capacity (Government of Jamaica, 2007a, 2007b; Loy & Coviello, 2005). The total electricity being installed in Jamaica is 818MW of which the independent power producers produce installed capacity 217 MW. The consumption for residential was recorded at 35% of annual GWh and 41% for large scale users (Government of Jamaica, 2007b). While the energy sector of Jamaica is managed by the PCJ under the Petroleum Act of 1979 the electricity and other utility company of Jamaica is regulated by he Office of Utilities Regulation (OUR) and guided by several Acts which the main legislations are:

- The Office of Utilities Regulation Act of 1995;
- The Natural Resources Conservation Authority Act of 1991;

- The Electricity Lighting Act 1890;
- The Electricity Development Act of 1958; and
- The All Island Licence of 2001

To date 92% of Jamaican has access to electricity. Electricity pricing is overseen by the OUR although the JPSCo does the final pricing. At present, price is estimate from the 2006 figure of US\$0.23 per kWh with a generation cost of US\$0.16 per kWh for residential/ low users; while the price for intensive industrial/ bulk users stand at an estimate of US\$0.18 – 0.21 per kWh (Government of Jamaica, 2007b). In a request from the JPSCo to meet its expected expenses and return on investment the OUR applied tariff for electricity connection for all customers regulated by the OUR. The (Jamaica Public Service Company Limited) has indicates that the objectives of the tariff are:

- Ensure returns on investment while maintaining the system and expanding reliable service;
- Promote efficient use of electricity by providing correct pricing to costumers; and
- Simplify the tariff structure which is critical to customer satisfaction.

According to Loy & Coviello (2005) the tariff structure allow for a price cap scheme to different end user, benefit to the JPSCo. It also provide for basic connection charges i.e. non-fuel base rate and variable fuel for IPP<sup>9</sup> (Jamaica Public Service Company Limited, ; Loy & Coviello, 2005).

### **3.3 Description of Renewable Energy Sector, History, Status and Potential for Electricity Generation in Jamaica's**

In order to move forward in implementing RE in the electricity sector in Jamaica, it is imperative that an understanding of the past, present and future be reviewed along with legal regime and partners that impact the sector.

#### **3.3.1 Historical review and status of Jamaica's renewable energy for electricity generation**

The use of RE for electricity generation in Jamaica commenced from 1899. In taking a historical look Hudson (1999) highlighted briefly in his article on the use of rivers and waterfall to generate electricity in Jamaica. As such, RE has been used since 1899 namely, hydropower used mainly to power Tram Car, a thing of the past in Kingston, Jamaica. The first hydroelectric stations to be commissioned were the Rio Cobre, in Bog Walk, St. Catherine and Serge Island, St. Thomas. Later in 1937 the White River hydropower station was commissioned by that land owner. In 1944 during the period of the Second World War, the government thought it expedient to use alternative power for electricity generation. As such, the planning and implementation of several hydroelectric stations were undertaken.

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<sup>9</sup> See Executive Summary Jamaica Public Service Company Limited Application for Tariff Revision

Stations commissioned were Roaring River, White River, Black River, Rio Bueno and Maggoty River. All these stations are small hydropower and run-of-the-river facilities.

The use of wind to generate electricity has not been around as long as hydropower use in Jamaica. However, wind mills were used for agricultural production and in fact approximately 86 were noted in 1804 mainly in the northern and eastern section of the island. In the 1930 to 1960 windmills were later used to pump water from shallow wells in the coastal plains of Clarendon and St. Elizabeth (Wright, 1996) and later displaced by electric pumps as a result of poor maintenance. It was not until the 1970's when studies were conducted on wind profile and later in the early 1990's in depth studies on the potential of wind for electricity generation. Despite the effort made in studies strong government commitment to implement wind as an alternative energy source for electricity generation was not made. The first wind power initiative was commissioned in late 1995 by and for a local High School (Munroe College) generating from a 225kW Vestas machine where excess power was sold to the JPSCo (Government of Jamaica, ; Wright, 1996, 2001). In the mid 1990's the PCJ with the British Company Renewable Energy Systems Limited commissioned a feasibility study for wind farm where the site should be able to generate a minimum of 20MW of electricity, as such, wind speed assessment was conducted across the island. Several potential local were identified with Wigton located on the Manchester Plateau being selected (Loy & Coviello, 2005; Wright, 2001). In 2004 the Wigton Wind Farm was commissioned generating 20.7 MW of electricity.

The Wigton Wind Farm which has been commissioned in 2004 generates 20.7MW of installed capacity. This has allowed the Government of Jamaica to benefit from savings on its oil bill, diversify its energy mix and benefit from clean (free and renewable) energy source (Altomonte et al., 2004). The project started in 1995 it has been reported to be a multi-stakeholder partnership with partners from the Government of the Netherlands, Petroleum Corporation of Jamaica and the National Commercial Bank of Jamaica. Barriers presented during the project planning stage were financial, land tenure, stakeholder consultation, environmental lobbyist and power purchase agreement negotiation. The wind farm, Wigton Wind Farm has allowed for an economic benefits deriving from the trade of certified emission reductions CERs estimated at US \$5/ ton CO<sub>2</sub>. This was sold to Corporación Andina de Fomento (CAF) (Altomonte et al., 2004). The Government of Jamaica has further indicated the desire to increase the energy mix to include additional RE source and expand the Wigton Wind Farm capacity.

Plans are in place to expand the capacity of the farm and consideration is being given for the implementation of other wind farms in Jamaica e.g. by JPSCo. Other achievement for wind and other RE is the establishment of the Centre of Excellence for Renewable Energy (CERE) in November 2006.

The electricity sector is almost totally dependent on the importation of oil and petroleum base product for electricity generation with minimal supply from renewable resources namely, hydropower (6 mini plants) and wind which account for approximately 6% (Government of Jamaica, 2007a; Petroleum Corporation of Jamaica, 2008). Table 3-7 provide the electricity installed capacity including those from hydropower and wind. Solar power photovoltaic supply off grid in two deep rural communities (demonstration projects) and solar power street lamps totalling of 77 has been erected.

To date there are 8 plants in operation all run by the JPSCo. These plants provide base loads for the public grid Table 3-3 Installed Hydropower for Jamaica. It is to be noted that new plants have been constructed while some has been decommissioned namely Serge Island and

Rio Cobre the remaining are either undergoing rehabilitation or had been recently rehabilitated.

Table 3-3: Jamaica Hydropower installed Capacity

Location and parish	Capacity (MW)
Upper White River, St. Ann	3.8
Lower White River, St. Ann	4.9
Roaring River, St. Ann	3.8
Rio Bueno A, Trelawny	2.5
Rio Bueno B, Trelawny	1.1
Maggotty Falls, St. Elizabeth	6.3
Constant Spring, St. Andrew	0.8
Rams Horn, St. Andrew	0.6
Total	23.8

Source: Renewable energies potential in Jamaica (Loy & Coviello, 2005)

### 3.3.2 Renewable Energy Potentials

This is marginal despite the potential resources of clean RE in Jamaica (Government of Jamaica, 2007a; Loy & Coviello, 2005) Jamaica’s daily solar irradiation rate has been estimated as 5KWh/m<sup>2</sup> or 1,800KWh/m<sup>2</sup> per annum (RECIPES, 2006), while wind is 13mph equivalent to 5.8m/s (Wright, 1996). Wright has noted that a systematic study has not been conducted on all areas/ island wide at the time of his assessment and as such there are sites that could provide above 40MW of wind power without creating stability problems for the national grid of over 650 MW. Currently wind and hydropower are the two main RE that are positioned to lead Jamaica in advancing the electricity mix to the national grid. Solar hot water and photovoltaic will be encouraged as indicated by (Government of Jamaica, 2007a) on an individual basis through means e.g. funds with the National Housing Trust.

#### 3.3.2.1 Wind

Further to Wright’s study in 1996, the Government of Jamaica has conducted additional studies during 1997 – 2004 and has identified several sites where the wind generation is in excess of 8m/s which is suited for wind generation thereby meeting the speed standard. From the studies it was remarked that some of the sites could produce up to 90MW (Government of Jamaica, 2004). The study was conducted in:

- Kingston – Palisades strip near to the Norman Manley International Airport;
- North Coast – Green Castle
- St. Mary – Annoto Bay (west of)
- Manchester – Spur Tree
- Manchester – Blenheim and
- Manchester - Wigton

Detail study is needed to verify each site's full potential. The study was conducted according to (Petroleum Corporation of Jamaica, 2008) by specific criteria in areas that where:

- accessibility by roads to transport turbines;
- land ownership is not an issue and land space is adequate to accommodate wind farms;
- within adequate proximity to the national electrical grid;
- of good topography and located within the vicinity;
- within the required distance from dwellings; and
- of suitable soil condition for the erecting of turbines

Further to the studies made, the (Petroleum Corporation of Jamaica, 2008) has estimated that the largest untapped wind energy can be found offshore along the coast.

### 3.3.2.2 Hydropower

Hydropower presently contribute 24MW to the grid, with a potential of 94 MW capacity Table 3-4 Jamaica Hydro Capacity (Government of Jamaica, ; Patterson, 2007).

*Table 3-4: Potential Hydropower Capacity for Jamaica*

Scheme/Location	Capacity (MW)
Back Rio Grande (BRG)	50.5
BRG (Upper)	6.0
Rio Grande	3.9
Great River	8.0
Laughlands Great River	5.3
Rio Cobre	1.0
Negro River	1.9
Yallahs River	2.6
Wild Cane River	2.5
Morgans River	2.3
Green River	1.4
Spanish River	2.3
Dry River	0.8
Martha Brae	5.4
Total	93.9

*Source: Ministry of Energy, Mining and Telecommunication*

### **3.4 Renewable Energy Legislation and Stakeholders in Jamaica**

Renewable energy form a small percentage of Jamaica's energy use between 2002- 2006 (Government of Jamaica, 2007b) with the present situation remaining more or less the same. This can be attributed to the delay in the implementation process of RE as a result of one, the barriers despite the 1995 Energy Policy (see legislative framework) and a Cabinet mandate to the PCJ in 2002 to accelerate the implementation of Jamaica's energy sector policy with one of the objective from the policy being "promoting diversification of the energy base and development of indigenous energy resources" (Petroleum Corporation of Jamaica, 2007). The barriers identified for Jamaica are technology, legislation and regulation, financing, human and resource capacity and awareness regarding technology, economic, and environmental benefits (Paulwell, 2004). Two commitment from the government for implementation of RE which include recognising the critical role RE plays in the country's progress (Loy & Coviello, 2005). The interpretation of the barriers for RE in Jamaica is similar to those highlighted for the CARICOM and as such will not be discussed here. However, an examination of the legislative and regulative framework that governs electricity generation and the main stakeholder role will be discussed.

Overall, despite the institutional and legislative/ regulatory challenges it appears that more effort is being made to under take other conventional fuel type for electricity generation than RE. This has been noted from an agreement made by the PCJ with JPSCo to produce a petroleum coke co-generational plant and contract to conduct further prospecting/ drilling of oil within Jamaica's water. This present action although in line with the Jamaica Energy Policy 2006- 2020 (Green Paper) lend itself to the encouragement of conventional fuel than the use of alternative indigenous fuel which is able to benefit socio-economic and environmental growth.

#### **3.4.1 Legislative and Regulative Frameworks that governs Renewable Energy in Jamaica**

A number of primary and secondary legislation guide the implementation of RE in Jamaica. As such, in this section an assessment of the primary laws and policy for Jamaica relating to electricity generation will be undertaken. This is done to ascertain how regulatory framework will be or can contribute to overcoming barriers to RE and encourage PPP for RE especially in light of electricity generation through wind resource.

##### **3.4.1.1 Jamaica Energy Policy Green Paper 2006-2020**

The 1995 energy policy sets six objectives that still form part of the 2006-2020 The Energy Policy of Jamaica Green Paper (Government of Jamaica, 2007a; Wright, 1996). These objectives include amongst other things to diversify the energy base for the country and encourage the development of indigenous energy source; as well as encouraging efficiency in energy production, the reduction in energy intensity of the economy and ensuring stable and adequate energy supply. This definitively set the stage for RE implementation with a few amendments in 2006-2020 that include ensuring energy security of energy supplies and provide for private sector participation in electricity generation (Government of Jamaica, 2007a). The specific policy for diversification of energy speaks to energy mix from energy sources such as natural gas, coal, nuclear and renewable energy. The policy recommendation sates "The Government of Jamaica will promote diversification of energy types to reduce reliance of the energy intensive sectors of the economy such as bauxite, electricity generation and transport on a single fuel type. Natural gas, coal and renewable energy sources are among

the alternatives which will be explored”<sup>10</sup>. The policy further address the need for protocol for electricity supply indicating as a matter of policy to have RE contributing to the national grid more significantly and reducing barriers to its development. As such, the Government will establish protocol to guide contractual arrangement, timeliness in finalising supply contracts and specifically addressing wheeling and net metering issues. Regarding competition within the electricity market, the Government intend to address this by exploring appropriate level of competition intended for the market and consistent with efficient operation.

Section 4.7 addresses the government objective more specific to RE resources. These are:

- To increase Jamaica’s RE contribution to electricity from 6% presently to 10% by 2010 and to 15% by 2020;
- To encourage RE deployment through tax policy;
- Encourage local financial sector to provide funding for RE;
- Encourage the development of solar system and biogas technologies locally;
- Facilitate low cost funding through national institutions for the implementation of solar heating solution at the household and institutional levels;
- Strengthen legislative and regulatory framework, establish protocols and govern trading relationships for premium pricing for RE.
- The PCJ and other public sector agencies will engender development and promote investment for RE; and
- Working with research institutions encourage research and development aimed at improving design and efficiency, provide technical assistance for energy RE sector.

In encouraging investment for the energy sector, the policy objective is to meet investment needs for energy that is consistent with policy for liberalisation within the energy sector.

In a more recent update on the policy Jamaica Information Service (2009) indicated that plans are afoot to revise the Jamaica Energy Policy Green Paper as a result of dated data being used reflecting as far as 2003-2006. The article also quoted the head of the PCJ who indicated that a renewable energy policy is essential to facilitate investment within that sector. It is anticipated that the policy would be finalised before the end of 2009 with revision including the Planning Institute of Jamaica (PIOJ) Vision 2030 development status and a Nuclear Power Policy.

#### **3.4.1.2 Power/ Electricity Policy for Jamaica (DRAFT) 2004**

The Power/ Electricity Policy for Jamaica set out 4 objectives to be achieved under section 1.0 of the Policy (Government of Jamaica, 2004) these are to:

- Ensure stable, secure diverse and sustainable supplies of energy at least economic cost (renewable exempted) in a deregulated and liberalised environment;

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<sup>10</sup> The Jamaica Energy Policy 2006-2020 page 9

- Reduce independence on imported energy through continued exploration for and development of indigenous energy resources where economically viable and technically feasible, especially by the private sector;
- Reduce the energy intensity while seeking to promote economic growth and minimise any negative environmental or macro economic impact on the economy; and
- Establish and maintain an appropriate multi-sector regulatory framework where market failure exists to protect the consumer and to ensure that government's policy objectives are addressed.

Regarding RE policy for the electricity sector, it is the intention of the Government of Jamaica to obtain the maximum benefit from RE thereby placing the onus on the OUR and JPSCo as the statutory obligation to promote its implementation. The draft policy further indicate that for RE to be implemented, separate tendering process will be required citing the Minister's power to set target for RE from time to time. The proposed target from the draft policy is 114MW RE and cogeneration to be implemented within the next 8 years from 2004 now having 3 years remaining.

The draft policy do make provision for capacity 15MW and less, indicating that the OUR should establish a procurement system to facilitate this process to enable timely implementation.

According to the Government of Jamaica (2004) draft policy it calls for the consolidation of environmental responsibilities under NEPA. And trust the OUR the responsibility to consult with NEPA on environmental protection matters and directive. Additionally, regarding the regulative and legislative framework, it call for the unbundling of the production and distribution supply chain into a regulated network/ retail sector as well as a competitive generation/ bulk electricity sector.

### **3.4.1.3 Petroleum Act**

Under The Petroleum Act of 1979 RE is not a direct vested right of the Petroleum Corporation of Jamaica (PCJ) its main right is Section 6 sub-section 1 of the Act gives the Corporation exclusive right to explore and develop the resources of petroleum within Jamaica's jurisdiction (land and sea) (Government of Jamaica, 1979). This places the responsibility of reducing the importation of oil as an objective for the PCJ and as such can be interpreted to use amongst other energy resource RE. To support this view, the Act gives the Minister with energy the responsibility to make regulation under Section 26 for the carrying out of the provision of the Act. Sub-section 1 of Section 26 provide a list of areas the Minister can make regulation for this include RE more specifically, "providing for the conservation of petroleum and other energy resources the avoidance of unnecessary waste of such resources".

### **3.4.1.4 The Office of Utility Regulation Act 1995**

The Office of Utility Regulation (OUR) Act give provision for the regulation of utility services by licence. It further has the responsibility to protect and conserve the environment, encourage the development of indigenous resources, encourage the competition of utility services and to protect the interest of consumers as it relate to utility services (Government of Jamaica, 1995). Section 4 (2) of the Act grant the responsibility to the Office to process



application for licence for a prescribe service and make the recommendation to the Minister regarding such application. The OUR also has the power to determine the rate or fares to be charge by utility services. Overall, the OUR has the power to attract investors for RE implementation and encourage its deployment and as indicated also by (Loy et al., 2004) the OUR has responsibility to the electricity sector to create a competitive environment, monitor electricity tariff and consumer protection.

#### **3.4.1.5 Natural Resources Conservation Authority Act**

The Natural Resources Conservation Authority (NRCA) Act (1991) entrust the NRCA now being part of the merged National Environment and Planning Agency (NEPA) to effectively manage Jamaica's natural resources to ensure its conservation, protection and proper use (Government of Jamaica, 1991). The NEPA under the Act can institute for the management conservation and protection of the natural resources:

- develop, implement and monitor plans and programmes;
- formulate standards and codes for the improvement and maintenance for the quality of the environment;
- investigate activities that might cause pollution to the environment. Thereby explicitly having control over emission of contaminants and discharge of wastes relating to the electricity sector;
- prescribe areas with description or category for development through a permit and licence system;
- revoke or suspend such permit or licence if it is satisfied that there has been a breach of any of the approved conditions.

The NRCA Act explicitly binds the crown as well as any person, body or agency over any matter which may have impact on the function of the Authority regarding matters of the natural resources and public interest.

#### **3.4.1.6 The Electricity Development Act 1958**

The Act administered by the Electricity Authority through the Parish Councils or the Council of the Kingston and St. Andrew Corporation (Government of Jamaica, 1958), has the responsibility to manage electricity throughout the Island. The Act provides for an efficient, co-ordinated and economical system of electricity generation capable of meeting the need of the island; promote and encourage the development and use of the Island resources for electricity generation; investigate matters relating to electricity generation including prospect for nuclear energy; and constantly review electricity service rates. The Authority also has the power to make regulation for rates to be charge for electricity supplied and fees payable. It further empowers the Minister to publicly own generation and supply systems and hold equity in the Rural Electricity Programme as well as 20% equity in the JPSCo on behalf of the Government of Jamaica(Government of Jamaica, 2004). The Authority has been dominate for years (Government of Jamaica, 2004).

### **3.4.1.7 The Electric Lighting Act 1890**

The Minister through the Local Authority may issue licence for electricity to suppliers or persons for public and private purpose. The Act call for an Electricity Inspectorate who shall have power relating to certain aspects of technical regulation within the sector. However, the Minister with overarching power can promulgate regulation for the limitation of the pricing of electricity to be charge. They also have the power to take over electricity plants with which they have issued licence to continue service after the supplier has indicated bankruptcy (Government of Jamaica, 1890, 2004).

The legislation framework to guide the development and implementation of RE in Jamaica is fragmented and limited in its capacity regardless of the Act under which responsibility lies. As such much more is need to overcome the barriers face in light of policy, legislation and establishing PPP.

### **3.4.1.8 The All Island Electric Licence 2001**

The Licence two main functions are one setting the framework within which the Jamaica Public Service Company Limited (JPSCo) operates and two, establishes through a framework for the least cost expansion plan for the planning and implementation of additional generation capacity to the national electric grid by competitive process (OUR, 2006). The Licence sets the guiding principles that govern the competition process as well as it allows for the JPSCo a generator and sole distributor of electricity to also bid in the process for additional supply. The process facilitated by the Office of utilities Regulation through the provision of the regulatory framework sets the guidelines, rules and regulation for additional expansion and along with the competitive process (OUR, 2006). The Licence oblige the Licensee with the approval of the OUR to conduct tender process for the expansion of electricity and to solicit independent evaluator for the evaluation of the bidding process. Notwithstanding, all electricity provider must hold and Licence issued by the Minister upon approval by the OUR (OUR, 2006).

#### **3.4.1.8.1 The Least Cost Expansion Plan – under the All- Island Electric Licence 2001**

The Least Cost Expansion Plan (LCEP) is a simulation model that provides an evaluation of the technical, economic performance and optimal generation investment path of propose alternative generation units feasibility. This also includes transmission and distribution, configuration and investment essential to support the new capacity (OUR, 2006). According to Government of Jamaica (2007b) an annual growth rate of 4% in energy generation is assumed for the public electricity for each projected LCEP. In essence LCEP provides the lowest economic cost for power supply to the consumer. This is in tandem with the Energy Policy 2006-2020 objective that seek to reduce the cost of electricity to end consumer, protect the Jamaican economy from energy price volatility with conventional fuel sources (Government of Jamaica, 2007a) and the OUR Act section 4 (3b) to “protect the interest of consumers in relation to the supply of a prescribe utility service”. According to the OUR (2006) consideration for LCEP must include:

- Demand and energy consumption increases that must be based on realistic assumption and influenced by logical projection of growth in the national economy;
- Historic demand and present consumption pattern;
- Of the projects being evaluated all costs i.e. variables, externalities and fixed;

- The present units performance and economic retirement dates of each; and
- The economic value of supply reliability and its appropriate level.

To date there are plans afoot to expand and improve the current electricity production of which are petcoke, coal, biomass and wind projects. In the interim a new combined cycle gas turbine is proposed; however, this require the construction of a new import terminal to receive natural gas (Government of Jamaica, 2007b).

### **3.4.2 Institutional/ Energy Stakeholders**

The stakeholder for the electricity sector is large and as such mention will be made of the main stakeholders indicated by the Government of Jamaica (2007a) and other literatures reviewed.

#### **3.4.2.1 Ministry of Energy, Mining and Telecommunication**

The Ministry has the responsibility of formulating policy, developing systems and process for the energy sector for its effective management and development to effect economic development and standard of living. As such, they provide oversight function and responsibility for the energy sector thereby monitors the energy supplies, identifies alternative energy sources and energy conservation Table 3-4 role and responsibility of the Ministry (Government of Jamaica, 2008b). They work with companies and retailers engaged in the use of petroleum and energy as well as the electricity sector namely agencies that fall under there portfolio:

- Petroleum Corporation of Jamaica and its subsidiaries (Petrojam Limited, Petrojam-Ethanol Company Limited and Wigton Windfarm Limited);
- Electricity Authority; and
- Rural Electrification Programme.

Notwithstanding, the Ministry has the power to influence RE implementation and by extension partnership agreements for the benefit of the nation.

The Ministry's vision for energy is to "to create and maintain a sustainable environment that encourages investment and competition in the energy sector; provides energy supplies in a safe, secure and cost effective way and facilitate the development and optimisation of renewable and alternative energy sources".

Table 3-5: Role Responsibilities and Mandate of the Ministry

<b>Key function of the Ministry</b>
Provide the policy framework and strategic direction for the operations of Divisions, Agencies and Departments.
Collaborate on the promulgation and amendment of legislation and regulations which guide the operations of its Agencies and Departments.
Set priorities and allocate financial and other resources, as appropriate.
<b>Based on the subject areas assigned, the mandate of the Ministry is to:</b>
Promote energy conservation and efficiency
Promote renewable energy sources and industrial (petroleum) safety
Refine products from crude oil and supply imported finished products for the local and export markets
Provide inspection service for electrical installations island-wide to enable (electrical) safety
Expand electricity service to rural areas and regularize urban electrification

Source: Ministry of Energy and Mining

### 3.4.2.2 Petroleum Corporation of Jamaica

The PCJ is entrusted with the responsibility to fulfil its responsibility under the Petroleum Act i.e. promote the development of petroleum resources in Jamaica and maximising chargeable benefits from the exploitation of these resources; along with implementing the national energy policy. The Corporation has a mandate to ensure energy security and to develop conventional, renewable and other alternative energy resources in a sustainable manner thereby preventing adverse environmental effects of petroleum usage, forging trade and or partnership agreement for national development (Government of Jamaica, 2003; Maillard, 2008). Additionally, the PCJ reports to the Ministry of Energy Mining and telecommunication (Centre of Excellence for Renewable Energy, 2008).

Further the PCJ has the right to negotiate contracts (include bids) for import, refinery, petroleum drilling/ mining and RE implementation agreements, operate refinery, transportation and sale of petroleum and petroleum products.

The PCJ current has 6 subsidiaries which are engaged in energy activities from conventional to renewable resources Table 3-5 Petroleum Corporation of Jamaica Subsidiaries and activities.

Table 3-6: Petroleum Corporation of Jamaica subsidiaries and activities

Subsidiaries	Main Business Activity
Petroleum Corporation of Jamaica (PCJ)	Implementation of the Petroleum Act and national energy policy
Petrojam Limited	Oil Refinery
Petrojam Ethanol	Ethanol production plant
Petroleum Company of Jamaica (Petcom)	Petroleum product distribution and service station owner
JARS	Airline refueling
Wigton Wind Farm Limited	Alternative energy – currently owns and operates a wind farm
Centre of Excellence for Renewable Energy	Alternative energy- research, project management and implementation

Source: Acquisition & Implementation of Corporate-Wide Human Resource Management System

In fulfilling its mandate under the energy policy, under the Energy Policy 1995, the PCJ was mandated to implement indigenous resources into the energy mix for Jamaica. In 2002 the Cabinet gave a directive to the Corporation to accelerate the implementation of Jamaica's Energy Sector Policy (Petroleum Corporation of Jamaica, 2007); the directive stated to:

- Facilitate negotiation to ensure stable and adequate energy supplies at least cost;
- Promote the diversification of the energy base to include the development of indigenous resources;
- Reduce the state's energy bill through the encouragement of energy efficiency and conservation;
- Minimise the adverse environmental effect as a result of fuel use; and
- Support the regulatory framework to protect consumers, investors and the environment.

The PCJ in fulfilling its mandate collaborates with its various energy stakeholders (e.g. investors and environmental stewards) to develop the island's indigenous resources. Additionally, the Corporation establishes in 2006 the Centre of Excellence for Renewable Energy (CERE) to ensure that the goals for RE in the Jamaica Energy Policy (Green Paper) is maintained and achieved also aligning its work to the Petroleum Act. As such, to achieve the goals the CERE set functions:

- building technical skills and capacity for RE;
- performing pre-feasibility and feasibility studies of potential RE;
- Supporting RE assessment studies in Jamaica; and
- Performing analysis for economic, costing and ranking RE option

Of note, the CERE is not entrusted to directly undertake negotiation of contracts for the implementation of RE that remains the purview of the PCJ and of its other subsidiaries.

Overall, the PCJ has the power to implement RE for national benefit as well as undertaking contracts offer bids for the implementation of RE. And through its subsidiary the CERE undertake researches to develop RE and RE technologies capacities etc.

### **3.4.2.3 The Office of Utility Regulation**

What are the roles and responsibility and how that impact RE implementation and PPP

The OUR fall under the portfolio of the Cabinet Office as such they report to them. Subject to the OUR Act it is the responsibility of the Office to regulate the utility companies namely water and sewerage, transport, telecommunication and electricity. Subject to the Act, it is the responsibility of the OUR to process application for licence for a prescribe service (base on the utility) and make the necessary recommendation to the Minister regarding such application. It is also the responsibility of the Office to oversee the All Island Electric Licence and the statutory function of the Office to set out the required regulatory framework and

guidelines to meet the additional electric capacity and support and in tandem with the energy, industrial policies and any other policy regarding electricity.

The Office mission is to contribute to national development through efficient delivery of utility services and affording providers reasonable return on their investment. To achieve this, the Office set objectives (from the OUR website) which are to:

- Establish and maintain transparent, consistent and objective rules for the regulation of utility service providers;
- Promote the long-term, efficient provision of utility services for national development consistent with government's policy;
- Provide an avenue of appeal for consumers in their relationship with the utility service providers; and
- Work with other related agencies in the promotion of a sustainable environment. To act independently and impartially.

With the OUR Act giving the Office the right to protect and conserve the environment as well as to encourage the development of indigenous resources, the Office from time to time open bids for the development of RE resources.

#### **3.4.2.4 Power Producers and Distributors**

The electricity power producers are regulated mainly by the OUR and by extension agencies by which legislation and regulations apply to the sector. They therefore have responsibility to adhere to the legislation and regulation that governs electricity, environment and planning and development. Under the electricity Acts and Licences the power producers have the responsibility to generate based on the required agreement to add bulk supply to the national grid and for the updating of their system to ensure that the required process and procedure are within permitted requirement. To date, there are 4 independent power producers and 1 distributor for the grid 2009; Table 3-6 below indicates the installed capacity of each power provider along with previous producers. As stated in the Government of Jamaica (2004), Independent Power Producers (IPP) [excluding the JPSCo] are not motivated under the present Power Purchase Agreement (PPA) to operate efficiently as their cost are presently affected by the JPSCo tariff scheme. It is hoped under the draft electricity policy that the PPA will provide incentive to manage cost including the pass-through of the tariff scheme. As reported further by the Government of Jamaica (2004), the IPP are reluctant to accommodate discussion with Government of Jamaica and the OUR to change the present PPA trading arrangement to be developed for the generation sector.

##### **3.4.2.4.1 Jamaica Public Service Company Ltd.**

What are the roles and responsibility and how that impact RE implementation and PPP

The JPSCo owner of 64% of total installed capacity in Jamaica was established since 1823 enjoys a monopoly as the sole supplier to the end users for electricity commercially in Jamaica. As such, they are responsible to generate, transmit and distribute electricity to the public. Under the All Island Licence, the JPSCo has the right to purchase electricity in bulk from private producers for transmission and distribution at the best effective price reasonable by

Government Policy. And operated in approved arrangement as set out by the OUR and not in discriminate dealings as operator of the system (Government of Jamaica, 2001). They are also empowered to provide a least cost expansion plan for electricity of which they submit to the OUR. According to the Government of Jamaica (2007a), under the present LCEP, the JPSCo has the authority to tender and evaluate bids. This is seen as potential conflict of interest and exposed competitors and compromises their position with the JPSCo. Noting as well that they have sole right to buy, transmit and distribute electricity for 26 years from 2006. Additionally, the LCEP also allows for RE implementation less than 15MW to be established outside of the bidding process. Within this in mind, the JPSCo's has expressed its intention to implement a wind farm to add to its electricity mix. The scheme used in purchasing electricity from IPP to the national grid is through a PPA and net metering and from small consumers' net billing both affected by the JPSCo tariff scheme.

#### JPSCo net billing

According to the Jamaica Public Service Company Limited (2009a) it allows customers with RE generators e.g. wind turbine and photovoltaic system who self generate for personal use to sell excess energy to the JPSCo at wholesale or "avoided cost" price which is set by the OUR. These customers will however, purchase electricity when they are in low supply from the renewable source at the existing rate as specified by the Tariff Schedule.

#### Difference between net billing and net metering

The JPSCo has indicated that there is a difference between net metering and net billing. Net metering allows for the sale of electricity to them would be at retail price. However the marked difference is the metering system. First the meter will spin backward to account for excess electricity generated and forward if private supply is insufficient to meet its demand i.e. that customer would then be using electricity from the JPSCo. Secondly, for net metering the meter records what is generated and the excess is credited or banked to the customer account for future consumption (Jamaica Public Service Company Limited, 2009a).

Additionally to the technical difference between the net systems, JPSCo cannot allow net metering for small producers to the grid as this would probable be a breach of the provision of their Licence as stated by the OUR. At present, the regulator policy allows for small producers i.e. of 100kWh or less to be added to the grid by the Standard Offer Contract issued by the JPSCo base on the Tariff structure, rights and responsibility of parties, safety, technical requirement of the facilities and interconnection costs<sup>11</sup>.

Overall, the JPSCo do have a strong influence on the return guarantee with the present financial scheme as independent power producer need to negotiate with them on the purchase price for electric sale for the grid. RE projects do have an advantage of 15% on the avoided cost but this may not be sufficient for long term guarantee on investment plus addition cost and risks associated within the regulatory/ legislative framework of the state.

#### **3.4.2.4.2 Wigton**

Wigton Wind Farm (WWF) a subsidiary of the PCJ is located in Wigton, Manchester. They contribute 20MW to the total installed capacity accounting for approximately 2.5% of the energy production mix. Having obtained the All-Island Licence from the OUR and having

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<sup>11</sup> See the OUR regulation policy support Net Billing

signed a PPA with the JPSCo to sell bulk electricity they receive for electricity sale at a fixed price US cent 5.6/kWh for the first year to fifth year of operation and US cent/kWh 5.051 from year 6 through the remaining years following its operation. The cost reflect the rates despite allowance of 15% on the avoided cost as a RE generating facility (Wigton Wind Farm, 2007).

WWF's function according to (Wigton Wind Farm, 2007) is to:

- Manage and operate the 20.7MW winf farm at Wigton, Manchester;
- Supply wind power to the local grid;
- Identify wind potential sites in Jamaica;
- Analyse wind data and ascertain the most feasible sites for expansion of wind power as a source of energy for Jamaica; and
- Negotiate the sale of carbon credits realised from operating a clean development mechanism.

The WWF is also entrusted undertake agreement of sale for the facility through the oversight of its parent company and the Ministry of Finance as well as to expand its capacity for electricity using any RE sources. The expansion of the facility and acquisition of other RE facility is supported under the LCEP/All-Island Licence. According to OUR (2006), a block of capacity will be reserved for additional RE sources and will be announced from time to time by the OUR. As such Wigton can bid for additional generation to increase wind capacity from RE.

#### **3.4.2.4.3 Jamaica Energy Partners (JEP)**

The Jamaica energy partners (JEP) an IPP generate electricity by using conventional fuel supplied by the PCJ/ Petcom. Of note, JEP own a base-load/cycling power generator facility (operate from a barge) and has the right under the Electric Lighting Act to operate a medium-speed diesel power generator and to sell bulk electricity subject to the licence in the Parish of St. Catherine. The installed capacity provide to the JPSCo is 124MW. They hold a 30 years licence negotiable prior to expiration, in addition, they operate under the request licence and permitting system for planning and environmental regulations (Government of Jamaica, 2005; Jamaica Public Service Company Limited, 2009b).

#### **3.4.2.4.4 Jamaica Private Power Company**

The Jamaica Private Power Company (JPPC) an independent power producer that supplies 60MW of installed capacity to the JPSCo (Jamaica Public Service Company Limited, 2009b). The plant is located in Windward Road, Kingston. They are licence under the Electric Licence for 30 years o operate a slow speed diesel generated station and related facility and to supply bulk electricity to the JPSCo through the PPA as of 1994 (Government of Jamaica, 1994). The JCCP have the right under the Licence to carry out activity it is entitle to.



#### 3.4.2.4.5 JAMALCO

The Jamaica Aluminium (JAMALCO) is a bauxite company that produces its own electricity and sell the excess to the JPSCo. As such, JPSCo has a co-generating arrangement with them i.e. they provide up to 11MW of electricity for distribution to the national grid (Jamaica Public Service Company Limited, 2009b).

Table 3-7: Electricity installed Capacity for Jamaica 2003 and 2007 by operator

Source	Installed capacity MW 2003	Installed capacity MW 2007
<i>Jamaica Public Service Company Limited (JPSCo)</i>		
Steam	332.0	292
Hydro	21.5	22
Slow speed diesel	36	36
Gas turbine	237.5	271.5
<b>Total</b>	<b>626.5</b>	<b>621.5</b>
<i>Independent power producer</i>		
Jamaica Energy Partners (JEP)	74.2	
Jamalcoa	11.0	6
Jamaica Private Power Company	61.3	61.3
Jamaica Boilers	12.1	-
Wartsilla (fuel)	74.2	124.4
Wigton Wind Farm	-	20
<b>Total</b>	<b>232.8</b>	<b>211.7</b>

Source: *Economic and Social Survey Jamaica* pg. 9 and *Renewable Energy Potential for Jamaica* pg. 17

#### 3.4.2.5 National Environment and Planning Agency

What are the roles and responsibility and how that impact RE implementation and PPP

The National Environment and Planning Agency (NEPA) is a governmental agency formed in 2001 under the modernisation programme. NEPA as such is a merged entity i.e. the Natural Resources Conservation Authority, Town and Country Planning Department and the Land Development and Utilisation Commission. NEPA therefore operate under the mandate of the following Acts:

- Natural Resources Conservation Authority Act;
- Wildlife Protection Act
- Beach Control Act;
- Watershed Protection Act;
- Town and Country Planning Act;
- Land Development and Utilisation Act

The core function of the Agency is to fulfil the mandate under the various Acts and regulations; which include but not limited to managing the natural resources of Jamaica, processing application for prescribe areas environment, planning and development, beach, construction and operation of industrial facilities, and enforcement.

Planning and building approval are required through from the Kingston and St. Andrew Corporation or the relevant Parish Councils depending on the location of a RE facility.

## 3.5 Specific Barriers to Renewable Energy in Jamaica

### 3.5.1.1 Barriers to RE implementation in Jamaica

It can be reiterated that no one policy instrument can drive RE implementation but a combination of supporting policy methods that is well structured to drive RE. The policy methods spoken of included economic policies which include levelling the playing field for both RE base and conventional use base investors, development of long-term policy and guidelines, planning and strategy development to fuel innovative policy approach; noting that these methods support the overarching RE policy. Additionally, with a good policy structure for RE it will address the other barriers that affect RE implementation.

The barriers that affect RE implementation in Jamaica were aligned to that of the Caribbean cited by CREDP and by extension those identified in the literature review. Nonetheless, the main issue for Jamaica are the need to have a separate policy for RE (address below), secondly the drive for continued conventional fuel use, more emphasis is being placed on finding oil within Jamaica's territory to the extent that joint venture public private partnership has been forged through the PCJ (vested power by the PCJ Act) and as well as expansion of the oil refinery facility to accept LPG. Additionally, the agreement signed with the JPSCo for cogeneration of a petcoke plant for electricity generation is but another indication for the use and priority place on petroleum product.

In decreasing the dependency on the importation of petroleum and petroleum base product to satisfy Jamaica's energy needs it would appear that indigenous resources are being overlooked. This despite the mandate from the 1995 Energy Policy and a Cabinet mandate to the PCJ; Jamaica do have an abundant resource of clean RE namely wind, solar and hydro that can be used to among other things generate electricity and heating. Some efforts have been made though small for the implementation of these and other form of RE to add to the energy mix as noted in the case study; however the effort and dedication in comparison to the use and exploitation of petroleum the political will is small. It must be noted that there are several committees, wide discussions and documentation/ recommendation for more use of and the great potential in Jamaica but action for implementation is staggering. As a result, it can be inferred from the barriers identified by UNDP, Mallon and CREDP/ Government of Jamaica that an additional barrier to RE implementation do exist, this being unplanned, short term and with a lack for long term vision this could be termed "*political priority*". It has been illustrated through the action of the politicians/ key decision makers that their priority is more align with priority for conventional fuel use and unplanned action for energy implementation. As such, the Jamaican model for barriers adapted from CREDP could therefore be amended to reflect the new barrier realised Table 3-7 below:

Table 3-8: Barriers to RE in Jamaica

Barriers Categories	Most Significant barriers identified
Policy	<p>Lack of commitment on the part of Government of Jamaica in the enactment of policy for RE;</p> <p>Fragmentation of roles and responsibilities including overlapping functions. These were noted during the examination of legislative and regulatory framework of not the PCJ and the OUR along with several other electricity Acts giving power to Authorities to implement RE within the energy mix for both the energy sector and electricity sector. As a result of the Acts roles overlap which made it difficult for any one organisation to take responsibility for implementing RE in Jamaica and by extension the electricity sector. As such, allocation of responsibilities need to be taken to address the barriers for RE in Jamaica as set out by CREDP;</p> <p>Lack of human resources for overcoming these defects;</p> <p>Lack of interest and commitment of national utilities; and discriminating taxation of RE product and other financial disincentives for RE technologies.</p>
RE Finance	<p>Insufficient acceptance of RE this has resulted in local banks being sceptical to provide loans for RE projects; and</p>
Human and institutional capacities	<p>Lack of project developers the present monopoly by JPSCo has created disincentives for local IPP to improve their facilities or even undertake RE implementation.</p> <p>The existing capacity-building activities and opportunities in RE are limited in Jamaica. In the Caribbean region this is scattered and fragmented. Additionally, capacity building is donor fed as a result, existing opportunities lack continuation, regional co-ordination and possibly integration; and</p>
Awareness and information	<p>There are few training RE opportunities in the region for officers/decision makers, technicians of ministries, utilities and local industry. Training opportunities offer to this group are often “donor driven” and not sustainable and do not reflect priority needs (energy policy, project development, formulating bankable projects).</p> <p>The lack of awareness of and confidence in the technology is key barrier to the commercial application of RE technology. A critical number of key persons is needed to be aware of RE, for the technologies and strategies to become accepted by the society;</p>
Political priority	<p>Most decision-makers would prefer to actually see functioning demonstration projects before investing in RE technologies;</p> <p>Insufficient availability and management of relevant energy data. Strengthening and improving the existing Energy Information System in the Jamaica and the Caribbean is crucial for the success of any national and regional energy project in general, and for RE projects in particular; and</p> <p>Lack of systematic RE resource assessment.</p> <p>Strong conventional energy priorities; and</p> <p>Lack of long-term vision.</p>

Source: Caribbean Renewable Energy Development Programme – Programme Brief

Additional barriers include:

- The Caribbean Energy Policy need to finalised to effect strategic implementation of strategies within each Caribbean state to the CARICOM;
- A revision of the Latin America and the Caribbean RE target need to be revised given little or no implementation to date

### 3.5.2 Energy situation in Jamaica

The energy situation demands that strategy and action to effect the improvement of the energy sector take place within the short, medium and long term in Jamaica. As such, the following give rise to the summary of this section:

- Target and action to cut Jamaica energy consumption need to be devised and implemented. The present ECE policy need to be finalised to ensure its implementation;
- More attention and action is need for the RE sector compared to conventional fuel as the solution so far will still add to Jamaica's environmental challenges. Specifically, oil exploration which now has resulted in phase 2 i.e. drilling to confirm oil quantity etc. Note this relates to off shore drilling and the fragile state of the marine environment. As well as Jamaica's debt burden with the importation of petroleum coke and LPG for electricity generation.

### 3.5.3 Electricity sector

The electricity sector has the potential to decrease its dependency on petroleum and petroleum base product significantly should the potential for wind and hydropower be realised as well as other RE resources that have smaller implementation potential.

Of merit the government of Jamaica has liberalise the electricity sector. Through the liberalisation of the sector, Jamaicans with access to electricity has increase from approximately 50% in 1970 to 92% in 2005 (Saunders, 2005). In keeping the sector liberalised, the state through the PCJ in 2007 made an attempt to sell the state own wind farm; while this was not successful it open further the avenue for PPP.

Dominate power supply, transmission and distribution entity in the JPSCo that negatively impact on the power producing sector;

There is a disparity in the cost of electricity charge per use between normal customer usage and lower customer usage.

## **4. Public- Private Partnership for Renewable Energy in Jamaica**

This chapter seek to discuss the type of PPP to be used in Jamaica to facilitate infrastructure development and in particular electricity generation. The chapter further seeks to compare the noted PPP against selected renewable schemes for electricity generation and further discusses and make recommendations based on the social, financial and resource/ environmental needs for the most appropriate PPP to be used.

The Government of Jamaica in its bid to build the public sector services generally undertake some level of partnership to finance the necessary project that cannot be financed directly through the national budget. Public-private partnership has been used in social reform for the city of Kingston – urban renewal, it has been used in the educational system prime example is the Human Employment and Resource Training/ National Training Agency, the transportation sector has also benefitted from with the Highway 2000 project, the protected area system has benefitted from co-management agreement although with environmental non-governmental organisation, and the use also within the health sector to provide private care or specialised health services and administrative service within public hospitals. Newer type of partnership in public-private partnership not listed by (Grasman et al., 2008; UN/ECE, 2007) is being used in Jamaica; namely product sharing agreement (PSA) and joint venture (JV) in the energy sector.

In 2007 the Government of Jamaica through its agencies the OUR and PCJ have been seeking for the electric sector Build Own Operate (BOO) and Joint Venture (JV) partnership to implement additional RE within Jamaica.

In liberalising the economy in the mid 1990's the Government still maintain its goal to encourage economic growth and benefit for improving the standard of living for the nation. As such, the Government has again expressed their intention to sell the WWF. The present ownership and management under the government (PCJ/ WWF Limited) is to establish and operate the wind farm as a catalyst to bring about new RE projects (Government of Jamaica, 2004). As a result, the PCJ is expected to enter into joint venture partnership with private sector as a minority equity partner subject to the approval by the Ministry of Finance.

In July of 2007 the PCJ opened a bid for the sale and expansion of the Wigton Wind Farm. They had received requests for proposals for the sale of the Farm by 8 interested investors; however, in September when bids were open no bids were received. The PCJ indicated that the sale of the Farm is to support the full cost recovery by the Government and to double the Farm's capacity. Concurrently to the bidding process by the PCJ, the OUR was also soliciting bids to implement RE plants in the country. According to Myers (2008) who interviewed the Chief Executive Officer of the PCJ indicated that the PCJ upon learning about the OUR separate tender they withdrew theirs. Myers further indicated that the guarantee rate of returns is not attractive for investors as the Government of Jamaica is offering based on its regulation a 15% premium is added to the avoided cost of generation<sup>12</sup> of what is being offered by the OUR. As such the rate is now US8.8cents plus 15% which would bring the cost to of returns on US\$0.10cents.

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<sup>12</sup> Avoided cost of generation is a basis for establishing the price at which alternative source of electricity may be sourced and to defined the market values of electricity generated by various sources: Declaration of indicative generation avoided costs.

An additional obstacle to the sale and RE identified is the PPA with the JPSCo and the recommendation of the Declaration of Avoided Cost proposed by the PCJ. The Petroleum Corporation of Jamaica (2009) has indicated that the Declaration of Avoided Cost methodology is being challenged based on the assumption and method used to arrive at the Cost.

#### 4.1 The need for PPP in the Electricity Sector

With limited financial resources to meet all national need, the state has limited capacity to finance the implementation and full management of this sector. In the Government of Jamaica's bid in the mid 1990's to 2000 to liberalise some of its assets including the sale of the state own JPSCo and recently attempts at sale for the state owned Wigon Wind Farm are just indications of its inability to finance and manage the sector for the additional benefit to the state. The cost of financing RE facilities especially wind is high i.e. initial investment PPP through equity share is a good way to share the risk and cost with the private investor so the debt burden to the government would reduce. Jamaica has several success models of PPP working some of which are HEART Trust/ NTA long standing historical record and relatively new Highway 2000 and Petrojam oil refinery. These attest to the increasing confidence that PPP works and builds confidence that equity share investment are bankable. Another aspect in building confidence of the investor (local regional and international) on the Jamaican RE is to attract them is equity share increase the pool of capital; it is a strategy to diversify from low-yield but maintaining low risk levels; it unlock valuable assets that were unreachable before especially with government guarantee as indicated by Dinica (2008) in the paper on Spain RE implementation along with other literature on Germany and Denmark; overall benefitting all partners.

Additionally, in the revision of literature undertaken it was revealed that neither government nor the private sector can undertake some projects alone. The risks and guarantees need both parties for its full potential to be realised. Given the present world economic crisis, the government of Jamaica is faced with surmounting pressure for economic growth, to decrease debt burden, the need to cut expenditure, in the energy sector implement alternative namely indigenous resources to *inter alia*, decrease the cost of electricity at the same time decreasing infrastructure cost for other sectors. To meet the present energy need PPP is one solution as it allows for the leveraging of technical professional resources, decision making would not be long and bureaucratic, financial performance will improve, investors would have confidence and the RE market will attract other type of partnership structure.

In Jamaica renewable energy investment is perceived as high-risk with return on investment slow to be realised. As such, private investors namely energy and financial institution are reluctant to invest their equity as other technology markets do have quicker returns and are more favourable. However, one merit for RE power generation is, it allow for guarantee based on its predetermined generation capacity and with a good financial scheme e.g. regulated tariff for power sold, cash flow would be stable and now predictable allowing for equity investors. In the Jamaican situation, one of the challenges faced in the electricity sector is the monopoly of the JPSCo as the single buyer of electricity power. This has proven to be a disincentive within the present IPP pool e.g. to operate efficiently. As such having a sole buyer is the greatest source of risk as in remaining solvent and in its willingness to pay for power generated noting JPSCo tariff mechanism scheme.

## 4.2 Comparison of Public- Private Partnership schemes for Renewable Energy electricity sector

A comparison will now be made on the three PPP schemes used in Jamaica. Two are proposed for the electricity sector in Jamaica. The assessment will be made on three criteria that of:

- Ability of the schemes to meet RE targets – be defined as achieving the goals as set out in the Jamaica Energy Policy 2006-2020 and the Power/electricity policy for Jamaica and superseding them;
- Economic benefits to be derived – defined as contributing the most to both party's economic pool, having less demand on the purse of government and investor; and
- Political feasibility – defined as political acceptance from politicians and the public.

A matrix Table 4-1 will be used as the assessment tool with data on the merit and demerit of each partnership scheme arising from the literature study. The section identifies the merits or demerits to both partners base on the criteria. Additionally, the weights to be applied to the selection process are:

- The least economic cost to construct and operate the plant;
- Degree of difficulty to access RE resource, distance from the national grid and the level of investment this may require; and
- The size of the facility i.e. installed capacity to be acquired.

Overall, the most appropriate partnership scheme(s) will be selected base on the criteria and weight.

BOO partnership is based on the private sector designing, building and operating an entity in perpetuity. And Joint Venture like BOO the private entity design, build and operate the good or service in addition to this the government is a partner and share in the profits and losses of the project. PSA is based on resource extraction awarding the right to the private entity to explore for minerals. In relation to RE it is the right to utilise resources that are more challenging to acquire and add to the grid. Overall it is a strategic alliance that enables complementary capabilities and resources to be utilised for the benefit of the project/ business e.g. finances, technology and human resources risk and rewards under shared control.

Table 4-1: Matrix for the assessment of PPP schemes for RE implementation in Jamaica

Criteria	PPP Scheme		
	Build own operate (BOO)	Joint venture (JV)/ equity share (ES)	Production Share Agreement (PSA)
Ability of the scheme to meet RE targets	With less government intervention it allows the private entity to focus on the core business against government bureaucracy that may delay valuable decision making. With 100% private sector rule provide a sense of total ownership that tend to prevail in liberal investment of resources	The integration of both management and business cultural approach will ensure the best for meeting target. Depending on the ratio in agreement owner investor limited liability will allow for ease in decision making. If not high level of bureaucracy may threaten the goal of the partnership and cause problem in meeting target	The target can be achieved once this type of agreement is modified for other resources excluding minerals and oil exploration. Given the guarantee that RE capacity is fixed it will encourage the private investor to meet the target and even supersede it.
Economic benefits to be derived	100% profit retain to the private entity managing the project. Government may receive benefit from taxes. Depending on the location of the investor revenue will expatriate.	Both partner benefit from the profit and share losses. Also depending on the agreement government can benefit more from taxes receive. Depending on the location of the investor revenue will expatriate.	Both parties would benefit and also depending on the agreement additional revenue may be gained for the government. Depending on the location of the investor revenue will expatriate.
Political feasibility	With an hands off approach some political and decision makers will support this type of venture. As well, as citizen may feel that their interest is not being taking into account by the political and decision makers.	Tend to have stronger support from all parties and as well political and decision makers including the populace. Government is viewed as fulfilling its mandate to the citizen.	Support from politician and decision makers will also be strong as well support from the citizens.

All partnership schemes meet the criteria, however, for the economic benefits and political feasibility JV/ES and PSA schemes have stronger support than the BOO. While JV/ES and PSA has the ability to derive greater economic benefit for government from the scheme through income generation tax and revenue from ownership, BOO save government spending through total ownership being allocated to the private entity. PSA also has the ability to save government spending as a result of the risk being almost completely the private investor's. JV/ES and PSA received more support as a result of government being a partner within the entity and also being able to receive revenue from profit made in addition to revenue from taxes received. Public support is also for this type of partnership as they feel that government as a partner will ensure that they operate as representatives of the populace in comparison to BOO and their social benefit seems more secure.

Jamaica has used all three partnership types in the energy or electricity sector. BOO has been used to attract IPP. This has been a success to date, however base on several issues one of which is the PPA and financial scheme being used the IPP are not encourage investing over and above that which is required presently by the All-Island-Electric Licence. Of note, literature has indicated that most states engage in BOO for electricity generation especially



from wind resource e.g. Germany, Spain, India and Costa Rica with financial schemes that encourage expansion of RE installed capacity (Dinica, 2008). Regarding contractual agreement for financing, Government of Jamaica under Highway 2000 (although a success story) had signed the agreement allowing yearly increment on toll applied this was based on the exchange rate stability. As a result the yearly change in price is viewed by the citizen as poor negotiation on the part of the government referring to the economic condition of the state and citizen.

The PCJ under the Act can undertake agreement for the fulfilling of its function. As such, they signed a JV agreement with the Venezuelan Government on behalf of *Petroleos de Venezuela S.A.* to divest *Petrojam Limited* aim at upgrading the oil refinery<sup>13</sup>. The JV has so far been successful; however, the PCJ was not transparent in the selection process and was thereby investigated by the Contractor General of Jamaica (Government of Jamaica, 2008a).

The PCJ has also engaged itself in PSA for the exploration of oil within Jamaica's territory. The agreement is influence by the legislative framework of Jamaica that governs petroleum exploration. The agreement set out rights to explore and drill wells; financial guarantee to the government by the investor to pay for the use of the land. The amount for the use of land will increase once oil is discovered (*Petroleum Corporation of Jamaica*, 2005).

Overall, all schemes are attractive base on the assessment and allocation of roles and responsibilities along with risk allocation. They have significant merits and demerits but careful consideration and processing must prevail. As such, consideration must be given to a combination of all compared PPP schemes to attract RE investors. The decision must be made though on the degree of challenge with the most difficult e.g. geo thermal and waste to electricity using PSA, then the medium degree applying to JV/ES e.g. wind and solar also depending on the size and the least difficult/ associated risk wind and solar apply to BOO.

### **4.3 Specific Policy necessary to make Public- Private Partnership Work in Jamaica**

With fossil fuel being finite and the present speculation on oil peaking, are factors that can enhance the growing need for alternative source of energy. Coupling as well with increasing cost per barrel of oil and environment concerns will encourage an increase in market share of renewable energy (Atabi, 2004). Importantly, to ensure an efficient society, a good function policy with a systemic focus on energy needs to be in place. This would allow for successful interaction between the dimensions of sustainable development (social economic and environment). Presently, energy systems in developing countries in particular Jamaica energy is not in tandem with an efficient system. Conventional fuel on one hand has been made more favourable economically by the track record, low initial investment and guarantee through government to government agreement. In Addition, there are no formidable policy structure for RE in Jamaica as a result of limited political backing when considering environmental concerns versus economic growth, fragmentation in regulating through Ministries overlapping functions through their portfolio agencies.

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<sup>13</sup> See Office of the Contractor General of Jamaica Report of investigation Conducted into the Divestment of Shares of *Petrojam Limited*

#### **4.3.1.1 Need for structure policy mechanism in Jamaica for RE**

Government of Jamaica over the years has discussed the need for indigenous and other alternative energy resource to be included in the energy mix; however, marginal steps relating to foundational establishment for RE has been undertaken. To date, there are several legislative documents that guide the electricity sector with the two main ones that address RE being Jamaica Energy Policy 2006-2020 (Green Paper) and the draft Power/electricity policy for Jamaica 2004. Both documents indicate the need for RE and proposed RE targets for the short – medium term but without the document being finalised there is little or no drive to guide RE implementation. Further to the policy structure, the Government of Jamaica through the Jamaica Energy Policy for 1995 and a directive from the Cabinet Office to the PCJ has mandated the implementation of RE into the energy mix but they fall short of mandating policy to drive RE implementation. In light of the lack of a RE policy to guide its implementation the words from UNEP (2008) is most applicable “in the absence of radical intervention by government, fossil fuel will remain the dominant energy source”. Thereby fuelling the oil bill and continuing the discussion on how to reduce it.

Secondly coupling with the lack of a structured policy to guide the implementation of RE in Jamaica is the fragmentation of the legislative structure on electricity. First, the energy responsibility is entrusted to the PCJ to foremost implement and manage RE in Jamaica. Second, the electricity sector being regulated by the OUR is also guided by several legislation that provide guidelines to its function and operation. Through the myriad of legislation arise several committees and ad hoc arrangements to manage and implement RE in Jamaica. These build fragmentation and poor strategy for RE implementation. The Government of Jamaica (2004) also identified this as an issue to the successful implementation of RE and electricity on a whole highlight that they conflict with the OUR Act and the JPSCo Licence. As such, an appropriate legislation should be promulgated to address the fragmentation and move the mandate of RE forward.

Thirdly is the weaknesses of individual legislation that speak to electricity and energy to address RE implementation mainly wind energy for the electricity sector. The main piece of legislation is the All-Island Electricity Licence, this allows for the production, sale, transmission and distribution of electricity to the national grid and customers. It further allows for the competitive bidding and expansion of electricity system through the LCEP. This legislation is weak as it does not allow for multiple suppliers of electricity and the present monopoly makes it hard for negotiation of financing schemes from IPP. JPSCo has the monopoly and it simply provides disincentives to the present IPP and has the potential as well to becoming a barrier to new entrants to the generation market especially when Government does not provide any guarantees on their investment. The present monopoly by the JPSCo also stands to impact future generations and negatively impacts the government’s goal of increasing the energy mix as well as expanding competition in the new generation capacity market. Additionally, including in the power provided to the JPSCo is the present tariff net metering and net billing scheme afforded to IPP (both bulk and private household). Noting that the OUR do regulate the annual charges to be met and overseeing the negotiation of fees paid the current scheme need to be revised as it also provide a disincentive to potential investors as a result of fuel and non fuel rates. Overall, a revision of the Licence is required to create transparency, trust, un-biased tendering process and a regulator of the process. The Government of Jamaica (2004) calls for “the production and distribution supply chain to be unbundled into a regulated network/ retail sector and a competitive generation/ bulk electricity sector” which is agreed with.

Fourthly, to enable the implementation of wind farms for the national grid all other barriers and issues relating to the structuring of policy and institutional barriers need to be addressed. Government of Jamaica is discussing whether or not to develop a policy for RE let alone a policy for Wind Energy use. It has been indicated by Petroleum Corporation of Jamaica (2009) that the discussion is to have one comprehensive policy i.e. the National Energy Policy which would embody all aspect of energy. Several literature have pointed to the need for separate RE policy to drive its implementation. This no doubttable indicate to investors and financial institution government's commitment and as such provide an incentive for there investment. Amongst the barriers identified by practitioners and researchers within the field of RE implementation, policy and legislation structure were noted. The literatures pointed to the lack of or insufficient support for policy mechanism to support RE leading to no or limited implementation; while Dinica (2008) stated that failure to have a good policy for RE will result in not meeting the desired target. In Mallon (2006) he argued for policy and policy reform to drive RE implementation and further caution that within policy development there are barriers that impede its structure. This is based on myths, pitfalls and oversight and in assessing PPPs theory and comparing the Jamaica case it can be argued that overlooking the policy for RE implementation and its barriers will impact on a successful partnership agreement and undermine its vision. Therefore Table 4-2 below maps the way forward for PPP mechanism using Mallon's concepts and adding another PPP mechanism and principle that is important to achieve RE implementation.

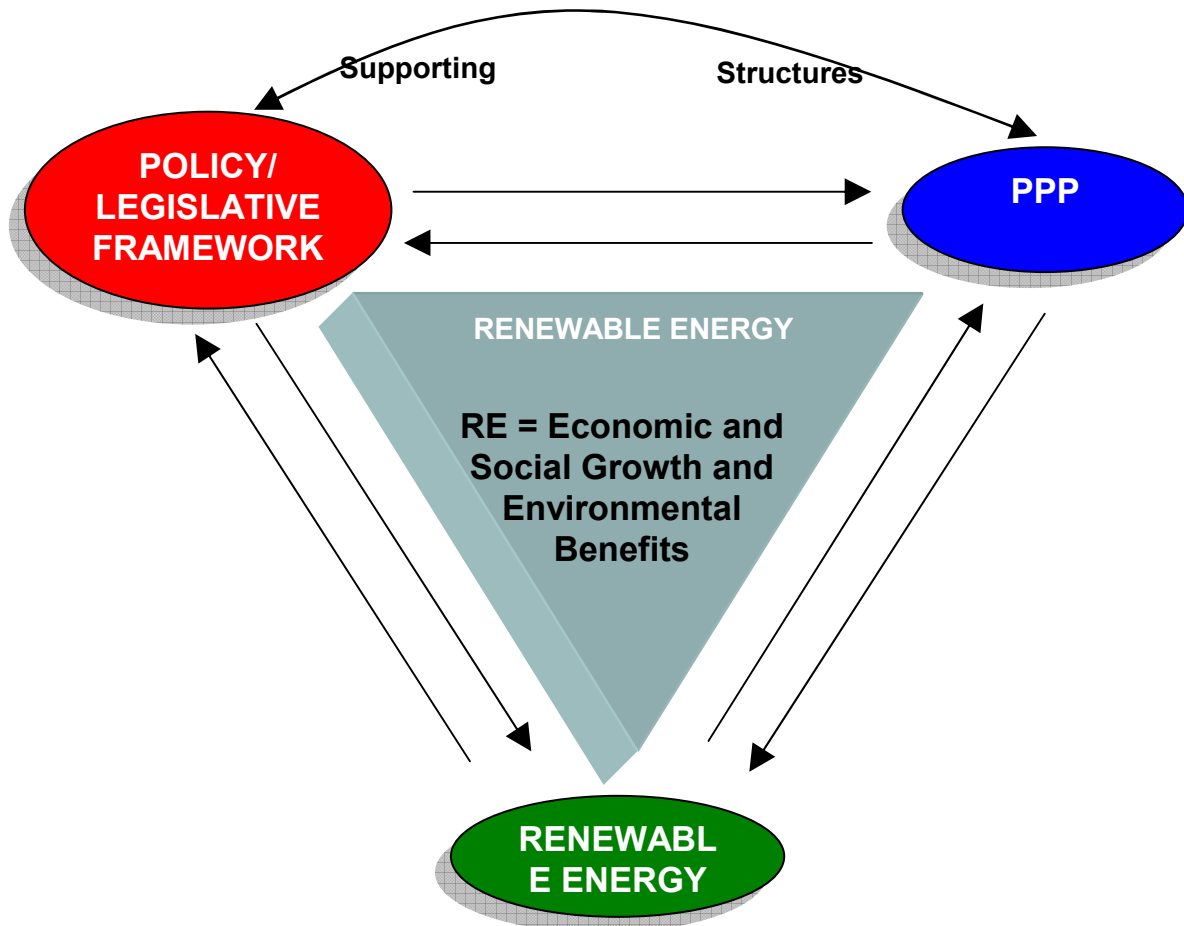
Table 4-2: Interface between PPP and how Jamaica RE policy should be structured

PPPs Mechanism	Principles	Way forward for Jamaica's RE policy
Policy	Linking policies to clearly defined goals	Having a separate policy for RE that focus on its objectives and goal. To have a comprehensive policy for energy will continue to perpetuate limited to no growth for RE too many target gets to meet without direct focus on RE and alternative source of energy and to add to the mix
Capacity-Building	Providing the support and collaboration at local, national, regional and global levels	Ensure capacity sharing thereby building the resource pool of the state and the private sector. Training opportunities especially for government RE staff, access to both private and public sector pool will also benefit policy makers and decision makers skill to effect positive improvement for the sector,
Legal Framework	Allowing flexibility in legal process	Having a base line framework but also periodical review of processes, procedure and goals, the ability to adjust the All-Island Licence to incorporate financial schemes and processes.
Risk Sharing	Allocating suitable risk burdens	Ensuring that the right partner assign the risk they are most capable of managing; don't take on anything to the detriment of the state or private sector e.g. do not accept liability that will negatively affect the government purse or the citizen; these must be avoided.
PPP Procurement	Ensuring clear and transparent processes	Ensure that this is in line with the Contract commission procurement plan and make the necessary recommendation for RE implementation. The LCEP must comply as well as any sale of RE or partnership signed.
Putting People First	Considering the benefits to and impacts on all shareholder	In the policy design, RE planning and partnership always play fair consider all stakeholders especially citizens ensure Jamaicans are also kept abreast of agreements and their knowledge base increase as well on RE technology etc.
Environment and Social Concern	Balancing sustainability and responsibility	Also consider the pillars of society: economy, society and the environment all have equal stands for growth and development.

Source: Grasman et. al. 2008. *Public-Private Partnership for technology growth in the public sector*

Overall, the learning for Jamaica is that a good policy structure and legislative framework with PPP will enable RE implementation. Figure 3 PPP framework below, additionally, government of Jamaica should ensure that states planning and energy requirements are inline to meet RE technology and its implementation. Further, it has been observed that policy for RE need to be structured clearly and well defined as indicated by Dinica (2008) in the case of Spain to include as well being clear, transparent, having a defined framework, incorporate planning and energy reform (Mallon, 2006; UNEP, 2008).

Figure 4-1: Public Private Partnership Framework



Source: *Energy Planning Methodology and Approaches: Jamaica's Experience*

#### 4.4 Specific Stakeholder and policy for Renewable Energy Implementation

Jamaica's present arrangement for governing the electricity and energy sector need to be revised; as three issues arise one functions overlap i.e. PCJ and OUR. As such, there is no coordination between the agencies to implement RE. This has led to the poor implementation of RE and the noted failure for bids in 2007 *inter alia*. Two, unattractiveness of RE financial scheme and non-economic incentive; it would appear from the literature that insufficient non-economic incentive was applied to the bids for partners to be motivated to undertake the venture. As well as, sufficient financial guarantee to the avoidance cost noted. Three, the number of stakeholders for electricity sector is wide which has resulted in a failure to implement, upgrade or just improve the electricity sector and more importantly implement

RE electricity. Given this situation to solve the challenges Government of Jamaica need to institute a body to oversee RE implementation with greater responsibility for the electricity sector. This body should also coordinate activities between the main agencies with responsibilities e.g. PCJ and OUR. It is not wise to develop another agency to carry out this function, as this would add to the fragmentation and poor coordination of activity within the energy and electricity sector for RE. As such a department or subsidiary of either the OUR or the PCJ can fulfil this mandate. The branch, division or subsidiary would also have the responsibility to undertake research and make recommendation for financial and non-economic guarantees as well as policy recommendation for RE especially for RE electricity.

#### **4.4.1.1 Renewable energy financial schemes**

It is in Jamaica's best interest to adapt a combination of financial schemes for RE. The present tariff and net metering being used should reflect the use of petroleum for electricity from IPP to the national grid and a combination of net billing and avoidance cost along with more feature of feed-in-tariff scheme apply to RE. With Jamaica's electricity sector offering a guarantee to the grid once the supply from producers is bulk, there following therefore should support a feed-in-tariff scheme adapted from (UNIDO & REEP):

- A pre-defined price or market price for out put depending which is greater or more economical;
- Specific period apply to the rate of purchase with the option after the end of the period to offer open-ended PPA and adjusted rates;
- The degree of difficulty base on technology use should influence final purchase price/ guarantee;
- Tariff should be influence by the end price to the consumer; and
- The tariff level should decrease over the years reflecting the potential for declining technology cost.

Adapting this system would mean that JPSCo's influence on the purchase price for RE would be minimal. Further, the scheme would be a part of the legislation guiding RE in the electricity sector and would not be counter or contradict the All-Island- Electric Licence issued to JPSCo.

Overall to eliminate duplication of efforts by the energy and electricity sectors and fragmentation of roles and responsibility it is recommended that the CERE within the PCJ be assigned the responsibility to coordinate RE activities between agencies, research guarantees for partnership agreement, be the independent body with oversight function of the processing of LCEP bids as well as other responsibilities they are now assigned.

## 5. Conclusion

Following the literature review, case study and findings, this chapter seek to summarise all the findings and provides an overview on RE implementation in Jamaica the challenges, opportunities, address the research questions and way forward for the electricity sector.

The research had assumed that the delay in implementing RE within the electricity sector in Jamaica has several barriers. The approach taken to address the barriers were within two methods, that of policy as a mechanism for addressing all barriers and second public-private partnership as the tool for overcoming the barriers to ensure full implementation. The result have shown that policy development mechanism and support for RE along with PPP notable build own operate, joint venture/ equity share and production share agreement has been tested and proven successful as the tools to ensure barriers to RE is overcome in order to meet the goals, objectives and target of increasing the energy and RE electricity mix of Jamaica. From the listed barriers identified by Government of Jamaica it was revealed that additional and critical barriers do exist to the implementation of RE. The research identified the complexity of the legislative and regulatory framework, roles and responsibilities of actors and the absence of a policy framework made any movement toward RE implementation very difficult.

Given that Government of Jamaica would accept the recommendations of this report and seeing to the implementation of RE; Jamaica's dependency on petroleum and petroleum base product for the electricity sector can contribute to a reduce energy oil bill for the country. This would result in a reduced oil bill for the state which in effect would strengthen the economy, social and environmental pillar and cause the overall improvement in the state's standard of living. Further, through Jamaica's experience, the lesson learnt can be made available to the sister states within the Caribbean Community (CARICOM) and thereby drive the overall improvement in poverty reduction, social and environmental health and economic growth.

### 5.1 Answer to Research Question Context

***Why is there a disparity in policy processes for renewable energy sources and enactment of renewable energy plants within the Jamaica?***

It has been revealed that the legislation that governs the management of the energy and electricity sector is numerous. The PCJ under its Act has the overarching mandate to implement RE through the Energy Policy of 1995 while the OUR has the responsibility through its Act and other Acts entrusted to it to regulate the electricity sector. Nonetheless there are other regulation that are outside the purview of the OUR that also governs the management and directive of both the PCJ and OUR in fulfilling its mandate for the implementation of RE of note the NRCA Act. It was also reveal in the finding that discussion has ensued in the promulgation of a policy to guide RE implementation. It was also revealed that the support in the government arena is to have one comprehensive energy policy that will address all aspect of energy. It has been argued by practitioners within the field of RE that a policy to guide RE and to ensure PPP need to be developed as this shows unequivocally that government support RE and would drive their investment in the sector, examples of this happening are seen in India, Spain and Germany. The study has also shown that Government of Jamaica has undertaken steps to increase petroleum within the electricity mix and energy sector. As well as the established legislation supporting petroleum and petroleum base products for the electricity sector.

The study has further shown that the number of actors within the energy and electricity sector that also manages the renewable energy overlap creating a bottleneck of no coordinated action; as such a disparity exist for renewable energy policy and implementation.

### ***How can partnership effect implementation of renewable energy in the electricity sector in Jamaica?***

Through the framework developed having an attractive PPP and correctly allocating roles and responsibilities along with risks will guarantee partners satisfaction and full implementation of RE goals. Consideration must however be given to a combination of PPP schemes namely BOO, JV/ES and PSA to attract RE investors. The decision of financial incentives must be made though on the degree of challenge with the most difficult e.g. geo thermal and waste to electricity using PSA, then the medium degree applying to JV/ES e.g. wind and solar also depending on the size and the least difficult/ associated risk wind and solar apply to BOO. Overall partnership will effect the implementation of RE in the electricity sector.

## **5.2 Recommendation to target audience**

The below form the recommendation from the research conducted

### Public Private Partnership

- Government of Jamaica must adapt one of three PPP or use a combination of all PPP compared within the research i.e. Build Own Operate, Joint Venture/ Equity Share and Production Share Agreement to effect renewable energy implementation within the electricity sector.

### Policy and Financial scheme:

- The policy structure needs to have clear objective answering questions such as, “What is to be achieved?”, “When should it be achieved?”, “How will we go about meeting the goals, objectives and targets?” and “Why should the mapped course of action be as it is set out?”. Undermining having a good policy would be like having no policy, as an unstable policy structure will result in RE investment failure and waned support. To be discussed now are the vehicle(s) for fulfilling RE implementation after promulgation.
- CERE need to be given the task/ mandate to look at guarantees to attract private partners, coordinate RE activities between agencies, research guarantees for partnership agreement, be the independent body with oversight function of the processing of LCEP bids as well as other responsibilities they are now assigned
- While there are merits to the use of the tariff schemes and net metering for petroleum base electricity generation; net billing, avoided cost and feed-in-tariff must be used to drive financial incentives along with other non-economic guarantees for renewable energy implementation.



### **5.3 Future Research**

Further research is necessary to:

- Determine the financial incentives to be given vis-à-vis implication on the All-Island – Electric Licence for the JPSCo;
- Adaptation of PSA for RE electricity generation for Jamaica; and
- Detailed assessment of sites for wind (offshore and on land), solar photovoltaic and geothermal RE use for electricity in Jamaica

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## **Abbreviations**

TDBB – Traditional design bid build

CFS – Contract fee service

O&M – Operating and maintenance

BOT – Build Operate transfer

BOOT – Build Own Operate Transfer

BLOT – Build Lease Operate Transfer

DBFO – Design Build Finance Operate

BOO – Build Own Operate

BBO – Build Buy Operate

JV – Joint Venture

ES – Equity Share

PPP – Public- private partnership

FIT – Feed – In – Tariff

MEAs – Multinational Environmental Agreements

CDM – Clean Development Mechanism

CEIS – Caribbean Energy Information Service

CREDP – Caribbean Renewable Energy Development Programme

ECE – Energy Conservation Efficiency

PCJ – Petroleum Corporation of Jamaica

OUR – Office of Utilities Regulation

JPSCo – Jamaica Public Service Company Limited

CAF – Corporación Andina de Fomento

CERE – Centre of Excellence for Renewable Energy

WWF – Wigton Wind Farm

IPP – Independent Power Producer

RE – Renewable Energy

CARICOM – Caribbean Community

NRCA – Natural Resources Conservation Authority Act

NEPA – National Environment and Planning Agency

LCEP – Least Cost Expansion Plan

JEP – Jamaica Energy Partners

JPPC – Jamaica Private Power Producer

JAMALCO – Jamaica Aluminium

LPG – Liquid petroleum gas

ECLAC – Economic Commission for Latin American and the Caribbean