

An assessment of fiscal and regulatory barriers to deployment of energy efficiency and renewable energy technologies in Belize

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Executive Summary

Belize is currently faced with several critical challenges associated with the production, distribution and use of energy. Despite an abundance of renewable energy resources, the country remains disproportionately dependent on imported fossil fuels, which exposes it to volatile and rising oil prices, limits economic development, and retards its ability to make the investments that are necessary for adapting to climate change, which pose a particularly acute threat to the small island states and low-lying coastal nations of the Caribbean.

This transition from energy consumption and supply patterns that are based on imported fossil fuels and electricity towards a more sustainable energy economy that is based on environmentally benign, indigenous renewable energy technologies and more efficient use of energy requires concerted action as the country is already challenged by limited fiscal space which reduces its ability to provide some fiscal incentives, which have been proven to be effective tools for the promotion of sustainable energy markets in a number of countries.

This report identifies the fiscal and regulatory barriers to implementation of energy efficiency measures and renewable energy technologies in Belize. Data and information were derived from stakeholder consultations conducted within the country. The major result of the assessment is that the transition of policies and plans into tangible action needs to be increased. In this regard, it is necessary to articulate sub-policies of the National Energy Policy to amend the Public Utilities Commission Act, to develop a grid interconnection policy, to establish minimum energy performance standards for buildings and equipment and to develop a public procurement policy.

Finally, decisions on renewable energy and energy efficiency-related incentives from the Government formally requires decision-makers to solve what may be extremely complex optimization problems in order to obtain the lowest-cost provision of energy services to society, thereby weighing the cost of revenue losses with the benefits of fuel and infrastructure expansion savings. The establishment of a management system that is efficient, flexible, and transparent, which will facilitate the implementation of the strategic objectives and outputs in the time available, with the financial resources allocated is recommended. Support is required for additional institutional and capacity strengthening.

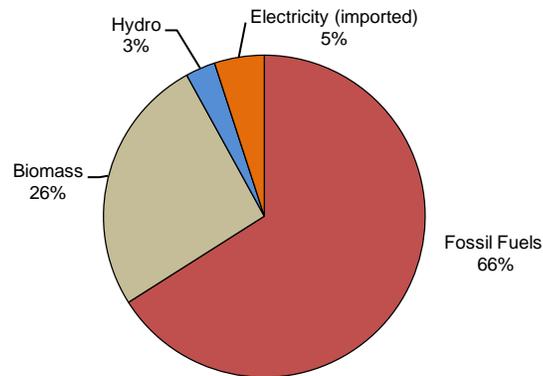
I. Introduction

A. General

The international economic situation has impacted on the Caribbean and has aggravated the high debt burden and falling competitiveness for its exports, especially services. In general, the economies of the region are characterized by very limited fiscal space and extreme vulnerability to external shocks. Meanwhile, there is cognizance that high energy costs are a significant proportion of their import costs. Due to the high cost of energy, Belize employs subsidies on fuel as a means of redressing the challenges of affordability faced by the poor and also to drive down economic production costs. Belize is also burdened with high indebtedness and as a result, substantial investments required for transformation of the energy economy are not readily available.

Belize acquires its energy from four main sources; fossil fuels (66 per cent), biomass which includes traditional biomass (fuel wood and charcoal) and bagasse (26 per cent), hydro (3 per cent) and imported electricity (5 per cent). This is shown in figure 1.

FIGURE 1
BELIZE ENERGY SUPPLY, 2009



Source: Organization of American States (OAS), "Toward a national energy policy. An assessment of the energy sector in Belize", 2011

Belize has vast endowment of renewable energy resources as the natural resource endowment of the country includes vast areas of land that is marginal for food production but suited to biomass feedstock production for fuel, fibres, fertilizers, and feed. If proven feasible, development of this resource would complement other available sources such as:

- Hydropower, which has already seen significant development and has future plans for expansion
- Wind, which has been found to be feasible in several locations
- Solar, for which there is scope to significantly increase the use of various technologies for providing energy services (including electricity) in remote areas, process water heating in small industrial facilities and cooling services in commercial buildings.

Additionally, there is scope for increased production from Belizean oil wells which could significantly reduce the energy-related trade deficit and improve energy security in Belize. However, dependence on imported liquid fuels, especially for transportation, continues to make Belize extremely vulnerable to international oil-price shocks which can significantly disrupt economic planning and deter foreign direct investment within the industrial sector. Whilst road transportation is dominant, other forms of transportation also play a vital role in the lives of the rural populace. Though some regulations are in place, inefficient practices characterize the sector and there is much scope for integrating sustainable energy practices therein.

On the basis of the foregoing, as well as on account of the extreme openness of its economy, macro-scale energy savings within Belize, in the medium term, is anticipated to not only create greater economic efficiency but also improve international competitiveness. There is considerable scope for increasing the efficiency in energy use whilst developing renewable energy resources; in so doing, the country will simultaneously reduce the negative effects of fossil-based energy on the environment while generating economic benefits. Consequently, the Government of Belize has sought, through the Strategic Plan of the Ministry of Energy, Science, Technology and Public Utilities (2012-2017), to: “accelerate development of the country’s fossil and renewable energy resources and improve energy efficiency and conservation”¹ in order to transform to an energy secure, low carbon economy by 2033. The core strategies seek to:

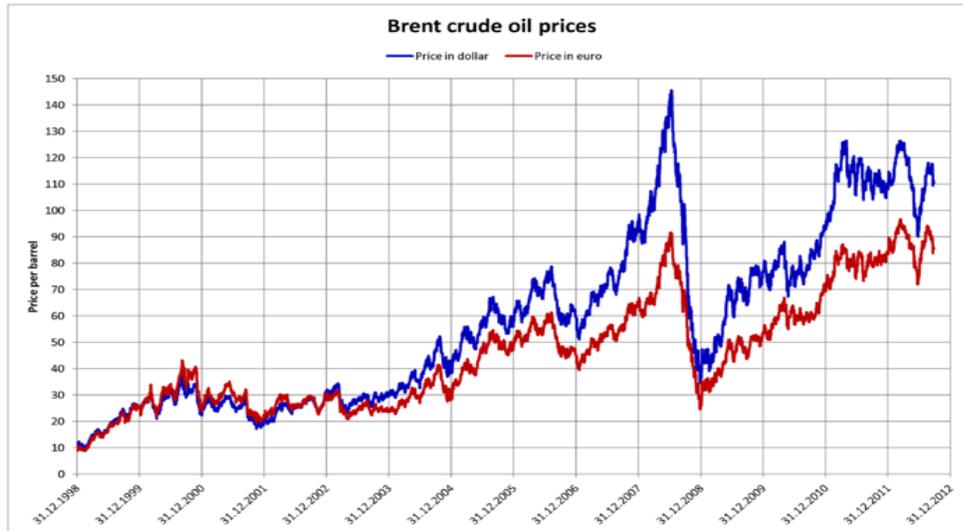
- Achieve minimum reduction in per capita energy intensity of at least 30 per cent by 2033
- Reduce the country’s dependence on imported fuels by 50 per cent by 2020
- Position the country as a net energy exporter by 2020

B. The petroleum sector

Domestic oil production in Belize places the country in a better position than the majority of its Caribbean counterparts. However, though the economy has turned around following the global recession of 2008-2009, the position of Belize as a net importer of oil still exposes the country to the vagaries of the global oil economy.

¹ For further information see Ministry of Energy, Science, Technology and Public Utilities Strategic Plan 2012-2017 at <http://estpu.gov.bz/images/media/mestpu%20strategic%20plan%20-%202012-2017.pdf>

FIGURE 2
CRUDE OIL PRICES, DECEMBER 1998-DECEMBER 2012
(US\$ and EUR)



Source: United States Energy Information Administration, “Annual Energy Outlook with Projections to 2040”, 2013.

Oil has, so far, not been discovered in large enough quantities to make Belize a net oil exporter; the country’s proven reserves have been estimated at around 6.7 million barrels and the sole oil producer, Belize National Energy (BNE) produced around 2,800 barrels of oil per day in 2011.² Belize imported around 88 per cent of the fossil fuels used at a cost of US\$ 339 million in 2011. Figure 2 shows crude oil prices from December 1998 to December 2012. Approximately 57 per cent of the imported fuel is consumed by the transport sector. The remaining 43 per cent is utilized towards electricity generation. The gas associated with crude oil extraction, in particular at the Spanish Lookout site, is processed by Belize National Energy into three output streams, inter alia:

- A natural gas mixture of methane and ethane
- Liquid petroleum gas (LPG), a mixture of propane and butane
- A mix of “heavier hydrocarbons”

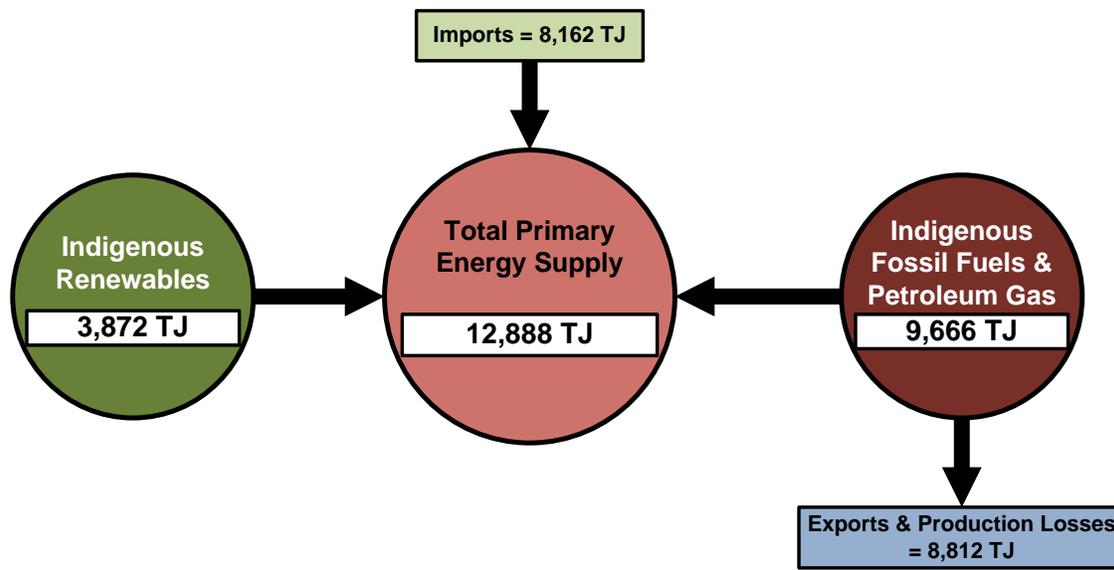
The natural gas mixture is used to fuel a 1 MW gas turbine that generates approximately 60 per cent of electricity needs of Belize National Energy and the LPG (around 2 million gallons per year) is stored and sold in the local market as cooking fuel; the domestic LPG account for around 30 per cent of current LPG consumption in Belize. The heavier hydrocarbons (occurring mainly as pentane, hexane, heptane and octane) are re-injected into the crude oil production train.

The supply matrix for electricity in Belize is among the most diverse within the region; hydropower is primarily exploited for electricity production, with three power plants on the Macal River and one on the Columbia River. There is also contribution from biomass, which is primarily bagasse that is derived from sugarcane processing at the Belcogen complex at Tower Hill. Also, fuel wood is traditionally

² See Annex 2 for a breakdown of indigenous energy production in Belize.

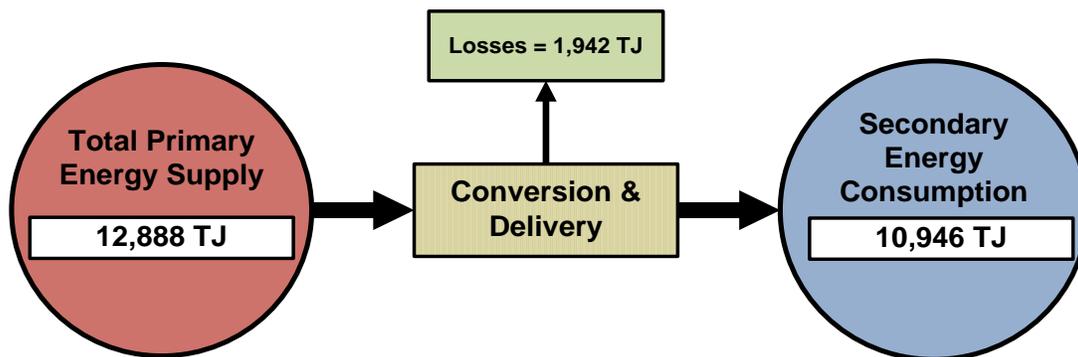
used for direct heating services, including cooking, as well as for conversion into a secondary energy carrier, charcoal. But petroleum sources still continue to dominate the energy economy in Belize. A breakdown of the energy sources is provided in the supply balance (see diagram 1) and the consumption balance, delineating the use and losses from the energy supplied is shown in diagram 2.

**DIAGRAM 1
BELIZE ENERGY SUPPLY BALANCE, 2010**



Source: Tillet, A., J. Locke and J. Mencias, prepared for the Government of Belize, “National energy policy framework. Energy by the people...for the people. Towards energy efficiency, sustainability and resilience for Belize in the 21st Century”, 2011

**DIAGRAM 2
BELIZE ENERGY CONSUMPTION BALANCE, 2010**

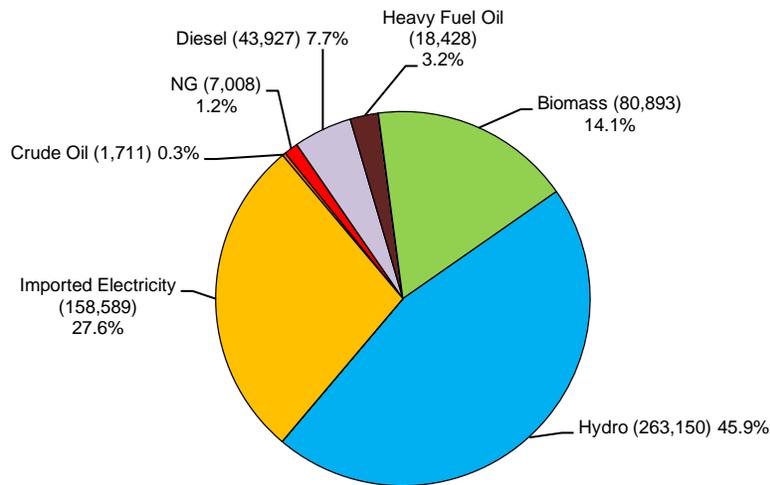


Source: Tillet, A., J. Locke and J. Mencias, prepared for the Government of Belize, “National energy policy framework. Energy by the people...for the people. Towards energy efficiency, sustainability and resilience for Belize in the 21st Century”, 2011

C. The electricity sector

Belize Electricity Limited (BEL) is the main commercial, transmitter, supplier and distributor of electric current in Belize. The company serves a customer base of approximately 77,000 accounts and satisfied a peak demand of 80.6 MW in 2010. BEL is a limited corporation owned by the Government of Belize (67 per cent); the Social Security Board (25 per cent); and a number of small shareholders (8 per cent). The current licensing agreement extends to 2015 and under the terms, BEL has the right of first refusal on any subsequent license grant (OAS, 2011). Figure 3 provides a breakdown of electricity production from the various primary fuel inputs. Importantly, around 60 per cent of the electricity supply was generated from renewable energy sources and 27.6 per cent was imported from Comisión Federal de Electricidad (CFE), which is the Mexican state-owned power company from which a single circuit 115 KV interconnection, that has a maximum transfer capacity of 50 MW, is available to Belize.

FIGURE 3
BELIZE ELECTRICITY GENERATION BY FUEL, 2010^a



Source: Tillett, A., J. Locke and J. Mencias, prepared for the Government of Belize, “National energy policy framework. Energy by the people...for the people. Towards energy efficiency, sustainability and resilience for Belize in the 21st Century”, 2011

^a Values in parenthesis indicate electricity supply in MWh

Belize produces the majority of its electricity from a mix of hydropower (45.9 per cent), biomass (14.1 per cent), and fossil fuels (12.1 per cent). However, the high dependence of the Belize electricity supply on hydropower has resulted in the Comisión Federal de Electricidad supply accounting in some instances for as much as 50 per cent of electricity during the drought periods, as an available 55 MW of hydropower capacity during the rainy period has dropped to as low as 13 MW during the dry season in the recent past.

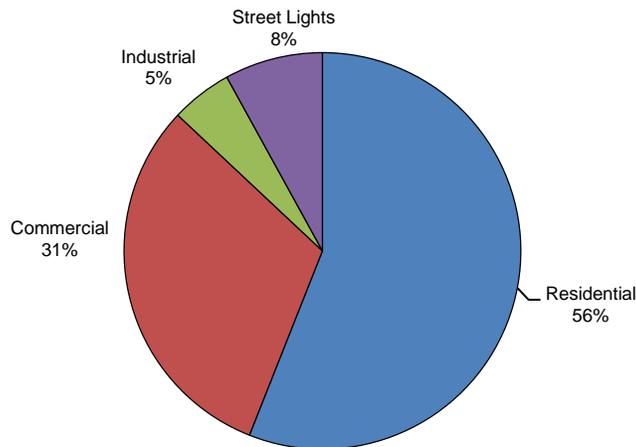
In 2011, electricity accounted for around 28.5 per cent (3,670 TJ) of the total primary energy supply in Belize. From this, around 573,707 MWh (2,065 TJ) of electricity was produced, with losses arising from generation, transmission and distribution. In general, total installed capacity of licensed power producers is 136 MWe and consists of:

- Mollejon Hydroelectric Plant, located on the Macal River, which has a typical output of 8 MW during dry season and 21 MW during wet season.
- Chalillo Hydroelectric Dam and Plant, which has an installed capacity of 7.3 MW (2 x 3.65 MW).

- Vaca Hydroelectric Plant, which has an installed capacity of 19 MW (2 x 9.0 MW and 1 x 1.0 MW).
- Hydro Maya Limited, which has installed capacity of 3.0 MW (1 x 2.4 MW and 1 x 0.6 MW) housed in its run-of-the-river hydroelectric facility.
- BEL-operated diesel facilities of around 26 MW, which has a diesel-fired gas turbine (rated at 22.5 MW but with actual output of around 20.0 MW) as well as 6 x 1.0 MW mobile high-speed diesel units.
- Belize Co-Generation Energy Limited (BELCOGEN) co-generation of around 27.5 MW of electricity, burning bagasse and heavy fuel oil, with around 13.5 MW of surplus supplied to the grid.
- Belize Aquaculture Limited, which owns a power plant that consist of 22.5 MW diesel (3 x 7.5 MW Wartsila medium-speed diesel units). The facility is a self-generator for its aquaculture operations but is currently not being dispatched by BEL because of problems related to the reliability and fuel Price.

Electricity consumption in Belize may be disaggregated as follows: 56 per cent for residential application; 31 per cent for commercial application; 8 per cent for street lights; and 5 per cent for industrial application (see figure 4). The weighted average electricity rate to consumers was US\$ 0.23 per kWh. As a part of its socioeconomic package, the Government created a social tariff within the formal electricity pricing structure whereby profits from mid- and high-end electricity consumers are used to cross subsidise the costs associated with the provision of electricity services to the poor; under this arrangement, “designated households” pay around US\$ 0.14 per kWh but with the caveat that their consumption does not exceed 60 kWh per month.

FIGURE 4
BELIZE ELECTRICITY END USE



Source: Organization of American States (OAS), “Toward a national energy policy. An assessment of the energy sector in Belize”, 2011

D. Demand for energy by sector

Residential (household) sector: In economically disadvantaged households, the main source of energy is fuel-wood and charcoal. Kerosene lamps and candles are the predominant source of lighting. The numerous problems associated with inefficient appliances require a combination of policies that would address efficiency of energy use, energy conservation and a change to more energy efficient appliances. In rural areas, there is also a need for access to electricity, especially for off-grid communal facilities. Electricity grid access in Belize is estimated at around 85 per cent, with 97 per cent in urban areas and 50 per cent in rural areas. Belize is making an effort to electrify its rural communities, which is partly responsible for the rising energy demand of around 9 per cent per year.

Industrial & commercial sectors: Fossil fuels dominate with diesel, heavy fuel oil and crude oil supplying 61.3 per cent of the energy consumption in this sector; 21.3 per cent was in the form of low-pressure steam produced from bagasse combustion in sugarcane processing; and the remaining 17.4 per cent was from consumption of electricity. The commercial sector includes, among others, wholesale and retail shops, hospitals, hotels, restaurants and recreation centres. Overall, the demand for energy in the sector is mainly met by grid electricity and off-grid diesel generators. Otherwise, LPG is widely used in commercial activities that require heating such as cooking in restaurants and drying in laundromats, accounting for about 11 per cent of energy use within the sector.

Mining sector: Within the mining sector, demand is met through self-generation and, in a few cases, from the electricity grid. There are opportunities for mining companies to participate in the electricity supply side through, for instance, the production of surplus power which can either be sold to the grid or to neighbouring off-grid communities. Mining in Belize has largely been limited to minerals such as dolomite and more recently, oil explorations. There is also limited amount of gold mining in some areas.

E. The transport sector

The transportation sector was the largest consumer of energy in 2011, accounting for 46.8 per cent of total secondary energy consumption. Of the fuels used for transport, gasoline accounted for 47.0 per cent of all consumption; diesel for 36.9 per cent; and kerosene (used as aviation fuel), crude oil³ and LPG⁴ for the remaining 16.1 per cent⁵. Given that almost 65 per cent of households do not own a vehicle, there is a significant demand for and usage of public transport, particularly taxis, mini-vans and buses. There is, however, a perception that the quality, convenience and affordability of public transport has deteriorated over the last decade, resulting in an increase of around 50 per cent in private vehicle (cars and light trucks) ownership in the last decade. Of note is the fact that an overwhelming majority of vehicle stock in Belize is second-hand; this has consequences in respect of fleet efficiency, reliability and emissions.

The population of Belize is small and scattered throughout the country. Consequently, the provision of suitable infrastructure is always a challenge because of large capital requirements for the same, especially in lieu of the relatively low population densities that result in low utilization rates. According to the Belize Second Communication to the Conference of the Parties of the United Nations Framework Convention on Climate Change (2011), the transportation infrastructure in Belize

³ Local crude oil is used as a substitute for diesel in certain heavy duty vehicles. The crude oil is usually left in drums for a time in order for impurities to settle, and then mixed with diesel in a 1:1 ratio.

⁴ About 3 per cent of the current gasoline vehicle stock has also been converted to run on LPG

⁵ Gasoline and diesel purchased in Mexico and Guatemala, and electricity used to charge golf carts in San Pedro and other locations in Belize are not accounted for in these calculations due to lack of data, although the amounts used should not significantly affect the results.

consists of approximately 541 km of paved highways, 2,542 km of paved and improved dirt roads and 3,909 km of unimproved dirt roads. Belize houses one international airport,⁶ ten local airports that serve the domestic airline industry, as well as private airstrips. There are three commercial ports that can accommodate large ocean freighters, namely Belize City, Commerce Bight, and Big Creek. Additionally, small water craft are utilized in order to transport persons to islands in the coastal zone.

F. Renewable energy

Currently, renewable energy technologies such as hydroelectricity, stand-alone solar photovoltaics, small wind electricity generation, solar thermal, biogas, biomass cogeneration and hybrid systems, such as diesel/photovoltaics and diesel/wind, are all being utilized at some scale in Belize. Hydroelectricity and biomass are the principal renewable energy technologies installed and operated in Belize; such outputs are captured in the energy balance for Belize. In contrast, wind and solar have very low penetration; typically, wind and solar facilities are installed and operated on cayes and other remote areas.

Hydropower: The most recent assessment of the hydroelectric potential in Belize⁷ has estimated that Belize could double its hydroelectric output by developing sites on the Macal and Mopan Rivers in the west and on principal rivers in the south of the country.

Biomass: Biomass energy resources are available naturally as forestry and agricultural residues, animal waste, landfill gas and more recently as energy crops. Fuel-wood and bagasse account for almost 22 per cent of total primary energy production.

Wind: Estimated mean wind velocity at 80 meters above ground is approximately 7 to 8 metres per second. Although some studies suggest that the potential for wind power in Belize is around 20 MW, no comprehensive wind assessment has been conducted.

Solar: In Belize, average solar radiation in an optimal tilt angle is roughly estimated at 2,000 kWh to 3,000 kWh per square metres per year.

G. The business economy

On average, the energy intensity of Belize is 13,668 Btu/US\$⁸ and is 14 per cent more than the average across small island developing States (SIDS) (see figure 5).

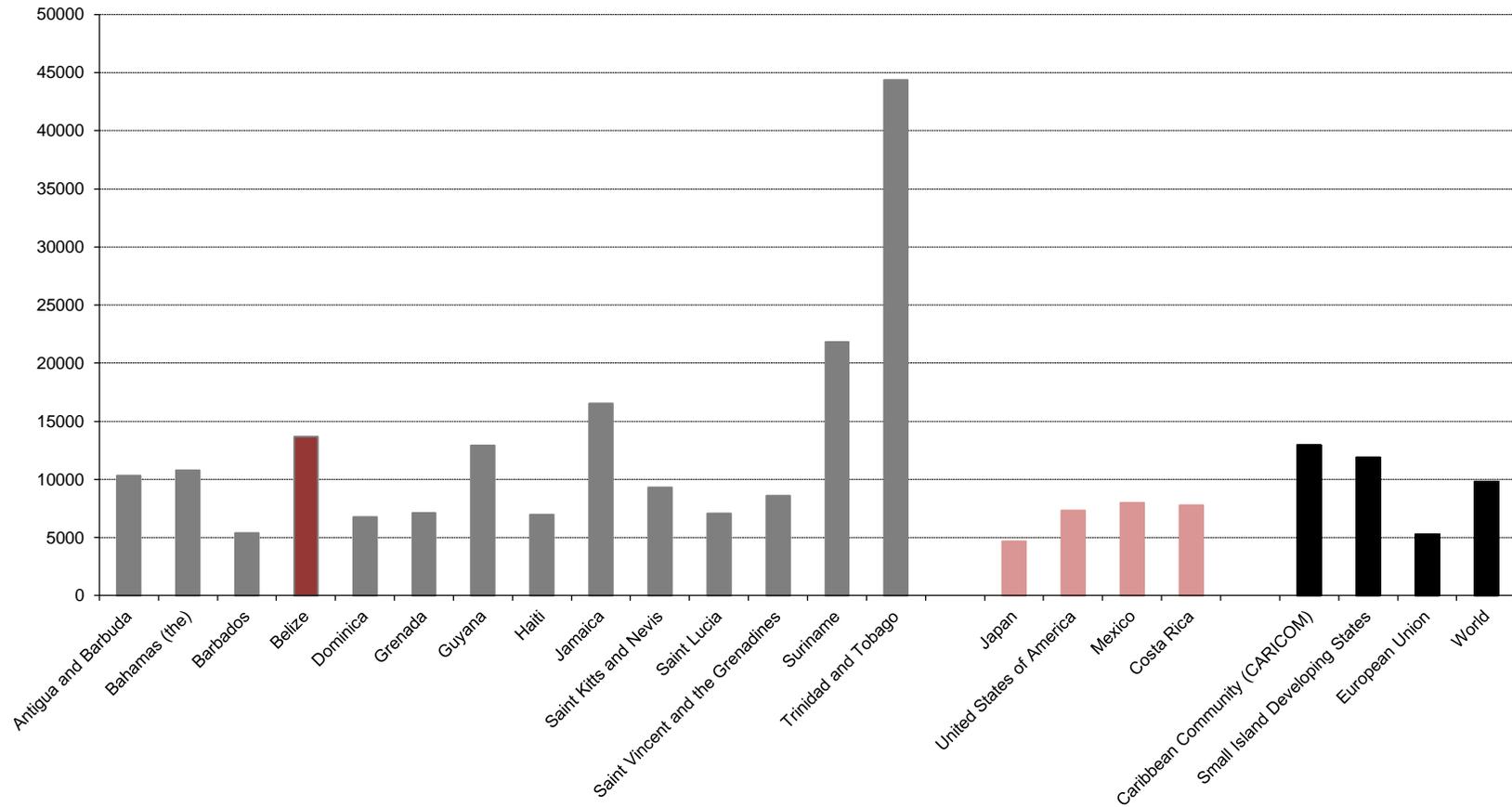
It is within this context that this report will seek to capture the fiscal and regulatory barriers to implementation of energy efficiency measures and renewable energy technologies.

⁶ A second international airport is under construction but completion has been delayed due to financing issues

⁷ The recent assessment is presented in a report to BEL by G.Soubrier, 2006, "Belize Hydroelectric Development Technical Report".

⁸ Energy Intensity is a measure of the amount of energy that is utilized to produce a dollar's worth of goods and services within the national economy.

FIGURE 5
ENERGY INTENSITY FOR CARICOM STATES^b
(Btu/US\$)



Source: Author, on the basis of official figures

^b Note: Comparisons are made with a number of select countries as well as world, small island developing States and regional averages

II. Methodology

This study addresses the policy (legislation and regulation) barrier and seeks to examine and build capacity in developing fiscal systems which will provide greater incentives for the promotion of renewable energy and energy efficiency products and services, which will support the establishment of sustainable energy markets. There is an expectation that the results will help to identify shortfalls within the fiscal and regulatory environment and sensitise policy makers to what is possible and realistic within the respective countries. The objectives of this study are, inter alia:

- The collection of data information on existing initiatives toward energy efficiency and renewable energy in Belize
- The identification of gaps and barriers that prohibit the implementation of renewable energy and energy efficiency products and services within the project countries
- The recommendation of options for the removal or minimization of existing gaps and barriers that prohibit optimization of sustainable energy markets within the project countries.

In essence, it is anticipated that based on the recommendations herein, respective national Governments will seek to revise their existing fiscal and regulatory systems so as to provide “greater promotion” for energy efficiency and renewable energy. Further, it is hoped that the outcomes of the revisions will contribute toward either the strengthening of existing policy instruments or the development of new instruments.

The methodology comprises a three-step process, which is illustrated in diagram 3.

A. Desk assessment

A literature review was undertaken through the collection and compilation of data on the traditional primary energy commodities (fossil fuels) and primary renewable sources (such as biomass and hydropower) looking in particular at the power generation and transport sectors. Opportunities for the country to curb energy-demand growth by making economies as efficient as possible while simultaneously meeting some of the essential energy needs through low carbon options were examined within the context of the existing technology products and end use markets, as well as the policies, barriers and institutional arrangements for same. Also, the experiences of countries that have successful markets for energy efficiency applications and renewable energy technologies were

assessed. This was done so as to glean insight into the policies, strategies and circumstances that either supported or hindered development of a thriving sustainable energy market economy. This information was collected through literature survey and the information used toward planning the subsequent phases of the project.

B. Analyses

A number of analyses were performed in order to obtain indicators for the Belize energy economy. In many instances, comparative analyses were performed. Some of the most important indicators utilized in this study are:

- Energy intensity (Btu/US\$): This is the total heat content of the fossil fuels (gasoline, diesel, fuel oil, jet fuel, kerosene and LPG) and non fossil fuels (bagasse, charcoal, fuel wood) consumed as a ratio of the Gross Domestic Product (GDP) and may be interpreted as the amount of energy that is utilized to produce a dollar's worth of goods and services within the national economy. High energy intensities indicate a high cost of converting energy into GDP and conversely, low energy intensity indicates a lower cost of converting energy into GDP.
- Energy efficiency (US/MBtu): This is the GDP as a ratio of the total heat content of the fossil fuels (gasoline, diesel, fuel oil, jet fuel, kerosene and LPG) and non fossil fuels (bagasse, charcoal, fuel wood) consumed. This is essentially an inverse relationship to energy intensity and high energy efficiency indicates a lower cost of converting energy into GDP.

These energy indicators (and the underlying databases) are used to reveal key relationships between energy use, energy prices and economic activity. This insight is crucial when assessing and monitoring past and present energy policies, and for designing effective future action.

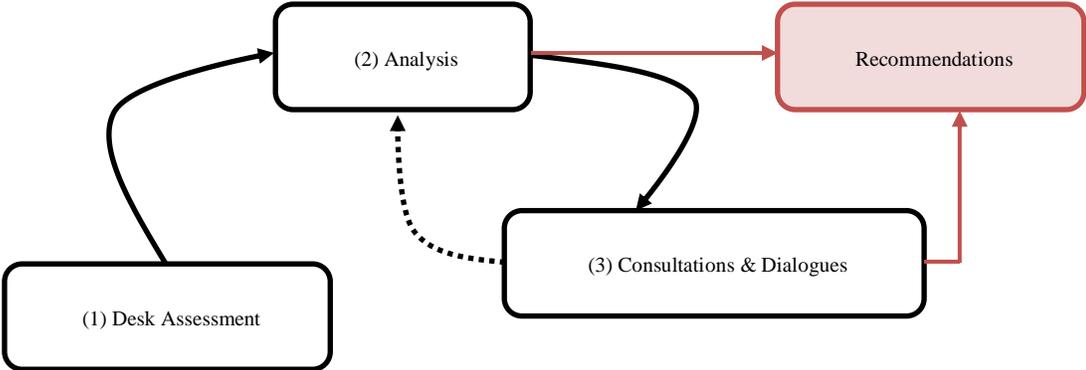
C. Stakeholder consultations and dialogues

Finally, stakeholder consultations, as well as a number of stakeholder dialogues, were conducted. In order to implement policies that is inclusive of society and encourages adoption by the respective stakeholders, it is necessary for Governments to consult with people and consequently, the consultations and dialogues were held to stimulate discussions among stakeholders on energy conservation and efficiency, oil dependence, oil-pricing, alternative energy applications, links with poverty, health and the environment, and the responsibility of the individual with regard to energy use. Specifically, the goals of the Belize Consultation Meetings were to:

- Identify current fiscal and regulatory loopholes that prohibit more broad based participation and wide spread deployment of renewable energy and energy efficiency technologies and
- Achieve a national consensus on what the respective stakeholders are prepared to do as part of a national consensus to meet energy needs in Belize.

The answers elicited therefore were in some instances used towards refinement of the analyses that had been previously performed but primarily formed part of the basis for the recommendations on the requisite fiscal and policy shifts for the Guyana sustainable energy economy.

**DIAGRAM 3
METHODOLOGY PATHWAY**



Source: Author’s compilation

III. Results

Belize is abundant in energy resources, particularly biomass, hydroelectricity, solar and wind. Although these resources could play a central role in the sustainable development of the country, they still remain under-utilized and despite the cognizance from successive governments, a variety of barriers or conditions continue to prevent significant investments in the sector.

Within Belize, much focus is on the substitution of imported petroleum fuels and electricity with renewable options, especially within the power generation sector. However, critical areas such as energy efficiency and energy conservation, which provide affordable and significant opportunities to reduce energy imports, are often overlooked. This fact has only recently been recognized by the Government and this has been documented in the extension of the Strategic Plan (2012-2033) of the Ministry of Energy, Science, Technology and Public Utilities where its first strategic pillar is: “Improving energy efficiency and conservation across all sectors: Transport; Industry; Commercial and Residential Buildings”. This is supported by a stated goal for minimum reduction in per capita energy intensity of at least 30 per cent by 2033, using energy utilization and GDP generated in 2011 as the baseline.

A. Overview of main findings

Within Belize, institutional deficiencies and administrative hurdles are major obstacles toward improving the energy sector. There is urgent need for a shift that transforms the sector from one that is primarily concerned with the production of electricity, and the marketing and distribution of liquid fuels for transport, to one that is a modern, market driven efficient producer of energy carriers and energy services for domestic and global consumption. Though, for instance, the Ministry of Energy, Science, Technology and Public Utilities (MESTPU) was established to function as the sole authority responsible for formulating and coordinating energy sector policies, energy governance continues to be a complex set of processes that occur between various players within the public sector. These groups include: Parliament, Cabinet, MESTPU, Ministry of Natural Resources and the Environment (MNRE) and Public Utilities Commission (PUC), as well as various government departments at the national, provincial and local levels. In reality, there is limited coordination among the respective parties and there continues to be an absence of integrated resource planning within the energy sector in Belize.

This study has also found that over the past two decades, most of the debate concerning promotion of the use of renewable energy in Belize has focussed on the provision of financial support schemes and on improving grid access conditions for renewable electricity generation. However, the

importance of addressing non-financial and non-technical barriers to renewable electricity, heat and transport has traditionally been largely undervalued.

With the assistance of a number of multilateral agencies, Belize recently embarked on a progressive path toward building the policy framework sustainable energy economy by:

- Modernizing its energy policy: Cabinet approved the National Energy Policy for Belize in January 2012
- Establishing a single authority responsible for formulation and coordination of energy sector policies and sub-policies: MESTPU was created in June 2012
- Developing a strategic plan for the deployment of the sustainable energy sector and its integration with science and technology innovation: The Belize National Sustainable Energy Strategy (2012-2033) recommends a set of programmes and action plans towards achieving a low carbon economy by 2033, with the supporting Science, Technology and Innovation (STI) Strategic Options (2012-2017) providing mechanisms for accelerating the promotion and use of innovation within the energy sector in particular.

However, it is necessary to strengthen the transition of policies and plans into tangible action especially since the Ministry, despite its central, coordinating role is limited by its own capacity and resources and further limited through lack of collaboration with other ministries and agencies. Some of the institutional barriers include:

- Limited capacity for the suitable development and implementation of regulations to support the National Energy Policy and the National Energy Strategy (2012-2033)
- Lack of coordination among different authorities and agencies
- Planning delays and restrictions; for example, approval of the Hydro Maya Power Plant took ten (10) years
- Long lead times in obtaining authorizations and permits
- High costs for obtaining permissions

In Belize, energy constitutes a large proportion of GDP and a considerable percentage of household energy expenditure. Fuel switching strategies are important to reducing the cost of energy services and there is considerable scope for lowering the energy intensity within a number of sub-sectors. The major energy consuming sub-sectors are categorized (in order of priority) into the following, inter alia:

- Transport: Low-carbon transport solutions in the following areas:
 - (i) Avoidance of fuel-use where possible, through the usage of broadband services for meetings and access to public services; currently, much travel in Belize is for face-to-face meetings and the transaction of business.
 - (ii) Reduction in fuel-use by shifting to increasing mass transit systems for commuters, and to non-motorized transport modes in-city, as well as by improvements in efficient fuel-use obtained by moving the vehicle fleet within Belize to more efficient vehicles.
 - (iii) Replacement of conventional fuel-use with renewable fuels through the utilization of advanced technology, such as flexi-fuel vehicles, electric and hybrid-electric; and alternative fuelled, in particular biofuel, vehicles.

In general, these require smarter transport planning and development of urban areas. Most importantly, the current state is one in which there is fragmentation of transport management; there are central and municipal responsibilities for rule making and enforcement.

- **Buildings:** In hot, humid climates like Belize it means keeping heat out by using cool roofs, glazed windows, and landscaping, whilst reducing heat sources by utilising daytime lighting, installing efficient lighting, using heat recovery systems for cooling and industrial heating where applicable.
- **Agriculture, including forestry:** This has evolved into an industry that has become highly dependent on oil, whether through field operations such as irrigation, harvesting and transport activities or post-harvest functions. Simultaneously, there is scope for direct energy efficiency activities such as drip irrigation practices and improvement in transport logistics planning. However, as oil supplies dwindle, the increasing reliance on agricultural products should shift from the food-only model to include the production of efficient energy carriers.

B. Renewable energy

1. Electricity

The electricity sector is governed by the Electricity Act and the Public Utilities Commission Act. PUC is an independent body of seven commissioners, appointed by the Governor General on the advice of the Prime Minister and the leader of the Opposition, and is mandated to enforce the Electricity Act and any related regulations. In statute, PUC is autonomous.

The Electricity Act requires PUC, inter alia, to:

- Ensure that “all reasonable electricity needs are met”
- Ensure that license holders are able to finance the business for which they are licensed
- Protect the interests of consumers in general (and, in particular, in rural areas)

In practice, because of the “cross-subsidy” that is embodied within the legislation, the Government of Belize pays for the infrastructure to bring electricity supply to rural areas. Generally, the Electricity Act is intended to deregulate the generation of electricity while maintaining a monopoly on distribution through the utility; the utility (distribution licensee) is allowed to make a “reasonable return on assets” employed in the providing quality electricity services; otherwise PUC may apply penalties thus lowering the net return allowable. However, there are no clear indicators for generation and distribution efficiency. Within Belize, private individuals are allowed to operate their own electricity generating units but must receive a license from PUC for generation that is in excess of 75 kW. The supply of electricity is exempt from the General Sales Tax that is typically paid on goods and services, as it is considered an input in the production of other goods. The legislation does not contemplate special tax incentives for those who generate electricity by means of renewable energy technologies.

On the distribution side, as of January 2000, BEL has been granted a 15-year license to generate, transmit, and distribute electricity and operate as a market monopoly covering almost the entire country, except for a small distribution entity set up in Spanish Lookout named Farmers’ Light Plant. The transmission licence granted to BEL is exclusive. The Electricity Act grants powers to PUC to establish regulations and by-laws on any matters within the industry, including the methodologies by which license holders may charge their customers.

Also, there has been a historically slow rate of rural grid connection, which has resulted in a significant number of small diesel-generation within hinterland areas. In essence therefore, there is a small, informal electricity generation sector that operates alongside the public grid. The absence of a registration system for these generators has limited the available data on this sub-sector. The following barriers apply to the generation of electricity from renewable sources.

Regulatory barriers

The following regulatory barriers to implementation of renewable energy technologies have been identified:

- Lack of integrated energy planning: MESTPU was established to mainstream the coordination of energy policy development and planning but there is no clear regulation or structure within which the planning process is embodied. The result is that despite the recommendation for broad-based energy planning through an Energy Steering Committee and the anticipated coordinating role of the Ministry of Energy, Science, Technology and Public Utilities, there continues to be little broad-based energy planning within Belize. Energy planning related to the electricity sector continues to focus on the least-cost expansion of generation capacity that increases access to electricity whilst keeping the tariff affordable and is the responsibility of the state-owned electric utility, BEL.

Given the long-standing participation and membership of Belize in the Caribbean Community (CARICOM), it has pursued deeper integration within CARICOM than it has done within Central America. Thus, Belize is part of the Caribbean Renewable Energy Development Project and the Caribbean Energy Information System but does not participate actively in the Sistema de Interconexión Eléctrica de los Países de América Central (SIEPAC), translated as the Central American Electrical Interconnection System, a cooperation programme between the European Union and Latin America in the energy sector; a critical issue stems from the fact that there has been no clear assessment nor judicious decisions regarding the participation of Belize within SIEPAC and how this will influence the opportunities for large scale generation, which would have otherwise suffered from a lack of scale.

- Lack of baseline data: It has been 10 months since the constitution of MESTPU and much of its ability to assess and plan is being stymied by a lack of historic data on energy consumption in general, and within the transport sector in particular. This limits the ability to set targets and to measure the achievement of indicators related to energy use as well as to make projections for judicious planning.
- Lack of spatial planning for renewable energy systems: The planning system should focus on the provision of guidance towards locations where particular renewable energy technologies, such as biomass production and wind generation, are most likely to be appropriate as well as shaping the criteria to be taken into account in the determination of project applications. This will serve to reduce the transaction costs associated with project siting and environmental permitting.
- Lack of institutional capacity for project evaluation and approval: There is a limited expertise for addressing renewable energy issues within Government ministries and agencies, which limits the approval process. This has served to limit the opportunity for diversification and renewable energy integration continues to focus on utility-scale hydropower and off-grid solar photovoltaics despite the massive opportunities for other sources.
- Weak regulation of the electricity sector: Many Caribbean countries that have made progress in the regulation of their electricity sector have a regulatory agency that is empowered to set service standards and tariffs. However, the regulator in Belize, PUC, seems to have legal, personnel and financial constraints, which limit its ability to fulfil its role. Moreover, although the regulator is limited in its role, it serves to make recommendations to the line Minister on matters related to the operation of the electric and water utility.
- Absence of systematic administrative procedures for the addition of utility-scale renewable energy generation to the grid: In the absence of a legal framework that delineates the rules of engagement for addition of utility scale renewables to the grid, investors will continue to require individual licenses from the Government and will

continue to negotiate power purchase agreements with the utility, BEL, on an ad hoc basis, which makes it difficult for potential project developers to plan and finance projects on the basis of open and consistent rules.

- There is neither legislation nor mechanism for grid connection and access by customer generators: Within the electricity sector, interconnection regulations such as net metering and net billing provide additional modes of encouraging micro-scale renewable energy investments, which cumulatively have the potential to rival large-scale investor led projects. Interconnection regulations for customer generated renewable energy is absent in Belize despite having the potential to reduce and stabilize demand from the Comisión Federal de Electricidad grid.
- Low qualification and the lack of reliable certification schemes for small-scale renewable energy installers: There are few trained and competent installers for small renewable energy and avoided generation systems, such as solar photovoltaics and solar water heaters in the Belize market. This is particularly relevant for single-family houses, where installers can often act as the decision-maker and may motivate potential users to buy sustainable energy technologies.

Fiscal barriers

- Lack of competitive pricing for renewable energy feeding into the grid: Renewable energy power feeding into the BEL grid is unlikely to receive full credit for the value of the electricity generated as current fossil-based prices are artificially low and will serve as a distorted baseline; and contribution of renewables to generation reliability and fuel savings are neither accounted nor reasonably compensated.
- Transaction costs are typically high, especially for small grid-scale renewable energy projects: Many projects, such as wind, waste-to-energy and biomass-to-energy will likely require information that may not be readily available or they may require additional time or technical personnel to assess and verify the bankability thereof. In particular, the cumbersome negotiations for securing Power Purchase Agreements often times add to the transaction costs.
- There are limited institutional incentives for renewable investments that deliver macroeconomic benefits to the country: Investment incentives that have been designed for the manufacturing sector are being applied to energy investors under similar conditions and consequently, there is no package of realistic fiscal incentives that are tailored and applicable to the renewables industry. The consequence is that investors seek appropriate incentives on case-by-case through the application for waivers, through the Cabinet.
- Absence of incentives for renewable energy technologies: The purchase of small renewable energy technologies and their integration into new building construction is not incentivized as there is no provision for duty and general sales tax exemption for small-scale renewable energy technologies. This is especially important in an environment where the integration of renewable energy technologies, such as solar photovoltaics, hybrid photovoltaics, and solar thermal systems for cooling and water heating, may add from 10 to 20 per cent to new building costs and simultaneously, there is very little or no cognizance among mortgage banks and insurance companies for the enhanced lifecycle of buildings with renewable energy technologies compared to the business as usual scenario. Consequently, the usual formulae are applied to the calculation of loans with the consequence that the additional investment that is required for renewable energy is prohibitive.

2. Transport

Belize does not have a transport policy per se, but the broad outlines of a policy framework may be found in the National Energy Policy, which seeks within the transport sector to: “promote optimum, efficient and environmentally conscious utilization of petroleum fuels and substitution”. Within the extension of the Strategic Plan (2012-2033) of the Ministry of Energy, Science, Technology and Public Utilities, the “reduction of the country’s dependence on fossil fuels consumption by 50 per cent by 2020 by increasing the provision of modern energy carriers utilizing domestic energy resources, coupled with improving energy efficiency and conservation” will require significant activities related to the replacement of fossil fuel sources with indigenous biofuels within the transport sector where the majority of the fossil fuels are used. The use of advanced vehicle technologies, in particular flexi-fuel vehicles, and biofuel blends, such as gasoline-ethanol and diesel-biodiesel blends, are important.

There are three main statutory schemes that govern transport matters in Belize:

- Transport by land is governed by the Motor Vehicles and Road Traffic Act and the Belize Land Transportation Authority (BLTA) is the Government agency in charge of its enforcement which falls under the portfolio of the Ministry of Transport and National Emergency Management (MTNEM). Since 2008, the Belize Land Transportation Authority has been given legal powers under the Belize Land Transportation Authority Act of 2007 and functions as a semi autonomous body; the Belize Land Transportation Authority generates its revenue from road permits, operation of the various bus terminals across the country and revenues generated from ticket fines among other things.
- Transport by sea is governed by the Carriage of Goods by Sea Act and the Belize Port Authority is the Government agency in charge of its enforcement; the BPA is also under the portfolio of the Ministry of Transport and National Emergency Management.
- Transport by air is governed by the Belize Airports Authority Act, and the Civil Aviation Act. The Ministry of Tourism, Civil Aviation and Culture is charged with the regulation of air transport.

Traditional transport infrastructure, particularly roads and ports, is a factor that inhibits the growth and efficiency of commercial and industrial activities. Though paved highways connect most major urban settlements and border areas, many roads are at best in a state of disrepair or, at worst, remain unpaved (commonly gravel or marl); it has been estimated that only about 17 per cent of secondary roads are paved. There is a lack of adequate funding for road maintenance, which has caused deterioration in their conditions; this has, in turn, made the transportation of goods and people less efficient and more expensive and also acts as a disincentive to the acquisition of modern vehicles. The following barriers apply to the use of renewable fuels and vehicle technologies within the transport sector.

Regulatory barriers

- Absence of a Transport Policy that integrates renewable fuel production, marketing and distribution into the current National Energy Policy for Belize: Though there is some degree to which biofuel options are captured within the National Energy Policy, there is a lack of comprehensive sub-policy on transport that takes account of modern advancements in renewable energy vehicle technologies, such as flexi-fuel vehicles, and options for electric vehicle and hybrid-electric vehicle use.
- Renewable energy vehicles, electric and hybrid-electric vehicles are not a priority within the Belize energy framework: Renewable energy options more targeted towards the direct replacement of liquid fossil fuels by bioethanol and biodiesel blends and targets within the extension of the Strategic Plan (2012-2033) of the Ministry of Energy, Science, Technology and Public Utilities.

- Lack of reliable biofuel supply: Consumers are also limited by the lack of reliable sources of biofuel stock. There is neither the availability of biofuel blends, which can be suitably integrated into the existing fuel supply chain, nor pure biofuels (biodiesel or bioethanol) that can be used directly in flexi-fuel vehicles. In fact, there are regulatory barriers within Belize that prohibit the active participation of the private sector in the agriculture, in particular the bio-energy sector according to the Sugar Cane Control Industry Act, 2000. Despite the promotion of biofuels targeting the transport sector within the National Energy Policy and the Ministry of Energy, Science, Technology and Public Utilities. Strategic Plan (2012-2017), there has been no clear articulation of regulation change to facilitate reliable production. Simultaneously, the use of sugar lands in Belize remains inefficient and methodologies that optimize product yield has the potential to either produce additional sugarcane for bioethanol or provide acreage for dedicated biofuel crop production.
- The Belize transportation sector is currently served by a very large, reliable infrastructure for petroleum based liquid fuels: If low-carbon, renewable fuels are to displace petroleum fuels, they must provide similar levels of cost, convenience, and reliability. The mainstreaming of renewable energy vehicles will depend heavily on the availability of infrastructure to support their energy requirements and will require Government to introduce appropriate regulations and legislation for the marketing and distribution of renewable fuels.
- Lack of information to make informed choices on domestic vehicle choices: Consumers are essentially limited by the available vehicle technology options within the country as well as the available infrastructure for fuel distribution. Both are creations of the motor vehicle regulatory environment within Belize, which has experienced very little change over the past three decades.
- Lack of plans for the integration of renewable energy vehicle technologies into the public transport sector: Public transport planning in Belize is limited to the provision of licenses to public vehicle operators. The availability of information on suitable vehicle technology options as well as the required infrastructure for their energy supply is lacking. There is very little synergy between the Ministry of Energy, Science, Technology and Public Utilities and the Ministry of Transport and National Emergency Management, which has served to restrict the exploration of options for the sector.
- There is very little regulatory push for the integration of biodiesel use into the fuel mix for water-based freight and fishing vessels; so far, biodiesel use in Belize have been limited to pilot demonstrations in a number of road-based vehicles such as light trucks and vans, as well as farm and production equipment, especially within small, rural communities.

Fiscal barriers

- Lack of competitive pricing: Belize does not provide incentives, such as duty waivers, for import of renewable energy vehicles. This serves to distort the markets in favour of conventional vehicles and the value added benefits of renewable energy vehicles are not compensated.
- Lack of incentives to encourage biomass production for the biofuel industry: Many farmers continue to over-focus on the production of traditional agricultural crops, including sugarcane, despite the relatively low yields that stem from under investment in the sector. There is scope to offer incentives schemes to farmers for “crop-switching” that produces “energy crops”, such as *Arundo donax*, that can be efficiently converted into biofuels through modern thermochemical processes.

- There are no fiscal incentives for the purchase of renewable energy, electric and hybrid-electric vehicle technologies: The current structure of customs duties and tariffs for vehicles were formulated over thirty years ago for the importation of conventional petrol or diesel-powered vehicles but have not been revised to accommodate the current paradigm in vehicle technologies and the energy strategy for the country.
- Absence of incentive for investment in renewable energy vehicle technologies for the public transport sector: The public bus and mini-bus systems constitute aging vehicle fleets of typically more than ten years and operate on marginal profits in an effort to keep public transport affordable. This limits the ability and willingness of operators to invest in new vehicle technologies. There are, nonetheless, significant opportunities for switching from conventional to renewable diesel, whenever sufficient supplies of the latter become available.
- Despite the opportunities for biodiesel use, there are no incentives for the use of renewable energy fuels within the maritime industry: Simultaneously, duty exemptions exist for the purchase of conventional diesel powered outboard engines.

C. Energy efficiency

1. Electricity

In 2011, the energy intensity of Belize was 13,668 Btu/US\$ which is 14 per cent more than the average across SIDS. Attainment of the strategic goal on energy efficiency will result in an energy intensity of around 9,500 Btu/US\$, which would place Belize among the “more progressive countries within the region” with respect to the efficiency of energy use.

Apart from transport and industry, buildings are the most important determinants of energy intensity in Belize. There are three principal statutory schemes that govern physical planning and buildings within Belize. The Housing and Planning Act (1947), which is a very old statute; the Land Utilization Act (1981) governs the use and development of land sub-divisions; and the Building Act (2003) governs the construction and use of buildings and introduces measures prescribing standards relating to the use of material and methods of construction. The Central Building Utilization Authority is the agency charged with enforcement of these provisions under the umbrella of the Ministry of Housing. Nonetheless, the absence of energy efficient building codes and minimum energy performances for appliances and equipment continue to retard electricity savings on the demand side. The following barriers have been ascertained to be important to the rate of implementation of energy efficiency applications within the electricity sector.

Regulatory barriers

- Imperfect information: MESTPU has been planning programmes for raising awareness toward energy efficiency but limited progress has been made in this area which is relatively new to consumers and is not a priority in Belize, where the choice in end use equipment and appliances is largely driven by the available options and pricing.
- Lack of decision-making power: A significant number of agencies in Belize lack centralized policies and processes for addressing energy efficiency. The lack of suitable inclusion of energy performance requirements in the Public Procurement Rules in particular, limits energy efficiency decision-making when purchasing goods and services for government.
- Split incentives: A split incentive may occur when the potential adopter of an investment is not the party that pays the energy bill. When this is the case, information about available cost effective energy efficiency measures in the hands of the potential adopter

may be insufficient. In multi-division (including government) organizations in particular, the lack of sub-metering may also be classified as a split incentive. Regulations, such building ordinances that govern strata developments, are required for dealing with split incentive barriers.

- Subsidized electricity prices: In Belize, a primary focus of the Government is the affordability of electricity rates, which has restricted the ability of the Government-owned utility to charge market rate to customers.
- Absence of minimum energy performance requirements: The act of subsidizing electricity rates without providing regulations, such as minimum energy performance, for end use is a barrier toward energy efficiency. There is an absence of energy efficiency requirements in the existing building code, and neither regulations nor standards for the energy performance of appliances and equipment within the domestic, commercial or industrial sectors.
- Lack of energy performance requirements for the utility: The power sector is not typically provided with operating licenses that are result-based and performance standards are typically absent. Issues such as generation efficiency and heat rate are not conditions for either the granting of licenses for generation by independent power producers or evaluation of the performance of the electric utility. The Public Utilities Commission Act does not allow the utility regulator to set and enforce efficiency benchmarks; in fact, self generators, which form a critical mass of the “informal” power generation sector in Belize, are not under the purview of PUC. Essentially, the Public Utilities Commission Act, and the structure of PUC itself, lacks some of the essential ingredients that are necessary to promote efficiency within the power sector.
- Lack of regulation for energy efficiency: Government regulations are not generally supportive of small distributed generation and avoided generation technologies, such as solar photovoltaics and solar water heaters. In particular, cogeneration is an important aspect of increased energy efficiency within large commercial and industrial applications, and has the potential to become an important part of the efficiency measures that support incremental expansion of capacity within Belize. However, there are no interconnection rules that support distributed renewable power generation and cogeneration. Typically, industries that are engaged in cogeneration must engage in complex power purchase agreements with the utility and seek waivers for importing efficient generation equipment. Government policies have mostly served to prioritize access to grid-based electricity services whilst keeping electricity cost affordable. Regulations for cost-effective mechanisms that seek to reduce energy use through the efficiency applications that do not compromise the quality of the end use service and shift the provision of some energy services from electricity sources to more direct renewable energy conversion technologies have been largely ignored. Though identified in the National Energy Policy and the Ministry of Energy, Science, Technology and Public Utilities Strategic Plan (2012-2017), not much have translated into regulations or action.

Fiscal barriers

- Absence of fiscal incentives for energy efficient technologies: Technologies that are energy efficient are sometimes more expensive to purchase than alternative technologies. In Belize, there are no fiscal incentives, such as waivers on customs duties and general sales tax for energy efficient items. This has served to keep the price of some energy efficient technologies and services uncompetitive. This is especially critical in a country that has limited access to capital due to the cost of, and requirements for, lending money by financial institutions.

- **Uncertainty of investment:** Despite recent increasing trends in the price of traditional energy sources, uncertainty about future energy prices and the actual savings from the use of energy efficiency technologies, combined with the irreversible nature of the efficiency investment, make the appropriate discount rate for analysing the net present value of energy savings uncertain. As a consequence, many, mostly large commercial, energy users weigh energy efficiency investment returns against that from traditional investment portfolios.
- **Investment risk:** Even though, for example, managers know the capital cost for an energy efficiency investment, there can be uncertainty about the medium to long term savings in operating costs. This means that the investment poses a risk which has been found to be very important to decision-makers in industry and large commercial applications. Government incentives that act to reduce the investment are essentially absent. In fact, promotion agencies, such as Belize Trade and Investment Development Service (BELTRAIDE), are focussed on investments in renewable energy generation and energy efficiency is not a priority. In cases where investment capital is available for energy efficiency, such as from the Development Finance Corporation, the developer has to bear the risk through debt financing portfolios with stringent collateral requirements.
- **Bounded rationality:** Decisions on energy efficiency-related incentives from government formally requires decision-makers to solve what may be extremely complex optimization problems in order to obtain the lowest-cost provision of energy services to society, thereby weighing the cost of revenue losses with the benefits of fuel and infrastructure expansion savings. However, the simple rational view assumes that government is a single actor, though in reality it consists of many actors with different, sometimes conflicting, objectives. The interests of one department or agency may, for example, be in conflict with those of others. In particular, revenue loss seems to be a major deterrent to the embracing of some energy efficiency initiatives and may need to be treated under a comprehensive revision of the systems for taxation in Belize.
- **Split incentives:** This issue also has a fiscal component. Split incentives are most significant in houses and commercial offices that have either been rented or leased, as well as in building developments, such as large apartments and commercial complexes, in which there is very little interaction between the developer and the buyer during the construction phase. A split incentive also applies to managerial behaviour toward commercial activities, such as hotels, wherein energy costs may simply be passed on to customers, and is perhaps the single most influential barrier for energy efficiency.

2. Transport

The following barriers are deemed to inhibit energy efficient practices within the transport sector.

Regulatory barriers

- **Lack of transport planning:** There is very little capacity within Belize for developing transport planning features, such as transport demand management that may provide domestic vehicle users with judicious decisions on route and lane selection for efficient travel. Further, the lack of a proper road infrastructure limits the ability of government to provide opportunities for high occupancy vehicle lanes within the city limits. However, the informal nature of current operations have served the city well for some years and with increasing traffic congestion and increasing private motoring, demand for central area parking and higher aspirations for good service delivery is creating justified pressure for change and a better quality of transport for commuters. Efficient transport networks and systems promote efficiency in movement and fuel use.

- Cross-border integration of transport systems: Legislation permitting foreign trucking and bus companies to operate commercially inside Belize, for either passengers or cargo to neighbouring countries or to compete directly with domestic carriers on domestic routes are limited.
- Subsidized public transportation prices: In Belize, a primary focus of the Government has been the affordability of public transport services, which has restricted the ability of privately-owned bus operators from charging market rate fares to customers. The public road transportation system has largely morphed into a low investment, quick profit enterprise to earn revenue towards the recovery of investments within the shortest possible timeframe. Transport management is typically limited to traffic management.
- Absence of minimum energy performance requirements: There are no regulations that are related to minimum energy performance for motor vehicles. Regulations for the import of vehicles do not attach minimum energy performance criteria for waivers and exemptions as the traditional tariff structures are over thirty years old and do not sufficiently take the promotion of efficient fuel use into account.
- Absence of emissions control standards for vehicles: Air pollution emissions associated with fossil fuel combustion generally reduce the quality and value of the air and also adversely affect human and ecosystem health. Importantly also, vehicle emissions tend to be inextricably linked with the efficiency of engine fuel use and provide a clear and present mechanisms for removing significant numbers of inefficient vehicles from circulation.
- Absence of energy management regulations for tourism and fisheries: Fisheries resources are the third largest foreign exchange earner of the country, benefitting over 2,000 families. When considered within its broader context, marine resources are the primary attraction to Belize by tourists, making tourism the number one income earner and employing one out of every four persons in the labour force. However, Belize has no regulation that tracks, plans or manages the use of fuel within these sectors and potential savings that can result from efficient engine use and fuel switching are largely ignored.

Fiscal barriers

- Lack of fiscal incentives: Obtaining additional capital to invest in energy efficient vehicle technologies may be problematic as commercial banks, through which the majority of new vehicles are purchased, do not usually examine the lifecycle costs, which would apply the benefits of fuel savings to the calculation of loans and insurance premiums. The availability of fiscal incentives such as tariff reduction and general sales tax exemption would serve to levelize the field between conventional and energy efficient vehicle technologies.
- Lack of risk adjusted pricing: Motor vehicle loans are a common feature in Belize. Although purportedly designed to match the ability of the borrower to repay the loan, the loan payback requirements do not consider the operating costs of the vehicle that is being purchased despite the impact of such costs on the total cash flow of the borrower. In general, a customer who purchases an energy-efficient vehicle reduces the risk to lenders through improvement of their net cash flow and should, but does not, reduce the interest rate on the loan.
- Split incentives: In the public transport and freight services, management and operational features can provide significant energy efficiency gains. Factors such as gross vehicle weight, driving practices and vehicle maintenance are important to fuel use efficiency and are frequently determined by the vehicle operator or fleet manager, who may not be the owner. As a consequence, the significance of fuel savings may not be sufficiently highlighted in the daily operation.

- Absence of fiscal incentives for fuel efficiency in the maritime industry: In Belize, there are no fiscal incentives, such as waivers on customs duties and general sales tax for energy efficient maritime items, such as outboard engine technologies and small biofuel production machinery. There are, for instance, significant opportunities for cooperatives and bodies associated with maritime tourism and fisheries to develop biodiesel production capability.

IV. Conclusions

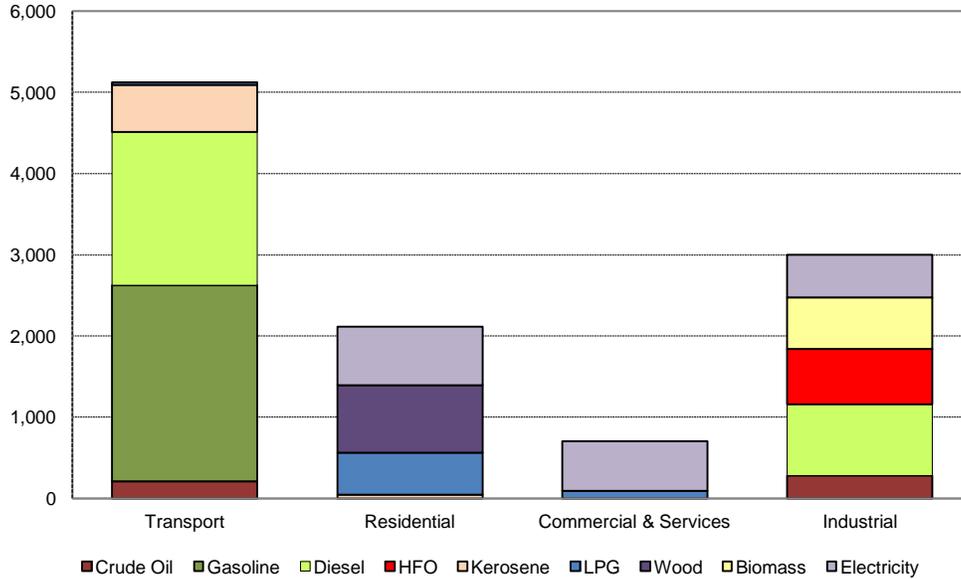
The challenge in Belize with respect to removal of barriers to implementation of energy efficiency measures and renewable energy technologies is effective implementation of legislation and lack of multi-stakeholder planning and coordination. Policymakers have typically had no agreed set of policies or agreed principles on which to devise sustainable strategies which can ensure continuity. For instance, the ability of BELTRAIDE to identify and attract investment within the sustainable energy sector has been stymied by the shift in priority focus from foreign direct investments to medium, small- and micro-enterprises to hotel and tourism investors within a five year period. Though MESTPU has been seeking to attract energy investors, the lack of a substantial relationship with other Government agencies, including BELTRAIDE, has limited its ability to influence the agenda of other parties.

It is important to note that in January of 2012, the Cabinet of Belize approved the National Energy Policy, but barriers to renewable energy use and energy efficiency applications remain. These barriers are multi-faceted, diverse and may often be specific to individual technologies and sectors. As such, effective policy solutions are required to address particular features of individual energy service markets, the circumstances of different types of energy-using organization, and the multiple barriers to energy efficiency within each entity. The development of sub-policies, which act in support of the overarching policies contained within the National Energy Policy, is therefore necessary for addressing the barriers in a targeted way. It is also likely that a combination of policies, in which several different initiatives work together in synergy, will be required. The basic elements of this mix are well-established and include best practice schemes, demonstration projects, training initiatives, market-based instruments, labelling schemes and minimum standards for the efficient energy use by equipment, appliances and buildings. The costs and benefits of these individual instruments will require careful analysis, as will the overall coherence of the mix.

Planning for employment of renewable energy technologies within the Belize energy sector is aligned to utility-scale replacement of fossil fuel based thermal generation through hydropower and biomass cogeneration, as well as remote solar photovoltaic systems. However, the Levelized Cost of Electricity is indicative of cost effective options. There is urgent need for integrated energy planning that examines the most viable and efficient mechanism for delivery of non electricity services, in particular water heating, industrial heating, cooling and some mechanical processes from renewable technologies. Indeed, the substitution of imported fuels with indigenous sources is a first step towards

creating energy independence for Belize. Figure 6 identifies the main areas of petroleum use by sectors from which large impact can be derived.

FIGURE 6
ENERGY CONSUMPTION BY SECTOR, 2010
(Terrajoules)



Source: Tillett, A., J. Locke and J. Mencias, prepared for the Government of Belize, “National energy policy framework. Energy by the people...for the people. Towards energy efficiency, sustainability and resilience for Belize in the 21st Century”, 2011

In essence, the technical framework for deployment of a successful market economy for sustainable energy within Belize exists within the National Energy Policy and the extension of the Strategic Plan (2012-2033) of the Ministry of Energy, Science, Technology and Public Utilities. However, despite its potential, the success of developing a sustainable energy economy within Belize is dependent upon the establishment of a management system that is efficient, flexible, and transparent, which will facilitate the implementation of the strategic objectives and outputs in the time available, with the financial resources allocated according to the technical specifications and quality standards articulated by the various frameworks. A critical part of this management system will reside in the ability of the Government to coordinate stakeholders and to communicate the energy vision for the country. Moreover, it is essential that the Government lead the process through direct participation within the sustainable energy markets. The introduction, in particular, of energy efficiency requirements in public procurement terms will simultaneously leverage Government influence as a major consumer and provide moral suasion to private sector stakeholders.

V. Recommendations

It is recognised that Belize needs to create a sustainable market economy for energy products and services that maximizes the development of its renewable energy resources while simultaneously leveraging the available fossil fuel resources that are available within the country. Much of these intentions and their concomitant strategies are embodied within the National Energy Policy (2012) and the MESTPU Strategic Plan (2012-2017), which are both congruent with the CARICOM Regional Energy Policy;⁹ and the SIDS DOCK¹⁰ target of 25 per cent improvement in power generation, transmission, distribution and end-use efficiency; and 50 per cent share of power generation provided by green generation (ocean, geothermal, solar, wind, waste, and biomass) by 2033. However, the country suffers from a lack of planning and coordination mechanisms and the translation of policies into regulations have been, at best, rather slow. This has resulted in the promulgation of policies and actions that continually under-optimize the rate of market deployment for renewable energy technologies and energy efficiency applications.

There is considerable technical potential for improving energy efficiency and the economics appear favourable, even without any introduction of direct subsidies. Such improvements frequently involve the adoption of established technologies of which the performance is well proven and involve relatively little technical risk. However, it has been recognised that a number of barriers such as lack of information, shortage of trained certified personnel, split incentives and access to finance inhibit the adoption of these technologies. In particular, the adoption of such technologies may be associated with various indirect costs that are difficult to capture within traditional energy-economic models. While there is a general consensus that an energy efficiency gap exists and that policy options to overcome this gap need to be identified and acted upon, there is considerable debate over the most effective approach.

The Government of Belize has recognized the deficiencies within the existing planning statutory scheme and is desirous of addressing the issue of land, a precursor for many large scale renewable energy projects, such as wind and biomass, under the Sustainable Land Management (SLM) Project. This is being addressed through the preparation of a comprehensive Land Use Policy and National Integrated Planning Framework to guide and implement the development of land

⁹ For more information on the CARICOM Energy Policy (1 March 2013), see www.caricom.org/jsp/community_organisations/energy_programme/CARICOM_energy_policy_march_2013.pdf

¹⁰ For more information on SIDS DOCK see sidsdock.org

resources. The primary outputs are three products: The National Land Use Policy; the National Integrated Planning Framework for Land Resource Development and the Land Suitability Mapping System for Belize. However, while these are positive actions, exploiting the vast potential within the country will require many more targeted and deliberate actions that address the major barriers.

A. General recommendations

In general, the following recommendations are made:

1. Develop and approve sub-policies to the National Energy Policy for Belize

These should be a comprehensive set of policies with targets that link seamlessly into the National Energy Policy and the extension of the Strategic Plan (2012-2033) of the Ministry of Energy, Science, Technology and Public Utilities. The sub-policies to be considered are:

Electricity

This is expected to outline the regulations, legislations, incentives, guidelines and fiduciary processes for addressing issues of electricity production, distribution, and consumption in Belize and should include:

- Grid integration of renewable energy systems
- Interconnection of distributed generated systems. In the case of Belize, net billing is recommended.
- Renewable energy and energy efficiency targets for utility scale electricity production
- Transmission and distributions systems, including smart grid systems.
- Utility obligations for demand side management
- Electricity tariffs, charges and quality of service
- Regulation
- Planning

In particular, the role of markets versus centralized planning should be determined, with the recommendation being made for a shift away from the current utility based planning towards the more inclusive integrated resource planning within the electricity sector.

Under the current legislation, electricity pricing is well regulated and codified in a number of laws including the Electricity Act (Amended) of 1992, the Public Utilities Commission Act of 1999, and the Electricity Tariffs, Charges and Quality of Service Standards By-Laws of 2001. However, the lack of an Electricity Policy that acts in support of the National Energy Policy continues to leave significant gaps in the electricity supply outlook for the near future as the country seeks to find answers to supplying increasing demand, replacing aging electricity supply infrastructure and fulfilling “political promises”, such as the commitments for net billing under the CARICOM Energy Policy and the renewable energy and efficiency targets of 50 per cent and 25 per cent respectively under the SIDS DOCK.

Transport

This should deal with the social, economic and environmental development, functioning and performance of the transport system in Belize. Transport is a key mechanism for promoting,

developing and shaping the Belizean economy and requires an extension of the legislation and regulations from its current focus on safety, infrastructure and ownership to efficiency and management. The policy should address outstanding issues such as:

- The provision, maintenance and upgrade of road and rail infrastructure
- Urban transit systems
- Transport demand management
- Public transport tariffs, charges, quality of service and regulation
- Planning

As in the previous case, the role of markets versus centralized planning is also important and the recommendation is for a shift away from the current system in which the Ministry of Transport and National Emergency Management has fiduciary responsibility for transport planning but has very little relationship with other transport stakeholders, including various Government departments at the national, provincial and local levels to a more inclusive planning mechanism.

In particular, there should be a strengthened role of the private sector in transport planning and the Transport Policy should be developed to support public private partnerships such as joint ventures with foreign private enterprises for the development of port, rail and road infrastructure. This will require either modernization or removal of the Belize Land Transportation Authority Act (2007). Also, attention should be given to modernizing the Motor Vehicles and Road Traffic Act to include labelling and standards for energy efficiency and emissions. This should seek to target issues related to motor vehicle import tariffs and charges, emissions controls and data reporting. In general, capital investment by the Government in transport infrastructure is limited and commonly follows multiple and often conflicting policy goals. For instance, short term policy goals of job creation are sometimes incompatible with the long term goals of sustainable economic growth and energy efficiency.

Sub-policies in renewable energy, agro-energy and biofuels, energy efficiency and sustainable tourism have either received significant attention within the National Energy Policy and the extension of the Strategic Plan (2012-2033) of the Ministry of Energy, Science, Technology and Public Utilities or have suitable templates within the region from which they can be developed.

2. Re-engage and legislate the establishment of the Energy Steering Committee

The Committee is responsible for coordinating energy planning issues among Government ministries and agencies. This body, though in existence, had not met since June 2012 which is some twelve months ago. The role of the Committee is important for providing recommendations for updates on, and ensuring congruence of the respective regulations on energy. The lack of public sector communication and coordination is a major inhibitor of the progressive agenda that is embodied within the National Energy Policy and the extension of the Strategic Plan (2012-2033) of the Ministry of Energy, Science, Technology and Public Utilities and requires serious attention. The recommendation is for the enactment of legislation to establish the Steering Committee as a statutory body that is chaired by the Ministry with portfolio responsibility for energy but reporting to Parliament.

3. Develop a sustainable energy plan

The Sustainable Energy Plan should delineate the actions that are necessary for implementation of the National Energy Policy, to include timelines for the respective actions. The Government of Belize has benefited from significant multilateral assistance toward the preparation and formulation of the National Energy Policy, the MESTPU Strategic Plan (2012-2017) and other related policy formulations. These have unfortunately not translated into regulations and implementable actions and the Sustainable Energy

Plan may facilitate this process. This is especially important in filling many of the capacity gaps that exist within the agencies that are responsible for translating the energy policies into action.

4. Strengthen the capacity and mandate of the Public Utilities Commission

PUC is responsible for monitoring and enforcing operator compliance with standards and targets set by Minister of MESTPU. However, while many Caribbean countries that have made progress in the regulation of their electricity sector have a regulatory agency empowered to set service standards and tariffs, in Belize, the regulator is an advisory body that makes recommendations to the Minister on issues related to licensing of independent power producers and the approval of tariff for the utility. Establishment of a privately financed, independent regulatory body is a vital first step to unbiased energy regulation. The Public Utilities Commission Act should be further amended to accommodate the recommended shifts, including financing from energy levies charged to utilities sector, and its mandate expanded to include the request for, and approval of, addition of new generating capacity, including in renewable energy technologies. These new powers will require institutional strengthening of PUC, and this may be facilitated through the availability of a sustainable source of income to provide a platform for such improvement.

B. Renewable energy

1. Electricity

The specific recommendations for the promotion of renewables within the electricity sector include the following:

- Finalise and introduce legislation for net billing

Mobilizing private sector investment is important to increasing the use of renewable energy in the energy mix. Therefore, barrier assessments are typically performed from the viewpoint of investors and project developers. However, creative market enabling instruments such as feed-in tariff, net metering and, its variant, net billing have the potential to attract non-traditional investments into the renewable power generation sector. While feed-in tariffs have been demonstrated to be a successful approach within the industrialized nations, it is believed that the premium pricing for employment of renewable energy technologies will negatively affect electricity rates within Belize. The utilization of net metering has borne relevance within the current context that seeks to provide targeted opportunity for the integration of small-scale renewable energy generation into the grid to meet some of the increasing demand as well as to simultaneously reduce dependence on the Comisión Federal de Electricidad supply and hedge against the risks of hydro dependence. Given the already high cost of managing the BEL utility grid, as a consequence of the small markets, there is a concern that the compensation of customer generators at retail rate will drive electricity costs up as grid operation and maintenance costs are recovered. Consequently, net billing may be more suited given its flexibility to address issues related to the utility's tariff structure and regulation for this should be developed to support the grid connection of small, distributed renewable energy generation systems. The 41st Special Meeting of the Council for Trade and Economic Development for energy recently approved a generalized net metering framework that includes net billing, for guiding the introduction of legislation for customer generation in CARICOM states.

- Determine and introduce incentives for distributed renewable energy generation and “avoided generation” technologies

Much of the current thrust towards renewable energy legislation within Belize focuses on grid scale renewable energy generation. In instances where small scale renewable applications are considered, there seem to be a focus on electricity generation applications and as a consequence,

attention is being paid mainly to distributed renewable generation systems such as solar photovoltaic. However, “avoided generation” technologies will directly reduce consumption of electric grid power in exactly the same way a renewable energy electric generation technologies increase useable energy at the customer site. For example, where a solar water heater is used in place of an electric water heater, a solar water heater that offsets 4,000 kWh of electricity per year has the same impact on grid power consumption as a photovoltaic system that produces 4,000 kWh. There is urgent need therefore, for the development of incentives for small renewable energy and avoided generation systems as part of the customer generator model distributed generation within Belize. Consideration should also be given to small, efficient cogeneration systems for commercial applications. The relevant numerical analysis is required for judicious planning that ensures incentives do not result in significant reduction in government revenue.

2. Transport

Specific recommendations for the promotion of renewables within the transport sector include:

- Introduce legislation and incentives that support commercial biofuel production

If alternative low-carbon fuels are to displace petroleum fuels, they must provide similar levels of cost, convenience, and reliability, which will require significant investment in supply as well as the domestic delivery infrastructure. Currently, general regulations governing investment within Belize do not provide incentives for renewable energy, including biofuel development. In fact, many investors are of the belief that the system of taxation is favourable only to the tourism and financial services and in essence, results in indirect taxation on monies brought into Belize for investment within the productive sector. Moreso, since 2008, the Government of Belize passed the Belize Constitution (Ninth) Amendment Bill, which allows the government ownership of a majority interest in public utilities and energy production companies within the country. This law has already been used toward nationalization of the public utility, BEL, in 2008 and may be a deterrent to potential private sector investment within the biofuel sector. In particular, commercial production of biofuels for domestic consumption and export, as well as the development of infrastructure to support the marketing, distribution and delivery of solid and liquid energy carriers is capital intensive.

There is need for clear signals from the Government through legislation and policies to include rules governing requests for proposal and project selection, as well as public private partnership and land rights agreements that will be necessary. In a sense, this confluence of requirements may be suitably embodied within a biofuels’ business plan for Belize.

- Introduce biofuel into the marketing and distribution matrix for transport fuels

There is need to develop legislation for introducing the transport fuels’ market to blends that constitute limited amounts of biofuels, inter alia: gasoline with 10 per cent ethanol (E-10), and diesel with 10 per cent biodiesel (B-10). The experience of the E-10 programme in Jamaica and the biofuel pilot programme of the Institute of Applied Sciences and Technology in Guyana may provide valuable insight towards the development of a local pilot programme. This will facilitate the introduction of biofuels into the transport fuel supply matrix but without the need for costly vehicle engine retrofits or new distribution infrastructure. Conventional vehicles are able to function normally using up to 20 per cent biofuel mix and the activity will facilitate direct fuel replacement within the existing vehicle stock. This proposal is, of course, contingent upon the sustainable availability of biofuel supply and the relevant capacity for monitoring and evaluation. The latter may be suitably developed through cooperation between the Caribbean Community Climate Change Centre (CCCCC) and the University of Belize.

- Introduce incentives for flexi-fuel vehicles and alternate fuel vehicles

There is need for utilizing pilot demonstrations, perhaps within the public sector, to determine performance and guide the process for incentive formulation for flexi-fuel and alternate-fuel vehicles that utilize ethanol and LPG respectively. The demonstration should be centred on fleet vehicles and baseline data that are collected and utilized to inform future decisions on flexi-fuel vehicles and

alternate fuel vehicles. It will be useful for car distributors to be engaged in the pilot if real market indicators are to be sufficiently captured and the outcome of this activity can form part of a public sector policy on vehicle procurement. This will be contingent on the sustainable availability of bioethanol and LPG supply and the relevant capacity for monitoring and evaluation. There is an expectation that Belize National Energy will be able to increase its supply of locally produced LPG within the near term and bio ethanol may be imported from Brazil whilst Belize could focus on development of domestic production. The data from the pilot demonstrations will be used to determine the incentive package for flexi-fuel vehicle and alternate fuel vehicle importers, which will be calculated from the energy savings derived.

C. Energy efficiency

The overarching recommendations for targeting barriers to energy efficiency in Belize are as follows:

- Integrate Energy Efficiency into Public Procurement Regulations

The importance for Government participation in sustainable energy, especially energy efficiency markets, is important for early market development (See Section D on benchmarking and quantitative aspects). The ability of Belize to suitably implement energy efficiency benchmarks into its procurement rules will rest on its ability to attract third party funding for some activities such as minimum energy performance certification of public buildings and vehicles. A pilot programme to study this may be developed with support from donor agencies and aspects of this may tangibly integrate a study for third party energy service companies financing that is being explored by CCCCC with support from the Global Environmental Facility (GEF) and the United Nations Environmental Programme (UNEP).

- Introduce minimum energy performance standards for buildings, equipment, appliances and vehicles

Minimum energy performance regulations should be developed and introduced to include options for building ratings, appliance standards and labelling, as well as vehicle fuel efficiency. The recommendation is for an amendment of the building code to include energy efficiency requirements, with an initial voluntary scheme that involves the issuance of certificates for buildings and building technologies that meet the energy performance requirements and additional levels of certification for those with superior performances. Similarly, the introduction of energy efficiency standards and labelling schemes for household and commercial appliances, and some types of equipment, such as motors, could be done through an initial voluntary scheme that will simultaneously provide guidance towards consumer awareness on energy use and benchmarks for fiscal incentives toward efficient appliance and equipment purchase. Energy efficiency support mechanisms, such as third party financing and government incentive programmes would apply only to those projects, activities or items that are designed to attain minimum energy performance certificates. Minimum energy performances provide a baseline for establishing the economic benefits that may be derived from energy efficient technologies.

Under this mechanism, there are opportunities for bringing energy efficient, avoided generation and renewable energy technologies under a single value added tax and duty exemption scheme. The success of the programme will mostly be dependent on the degree to which monitoring, as well as penalties and enforcement for breaches, are instituted. Belize is part of the Energy for Sustainable Development project, which is being supported with Global Environmental Facility/United Nations Environmental Programme funding, which can form the frameworks for energy efficient building codes and appliance standards and labelling programmes.

- Introduce legislation for the operation of Energy Service Companies

In order to increase the size of the energy efficiency markets in Belize financing options need to be examined and access to financing is necessary. A major criterion for market expansion must be the development of mechanisms to encourage the finance sector within the respective countries to create new or leverage existing credit instruments for the residential and commercial energy efficient markets, which will require direct Government intervention. The support of multilateral global and regional funding facilities, such as the Inter-American Development Bank and Caribbean Development Bank will be required and government support may initiate a number of blended grants/loans that will capitalize to financial institutions or third-party financiers, such as energy service companies.

The legislation that is required for the establishment of energy service companies should receive serious consideration and the SIDS DOCK, of which Belize is a founding member and host country, may be a suitable structure for assisting in the collection of baseline data that is necessary toward deriving sufficient understanding of same.

1. Electricity

- Mandate energy efficiency targets for utility scale generation, as well as transmission and distribution

Within Belize, regulation of the electricity sector could be strengthened, competition introduced and the tariffs increased in keeping with market rates. This should aid in improvements in the electricity sector toward the adaption and exploitation of new technological opportunities for efficient generation, transmission and distribution of power. Whilst there is agreement that fuel cost is a not a major problem facing the electricity sector in Belize (60 per cent of electricity is generated from renewable sources) there is need for deeper reform in the operations the sector as there are significant gains to be derived from benchmarking within the sector and efficiency targets for the generation, transmission and distribution of electricity are important. Currently, this is not addressed under the Public Utilities Commission Act.

In particular, the quality of the mains voltage and frequency supply is important, since the efficiency performance of end use technologies, including light bulbs, appliances and equipment, require correlation between the electricity supply and manufacturer specifications.

- Mandate utility-led demand-side management

In particular, it will be useful for the utility to become more directly involved in providing assistance to large customers who are inefficient in their use of electricity. The case of the Belize Water Service, the water utility, is of particular interest. In essence, the electric utility could be mandated to perform demand side management activities for commercial and residential customers with clear benchmarks and targets identified for same; this will require amendments to the Electricity Act and the Public Utilities Commission Act. The latter is required because of an expectation that PUC will monitor and regulate the performance of the utility's demand side management activities.

2. Transport

- Conduct an assessment of the transport sector as a precursor to transport policy design

It is recommended that a detailed assessment of energy use within the transport sector should be conducted. This could include the identification of opportunities for improved efficiency in vehicle technology, renewable and alternate fuel use, as well as the development of a model for transport demand management. Transport demand management is critical to transport planning and includes the identification of modes, routes and schedule for travel and takes into account policies and legislation for supporting a country appropriate model for the sector. This activity is congruent with the establishment of minimum energy performance for vehicles and will inform the economic benefits to be derived from vehicle efficiency, which will guide the trade off in revenue loss from any tariff

incentive given. In particular, there is a perception that the success in shifting significant population from Belize City to Belmopan will be dependent on the efficiency of the transport system between the two cities; currently, Belmopan has an estimated population of around 15,000 whilst the population in Belize City stands at around 60,000.

- Establish import tariff regime that reflects vehicle efficiency

The current import tariff structure is at best neutral towards vehicle efficiency. The tariff structure is still based on engine size, cubic centimetres (cc) rating, though significant technology advancements especially since the last five years when the price of oil reached record level of US\$ 148 per barrel in 2008, has effectively removed the correlation between vehicle efficiency and cc rating. This proposal is for an assessment towards the establishment of a vehicle tariff structure so as to develop an alternative that suitably reflects renewable and efficient vehicle technologies. The new structure is expected to incentivise vehicles with high efficiency indicators, such as miles per gallon, and provide appropriate categories for renewable energy vehicle technologies, such as hybrid-electric vehicles, electric vehicles, flexi-fuel vehicles and alternate fuel vehicles.

- Conduct a gap assessment of the information and communication technology platform

This assessment should determine the existing infrastructure and provide details on the technical, fiduciary and financial requirements for building a modern information and communication technology (ICT) backbone with reliable broadband to support voice, video and data communication across the major population areas in Belize. This is intended to provide guidance on the level to which services, especially e-banking, e-government and e-learning can be suitably provided, thereby reducing the necessity for long distance commute that has become a feature of Belizean society. This would enhance the ability of the society to more efficiently engage in real time activities such as information sharing and video meetings and would facilitate telecommuting. Once the techno-feasibility have been determined, appropriate legislation and regulations related to access to information, e learning, online financial transactions, cyber crime and cyber security will be required.

D. Benchmarking and quantitative aspects

In terms of benchmarking for its public sector operations and buildings and showing the value of these metrics in driving energy and cost savings, perhaps the most critical place to start in Belize is the operation of the public sector. In 2012, the electricity bill of the Government was around US\$ 7 million. Benchmarking provides an opportunity for the establishment of targets and indicators within the public sector for:

- Small-scale renewable energy distributed generation
- Avoided generation, such as water heating (hospitals) and cooling (offices)
- Building efficiency
- Transport efficiency

Although international benchmarks can provide useful information, special attention could be given to issues associated with the existence of different operating environments in terms of physical, geographical, institutional and regulatory frameworks. For instance, the District of Columbia in the United States of America uses the following medians for public buildings over 10,000 ft²:

- 146 kBtu/ ft² for fire and police stations
- 246 kBtu/ ft² for libraries
- 100 kBtu/ ft² for recreation facilities
- 163 kBtu/ ft² for hospitals and public lodgings

A number of opportunities exist for examining target indicators for energy efficiency within various economic sectors in Belize. However, within the sustainable market framework, public procurement serves as a key policy tool for governments to drive the agenda and achieve shifts in market practices by leveraging its significant purchasing power and regulatory influence. As purchasers of a diverse range of goods, services and infrastructure to meet not only their own operational needs but also to deliver on their public service mandate, government procurement spending represents scaled up and long term demand across a wide number of industries.

Strategically directed, the demand created by public procurement policies have the ability to act as a market supporter and catalyst, incentivizing businesses to take the risks to invest, innovate and commercialize green products and services. A common mechanism for benchmarking public procurement policies is the Global Energy Basel Grading Tool, which covers questions of sustainable public procurement by means of its 10 topics, inter alia: Accountability, transparency, customer focus and results orientation, poverty responsiveness, power balanced partnerships, shared incentives, sound financing mechanisms, proactive risk management and resource protection. Government procurement should be considered an essential demand side strategy for incentivizing and incubating innovation for growing the sustainable energy markets within Belize.

E. Progress and next steps

Markets are not perfect, but neither are the institutions that seek to improve them. When government intervention is appropriate, it is unlikely that there will be a single best policy solution, for example, government minimum efficiency standards. Instead, the best choice may be a realistic mix of multiple complementary approaches tailored to particular circumstances that seek to overcome market failures or reduce high transaction costs or both. In addition, the selected options should be based on a pragmatic assessment of the limitations of the relevant institutions and policies.

Belize has benefited significantly from the contributions of the Organization of American States towards the development of the National Energy Policy and CCCCC that provided assistance to MESTPU in developing the Strategic Plan (2012-2017). Moreover, the location of CCCCC and the SIDS DOCK Secretariat in Belize has provided significant impetus towards the process of energy planning. However, there is need to involve multiple stakeholders in the development plans of the country. Furthermore, the country is characterized by a relative weakness in the capacity of its institutions and this has been manifested through the failure to implement many of the policies. In fact, the popular perception, which has been supported somewhat by these findings, is the lack of clarity in linkages between the energy policy and the actual regulatory environment for energy.

The development of a thriving market for sustainable energy in Belize is mostly stymied by the lack of coordination within Government agencies and between the Government and the private sector. In terms of energy efficiency and conservation, the transport sector is particularly interesting as there is clear opportunity for examining rail service, which includes perhaps neighbouring Mexico, as part of a broad-based transport model for internal (Belmopan-Belize City) and cross-border (Belize-Mexico) network. This is consistent with other strategies including that for sustainable tourism. Given the degree of synergies between the Belize and Mexico energy systems, it is critical for Belize to examine its own strategies within the context of the Mexican strategies and seek to identify complementary areas for cooperation. The obvious next step is dialogue among the principals to agree on what are the acceptable recommendations and a suitable mechanisms and timetable for pursuing same. In terms of the fiduciaries, priority must be given to the continued strengthening of MESTPU and PUC, as well as the articulation of legislations that reflect the picture that has been painted by the National Energy Policy and MESTPU Strategic Plan (2012-2017). Again, some focus must be given toward communication and coordination.

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Annexes

Annex 1

Petro-Caribe Agreement, Belize

In June 2005, Belize signed onto a Petro-Caribe Agreement, along with Antigua and Barbuda; The Bahamas; Cuba; Dominica; The Dominican Republic; Grenada; Guyana; Jamaica; Nicaragua; Suriname; Saint Lucia; Saint Kitts and Nevis; Saint Vincent and the Grenadines. This Facility provides access to fuel from Venezuela on a credit basis which extends over a period of at least 25 years on a low-interest basis and consists of fixed percentage credits that are based on global oil prices: If oil prices reached a critical value, Petro-Caribe Member Countries would benefit from a loan.

In essence, if the price of oil is US\$ 30 per barrel, a 25 per cent credit line would be provided; at US\$ 40 per barrel, it would become 30 per cent; and at US\$ 50 per barrel, it moves to 40 per cent. Whenever the price of oil reached US\$ 100 per barrel, 50 per cent of the payments would be converted into a 25 year, on per cent loan to the beneficiary country.

PetroCaribe has helped the balance of payments position of since the Facility required less up-front spending on oil imports; but this saving does not typically translate into lowering of the fuel costs. Government still had to find additional subsidies to “manage the cost” of gasoline and diesel at the pump and the price of electricity from the utility.

The Petro-Caribe Agreement superseded the Caracas Energy and San Jose Accords.

Annex 2

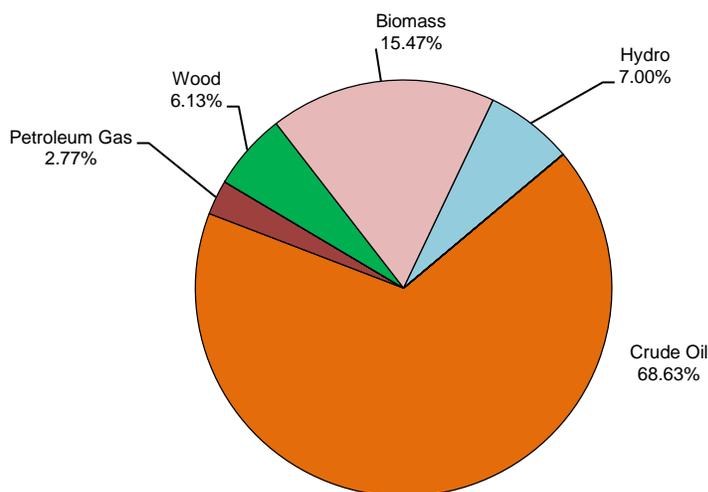
Primary energy consumption

A total of 13,538 TJ of indigenous primary energy was produced in Belize in 2010; comprising of:

- 1,513,700 barrels of crude oil
- 189,212,500 scf of petroleum gas
- 263,150 MWh of hydro-electricity
- 403,675 metric tons of bagasse (for steam and electricity generation)
- 43,253 metric tons of fuel wood (firewood)

When measured on the basis of energy content; crude oil and petroleum gas accounted for 68.6 per cent (9,291 TJ) and 2.8 per cent (375 TJ) of energy production; while renewables made up the remaining 28.6 per cent (3,872 TJ) and consists of bagasse (15.5 per cent), hydro (7.0 per cent) and wood fuel (6.1 per cent) (see figure 10).

FIGURE 7
DOMESTIC ENERGY PRODUCTION BY PRIMARY ENERGY CONTENT, 2010



Source: Tillett, A., J. Locke and J. Mencias, prepared for the Government of Belize, “National energy policy framework. Energy by the people...for the people. Towards energy efficiency, sustainability and resilience for Belize in the 21st Century”, 2011

Annex 3

Participants, consultations and dialogues

TABLE 1
STAKEHOLDERS' CONSULTATIONS, TUESDAY 19 FEBRUARY 2013

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Source: Author's compilation

TABLE 2
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|------------------|--------------------------------------------------|---------------------------------|
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Source: Author's compilation