

ISSN 1727-9917

S E R I E S

STUDIES AND PERSPECTIVES

ECLAC SUBREGIONAL
HEADQUARTERS
FOR THE CARIBBEAN

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

Devon O. Niel Gardner
Dillon Alleyne
Charmaine Gomes



UNITED NATIONS

E C L A C



german
cooperation

DEUTSCHE ZUSAMMENARBEIT

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

Devon O. Niel Gardner
Dillon Alleyne
Charmaine Gomes



The views expressed in this document, which has been reproduced without formal editing, are those of the authors and do not necessarily reflect the views of the Organization.

United Nations Publication

ISSN 1727-9917

LC/L.3755

LC/CAR/L.406

Copyright © United Nations, February 2014. All rights reserved

Printed in United Nations, Santiago, Chile

Member States and their governmental institutions may reproduce this work without prior authorization, but are requested to mention the source and inform the United Nations of such reproduction.

Contents

Abstract	7
I. Introduction	9
A. Context	9
B. Background	10
1. Oil imports	12
2. Electricity	14
3. Transport	15
4. Renewable energy	15
5. The business economy	16
II. Methodology	17
1. Desk assessment.....	17
2. Analyses	18
3. Stakeholder consultations and dialogues.....	18
III. Identification of barriers to implementation of renewable energy technologies	21
A. Preamble.....	21
B. Overview of main findings.....	21
C. Electricity	23
1. Barriers impacting on the use of renewable energy technologies	23
2. Barriers specific to large renewable energy systems.....	24
3. Barriers specific to micro and small renewable energy systems	25
4. Barriers specific to avoided generation systems	25
D. Transport	26
1. Barriers affecting energy efficient vehicle technology	26
2. Barriers specific to efficient energy use in domestic transport	26
3. Barriers specific to efficient energy use in public transport and freight services	27
4. Barriers specific to efficient energy use in maritime transport	27
IV. Identification of barriers to implementation of energy efficient measures	29
A. Preamble.....	29

B.	Overview of main findings.....	29
C.	Electricity	30
1.	Barriers affecting implementation of energy efficiency measures	31
2.	Barriers specific to energy efficiency in generation, transmission and distribution.....	32
3.	Barriers specific to energy efficiency in industrial and large commercial applications.....	32
4.	Barriers specific to energy efficiency in small commercial and domestic applications	32
D.	Transport	33
1.	Barriers affecting energy efficient vehicle technology	33
2.	Barriers specific to energy efficient use in domestic transport	33
3.	Barriers specific to efficient energy use in public transport and freight services	34
4.	Barriers specific to efficient energy use in maritime transport	34
V.	Benchmarking and quantitative aspects	35
VI.	Recommendations	37
A.	Renewable energy	37
1.	Revise and update the National Energy Policy (NEP) for Guyana	37
2.	Establish a standing committee of inter-agency operatives for coordinating energy planning issues among government ministries and agencies	38
3.	Strengthen the capacity and mandate of the Guyana Energy Agency	38
B.	Energy efficiency	40
1.	Integration of energy efficiency into public procurement regulations	41
2.	Introduction of minimum energy performance (MEP) standards for buildings, equipment, appliances and vehicles.....	41
3.	Energy service companies (ESCO) financing for energy efficiency.....	42
C.	Progress and next steps	43
VII.	Conclusions	45
Annexes		49
Annex 1	PetroCaribe Agreement.....	50
Annex 2	Guyana primary energy consumption by type	51
Annex 3	Model for inundation of north coast from sea level rise, Guyana	52
Annex 4	Ease of doing business - Guyana.....	53
Annex 5	The Guyana Energy Agency (GEA)	54
Annex 6	Stakeholder consultations.....	56
Studies and Perspectives series - The Caribbean: issues published		58
Tables		
TABLE 1	GUYANA OIL IMPORT TRENDS	14
TABLE 2	PROJECTED GLOBAL LEVELIZED AVERAGE COST OF POWER PLANTS ENTERING SERVICE IN 2017	46
TABLE A.1	GUYANA PRIMARY ENERGY CONSUMPTION BY TYPE	51
TABLE A.2	EASE OF DOING BUSINESS - GUYANA.....	53

Figures

FIGURE 1	ENERGY INTENSITY FOR CARICOM STATES	12
FIGURE 2	CRUDE OIL PRICES (IN DOLLARS AND EUROS) DECEMBER 1998-DECEMBER 2012	13
FIGURE 3	DEMAND REDUCTION THROUGH ENERGY EFFICIENCY	41
FIGURE 4	VARIOUS PATHS OF ENERGY FROM SOURCE TO SERVICE; LINES INDICATE POSSIBLE ENERGY PATHWAYS	47

Diagrams

DIAGRAM 1	METHODOLOGY PATHWAY	19
DIAGRAM 2	GEB GRADING TOOL FOR PUBLIC PROCUREMENT BENCHMARKING	36

Maps

MAP 1	SOLAR INSOLATION MAP: CENTRAL AMERICA AND THE CARIBBEAN	11
MAP A.1	PROJECTION SHOWING INUNDATION OF COASTLAND AT MINIMUM AND MAXIMUM STORM SURGE IN 2031	52

Abstract

Guyana, like many CARICOM countries continues to depend on imported oil that fuels the electricity and transport sectors. Simultaneously, the high level of expenditure on oil reduces the financial resources available to invest in social development, environmental protection, adaptation to climate change and improving food security. The electricity sector in Guyana, in particular, offers significant opportunities for achieving reductions in fossil imports. However, fiscal and regulatory barriers to energy efficiency and renewable energy use are apparent in Guyana.

This document seeks to identify these barriers and propose strategies that may be utilised to remove them. Consultations were held with experts from the energy agency as well as the ministries of finance and utilities in order to obtain data and information that will inform the analysis. It was found that an increasing demand for reliable, cost effective, accurately priced energy supplies is a major challenge to sustainable economic development in Guyana and the country experiences difficulties in accessing capital especially for smaller firms and lower to middle income households. The limited knowledge of the technical risks associated with renewable energy and energy efficiency projects limit local investments and opportunities for foreign capital and are affected by high transaction costs. Furthermore, the strategic removal of energy subsidies continue to undermine the economic case for improved energy efficiency and increased renewable energy use. Planning for renewable energy use within the Guyana energy sector remains wedded to utility scale hydropower replacement of fossil based thermal generation, as well as remote solar PV systems. However, the Levelized Cost of Electricity (LCOE) is indicative of other cost effective options. The substantive goal of the Government of Guyana should be related to the creation of a country in which there is equitable availability of energy intensive goods and services to its people that harmonizes economic growth, social progress and environmental stewardship.

I. Introduction

A. Context

Energy is critical for development and for most socio-economic activities and is associated with the production of goods and the provision of services. Economic growth in nations has been typically accompanied by large increases in energy use. Meanwhile, the price of energy is connected to recession, employment, productivity and stock market performance. It is no coincidence therefore that the strongest economies within the world all produce significant amounts of energy from indigenous sources. The decoupling of economic development from resource use which comprises reduction of fossil fuels use and scaled up deployment of renewables, is expected to contribute to global sustainable development and climate mitigation objectives.

The international economic situation has impacted on the Caribbean and has aggravated a number of ongoing challenges. Among these challenges are high debt burdens 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, some Caribbean countries employ “subsidies on fuel” as a means of addressing the challenges of affordability faced by the poor and also to drive down economic production costs. In examining the policy landscape, the tradeoffs between incentives to sustainable economy and the expedient measures for poverty alleviation must be properly addressed. The assumption is that significant economic gains can be made through energy savings from energy efficiency and the substitution of imported oil with indigenous, renewable sources of energy. However, careful analysis is required for selection of the most cost effective options for incentives and regulations that will suitably support the country’s energy strategy, especially during this period of fiscal stress.

An increasing demand for reliable, cost effective, accurately priced energy supplies is a major challenge to sustainable economic development in Guyana. A sustainable energy sector that provides

secure, reliable, environmental friendly and affordable energy services is especially important to poverty reduction. The Household Income and Expenditure Survey and Guyana Living Conditions Survey, each show that the proportion of households living in moderate poverty (on US\$2 daily) has declined from 4 per cent to 36.3 per cent in seven years. According to UNDP, extreme poverty dropped from 28.7 per cent to 19.1 per cent over the same period.

Modern energy services are a prerequisite for poverty alleviation, as targeted in Millennium Development Goal (MDG) 1, since it enables income generating activities and the establishment of enterprises, which help to provide the state with sufficient resources to alleviate hunger and meet most of the other social and welfare related MDGs.¹

Guyana, like many CARICOM countries continues to depend on imported oil that fuels the electricity and transport sectors. The ongoing escalation of crude oil and energy prices and the current dependence on petroleum is neither sustainable for supplies nor affordable in the long term. Simultaneously, the high level of expenditure on oil reduces the financial resources available to invest in social development, environmental protection, adaptation to climate change and improving food security.

The majority of countries with high penetration rates for renewable energy technologies and energy efficiency applications have regulations that set national targets, which in many instances include mandatory energy criteria (minimum energy performance) for select types of buildings. However, many countries, especially within the Caribbean, have continued to trust voluntary action, the disadvantage being that in the absence of strong regulations (push factors), there is greater need for fiscal and financial incentives, such as tax breaks, investment grants and low interest loans (pull factors) that make sustainable energy investments more attractive to investors and customers alike, especially during the initial market stage. Guyana is also limited in its ability to provide fiscal and tax incentives as a consequence of their current economic situation. Simultaneously, problems of information gaps and limited skills are widespread and increase the transaction costs for sustainable energy projects.

The Sustainable Energy in the Caribbean (SEC) Project seeks to identify barriers and gaps that currently retard or prohibit the development of suitable regulatory systems and fiscal policies which will provide the appropriate push and pull factors for development of renewable energy and energy efficiency applications in Guyana. In particular, the project is intended to assist in the identification of no-cost or low-cost barriers which may be accessible to the government and thus, sensitise policy makers to what is possible and realistic. The expected outcome of the Project is a clear enhancement in the internal conditions of government entities to revise and reformulate national fiscal policies, strategies and regulations in order to make them more congruent and coherent with the sustainable energy vision for the country. This will provide the best potentials for regulatory, fiscal and other support for sustainable energy technologies and services.

It is within this context that this report seeks to identify the fiscal and regulatory barriers to implementation of energy efficiency measures and renewable energy technologies in Guyana. It is expected that recommendations as to tools and mechanisms for removal of these barriers will be made.

B. Background

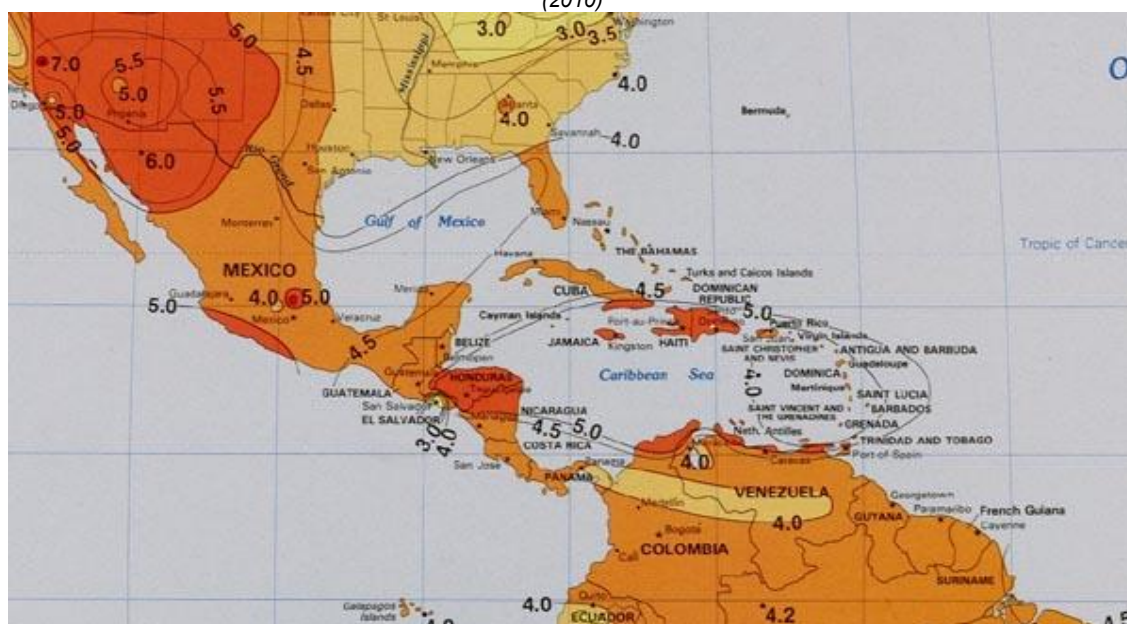
According to the Guyana Energy Agency (GEA)² Guyana consumed approximately 6.1 million barrels of oil equivalent (boe) from a variety of energy sources in 2012, inter alia, diesel, fuel oil, gasoline, kerosene, liquid petroleum gas (LPG), fuel wood, charcoal, bagasse, rice husk, and biogas. Imported fossil sources constituted 79 per cent or over 4.8 million boe, which represents approximately US\$ 600 million in imports at US\$ 123 per barrel for oil. Meanwhile, a number of

¹ See UNIDO < <http://www.unido.org/resources/publications/energy-and-environment/energy-and-climate-change.html>>.

² Kiran Mattai (May 2013). Personal Communication.

options exist for Guyana to draw upon its natural resources to provide renewable sources of energy. In particular, an inventory of the hydropower potential in Guyana identified 67 potential hydropower sites across four major river basins (Cuyuni, Mazaruni, Potaro and Essequibo), which amounts to an accumulated hydropower potential of approximately 7,000 MW. There are also complementary options for development of cost effective wind, biomass, and waste to energy and solar PV systems as well as the utilization of generation offset technologies such as solar water heating and solar cooling (see map 1). There is additional scope for critical areas such as energy efficiency and energy conservation, which provide affordable and significant opportunities to reduce energy imports. The amount of energy used to provide a unit of GDP in Guyana (12,896 BTU per US\$) is, in general, higher than the majority of CARICOM states and is, in particular, more than twice that of the more developed economies of the European Union (EU) and Japan (see figure 1).

MAP 1
SOLAR INSOLATION MAP: CENTRAL AMERICA AND THE CARIBBEAN
(2010)



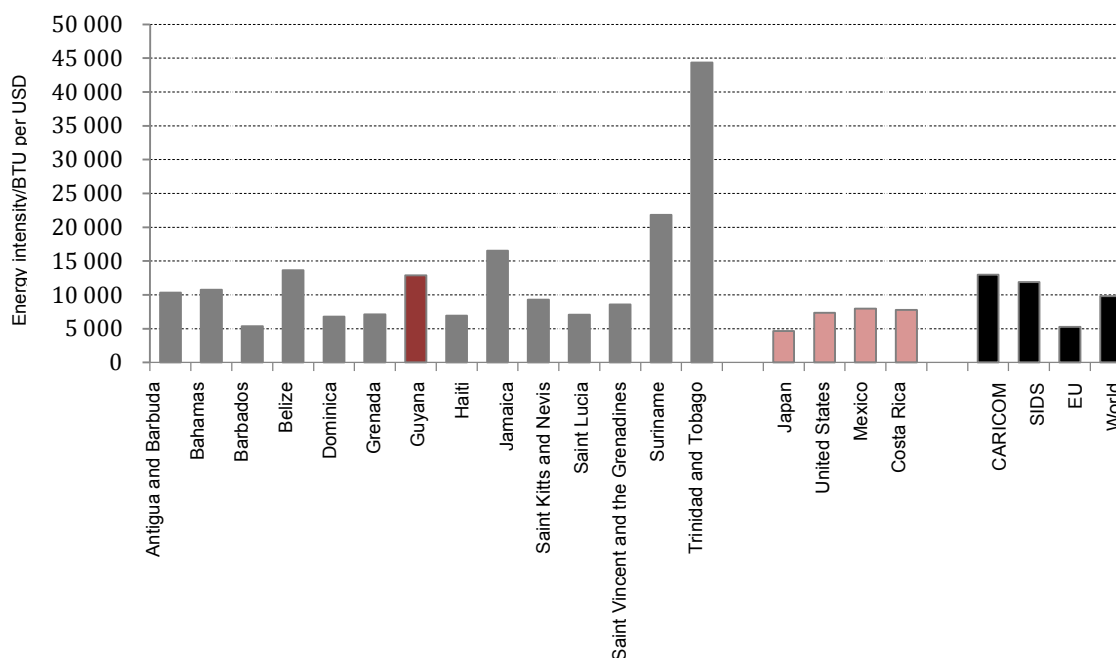
Source: National Renewable Energy Laboratory, 2010.

Note: The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations.

On the basis of the foregoing, macro-scale energy savings within Guyana, 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 and in so doing, the country will simultaneously reduce the harmful effects of fossil based energy on the environment while generating economic benefits.

The electricity sector in Guyana, in particular, offers significant opportunities for achieving reductions in fossil imports. As a consequence of the current heavy dependence of the sector on imported fossils, fuel cost constitutes a significant portion of the production cost for electricity. Conservative estimates, which are based on 40 per cent efficiency in generation and 32 per cent transmission and distribution losses, suggest that only around 27.2 per cent of the energy used for power production reaches the end user.

FIGURE 1
ENERGY INTENSITY FOR CARICOM STATES



Source: Author's compilation: comparisons made with a number of select countries as well as World, Small island developing states and regional averages.

This situation is further exacerbated by the fact that many end users utilize inefficient applications, such as incandescent bulbs and low performance refrigerators to produce energy services. Technologies and practices that target energy efficiency and conservation can play a major role in fuel cost reduction. Transport is important and it is estimated that approximately 28 per cent of all liquid fossil fuels imported into Guyana are for the transportation sector.

Recent analyses of the bio-energy potential in the country were intended to inform policy and regulations on bio-energy production and the investment that is required for supporting biofuel projects. A key motivation behind biofuels is that it may be used as a direct replacement for fossil based fuels in both the electricity and transport sectors, whilst simultaneously creating opportunities for linkages with agriculture.

1. Oil imports

At present, the price of oil continues to hover at around US\$ 100 per barrel after reaching its highest levels since October 2008 during the last quarter of 2012 (see Figure 2). The current oil price is already significantly above the levels experienced prior to 2007. During 2007-2008, oil and most other commodities were subject to a speculative bubble that pushed the price of Brent crude up to US\$ 147.50 at its peak in July 2008. In monetary terms, it has been estimated that an increase of US\$10 in the world crude oil price currently translates to a 1.5 per cent decrease in GDP within small island developing States (SIDS),³ including Guyana.

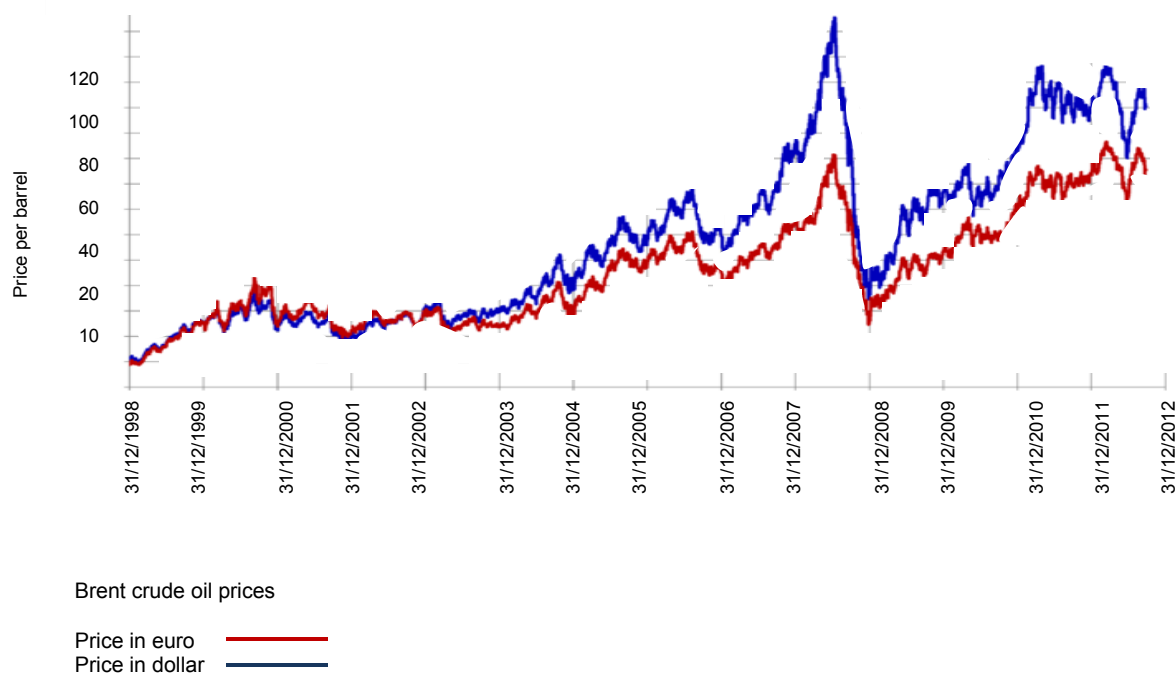
But despite the availability of options, the current energy systems within Guyana depend primarily on expensive, imported oil. Guyana's main supplier of electricity generation is highly dependent on petroleum. Approximately 95 per cent of GPL's electricity is generated from petroleum derived fuels, with 5 per cent supplied from the cogeneration of biomass by the Guyana Sugar Company (GUYSUCO). Also, a significant portion of the population own either off grid or grid

³ United Nations Development Programme Human Development Report 2007.

connected, stand by electricity generators that are diesel fuelled. The demand for oil is not limited to the electricity sector. The transport economy is characterized by diesel and gasoline fuelled vehicles and it is estimated that approximately 28 per cent of all liquid fossil fuels imported into Guyana are for the transportation sector. In general, oil import constitutes around 24 per cent of GDP, which is in accordance with the Caribbean average of 29 per cent.

Recently, Guyana has been experiencing robust economic growth as a consequence of upturns in the price of commodities on the global market. This has increased energy demand, which is manifested in rising consumption of petroleum products. In 2010,⁴ Guyana imported just over 4.1 million boe of petroleum products at a cost of US\$ 377 million but in 2011 the importation of petroleum products rose to around 4.3 million boe and the cost was US\$ 548 million. The fact that a 4.9 per cent increase in oil imports resulted in an increase of nearly 46 per cent price increase is evidence of the volatility in the global oil economy.

FIGURE 2
CRUDE OIL PRICES (IN DOLLAR AND EUROS) DECEMBER 1998 – DECEMBER 2012



Source: United States Energy Information Administration, 2013.

Since 2005, Guyana has benefitted from the PetroCaribe Agreement with Venezuela as a means of managing oil payments (see Annex 1). Over the five year period, 2007 – 2011, the country accessed more than US\$ 300 million in PetroCaribe oil financing.

⁴ Guyana Energy Agency, 2013.

TABLE 1
GUYANA OIL IMPORT TRENDS

Year	Total oil and oil product imports (barrels)	PetroCaribe imports (barrels)	PetroCaribe imports (us\$)	PetroCaribe financing (US\$)
2007	3 900 000	640 895	61 280 208	27 261 994
2008	3 700 000	1 419 868	157 368 355	80 096 310
2009	3 997 200	1 079 252	76 352 581	32 853 436
2010	4 152 412	1 022 907	89 233 165	44 836 346
2011	4 330 193	1 451 843	175 811 947	105 140 994
Total		5 614 765	560 045 904	290 189 080

Source: Guyana Energy Agency Annual report, 2012.

2. Electricity

The single electricity utility, Guyana Light and Power (GPL), is a vertically integrated government owned company. Power generation is dominated by thermoelectric plants with engine driven generators that are based on liquid fossil fuels (diesel and Heavy Fuel Oil). In 2012, GPL had generation facilities at ten locations and a total installed capacity of 156.9 MW of which 51.6 MW is based on diesel generation and 105.3 MW is derived from Heavy Fuel Oil (HFO). But much of the power generation facilities in Guyana are over 22 years old. In fact, 27.8 MW is based on thirty odd years old high speed units. The consequence of this is that the total reliable generation capacity is around 125.7 MW and peak demand may reach as high as 130 MW.⁵ The lack of spare capacity limits the ability of the utility to maintain suitable spinning reserve⁶ and consequently, reliability of the grid is compromised.

In general therefore, a significant portion of the Guyana energy economy constitutes the power sector that is characterized by small, generation plants with limited efficiency and distribution losses of around 31-32 per cent. Meanwhile, the demand for electricity from residential, commercial and industrial consumers continues to rise and it has been estimated that Guyana experiences an average of 31 power outage days per year. Part of the response to this situation is a recent US\$ 42 million Infrastructure and Development Project, a new 26 MW HFO fired power plant (US\$ 32 million) and a frequency standardization project (US\$ 9.4 million). GPL is also in the process of converting the network frequency in several areas from 50 Hz to 60 Hz.

The majority of the distribution networks in Guyana was built over 40 years ago and operated at a voltage supply and frequency cycle of 4,160 V and 50 Hz respectively. This situation is limited in capacity and the upgrade and frequency conversion are expected to increase the transmission and distribution capacity and boost the quality of power supply as GPL seeks to reduce its heavy transmission and distribution losses to “manageable levels”.

Grid electricity coverage in Guyana is 81 per cent, which is lower than in the majority of states of the Caribbean Community (CARICOM). Electricity coverage is over 90 per cent in the coastal zone, where 90 per cent of the population is concentrated. However, the grid-based electrification of the hinterland to supply approximately 70,000 residents in around 170 small communities remains a challenge. While some communities have resorted to off grid diesel power generation, others have recently begun to produce electricity from solar photovoltaic (PV) technologies. Under the LCDS, the

⁵ Information obtained from Guyana Power and Light (GPL) Inc.

⁶ Employing spinning reserve is an electricity system operator’s *first strategy* for maintaining reliability following a major contingency, such as the unplanned loss of a large generation facility or critical transmission line.

Government of Guyana is already expanding the hinterland electrification for rural communities on off grid solar-PV systems and so far 11,000 solar PV systems have been provided.

3. Transport

Approximately 85 per cent of Guyana is covered by forest and the population (around 800,000 persons) is concentrated in settlements (Georgetown, Linden and New Amsterdam) that are in the north of the country, within 50 to 100 km of the coast. Road transport accounts for as much as 97 per cent of people and 35 per cent of freight movement. The majority of these movements is concentrated within the populated coastal strip and though there is much difficulty in obtaining reliable data on the road network, most estimates suggest that there is around 2,600 km of “declared” and “undeclared” roads within the country. There is an extensive network of paved roads along the coastal strip of the country. In particular, the road between Georgetown and New Amsterdam receives regular maintenance and periodic upgrades.⁷

There is also an extensive river system and the small hinterland populations still depend on inland waterways for connection to the rest of the country. Two of the country’s major international port facilities, the Ports of Georgetown and New Amsterdam, are found on the banks of the Demerara and Berbice Rivers respectively. These ports account for significant movement of freight and though (on account of the significance as a transshipment port for bauxite and fuels) New Amsterdam is the larger port in throughput terms, Georgetown handles general cargo, sugar, grains, petroleum products and other goods for the general population.

It has been estimated that traffic flow along the East Corridor between New Amsterdam and Georgetown is around 20,000 vehicles per day. In and around the city of Georgetown, the vehicular traffic is particularly high and heavy congestion is becoming a common feature. A large number of “licensed buses and minibuses” also operate in Guyana,⁸ minibuses and “taxis”, mostly serve Georgetown and neighbouring areas.

Otherwise, domestic vehicles are becoming increasingly important and it is estimated that there are around 72 vehicles per 1,000 persons. The public transportation sector is privatised so there is no direct government involvement or regulation, particularly for fares. There are about 4 associations that represent minibus operators (the two major ones are - Guyana Public Transportation Association and General Minibus Association) while Guyana Taxi Drivers Association represents taxi operators. The most distinct forms of govt involvement or regulation are traffic laws and adjustment of the excise tax.

Similarly, road freight is characterised by similar diesel powered trucks and vans. Air transport also plays a vital role providing a link between the coastal areas and communities in the hinterland, many of which are inaccessible by any other means of transportation. In general, there is a heavy dependence on diesel and, to a lesser extent, gasoline within the Guyana transport sector, which have accounted for around 28 per cent of oil imports.

4. Renewable energy

Though Guyana continues to depend on expensive and unsustainable fossil sources of energy, the country has significant endowments in renewable energy resources and is ideally suited for the development of cost effective renewable energy systems. New technologies are becoming more economical and commercially mature, uncertainty in conventional fossil fuels and other inputs are creating “increasing risks” for future electricity costs, and “old assumptions and myths” about economies of scale in power generation are dissipating.

⁷ Ministry of Public Works and Communication/EDF (December 2005). Guyana: Transport Sector Study Available at: <<http://ufdc.ufl.edu/UF00084207/00001/allvolumes>>

⁸ A 2005 estimate placed the number of “licensed buses and minibuses” operating in Guyana at around 8,000.

- **Solar energy:** Guyana is located near the equator and receives a daily average radiation of around 5 kWh per m² per day on horizontal surfaces. As such, for many years, solar energy has been used for several purposes such as drying agricultural produce and for electricity production. In several hinterland communities, solar energy is used for water pumping, two-way radio transmission and telecommunication and more recently, electricity production.
- **Hydropower:** There are several sites that have potential for hydro-power development. A total of sixty seven (67) potential sites ranging from a few kilowatts to over 2,000 MW, with a total output capacity of 7,000 MW have been identified and hydropower serves as a significant plank within the Guyana LCDS. Plans to build a 165 MW hydropower plant on the Amaila Falls in west central Guyana, near Linden, are underway.
- **Wind energy:** Historically, wind energy has been used in Guyana along the coastline for battery charging, and in the hinterland areas for pumping water. Many of the wind chargers fell into disuse however as diesel produced electricity became more reliable, whilst wind pumps fell into a state of disrepair due to a lack of replacement parts and expertise to maintain the equipment. Additional long term wind flow measurements are required to assess the technical feasibility of large wind farms within the country as sufficient baseline data does not exist.
- **Bioenergy/biofuels:** Guyana has significant experience in using biomass and biofuels in electricity generation. Today, there is large scale electricity generation at each sugar estate from burning bagasse and raising steam which is fed to turbines for self generation of power, as well as for sale to the grid. Sugar cane bagasse and rice husk continue to provide options for additional power generation and both residues can be used as alternative, low carbon technologies that can be used to provide back-up thermal capacity even within the low carbon economy that favours hydro projects. The first experience in commercial scale cogeneration within Guyana was the Skeldon Cogeneration Project (that produces 8.0 MW of power for the sale to grid) by GUYSUCO. There are also significant opportunities for liquid fuel production from biomass but this area has remained relatively under developed despite significant interest from potential investors and developers, mostly based in Brazil and Trinidad and Tobago.

5. The business economy

The experiences with reliability, results in customer demand frequently exceeding the “available generating capacity”. In effect, several businesses in Guyana have self-generation capacities, which are estimated to be around 70 MW.⁹ The issue of electricity supply is significant for businesses and, in a recent survey, 40.49 per cent of Guyana businessmen cited the unreliability in electricity as a “primary constraint to their operation”. This is compounded by the difficulty in obtaining access to utility grid connection, which is reflected in the Ease of Doing Business Ranking where Guyana ranks 148 out of 185 countries in access to electricity. There are seven processes that take an average of 109 days before connection to the grid is provided (see Annex 3). Despite improvements in other business processes, such as the ease of business start-up, ease of access to credit and the ease in cross-border trading, the issue of electricity access remains to be improved.

⁹ Renewable Energy and Energy Efficiency Programme (REEEP) Policy Database (2013)

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 within the project countries – Belize, Curacao and Guyana;
- The identification of gaps and barriers that prohibit the implementation of renewable energy and energy efficiency products and services within the project countries and;
- 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.

1. Desk assessment

The methodology comprises a three-step process (illustrated in Diagram 1).

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.

2. Analyses

A number of analyses were performed in order to obtain indicators for the Guyana 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 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 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.

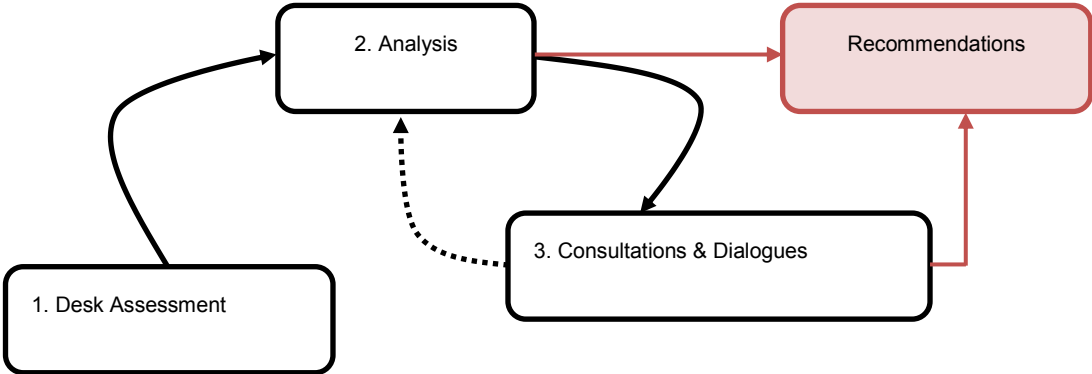
3. Stakeholder consultations and dialogues

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 Guyana 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 Guyana's energy needs.

The answers elicited there from 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 1
METHODOLOGY PATHWAY**



Source: Author's illustration.

III. Identification of barriers to implementation of renewable energy technologies

A. Preamble

The need for enacting policies to support renewable energy is often attributable to a variety of barriers or conditions that deter investments in the sector. The main barriers to renewable energy include, inter alia:

- Subsidies (direct or indirect) for the conventional forms of energy;
- High initial capital costs, which are not sufficiently assessed against fuel price risk;
- Imperfect capital markets that favour traditional production and supply energy;
- Lack of skills and information on renewable energy systems and;
- Poor market acceptance of renewable technologies, which invariably results in technology prejudice, increase in financing risks and high transaction costs.

In essence, these barriers may be classified as market distortions that unreasonably “discriminate” against renewable energy systems, which therefore increase the cost for renewable energy use relative to that of conventional sources. Fiscal policies are usually required to “rebalance” the market and in so doing, account for the hidden costs in the traditional energy sector. Additionally, there are a variety of administrative and institutional factors (non-financial and non-technical barriers) within the various sectors that may be suitably addressed by regulatory policy solutions. The reduction or the removal of no-cost barriers may be achievable in the short term within the repertoire of instruments that can be used to promote renewable energies.

B. Overview of main findings

The main result of this study is that the “current” Guyana energy policy which was formulated in 1994 has not been amended legislatively to take into account the evolving energy environment with respect to

employment of alternative sources of energy. Much of the recent legislation related to the energy sector has been introduced through the Electricity Sector Reform Law (1999), which details further responsibilities of GPL and the processes for the setting of tariffs and extension of electricity to new customers. Other subsequent articulations that provide an additional framework for the energy policy include Chapter 39 of the National Development Strategy (NDS, 1996) – with subsequent modifications contained in Chapter 7 of the Revised NDS (2000); the Hinterland Electrification Strategy (2007); the Power Sector Policy and Investment Strategy (2010); and the Low Carbon Development Strategy (LCDS, 2010). In particular, the LCDS seeks to identify sustainable mechanisms for “low carbon growth” within Guyana as part of a wider global GHG mitigation effort. Of significance are the planned investments in: (i) a 165 MW hydropower facility at the Amaila Falls for renewable electricity production; and (ii) an improvement in the fibre optic infrastructure for increasing broadband internet access to support additional technology driven information and communication platforms within Guyana.

However, there are still many energy and energy related issues that remain to be framed in a comprehensive National Energy Policy (NEP). Though a policy framework is contained within the GEA Strategic Plan (2012- 2016), many stakeholders are not sufficiently acquainted with the various facets and in this regard, there needs to be an awareness building programme to facilitate implementation of the policy. The recent CARICOM Regional Energy Policy (2013), which was passed at the 41st Special Meeting of the Council for Trade and Economic Development (COTED) for Energy in March, provide a context within which the current NEP may be revised.

This study also found that, over the past two decades, much of the debate concerning the promotion of renewable energy technologies in Guyana has been focused on the provision of financial support schemes for attracting investments for renewable power generation and, more recently, on small distributed renewable generation systems. Indeed, these are crucial issues which will continue to command serious attention in the future and, if properly administered, must engage judicious cost accounting that allows only the selection of the options that deliver macroeconomic benefits for incentives, especially during this period of fiscal stress. Meanwhile, the importance of tackling non-financial and non-technical barriers to renewable electricity, heat and transport has traditionally been undervalued and remains underdeveloped. Though there has been some recent focus on addressing capacity building and public awareness, administrative hurdles continue to play a significant role in deterring RE investments. These include:

- Improved clarity and transparency for RE project approval;
- Planning delays and restrictions;
- Lack of coordination among different authorities and agencies;
- Long lead times in obtaining authorizations and;
- Costly process for obtaining permission.

In principle, all renewable energy generation technologies, even small-scale systems, are impacted by administrative barriers, which, one way or another, increase transaction costs for the RE developer and the society as a whole as there are many authorities involved in an (incoherence of) administration of procedures and framework. Barriers linked to large scale project approval, grid connection and access for distributed generation (DG) systems, as well as a perception of “under-regulation” of the electric utility are especially significant.

As it relates to the transport sector, there has been some effort in understanding or addressing the use of fossil fuels for road, air and maritime transport in Guyana. According to the GEA, “the Government of Guyana will continue to aggressively pursue the opportunities for increased biofuels production (biodiesel and bioethanol) for export and local consumption”. Nonetheless, the transport sector continues to account for 28 per cent of fossil fuel imports and is second only to the power generation sector (which is 33 per cent). The priorities of the sector have been focused on the improvement of road infrastructure and the affordable movement of people and goods, especially within the northern population belt. Work related to the introduction of biofuels into the liquid fuel supply chain

for the transport sector has, thus far, been limited to small, pilot demonstrations conducted by the Institute of Applied Sciences and Technology (IAST). More recently, the GEA indicated an intention to propose legislation to revise the Guyana Revenue Authority (GRA) Act to incentivize the importation of energy efficient vehicle technologies. However, reference to renewable energy technologies have been limited to pilot scale demonstration of hybrid electric vehicles (HEV) and flex fuel vehicles (FFV) in some government agencies. Nonetheless, opportunities for Electric Vehicles (EV), especially when based on a renewable energy electric grid, biofuel (bioethanol and biodiesel) and alternate fuel (LPG) vehicles continue to persist. Within the sections that follow, specific regulatory and fiscal barriers that hinder renewable energy power generation and renewable energy vehicle technology use are identified.

C. Electricity

1. Barriers impacting on the use of renewable energy technologies

Within Guyana, the regulations with direct applicability for the electricity sector are:

- Hydroelectric Power Act and Regulations, 1956;
- Hydroelectric Power (Amendment) Act, 1988;
- Electricity Sector Reform Act, 1999;
- Public Utilities Commission Act, 1999;
- Electricity Sector Reform (Amendment) Act, 2010;
- Public Utilities Commission (Amendment) Act, 2010.

The electricity sector falls under the portfolio responsibility of the Prime Minister the primary focus of the country's electricity strategy has been the provision of basic electricity services to isolated and distant communities¹⁰ as well as the provision of affordable services to residences and businesses. This has significantly challenged the ability of the utility, GPL, to operate on a commercial profit/loss basis and government frequently provides subventions to assist with capital development and operational costs. Integrating power from solar, wind, ocean and biomass will require the utility to develop control systems that will utilize additional skills than those which are typically used within the traditional fossil based generation system.

The capacity that exists within the utility is sufficient for energy planning that is related to least cost expansion of electricity generation and management of the power sector in accordance with the priorities of the Government in terms of access and affordability. As a consequence, there has been a focus on affordable, utility scale renewable energy power, which can directly replace fossil fuel generation, and there are efforts to develop hydropower. Also, there has been some degree of promotion of small scale distributed RE technologies but this has been limited to the installation of solar PV systems in the hinterland regions. In general, efforts to integrate RE into the Guyana electricity sector have not been market driven but are based on stand-alone government projects. As a consequence, the country's strategy for renewable energy power generation has not been framed within the context of a modern energy policy. The following barriers apply to the generation of electricity from renewable energy sources.

¹⁰ See Hinterland Electrification Strategy < Available at <http://www.electricity.gov.gy/Hinterland%20Electrification%20Strategy.pdf>>.

a) Regulatory

i) *Lack of a modern energy plan that integrates renewable energy power generation into a Sustainable Energy Policy for Guyana*

Though there is some degree to which alternative sources of energy is captured within the LCDS, modern advancements in renewable energy technologies and options, as well as the current state of the Guyanese and global economies need to be considered.

ii) *Lack of a long-term strategy for grid expansion that seeks to make timely and deliberate technological enhancements to the existing grid so as to facilitate the systemic addition of renewable energy*

These are major infrastructure projects which need to be carefully planned requiring a paradigm shift from the current method of forecasting which is limited to five year rolling plans.

iii) *Lack of spatial planning for RE systems*

The planning system's focus is expected to be on provision of guidance on the locations where particular renewable energy technologies are most appropriate as well as the shaping of criteria for determining the project applications that are in keeping with the national sustainable energy strategy. This will serve in particular, to reduce transaction costs associated with project sitting and environmental permitting.

iv) *Lack of institutional capacity for project evaluation and approval*

There is a limited technical expertise for dealing with renewable energy issues within the respective government ministries and agencies, which compromises efficiency in processes. This has served to limit the opportunity for diversification and RE integration continues to focus on utility scale hydropower and off grid solar PV.

v) *Weak regulation of the electricity sector*

The regulator (PUC) seems to have considerable legal, personnel and financial constraints, which limit its ability to fulfil its role in regulation of the electricity sector and in setting service standards and tariffs.

b) Fiscal

i) *Lack of a modern energy plan that integrates renewable energy power generation into a Sustainable Energy Policy for Guyana*

Renewable energy power feeding into the GPL grid is unlikely to receive “full credit” for the value of the electricity generated as: (i) current fossil based prices are “artificially low” and will serve as a distorted baseline; and (ii) contribution of renewable energy to generating reliability and fuel savings are neither accounted nor compensated.¹¹

ii) *Transaction costs are typically high, especially for small, grid-scale renewable energy projects*

Many projects, such as wind, waste to energy, 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 feasibility. The absence of a recent assessment of renewable energy resources within Guyana as well as the burdensome utility interconnection requirement will add to the transaction costs.

2. Barriers specific to large renewable energy systems

a) Regulatory

Administrative procedures for the addition of utility-scale RE generation to the grid need to be updated. In the absence of a legal framework that delineates the “rules of engagement” for addition of utility scale renewable energy sources to the grid, the utility will continue to negotiate Power Purchase Agreements (PPA) on an ad hoc basis, which makes it difficult for potential project developers to plan and finance projects on the basis of transparent and consistent rules.

¹¹ The case of GUYSUCO, which is the only renewable IPP was particularly useful toward this conclusion.

b) Fiscal

There is a lack of institutional incentives for renewable energy technologies that deliver favourable Levelized Cost of Electricity (LCOE) to the country.

Without reliable information on the relative costs and benefits of the available renewable energy technologies, it is difficult for the government to accurately assess which technologies are the most appropriate for the various circumstances and decision makers may therefore not fully understand the opportunities.

3. Barriers specific to micro and small renewable energy systems**a) Regulatory**

There is an absence of legislation and mechanisms for grid connection and access.

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 RE is absent in Guyana and have the potential to provide significant stability and reliability to the grid.

b) Fiscal

There is a lack of incentives for third-party financing of building integrated RE technologies.

The development of building integrated RE systems are incentivized through recent Customs and Value added Tax (VAT) Acts that provide exemption for some small scale RE technologies. However, the more integration of RE technologies, such as solar PV, hybrid PV, and solar thermal systems for cooling and water heating, may add 10 – 20 per cent to building costs. Meanwhile, there is limited recognition among mortgage banks and insurance companies for enhanced lifecycle of buildings with RE technologies compared to the BAU scenario and the usual formulae are applied to the calculation of loans and insurance premiums. In cognizance of the macroeconomic benefits of distributed RE applications it may be necessary to consider incentivizing the financial sector. The traditional approach of incentivizing end users through tariff and tax exemptions is, in cases, not sufficient to reduce the cost barrier for RE technologies.

4. Barriers specific to avoided generation systems**a) Regulatory**

There is low qualification and a lack of reliable certification schemes for installers.

A typical barrier that continues to persist is also the lack of trained and competent installers for avoided generation systems, such as solar water heaters (SWH), in most markets. This is particularly relevant for single-family houses, where installers can often act as the decision-maker and may motivate potential users to buy “avoided generation” technologies. If they are not specifically trained, they may discourage consumers or even provide a poor installation, with a negative impact on the functionality of the system and on the image of the technology.

b) Fiscal

Spilt incentives happen when those responsible for paying energy bills are different to those making capital investment decisions.

Many “avoided generation” systems, such as solar water heaters are ideally suited to hospitals, hotels and apartment buildings. However, frequently, the people who make the investment happen (substitute or replace grid based energy services with off grid alternatives) are not the ones who realize the electricity savings. In Guyana therefore, building design and the choice of energy technologies are influenced by factors that are deemed more expedient to the developer and there is neither the requirement nor incentive for project developers to include building operating and maintenance cost in bid tenders.

D. Transport

Transport is central to the daily life of the country. It permits manufacturers to assemble the inputs needed to produce their goods, it connects producers to consumers and it brings people to work, to school and makes possible a wide and varied range of leisure and business activities. Expenditure on transport accounts for a major part of people's personal budgets, and is an important component of the final price of most agricultural products and minerals. A significant component of transportation expenditure goes towards the purchase of fuel. Although road transportation is dominant, various other forms of transportation (water and air) play vital roles 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 efficient energy practices therein.

The transport sector is responsible for 28 per cent of fossil fuel use and is therefore the second largest emitter of GHG emissions, second to the energy industries, and is responsible for nearly 20 per cent of emissions. These features apply primarily to energy use for domestic transport as most of the vessels that are engaged in international air and marine transport typically purchase their fuel outside of the country. Despite the importance of the transport sector to energy end use, much of the energy planning has largely focussed on the electricity sector because energy planning has largely been dominated by the public utility. Activities within the transport sector have largely focussed on marketing and distribution of marine and land vehicles, as well as the transport fuels to power them. Further, expansion of road infrastructure within the populated areas and increasing the available vehicles for public transport have provided much of the backbone for transport management. The sector is one that is largely disaggregated with many diverse actors ranging from the Ministry of Public Works, which has portfolio responsibility for the transportation, to motor vehicle and fuel distributors, to public, commercial and private vehicle operators.

1. Barriers affecting energy efficient vehicle technology

a) Regulatory

i) *Subsidized fuel prices*

A primary focus of government is the affordability of fuels, which has restricted the ability of the government-owned distributor, Guyana Oil Company (GUYOIL), from charging "market rate" to customers.

ii) *Absence of minimum energy performance (MEP) requirements*

The act of subsidizing fuel rates without providing regulations, such as minimum energy performance for motor vehicles, is a barrier toward energy efficiency and the converse is true. Regulations permitting the duty-free import of vehicles (that are four years and older) without conditions for minimum energy performance are incongruent with the promotion of efficient fuel use.

iii) *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.

b) Fiscal - access of capital

Vehicles that are energy-efficient (especially hybrid EV) are sometimes more expensive to purchase than those that use alternative technologies. In Guyana, obtaining additional capital to invest in energy efficient vehicle technology may be problematic since access to capital was identified as a major challenge in the "Ease of Doing Business Report".

2. Barriers specific to efficient energy use in domestic transport

a) Regulatory - lack of transport planning

There is very little capacity within Guyana, and indeed the Caribbean, 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 limitations of road infrastructure

stymie the ability of government to provide opportunities for High Occupancy Vehicle (HOV) lanes. However, the informal nature of current operations have been effective 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.

b) Fiscal - lack of risk adjusted pricing

Motor vehicle loans are a common feature and although designed to match the ability of the borrower to repay 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 the lender (by improving his/her net cash flow) and should, but does not reduce the interest rate on the loan.

3. Barriers specific to efficient energy use in public transport and freight services

a) Regulatory - cross-border integration of transport systems

Legislation permitting foreign trucking and bus companies to operate commercially either to transport passenger or cargo to neighbouring countries or to compete directly with domestic carriers on domestic routes is absent.

b) Fiscal - split incentives

Similar to the electricity sector the issue of split incentives proves to be significant for the public transport sector. 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 may not be important to the daily operation.

4. Barriers specific to efficient energy use in maritime transport

a) Regulatory

There is very little or no regulatory push for the integration of biodiesel use into the fuel mix for ferries, river boats and other water-based freight vessels.

So far, biodiesel use in Guyana have been limited to pilot demonstrations in a number of road based vehicles (light trucks and vans) as well as farm and production equipment that are owned by the IAST.

b) Fiscal

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 (of 75 hp or less), which have the capability of using biodiesel without modification. With respect to maritime fuel, government's priority has been focussed on controlling fuel smuggling from neighbouring Suriname and Trinidad, where the unit price is an order of magnitude lower than in Guyana. The GEA manages a Fuel Marking Programme that seeks to account for the inflows and outflows of bunker fuels.

IV. Identification of barriers to implementation of energy efficient measures

A. Preamble

The government's renewable energy and energy efficiency policy position is embedded within the LCDS which aims to convert the power sector to renewable energy sources by 2020. In this regard, emphasis has been on developing hydroelectric schemes. The official Energy Policy of Guyana (1994) was approved in 1994 and advocates the replacement of imported petroleum, as far as possible, by indigenous renewable energy sources. More recently, the System Development Plan (2000) prepared by GPL, as well as its Development and Expansion Programme (2007-2011) reflect the official government position toward utilizing Guyana's renewable energy resources such as biomass and hydropower. Though programmes have provided over 11,000 households with stand-alone photovoltaic (PV) panels in the rural hinterland, there has been very little activity toward improving the efficiency with which energy is generated, transmitted and distributed. In essence, only 27.2 per cent of the energy used for power production reaches the end user. This situation is further exacerbated by the fact that many end users utilize inefficient applications, such as incandescent bulbs and low performance refrigerators, to produce energy services.

The transport sector in Guyana also offers significant opportunities for achieving reductions in fossil fuel imports. It is estimated that approximately 28 per cent of all imported liquid fossil fuels are for the transportation sector. Policies to reduce vehicle fuel consumption will need to also take into account tradeoffs among vehicle performance, size, weight, and fuel consumption. Vehicle purchasers and users have traditionally shown preference for greater vehicle performance and size, providing market "pull" for these attributes. Automobile companies and dealers compete with each other by offering ever increasing performance and vehicle size, providing the "push."

B. Overview of main findings

Much of the inefficient energy use is in the electricity sector. The high rate of distribution and commercial electricity losses suggest the need for improved efficiency in all parts of the sector. While

the GEA has indicated, through its Strategic Plan (2012-2016), its intention to pursue demand side efficiency programmes, efficiency plans on the electric utility side continue to be limited to the replacement of diesel power generation plants with hydropower. Meanwhile transmission and distribution losses are at around 31 – 32 per cent and the need for demand side management (DSM) programmes especially for households, which constitute the largest proportion of total final consumption need to addressed.

The absence of modern energy policy that comprehensively frames existing legislation that seeks to address energy efficiency issues has been noted. Nonetheless, the advances made towards incentivizing the purchasing of energy efficient technologies, as contained in the recent Customs and Value added tax (VAT) Acts that provides waivers and exemptions for “machinery and equipment for generating electricity from non traditional sources such as solar, biomass and wind”. The current legislation also supports distributed renewable energy power generation technologies for households, commercial and industrial operations. The incentives are targeted however at product purchases and have so far, failed to encourage sustainable application of energy efficient measures for the commercial and industrial sector through performance based incentives.

There is a multi-step process whereby primary energy is converted into an energy carrier (heat, electricity or mechanical work), and then into an energy service. Since people need energy services and not energy the goal of the sustainable market economy is to meet those needs in an efficient manner that requires less primary energy consumption and with low-carbon technologies that minimize CO₂ emissions. The Guyana LCDS does not pay sufficient attention to this principle and energy efficiency is typically overlooked in the various regulatory and incentive schemes, as well as in energy planning cycles.

C. Electricity

Regulations with direct applicability for the electricity sector are:

- Hydroelectric Power Act and Regulations, 1956;
- Hydroelectric Power (Amendment) Act, 1988;
- Electricity Sector Reform Act, 1999;
- Public Utilities Commission Act, 1999;
- Electricity Sector Reform (Amendment) Act, 2010;
- Public Utilities Commission (Amendment) Act, 2010.

It has been previously mentioned that GPL is a vertically integrated, government owned utility, with exclusive rights for the distribution of electricity but operating within a deregulated market for power generation. Independent Power Producers (IPPs) own and operate 45 per cent of the installed generation capacity, which is thermoelectric and the Amaila Falls Hydropower Project is also based on a PPA between GPL and a private developer, Amaila Falls Hydro Inc. However, IPPs are in the business of selling electricity and most have secured complex, take or pay PPAs, which do not require them to make investments in power generation efficiency. Generation licenses for the IPPs are granted by the Prime Minister and the terms contained within each license supersede the PUC Act, which governs the regulation of the sector. The utility, GPL, has tried to make improvements to generation efficiency or transmission and distribution losses. Between 2003 and 2008, no investments were made within the utility and during that period there were no upgrades to the generation and grid infrastructure.¹² The consequence is that the facilities have not kept abreast with current trends that promote efficient practices and currently, struggle to provide stable and reliable supply to meet customer demand. The most immediate opportunities for energy efficiency will therefore be found on the demand side.

¹² Private communication between Consultant and Guyana Power Limited, 2013.

However, the Guyana market is complex and end users benefit from a “social tariff” for electricity that seeks to keep the commodity affordable to domestic users and attractive for commercial investors. Moreover, experience has shown that the diffusion of economically superior technologies is typically gradual. Though awareness of this empirical reality make the existence of barriers for energy efficiency applications less perplexing, the Study seeks to answer the question of whether the optimal rate of diffusion is greater than the observed rate and to identify the reasons therefor.

1. Barriers affecting implementation of energy efficiency measures

a) Regulatory

i) Despite the opportunities for biodiesel use, there are no incentives for the use of renewable energy fuels within the maritime industry

The lack of adequate information about potential energy-efficient technologies inhibits investments in energy efficiency measures. Though the GEA recently launched programmes for raising awareness toward energy efficiency, the area is relatively new to consumers and will, in time, be effective.

ii) Limited decision-making authority

Limited authority among energy efficiency decision-makers in most organizations is likely to inhibit implementation of projects. The limited emphasis on energy management lead to constraints when striving to implement energy efficiency measures and many organizations lack centralized policies and processes for treating with energy efficiency. The lack of suitable inclusion of energy performance requirements in the Public Procurement Rules limits the ability to make energy efficiency decisions when purchasing goods and services for government.

iii) Split incentives

A split incentive may occur when the potential adopter of an investment is not the party that pays the energy bill. If so, information about available cost-effective energy efficiency measures in the hands of the potential adopter may be insufficient. This situation is common in residential and commercial landlord tenant arrangements or business owner manager relations. In multi division organizations in particular, the lack of sub-metering may also be classified as a split incentive.

iv) Subsidized electricity prices

A primary focus of government is the affordability of electricity rates, which has restricted the ability of the government owned utility to charge “market rate” to customers.

v) Absence of minimum energy performance requirements (MEP)

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 Building Code requirements, as well as efficiency regulations and standards for appliances.

b) Fiscal

i) Access of capital

Technologies that are energy-efficient are sometimes more expensive to purchase than alternative technologies. The process for obtaining additional capital to invest in energy efficient technologies may be a challenge and access to capital was identified as a major challenge in the Ease of Doing Business Report.

ii) 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.

iii) 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, this assumes that government is a single actor. Revenue loss seems to be a major deterrent to the embracing of some energy efficiency initiatives. There is also a perception that the government bases decisions on normal procedures and do not usually treat exceptional cases appropriately.

2. Barriers specific to energy efficiency in generation, transmission and distribution

a) Regulatory - lack of energy performance requirements

The power sector is not typically provided with operating licenses that are results-based and performance standards are typically self-regulatory. Issues such as generation efficiency and heat rate are neither conditions for the granting of licenses for generation by IPPs nor evaluating the performance of the electric utility. The PUC Act does not allow the utility regulator to set and enforce efficiency benchmarks. In fact, self generators which form a critical mass of the power generation sector are not under the purview of the PUC. Essentially, the PUC Act needs to be updated as it currently does to provide the regulatory powers that are necessary to promote efficiency within the power sector.

b) Fiscal - lack of fiscal capital

Significant losses occur throughout the process of transmitting and distributing electricity to end users with technical losses having been estimated at 18 per cent. However, the electric utility lacks the capital resources with which to undertake any significant investment in grid upgrade and the failure to realise potential savings from efficiency gains serve to further weaken its financial standing.

3. Barriers specific to energy efficiency in industrial and large commercial applications

a) Regulatory - lack of regulation for cogeneration

Increase in 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 capacity expansion. However, there are no interconnection rules that support cogeneration. Typically, industries that are engaged in cogeneration must engage in complex power purchase agreement (PPA) with the utility and seek waivers for importing efficient generation equipment.

b) Fiscal - 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 so that investment poses a risk. Such concerns have been found to be very important to decision-makers in industry and large commercial applications. Government incentives that act to reduce the investment are not available.

4. Barriers specific to energy efficiency in small commercial and domestic applications

a) Regulatory - lack of regulation for energy efficiency

Government regulations that act in support of energy use for households and small commercial applications are focussed on distributed generation technologies such as solar PV systems. Government's policies have served to prioritize the available access to electrical energy services whilst keeping electricity cost affordable. However, cost effective mechanisms that seek to reduce energy use through efficiency applications without compromising the quality of the end use service are by themselves not useful. Similar focus and priorities should also be given to management systems, such as Household Energy Management Systems (HEMS) for middle and high income residences and Energy Management Systems (EMS) for commercial entities. The cost of procuring and installing these systems may be prohibitive to normal market uptake.

b) Fiscal - split incentives

As previously mentioned, split incentives are the most significant in houses and commercial offices that have either been rented or leased, as well as in building developments in which there is very little

interaction between the developer and the buyer during the construction phase. Split incentives also apply to managerial behaviour toward commercial activities wherein energy costs may simply be passed on to customers. The split incentive is perhaps the single most influential barrier for energy efficiency.

D. Transport

Expenditure on transport accounts for a major part of people's personal budgets, and is an important component of the final price of most agricultural products and minerals. A significant component of transportation expenditure goes towards the purchase of fuel. Although road transportation is dominant, various other forms of transportation such as by water and air play vital roles in the lives of the rural populace. Though some regulations are in place, the sector is limited in terms of efficiency and there is much scope for integrating efficient energy practices within the operations.

Most importantly, a focussed vision is needed to ensure that the changes being made to the transport system are synchronised and that they are in accordance with national objectives and priorities, including those related to energy use and GHG emissions. A transport policy that highlights activities for promoting fuel use efficiency and mechanisms for the efficient movement of people and goods is critical. However, the transport sector is in a transition phase and the government is gradually moving towards reducing its direct involvement in transport operations and concentrating on policy, investment and regulatory issues.

1. Barriers affecting energy efficient vehicle technology

a) Regulatory

i) *Subsidized fuel prices*

In Guyana, a primary focus of government is the affordability of fuels, which has restricted the ability of the government owned distributor, Guyana Oil Company (GUYOIL), from charging "market rate" to customers.

ii) *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 mechanism for removing significant numbers of inefficient vehicles from circulation.

b) Fiscal

i) *Access of capital*

Vehicles that are energy-efficient (especially hybrid EV) are sometimes more expensive to purchase than those which use alternative technologies. The challenge may be in obtaining additional capital to invest in energy efficient vehicle technology and in accessing capital.

2. Barriers specific to efficient energy use in domestic transport

a) Regulatory - lack of transport planning

There is very little capacity 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 (HOV) lanes. However, 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.

a) Fiscal - lack of risk adjusted pricing

Motor vehicle loans are available and although designed to match the ability of the borrower to repay the loan, the 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 the lender (by improving net cash flow) and should, but does not reduce the interest rate on the loan.

3. Barriers specific to efficient energy use in public transport and freight services

a) Regulatory - cross-border integration of transport systems

Legislation permitting foreign trucking and bus companies to operate commercially either to carry passenger or cargo to neighbouring countries or to compete directly with domestic carriers on domestic routes are absent.

b) Fiscal - split incentives

Again, the issue of split incentives proves to be significant for the public transport sector. 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 necessarily be the owner.

4. Barriers specific to efficient energy use in maritime transport

a) Regulatory - subsidized transport costs

Government is spending substantial sums of money on providing subsidized transport services to hinterland areas – particularly through the river ferry service – on the grounds that this is beneficial to the economy. However, the provision of such services appears to be borne out of an obligation of tradition rather than on an objective assessment of need. The lack of an explicit public service obligation (PSO) makes it difficult to establish whether the level of subsidy is justified and whether the service could not be more efficiently provided by a more “business oriented approach”.

b) Fiscal - limited capital for investment

Government has not focused on direct investment in more modern, efficient maritime transport systems that will provide better fuel efficiency than the present fleet. The lack of maintenance funding is acute in the river ferry sector in particular. Government spending is more targeted toward fuel cost than on issues related to operational efficiency, such as systems maintenance and fuel switching.

V. Benchmarking and quantitative aspects

Modern methods of leadership suggest that it is important for governments to lead by example, establishing 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 Guyana is the operation of the public utility, GPL. Benchmarking provides an opportunity for the establishment of unambiguous targets and indicators for:

- Renewable energy power generation (per cent);
- Power plant heat rates (kWh/Btu) and;
- Transmission and distribution losses (per cent)

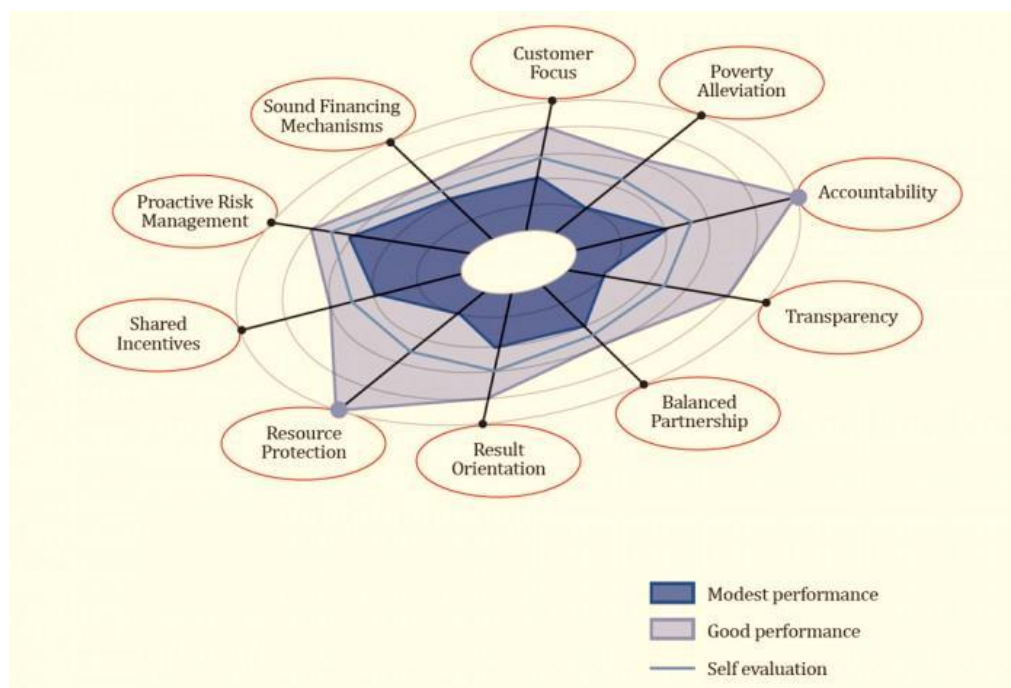
On the demand side, a number of opportunities also exist for examining target indicators for energy efficiency within various economic sectors in Guyana and although international benchmarks can provide useful information, special attention must be paid to issues associated to the existence of different operating environments in terms of physical, geographical, institutional and regulatory frameworks. For instance, the District of Colombia, 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 and;
- 163 kBtu/ft² for hospitals and public lodgings

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's 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 (GEB) 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 (see diagram 2).

DIAGRAM 2
GEB GRADING TOOL FOR PUBLIC PROCUREMENT BENCHMARKING



Source: Global Energy Base <http://www.globalenergybasel.com>.

Government procurement should be considered an essential demand side strategy for incentivizing and incubating innovation for growing the sustainable energy markets. The energy efficiency and renewable energy potential of the country will be most reasonably realized within the creation of a sustainable environment within which government is a primary participant.

VI. Recommendations

A. Renewable energy

The need to rapidly transition the energy economy of Guyana toward more sustainable indigenous, energy sources is clear. The country faces a series of interrelated energy challenges. The grid will require new electricity generation in order to meet mid-term demand growth and to replace aging infrastructure. Also, the country does not have a well diversified energy portfolio and is exposed to fossil fuel price volatility. Under the LCDS there is an expectation that current fossil fuel-based thermal generation plants will be replaced by hydropower beginning with the 165 MW Amaila Falls project. However, the importance of diversifying generation sources should not be underestimated.

The improved competitiveness of renewable energy is being driven by a virtuous circle in which their rapid deployment, encouraged by support policies to overcome barriers to their use is leading to significant and rapid reductions in cost for many renewable energy technologies. These falling costs suggest that policy makers should take note that the cost of supporting renewable energy technologies with well designed packages of fiscal incentives is declining over time.

The overarching recommendations are as follows:

1. **Revise and update the National Energy Policy (NEP) for Guyana**

A comprehensive overarching policy that targets security of energy supply as its main priority, linking this supply to the country's low carbon strategy is recommended. The NEP will likely draw from existing policies that currently act in support of the sustainable energy sector, including the CARICOM Regional Energy Policy, and should include sub policies for:

a) **Electricity**

This is expected to outline the regulations, legislations, incentives, guidelines and fiduciary processes for addressing issues of electricity production, distribution, and consumption. This should include: (i) grid integration of renewable energy systems; (ii) interconnection of distributed generated systems and Net Billing; (iii) renewable energy and energy efficiency targets for utility scale electricity production; (iv) transmission and distributions systems including smart grids; (v) utility obligations for demand side management; (vi) electricity tariffs, charges and quality of service; (vii) regulation; and (viii) planning.

In particular, the role of markets as opposed to 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 (IRP) within the electricity sector.

b) Transport

This should deal with the social, economic and environmental development, functioning and performance of the transport system. Transport is a key mechanism for promoting, developing and shaping the Guyanese economy and requires an extension of the legislations and regulations from one that is currently focused on safety, infrastructure and ownership to one that is based on efficiency and management. The policy, while continuing to address issues such as (i) provision, maintenance and upgrade of road and rail infrastructure; (ii) urban transit systems; and (iii) public transport tariffs, charges, quality of service and regulation, should also seek to promote (iv) transport demand management; and (v) planning. The role of markets and centralized planning is important.

- The other major sub-policies should be:
- Renewable energy
- Agro-energy and biofuels
- Energy efficiency

2. Establish a standing committee of inter-agency operatives for coordinating energy planning issues among government ministries and agencies

This body will support the GEA by highlighting and providing sectoral recommendations for addressing issues within the energy sector, so as to ensure congruence and cross sectoral coordination. The lack of public sector communication and coordination has been identified as a significant inhibitor to the progress of the work of the energy sector. The committee should constitute representation from government ministries and agencies with responsibility for energy, transport, agriculture, environment and tourism as well as the public utilities, standards bureau and the development bank. The precise terms of reference and scope of the committee can be determined through consultation among stakeholder agencies.

3. Strengthen the capacity and mandate of the Guyana Energy Agency

Capacity building should include:

- Full responsibility for energy policy and energy planning with a re-examination of reporting procedures and fixed revision dates for policy and target revisions;
- Strengthening of the Statistics Division to include responsibility for periodic publication of Energy balances and other target indicators, including public sector indicators and the maintenance of energy information systems (EIS) for the provision of data for judicious decision-making that is related to the energy sector;
- Creation of a sub-division with primary focus on renewable energy, energy efficiency, policy evaluation and public education. This will include the presence of a One-stop Office for potential investors that may provide information on commercially-accessible renewable energy resources as well as energy efficiency applications and opportunities for various end-users;
- Creation of a Projects Unit, staffed by personnel with the capacity to focus on and prepare Project Proposal Documents that are aimed at attracting grant funding for demonstration projects that will provide suitable “concept proofs” for technology transfer and innovative use of renewable energy and energy efficiency systems;

- Creation of a Rural Fuels Project, which seek to develop and manage the sustainable production of biodiesel in hinterland communities through the transfer of promising, emerging technologies for Biomass to Liquids (BtL). The biofuel that is produced is expected to integrate seamlessly into the energy sectors for the respective communities by directly replacing diesel use in power generation, as well as road and maritime transport.

The capacity for standards and testing should be consolidated in a single agency, especially in circumstances where resource availability is limited. Given that the GBS is expected to take on the responsibility of measurement and verification of standards for biofuels, as well as the monitoring of appliances for labelling and energy performance, it may be useful to create a transitional mechanism for building that institution and the capacity therein to handle the demands of a modern and effective national standards body.

More specific recommendations as follows:

a. Electricity: there is urgent need for regulation strengthening

The PUC is responsible for monitoring and enforcing operator compliance with standards and targets set by the Office of the Prime Minister. The PUC is responsible for monitoring and enforcing operators' compliance with commitments emanating from licenses and standard terms and conditions for operations, including operating standards and performance targets and development of expansion plans, handling consumers' complaints and advising OPM on these issues. The PUC is also responsible for determining and approving tariffs charged by public suppliers, even though, in GPL's case, tariffs are determined by a rate setting formula incorporated into GPL's license and the First Schedule of the 1999 Electricity Sector Reform Act (ESRA). Most 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 Guyana, the regulator seems to have considerable legal, personnel and financial constraints, all of which limit its ability to fulfil its role.

Establishment of a privately-financed, independent regulatory body is a vital first step to unbiased energy regulation. The PUC Act should be further amended to accommodate the recommended shifts, including financing from energy levies charged to utilities sector and its mandate include the request for and approval of addition of new generating capacity, including RE. These new powers will require institutional strengthening of the PUC. The model of the Office of Utilities Regulation (OUR) in Jamaica can provide useful guidance.

b. Renewable energy resource assessment

The last renewable energy resource assessment for Guyana was conducted in 1999. Since then some attempts have been made to continue this process on a case by case basis as part of the techno- feasibility requirement for projects. There is need to update the latest study to produce country wide renewable energy assessments, which include the location of commercially developable RE resources in Guyana. This will reduce the transaction cost to external developers.

c. Finalise and introduce legislation for net billing

There remain major barriers to scaling up renewable energy. Regulatory uncertainty has been a major complaint among renewable energy project developers and investors who find it difficult to commit millions of dollars when there is a risk that policies will change during a project's lifetime and jeopardize ROI. While banks still play a major role, large developers are increasingly working with third party investors. But these investors often do not want to be tied to a project for the entire fifteen to twenty year life of a Power Purchase Agreement (PPA) and are structuring deals so these parties can exit after five or six years. 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.

d. Provide fiscal support for avoided generation technologies

In instances where small scale renewable energy applications are considered, there seems to be a focus on electricity generation applications and as a consequence, attention is paid mainly to distributing RE generation systems such as solar PV. However, avoided generation technologies will directly reduce

consumption of electric grid power in the same way RE electric generation technologies increase useable energy at the customer's 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 PV system that produces 4,000 kWh. There is greater need to make legislative provision, through specific tranches of funding and integrated planning, for renewable energy cooling and heating devices.

e. Transport: introduce biofuels blends into the marketing and distribution matrix for transporting fuels

There is need to develop legislation for introducing the market to fuel blends that constitute limited amounts of biofuels, inter alia, gasoline with 10 per cent ethanol (E10) and diesel with 10 per cent biodiesel (B10). The experience of the IAST pilot programme may be used to model a roll out of this in the country. This will facilitate the "surgical" introduction of biofuels into the transport fuel supply matrix but without the need for costly vehicle engine retrofits to accommodate the change. Conventional vehicles are tolerant of up to 20 per cent biofuel mix and the activity will facilitate direct fuel replacement within the existing vehicle stock.

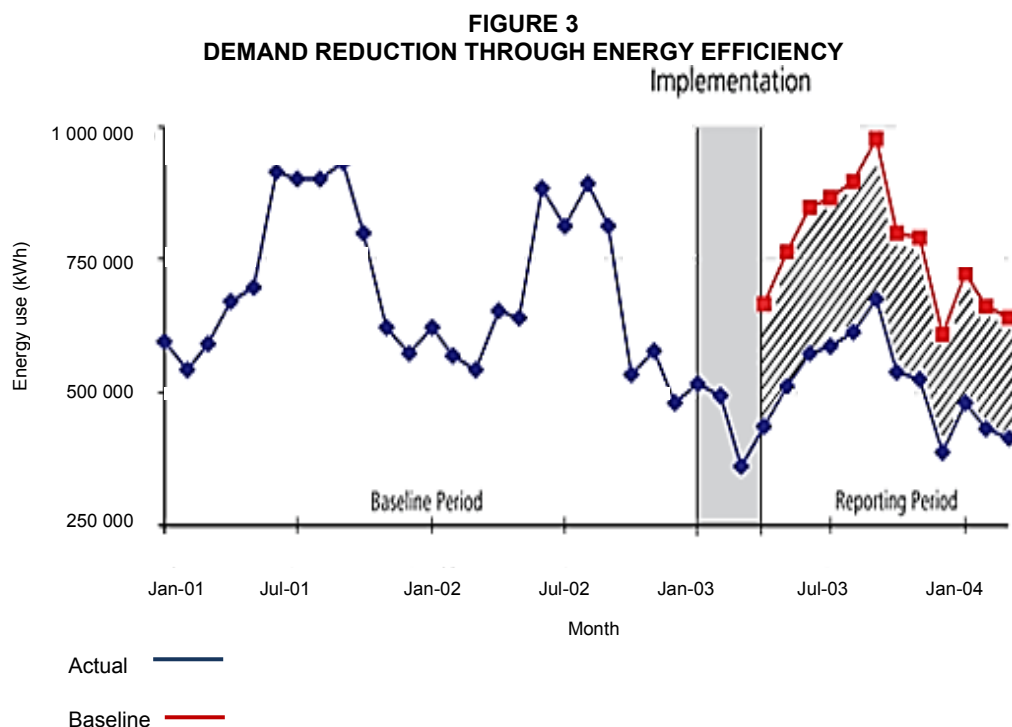
f. Introduce incentives for flexi-fuel vehicles (FFVs) and alternate fuel vehicles (AFVs)

In accordance with an original proposal from the GEA, it is recommended that legislation to facilitate the introduction of a pilot fleet of FFV Guyana should be passed. This will include exemptions from Custom Duties and VAT for the vehicles. The demonstration should be centred on fleet vehicles and baseline data that are collected and will be utilized to inform future decisions on FFV. It will be useful for car distributors to be engaged in the pilot if real market indicators are to be sufficiently captured.

B. Energy efficiency

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 which involve relatively little technical risk. However, it has long 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 hidden costs that are difficult to capture within traditional energy-economic models. However, 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 application of energy efficiency technologies which cost around an order of magnitude less (around US\$ 250 per kW) than an equivalent capacity for renewable energy power generation (US\$ 2,500 per kW), is complementary rather than adversary to renewable energy. Reduction of energy use to optimum levels through the application of energy efficiency technologies and methods serves to significantly reduce the energy demand that needs to be filled by renewable energy generation (see figure 3).



Source: EIA, 2013.

The overarching recommendations for targeting barriers to energy efficiency in Guyana are the following:

1. Integration of energy efficiency into public procurement regulations

The ability of Guyana to suitably implement an 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 (MEP) Certification of public buildings, in particular for office buildings, schools and hospitals. A pilot programme to study same may be developed with support from donor agencies. Aspects of this may tangibly integrate a study for third party ESCO financing.

2. Introduction of minimum energy performance (MEP) standards for building, equipment, appliances and vehicles

MEP 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 to 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, would be done through an initial voluntary scheme that simultaneously provides guidance towards consumer awareness on energy use and benchmarks for fiscal incentives toward efficient appliance and equipment purchase.

Under this mechanism, there are opportunities for bringing additional energy efficient and avoided generation technologies under the current VAT and Duty Exemption Scheme. The success of the programme will be dependent on the degree to which monitoring, as well as penalties and enforcement for breaches, are instituted. There are opportunities for cooperation with the Eastern Caribbean Efficiency Labelling Programme (ECELPL) in OECS countries and the Energy for Sustainable

Development (ESD) that includes the OECS as well as Belize and Trinidad and Tobago. Frameworks for energy efficient building codes and appliance standards and labelling programmes are being developed under the respective projects.

3. Energy service companies (ESCO) financing for energy efficiency

Without access to financing options the energy efficiency markets in Guyana will remain small. 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 EE markets, which will require direct government intervention. The support of multilateral global and regional funding facilities, such as the IADB and CDB respectively, will be required and government support may lead to the introduction of a number of Blended Grant/Loans that will capitalize to financial institutions or third-party financiers. The legislation that is required for the establishment of ESCOs should receive serious consideration and there is opportunity for Guyana to participate in current regional and sub regional projects in this area. The SIDS DOCK, of which Guyana remains to become a signatory, is one such modality.

a. Electricity: mandate energy efficiency targets for utility-scale generation as well as transmission and distribution

Regulation of the energy sector needs to be improved as competition is non-existent and the tariffs are below market rates. This situation has caused the electricity sector to be slow in adapting to and exploiting new technological opportunities for efficient generation, transmission and distribution of power. The high and unpredictable cost of imported oil has narrowed focus on fuels. However, the substitution of fossil based thermal plants by hydropower will not be enough. It has been predicted that within three years, under the BAU scenario, the 165 MW capacity of the Amaila hydropower plant will be exceeded. Whilst there is agreement that fuel cost is a major problem facing the electricity sector there is need for deeper reform of its operations. 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. Further amendments to the Electricity Sector Reform and the PUC Acts should be done to reflect same, with the responsibility to evaluate and monitoring compliance becoming a function of the PUC and the attainment of targets linked to the performance contracts of managers.

b. Transport: conduct an assessment of the transport sector as a precursor to the transport policy design

An assessment of the transport sector that was done in 2006 reflects the sector as it was nearly ten years ago when the price of oil on the global market was around US\$ 40 per barrel. At that time the assessment did not address issues related to energy except where it was linked to efficiency in movement of people and goods. Also, since the preparation of that assessment, significant shifts have occurred within the economy. It is recommended that a detailed assessment of energy use within the transport sector be conducted to include the identification of opportunities for improved efficiency in vehicle technology, renewable and alternate fuel use and transport demand management. Transport demand management 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 MEPs 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.

c. Establish import tariff regime that reflects vehicle efficiency

The current import tariff structure is at best neutral towards vehicle efficiency. In fact, the eligibility of vehicles that are over four years old for Duty and VAT Exemptions threatens vehicle efficiency as the most significant technology advancements towards same occurred over the last five years, when the price of oil reached record level of US\$ 148 per barrel in 2008. Further, a tariff regime that supports vehicle efficiency should also provide disincentives for inefficient vehicles. This proposal is for an assessment towards the establishment of a vehicle tariff structure that suitably reflects renewable and efficient vehicle technologies. The structure is expected to incentivise vehicles with high efficiency

indicators (such as miles per gallon) and suitably categorize renewable energy vehicle technologies, such as HEV, EV and FFV.

C. Progress and next steps

The development of a thriving market for sustainable energy in Guyana is mostly stymied by the application of subsidies (mostly indirect) to the sector and the persistence of government in using pricing mechanisms for electricity and transport fuels as a means toward redressing the challenges of affordability faced by the poor and also to drive down economic production costs. While an immediate removal of the subsidies will create economic shock and is therefore not desirable, strategic changes within the existing energy economy have the potential to reduce government expenditure on these subsidies. With respect to energy efficiency in particular, reduction in end-use consumption will, if properly managed, result in a reduction in the use of expensive, imported fuels for electricity generation and transport, which redound to the reduction in the subsidy amounts. This relieves the government of some of the fiscal burdens associated with same. Otherwise, the following apply: The strategic changes can serve to (i) attract new capital inflows to (and lessening capital outflows from) the energy economy and (ii) create a shift in paradigm in which various sectors of the economy exhibit greater interest in their energy use and options for reduction.

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 strengthening of the GEA and the PUC, as well as broadening the participatory process for energy planning.

VII. Conclusions

Barriers to renewable energy and energy efficiency in Guyana are similar to those in other developing countries and also similar to those in developed countries, but are more pronounced. The brain drain issue has been previously highlighted. Difficulties in accessing capital are also common especially for smaller firms and lower to middle income households. While this is partly a consequence of the hidden costs that are associated with various components of the sustainable energy project cycle, it tends to be exacerbated by the deficiencies within the financial sector. The limited knowledge of the technical risks associated with renewable energy and energy efficiency projects limit local investments and opportunities for foreign capital are affected by the high transaction costs that are a consequence of the limited availability of in country expertise. This should be an area for some amount of serious focus, alongside the strategic removal of energy subsidies which continues to undermine the economic case for improved energy efficiency and increased renewable energy use.

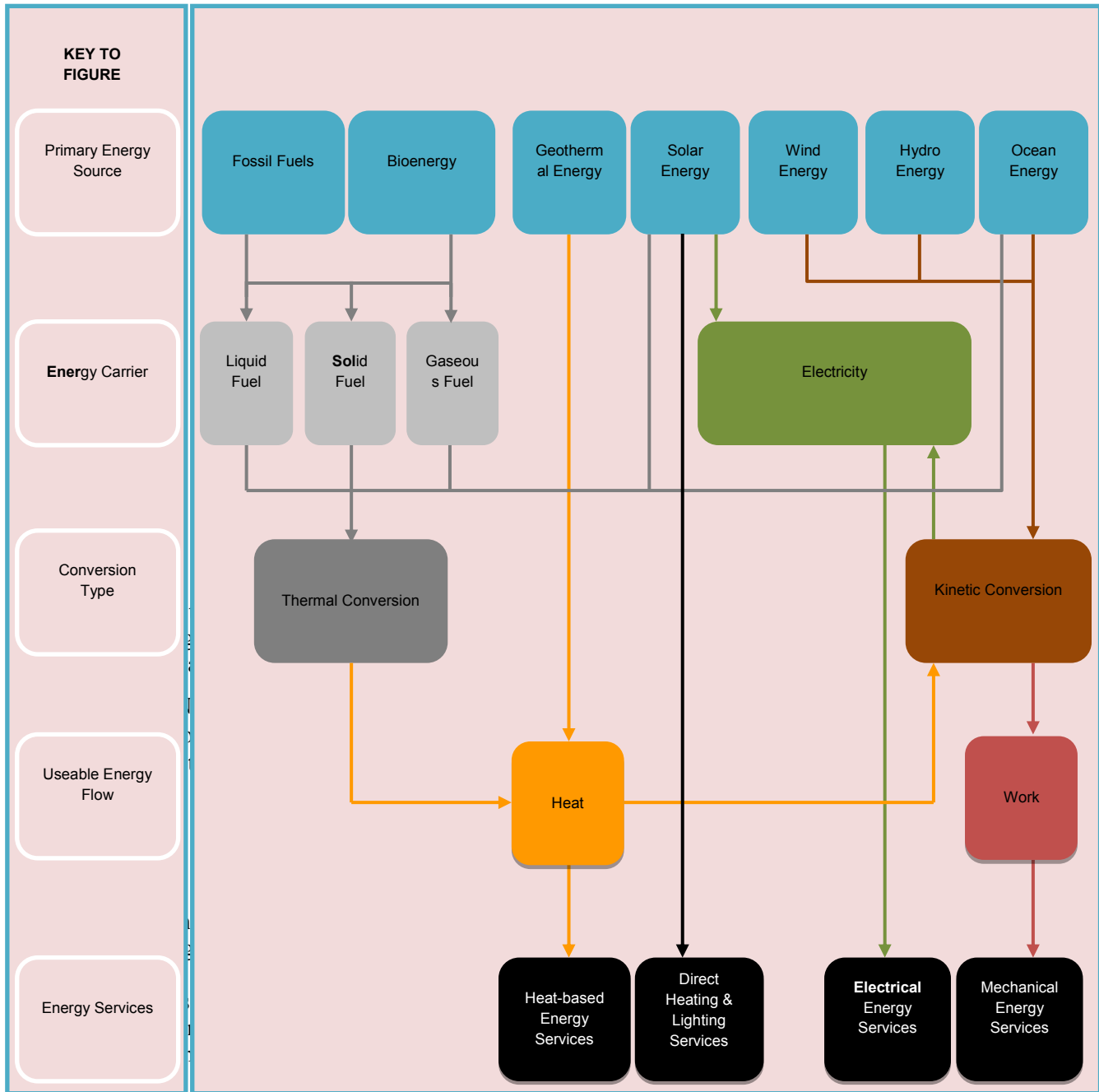
Planning for renewable energy use within the Guyana energy sector remains wedded to utility scale hydropower replacement of fossil based thermal generation, as well as remote solar PV systems. But the Levelized Cost of Electricity (LCOE) is indicative of other cost effective options (table 2). Moreover, communities do not require electricity but rather use electricity as a means of providing a desired energy service as electricity is an energy carrier (see figure 4). The substantive goal of the Government of Guyana should be related to the creation of a country in which there is equitable availability of energy intensive goods and services to its people that harmonizes economic growth, social progress and environmental stewardship.

TABLE 2
PROJECTED GLOBAL LEVELIZED AVERAGE COST FOR POWER PLANTS ENTERING SERVICE IN 2017
(2010 US\$/mwh)

Plant type	Capacity factor (%)	Levelized capital cost (%)	Fixed O&M	Variable O&M (including fuel)	Transmission investment	Total system levelized cost
Conventional coal	85	65.8	4.0	28.6	1.2	99.6
Advanced coal	85	75.2	6.6	29.2	1.2	112.2
Advanced coal (CCS)	85	93.3	9.3	36.8	1.2	140.7
Natural gas (conventional CC)	87	17.5	1.9	48.0	1.2	68.6
Natural gas (advanced CC)	87	17.9	1.9	44.4	1.2	92.8
Natural gas (advanced CC with CCS)	87	34.9	4.0	52.7	1.2	92.8
Natural gas (conventional combustion turbine)	30	46.0	2.7	79.9	3.6	132.0
Natural gas (advanced combustion turbine)	30	31.7	2.6	67.5	3.6	105.3
Advanced nuclear	90	88.8	11.3	11.6	1.1	112.7
Geothermal	92	76.6	11.9	9.6	1.5	99.6
Biomass	83	56.8	13.8	48.3	1.3	102.2
Wind	34	83.3	9.7	0.0	3.7	96.8
Wind - offshore	27	300.6	22.4	0.0	7.7	330.6
Solar pv	25	144.9	7.7	0.0	4.2	156.9
Solar thermal	20	204.7	40.1	0.0	6.2	251.0
Hydro	53	76.9	4.0	6.0	2.1	89.9

Source: Author's compilation.

FIGURE 4
VARIOUS PATHS OF ENERGY FROM SOURCE TO SERVICE; LINES INDICATE
POSSIBLE ENERGY PATHWAYS



Source: Author's compilation.

Annexes

Annex 1

PetroCaribe Agreement

In June 2005, Guyana signed onto a PetroCaribe Agreement, along with Antigua and Barbuda, the Bahamas, Belize, Cuba, Dominica, the Dominican Republic, Grenada, Jamaica, Nicaragua, Suriname, Saint Lucia, St Kitts and Nevis and 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, PetroCaribe 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. However, this saving does not typically translate into lowering of the fuel costs. Motorists still had to find more money for gasoline and diesel at the pump and the electricity utility saw no reduction in its fuel bills. Nonetheless, the favourable balance of payments allowed Government to find monies for “subsidies” to GUYOIL and GPL, which was used to contain energy prices during the periods of extreme volatility such as in 2008.

The PetroCaribe superseded the Caracas Energy and San Jose Accords.

Annex 2

Guyana primary energy consumption by type

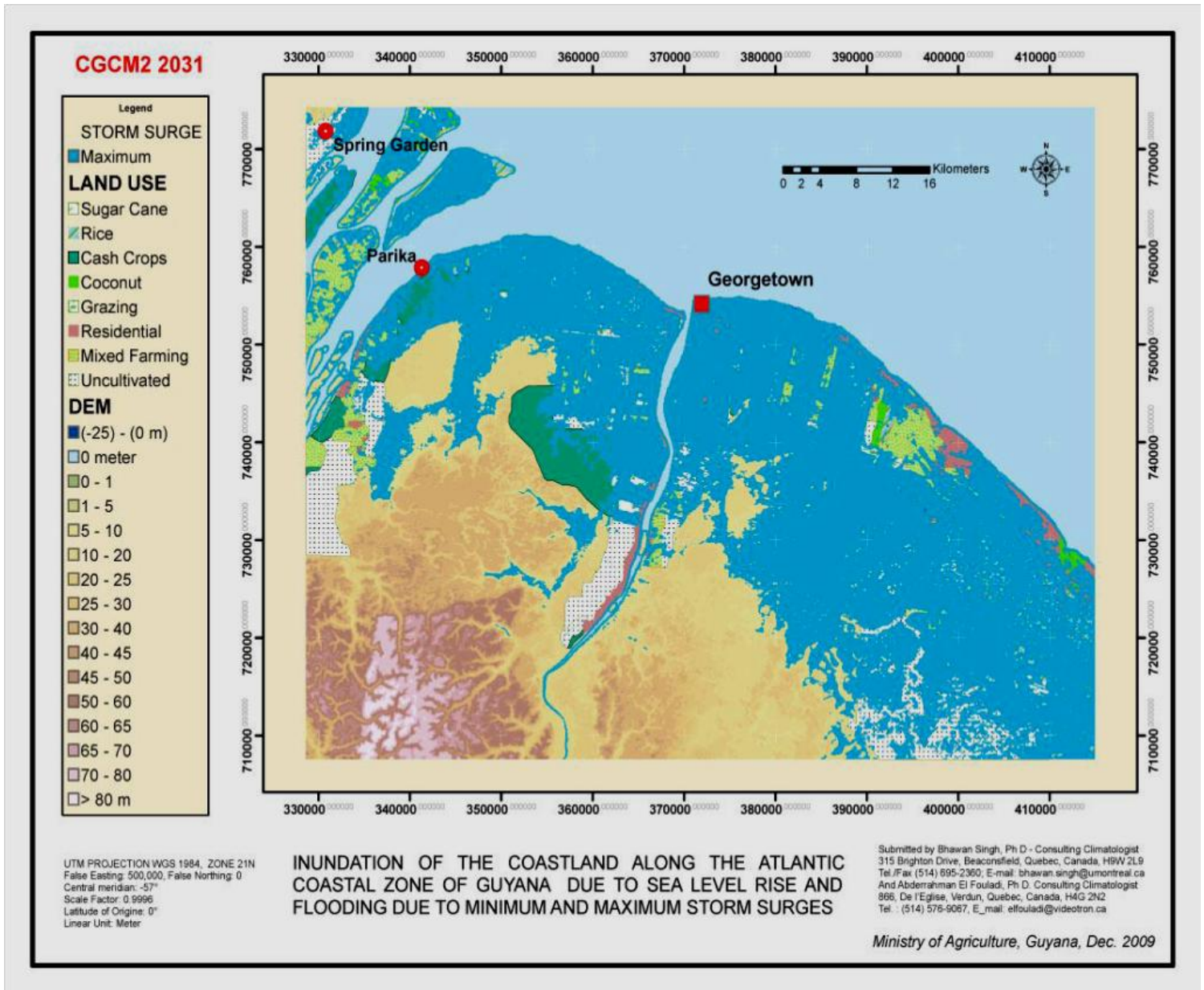
TABLE A.1
GUYANA PRIMARY ENERGY CONSUMPTION BY TYPE

	Barrels	Litres	Density (kg/m ³)	Mass (kg)	Net calorific value (GJ/T)	Primary energy			
						Energy value (GJ)	Energy value (BOE)	Energy value (TOE)	Energy value (GWh)
Avgas	12 333	1 960 864	707	1 386 331	47.0	65 712	10 737	1 596 .506	18.253
Kero	229 909	36 552 542	802.6	29 337 070	46.93	1 376 789	224 965	32 884 033	382.441
Gasoline	11 140 119	181 264 099	740.7	134 262 318	47.10	6 323 755	1 033 293	151 040 298	1 756 599
Fuel oil	1 190 973	189 349 226	944	178 745 669	42.60	7 614 566	1 244 210	181 870 773	2 115.157
Diesel	2 167 950	344 675 822	843.9	290 871 926	45.66	13 281 212	2 170 133	317 216.02	3 689.226
LPG	180 565	28 707 465	539	15 473 324	50.08	774 904	126 618	18 508 265	215.251
Biodiesel	1 122	178 369	880	156 965	37.000	5 808	949	138.714	1.613
Bagasse				1 026 537	7.000	7 185 176	1 174 048	171 614.9	19 958
Charcoal				1 672 306	30.000	50 169	8 198	11 198.27	85.093
Fuel wood				17 018 698	18.000	306 337	50 0555	7 316.723	85.093
Rice husk					14.000	0	0		
Solar pv						6 375	1 042	152.253	1.77
Wind						256	42	6.126	0.0712
Biogas							0.00		
Total	4 922 971	782 688 388				36 991 058	6 044 291	883 516	10 275

Source: Guyana Energy Agency, 2012.

Annex 3 Model for inundation of north coast from sea level rise, Guyana

MAP A.1
PROJECTION SHOWING INUNDATION OF COASTLAND AT MINIMUM AND MAXIMUM STORM SURGE IN 2031



Source: Second national communication to the United Nations Framework Convention on Climate Change, Government of Guyana, 2012.

Note: The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations.

Annex 4

Ease of doing business - Guyana

Economies are ranked on their ease of doing business, from 1 – 185. A high ranking on the ease of doing business index means the regulatory environment is more conducive to the starting and operation of a local firm.

TABLE A.2
EASE OF DOING BUSINESS - GUYANA

Ease of doing business rank	114
Ease of starting a business	89
Ease of getting construction permits	29
Ease of registering property	114
Ease of getting credit	167
Protection of property investments	82
Ease of paying taxes	118
Facilitation of cross-border trade	84
Enforcement of contracts	75
Ease of resolving insolvency	138
Ease of getting electricity services	148
Number of procedures	7
Length of procedures/days	109
Cost of obtaining electricity % per capita income	518.7

Source: World Bank / International Finance Corporation.

Annex 5

The Guyana Energy Agency (GEA)

The Guyana Energy Agency (GEA), a corporate body, was established in 1997 by the Guyana energy agency act 1997 (act no. 31 of 1997). The act has been amended over the years to foster harmonization, increased monitoring, better regulation and greater enforcement in the energy sector. At present, the mandate and activities of the GEA are governed by the following legislation:

- Guyana Energy Act, 1997
- Energy sector (Harmonization of Laws) Act, 2002
- Guyana Energy Agency (Amendment) Act, 2004
- Guyana Energy Agency (Amendment) Act, 2005
- Guyana Energy Agency (Amendment) Act, 2011
- Petroleum and petroleum products regulations, 2004
- Hydroelectric Power Act and regulations, 1956
- Hydroelectric power (Amendment) Act, 1988
- Electricity sector reform Act, 1999
- Public Utilities Commission Act, 1999
- Electricity Sector reform (Amendment) Act, 2010
- Public Utilities Commission (Amendment) Act, 2010

The core functions listed in section 5 of the principal act (no. 31 1997) of are:

- To advise and make recommendations to the Minister regarding any measures necessary to secure the efficient management of energy and the source of energy in the public interest and to develop and encourage the development and utilisation of sources of energy other than sources presently in use Energy sector (Harmonization of Laws) Act, 2002;
- To develop a national energy policy and secure its implementation;
- To carry out research into all sources of energy including those sources presently used in Guyana for the generation of energy, and securing more efficient utilization of energy and sources of energy;
- To monitor the performance of the energy sector in Guyana, including the production, importation, distribution and utilization of petroleum and petroleum products;
- To disseminate information relating to energy management, including energy conservation and the development and utilization of alternative sources of energy;
- To grant and issue licences relating to petroleum and petroleum products, including import licences, wholesale licences, importing wholesale licences, retail licences, bulk transportation carrier licences, storage licences and consumer installation licences;
- To utilise a marking system to add markers to petroleum and petroleum products imported by every person under an import licence or import wholesale licence for the purpose of identifying such petroleum and petroleum products as having been legitimately imported;

- To take samples of petroleum and petroleum products from any person at random throughout Guyana and carry out tests and examinations to determine the presence or level of the markers in the samples of the petroleum and petroleum products;
- To perform the necessary tests to determine whether the marker(s) is (are) in the required proportion and any further test necessary to determine whether the petroleum and petroleum products have been lawfully obtained, stored, possessed, offered for sale, blended or mixed with any substance that is not approved;
- To prosecute in the Magistrates' Courts persons who are in possession of petroleum and petroleum products bearing no markers or at a concentration contrary to that required;
- To prosecute in the Magistrates' Courts persons who import petroleum and petroleum products without an import licence or wholesale import licence;
- To prosecute in the Magistrates' Courts persons who purchase, obtain, store, possess, offer for sale, sell, distribute, transport or otherwise deal with illegal petroleum.

Section 6 of the Act further outlines several advisory functions of the Agency:

- To study and keep under review matters relating to the exploration for, production, recovery, processing, transmission, transportation, distribution, sale, purchase, exchange and disposal of energy and sources of energy;
- To report thereon to the Minister and recommend to the Minister such measures as the Agency considers necessary or in the public interest for the control, supervision, conservation, use and marketing and development of energy and sources of energy;
- To prepare studies and reports at the request of the Minister on any matter relating to energy or any source of energy, including research into alternative sources of energy, or the application of such research, and to recommend to the Minister the making of such arrangements as the Agency considers desirable for cooperation with governmental or other agencies in or outside Guyana in respect of matters relating to energy and sources of energy;
- To advise the Minister or assigned authority on matters relating to the administration and discharge of the functions of the Electricity Sector Reform Act 1999.

The GEA falls under the purview of the Prime Minister who has direct portfolio responsibility for energy and electricity.

Annex 6

Stakeholder consultations

STAKEHOLDER CONSULTATIONS – WEDNESDAY 16 JANUARY 2013		
Name	Organization	Contact information
Kiran Mattai	Guyana Energy Agency	Kiranm_15@yahoo.com
Shevon Wood	Guyana Energy Agency	Shevon.wood@yahoo.com
William Holder	Guyana Energy Agency	
Alwin Etwah	Guyana National Bureau of Standards	aetwah@gnbsgy.org
Sharma Dwarka	Guyana Sugar Company (GUYSUCO)	sharmad@guysuco.com
Lensworth Blair	Guyana Water Inc.	lensworthb@gwi.gy
Kevin Vickerie	Office of the Prime Minister	kevinvickerie@gmail.com
Clairmont Clementson	Ministry of Agriculture	Kemba_cc@yahoo.com
Melcita Bovell	Ministry of Education	Melcita_b@yahoo.com
Naresh Mongor	Ministry of Health	gfoave@hotmail.com
Emil McGarrell	Ministry of Housing and Water	
Jason Fraser	Ministry of Housing and Water	hweconomist@gmail.com
Bramhanand Singh	Ministry of Local Government	Ken_singh@yahoo.com
Ashton Simon	Ministry of Natural Resources	
Omlear Lochan	Ministry of Natural Resources	olochan@nre.gov.gy
Terrence O'Brien	Ministry of Public Works	tcobrien49@yahoo.com
Trevlon Pyle	Ministry of Public Works	trevlonp@yahoo.com
Nicola Namdeo	Ministry of Tourism	nicole9005@gmail.com
Andrew Mendes	Farfan & Mendes Ltd.	amendes@fmlgy.com
M. Farina	GBTI	corporatehouse@gbtibank.com
Clement D.M. Duncan	GMSA	clementduncan@gol.net.gy
Badrie Persaud	Guyoil	badriep@gmail.com
S. Hussein	Guyoil	sandigy@yahoo.com
Clinton Williams	Private Sector Commission	gnucadmin@ewirelessgy.com

STAKEHOLDER CONSULTATIONS – THURSDAY 17 JANUARY 2013

Name	Organization	Contact information
Deonarine Jagdeo, Deputy CEO	Institute of Applied Sciences & Technology (IAST)	djagdeo2000@yahoo.com Prem1932@yahoo.com
Prem Persaud Chairman	Public Utilities Commission (PUC)	(592) 227 3293 (592) 231 0075
Aeshwar Deonarine, Deputy CEO	Guyana Power & Light Inc. (GPL)	a.deonarine@gplinc.com



UNITED NATIONS

Series**ECLAC****Studies and Perspectives**

ECLAC
SUBREGIONAL
HEADQUARTERS
FOR
THE CARIBBEAN

Issues published

A complete list as well as pdf files are available at

www.eclac.org/publicaciones

27. An assessment of fiscal and regulatory barriers to deployment of energy efficiency and renewable energy technologies in Guyana, LC/L.3755, LC/CAR/L.406, 2014.
26. Caribbean forum: Shaping a sustainable development agenda to address the Caribbean reality in the twenty-first century, LC/L.3756, LC/CAR/L.400 Rev.1, 2014.
25. The use of census data for national development planning – Focus on the 2010 Population and Housing Census, LC/L.3726, LC/CAR/L.414, 2014.
24. Preliminary overview of the economies of the Caribbean 2012-2013, LC/L.3680, LC/CAR/L.410, 2013.
23. Economic Survey of the Caribbean 2011-2012: Positive growth amidst lingering downside risks, LC/L.3623, LC/CAR/L.402, 2013.
22. Municipal solid waste management in the Caribbean – A benefit cost analysis, LC/L.3543, LC/CAR/L.349, 2011.
21. Threshold effects in the relationship between inward foreign direct investment and import productivity growth in Latin America and the Caribbean, LC/L.3542, LC/CAR/L.287, 2011.
20. Knowledge management in the public sector: An online presence as a tool for capture and sharing, LC/CAR/L.351, 2011.
19. Creative industries in the Caribbean: A new road for diversification and export growth? LC/CAR/L.348, 2011.
18. Regional environmental policy and sustainable tourism development in the Caribbean, LC/CAR/L.353, 2011.
17. Social health protection for the elderly in the English-speaking Caribbean, LC/CAR/L.350, 2011.
16. Caribbean Millennium Development Goals Report 2010, LC/CAR/L.371, 2011.
15. An analysis of the status of implementation of the Convention on the Rights of Persons with Disabilities in the Caribbean, LC/CAR/L.280/Rev.1, 2011.
14. Preliminary Overview of the Economies of the Caribbean: 2010-2011, LC/CAR/L.295, 2011.
13. Economic Survey of the Caribbean 2010-2011: Improving economic prospects amid global recovery, LC/CAR/L.308, 2011.
12. Innovation in the tourism sector: a case study from the Commonwealth of Dominica, LC/L.3509, LC/CAR/L.296, 2011.
11. Availability, collection and use of data on disability in the Caribbean subregion, LC/L.3334-P, LC/CAR/L.283/Rev.1, 2011.

STUDIES

AND

PE

SPEC

TIVES

27

STUDIES

AND

PE

SPEC

TIVES

STUDIES AND PERSPECTIVES

Series

C E P A L

ECONOMIC COMMISSION FOR LATIN AMERICA AND THE CARIBBEAN

COMISIÓN ECONÓMICA PARA AMÉRICA LATINA Y EL CARIBE

www.eclac.org