SITUATION AND PERSPECTIVES ON ENERGY EFFICIENCY IN LATIN AMERICA AND THE CARIBBEAN

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FOR PARTICIPANTS ONLY
DOCUMENT No. 1

30 October 2009

ORIGINAL: Spanish

Regional Intergovernmental Meeting:
XL Meeting of Energy Ministers

Havana, Cuba, 30 October 2009

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The document was prepared for the Regional Intergovernmental Meeting: Energy Efficiency in Latin America and the Caribbean, held 15-16 September 2009, with assistance from the German Federal Ministry for Economic Cooperation and Development (BMZ) and German Technical Cooperation (GTZ).

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Executive Summary

The purpose of the present study is to analyse the situation and perspectives for actions and instruments associated with energy efficiency in the 26 Latin American and Caribbean countries that are members of the Latin American Energy Organization (Organización Latinoamericana de la Energía, or OLADE).

The study focused on determining the following aspects of each country's national energy programmes: (i) recent advances in policy, regulatory and institutional frameworks; (ii) key actors in energy efficiency and their effective roles; (iii) resources and funding mechanisms for energy efficiency programmes; (iv) results of energy efficiency programmes to date; and (v) lessons learned.

In evaluating ***recent advances in policy, regulatory and institutional frameworks***, it would be unrealistic to compare the results of energy efficiency programmes in Latin America and the Caribbean with those successfully executed in countries that are more highly developed and/or that have a history of energy efficiency policy dating back to the first oil shock in the 1970s. Thus, programmes in Latin America and the Caribbean should not be measured against those of countries like Germany, the Netherlands, the United States, Japan, Australia.

Analysis of the 26 countries shows differences, from one country to another, among the regulatory frameworks associated with energy efficiency. Thus, it is difficult to establish "common denominators" for this parameter in the region. In many of the countries, however, there is a trend toward creating (or, in cases where they already exist, strengthening) national energy efficiency programmes, and providing them with the legal and regulatory support necessary to further the government's policy decisions in this area. These programmes are the result of public leadership, with the degree of private sector participation varying from country to country.

Analysis of the ***key actors in energy efficiency and their effective roles*** shows that public sector activities, projects and programmes for promoting and developing energy efficiency are overseen by ministries, national commissions and/or energy management secretariats, which have varying degrees of visibility and influence, depending on the particular country.

In Brazil, the principal programmes in operation are managed by energy companies (PROCEL-Electrobras and CONPET-Petrobras), though they coordinate their activities to conform to the policies of the country's Ministry of Mines and Energy. Energy regulators in the region responsible for electricity or fuels—with the exception of Brazil's ANEEL—have practically no role in promoting energy efficiency. Moreover, in only a very few cases do energy distribution firms promote energy efficiency among their

clients, and when they do, their efforts are aimed at reducing peak demand. Few firms have a corporate policy that calls for demand management.

The wide range of public and private actors involved in the region's energy efficiency programmes appears to be the result of four main factors: (a) political support from government; (b) continuity of efforts and institutional structures; (c) access to funding; and (d) capacity for promoting and providing information on energy efficiency measures.

With regard to ***resources and funding mechanisms for energy efficiency programmes***, in the vast majority of countries funds for promoting and developing energy efficiency come from national budgets. This means that, except in countries with active energy efficiency policies, there are serious limitations on the mission.

Most of the 26 countries covered in this study face major challenges in obtaining resources to promote energy efficiency. Chile, which recently saw a large increase in the budget of its national programme—the National Energy Efficiency Programme (Programa País Eficiencia Energética, or PPEE)—has been an important exception.

The study also attempts to analyse the ***results of energy efficiency programmes*** to date. For each country, the depth at which the results could be evaluated depended on the quantity and quality of available information. Within those constraints, information from the parties involved, whether direct (from interviews or reports) or from relevant websites, was assumed to be accurate.

Analysis of the available information suggests that the quality of the statistics and performance indicators that make it possible to quantify results is still inadequate (except, with some limitations, in the cases of Mexico and Brazil). Due to these shortcomings in quantity and reliability of information regarding specific results, it is impossible to draw concrete, accurate conclusions (excepting, again, with regard to Mexico and Brazil).

In terms of ***lessons learned***, except for Mexico and Brazil no evaluation documents were found for the countries whose energy efficiency programmes have compiled lessons learned. There has been little systematization—indeed, no institutionalized systematization at all, in some cases—of the lessons emerging from national experiences and initiatives.

Reports and records of consultants' personal experiences working on energy efficiency in the various countries are somewhat haphazard. While these documents provide some indications of the results of the programmes, they do not constitute a well-organized and institutionally reliable set of national statistics. This appears to be one of the weakest points in the countries' institutions, in terms of energy efficiency efforts undertaken within the national policy framework.

One lesson that does emerge clearly from the region's experience is that the mere existence of energy efficiency legislation in no way guarantees that there will be positive effects on (a rational reduction of) energy demand. This will not occur unless energy efficiency activities, projects and programmes that are adapted to national realities are developed and systematically implemented. The State has difficulty monitoring—and, where the law provides, sanctioning—behaviours that do not conform to legal requirements. Economic and cultural barriers in Latin American and Caribbean societies hinder the full enforcement of energy efficiency standards, while a lack of human resources (due to budgetary constraints) means that monitoring and enforcement systems are inefficient.

The present study compiled the following lessons learned. While these do not correspond to specific countries, they are certain to have broad applicability in many of the region's countries:

- Achieving concrete results in rational and efficient energy use requires institutions capable of designing, implementing and operating programmes on a stable, ongoing basis.
- There continues to be great potential for energy saving. Overall, 20-25% of energy consumption could be eliminated, through measures that would rapidly pay for themselves.

- Policy signals have been insufficient to induce energy-saving behaviours and actions among users.
- Capacity building efforts should be undertaken to strengthen institutions that are already operating, before creating new institutions.
- Efforts are needed to promote the development of decentralized institutional capacities (at the state, provincial and municipal levels) for formulating energy efficiency programmes.
- Private funding must be more closely articulated with energy saving opportunities.
- Efforts to educate, train and inform the public should be increased.
- Implementing efficiency standards increases the potential for saving, by providing information to consumers.
- On average, 75% of the refrigerators in use today are approximately half as efficient as new refrigerators entering the market. This represents a great opportunity for energy saving through replacement of these older products.
- Cogeneration for industry and large tertiary-sector facilities has huge potential that has remained unexploited due to the lack of regulatory incentives.
- National energy efficiency programmes require funding mechanisms designed specifically to address and coordinate the massive number of investment decisions required by these programmes.
- It is essential to know how to quantify opportunities, without spending more, in doing so, than is saved in the process.
- Regulatory frameworks are lacking and/or weak.
- There need to be more strategies for providing education—and for building awareness and promoting energy saving—for people in government and in the education and business sectors, as well as for individual users.
- There is a scarcity of national/regional technical personnel dedicated to energy efficiency.
- There is a lack of funding for equipment and project development.
- The market for energy services firms remains under-developed.
- There is little involvement on the part of electricity and fuel providers.
- Programmes for institutional strengthening are lacking.
- Supply-side efficiency has been shown to work: the sector's deregulation created incentives for competition, resulting in drastic reductions in consumption in certain areas.

Preliminary conclusions

The research conducted for this report produced the following provisional conclusions:

- The situation of national energy efficiency **programmes, projects and initiatives varies widely from one country to another** as a result of numerous factors, including the size and form of a country's economic structure, its population distribution, access to technology and information, regional and world integration, access to funding, development of regulatory instruments, and climate-related, cultural and social factors, etc.
- **Regulatory and institutional contexts differ widely**, and because these realities must be tailored to each country's conditions, they cannot be standardized. Thus, it makes no sense for countries to "copy" regulations used in other countries, even if they have been

highly successful there. They must instead be adapted to individual circumstances. This, however, does not mean ignoring success stories or missing opportunities to evaluate possible adaptations of other countries' experiences to local realities.

- In a number of the region's countries, there is a critical **lack of continuity in energy efficiency policy**, which has not been integrated, as it should be, with State policy.
- The lack of continuity creates a risk that there will be **insufficient articulation among high-capacity technical teams.** Numerous years of continuous work are required to train national experts to work with energy efficiency programmes.
- Most of the countries studied here have no (or very **few**) **specific domestic sources of funding** for energy efficiency programmes.
- Energy efficiency programmes are still **excessively dependent on international cooperation**, although energy price signals have begun to reflect conditions of scarcity and the growing need for investment as a means of increasing supply. There need to be stronger national initiatives to rationally and efficiently reduce consumption.
- **Lack of knowledge on the part of users** continues to create major barriers to more efficient use of energy.
- The **mere existence of laws, decrees or regulations** making energy efficiency measures mandatory does not guarantee the success of national programmes.
- There are clearly **difficulties in monitoring the results of energy efficiency programmes** in the countries examined. The absence of key indicators of success (or failure) is a major shortcoming of national programmes.

Introduction

The purpose of this study is to analyse the situation and perspectives with regard to actions and instruments associated with energy efficiency in the 26 Latin American and Caribbean countries that are members of the Latin American Energy Organization (Organización Latinoamericana de la Energía, or OLADE).

When this document went to press, substantive information was available on 22 of the 26 countries studied: Argentina, Barbados, Brazil, The Plurinational State of Bolivia, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname, Trinidad and Tobago and Uruguay. The final version of this report will incorporate studies of the remaining four countries.

The basic aspects of the situation and perspectives for national energy efficiency programmes that the study analysed in relation to each of the countries were: (i) recent advances in policy, regulatory and institutional frameworks; (ii) key actors in energy efficiency and their effective roles; (iii) resources and funding mechanisms for energy efficiency programmes; (iv) the results of energy efficiency programmes to date; and (v) lessons learned. The present document has been structured according to those five basic themes.

1. Recent advances in policy, regulatory and institutional frameworks

On this subject, the aim of the study was to examine recent advances in policy, regulatory and institutional frameworks associated with energy efficiency (legislation, standards, institutions, public and private national programmes, etc.) and to measure these against some benchmark or standard of international best practices, e.g., by comparing them with countries that are internationally recognized for their energy efficiency achievements.

Each country's regulatory and institutional frameworks were examined in relation to energy efficiency, and compared with a programme—considered to be successful—outside the region. The reference programme chosen here was that of Spain's Institute for Energy Diversification and Saving (Instituto de Diversificación y Ahorro de Energía de España, or IDAE).

There are various justifications for comparing Latin American and Caribbean (LAC) experience with that of Spain, not least of which is the cultural affinity between the respective societies.

Indeed, the issue of rational and efficient energy use is closely associated not only with technical issues, but also with the uses and habits prevalent in the societies where energy savings programmes are being implemented or where efforts in this direction are being made. Aspects of a society's culture are of paramount importance to the success of these programmes.

2. Key actors in energy efficiency and their effective roles

The study attempted to identify the relevant actors, and the role that each plays in activities, programmes, projects and/or institutions designed to promote and carry out energy efficiency activities, with a focus on comparing these with the dynamics seen in the country selected as a benchmark.

The study identifies the principal institutional actors, whether public, private or mixed, and describes their roles in developing national energy efficiency programmes.

3. Resources and funding mechanisms for energy efficiency programmes

The aim here was to identify how countries with such resources finance their energy efficiency activities, programmes and projects; what barriers they confront, and how their situation compares with best international practices in funding energy efficiency, whether this is done through budgetary resources or depends on earmarked international cooperation funds.

4. Results of energy efficiency programmes to date

Here, the effort was to ascertain whether there are statistics and performance indicators to quantify the results of these programmes, to determine whether the countries themselves have evaluated their results, and to bring together the available statistics, performance indicators and evaluations.

Each of the country's results were evaluated. The depth of the evaluation depended on the quantity and quality of information available.

5. Lessons learned

The study attempted to ascertain what worked, what did not work and how to make improvements; what can be learned from the Latin American experience to date in working to improve the formulation, funding and execution of policies, programmes and instruments designed to achieve energy efficiency goals; and what central elements should be incorporated in the new generation of policies, programmes and instruments to maximize the probability of success.

The lessons learned from each programme were analysed, although the analysis was inevitably shaped by the quality and reliability of the information obtained. General conclusions were then drawn.

I. Barbados

1. Recent advances in policy, regulatory and institutional frameworks

Barbados has a number of regulations and procedures designed to promote energy efficiency, of which the main ones are the following:

- The government grants firms a tax exemption of 150% of investments made in projects associated with energy efficiency.
- The government permits individuals to request tax exemptions for money spent on energy audits commissioned to assess ways of improving energy use in homes or businesses.
- The government permits individuals to request tax exemptions for money spent on retrofitting homes or businesses.

Barbados's energy efficiency policy encourages all attempts to reduce the demand for imported oil.

With regard to explicit policies for promoting energy efficiency, Barbados provides tax exemptions for all energy-saving-related investments.

The government considers it politically prudent to reduce dependence on imported oil, and its general intention is to move towards intensive development of alternative energy sources.

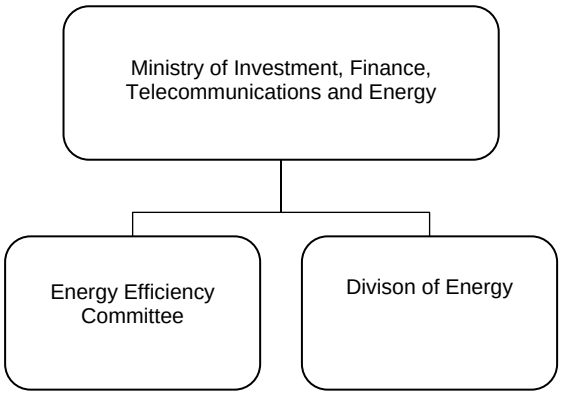
Spending on imported energy reduces the country's financial reserves, and the government considers this issue particularly important because of the recent wide fluctuations in oil prices. High oil—and, thus, thermal electric energy—prices pose a threat, since they have a major impact on local production costs.

Barbados views energy efficiency as a way of reducing the negative environmental impact of greenhouse gases produced by burning fossil fuels.

The government also considers it feasible to evaluate users' response to energy efficiency programmes, once these are implemented.

The institutional position, within the Barbados government, of the office responsible for energy efficiency issues is indicated in the following figure.

FIGURE 1
INSTITUTIONAL SCHEME WITH RESPECT TO ENERGY



Source: Government of Barbados website.

Other initiatives associated with energy efficiency

In March 2009, Barbados launched a sustainable energy framework programme to promote and support energy conservation and sustainable energy programmes, thus encouraging alternatives and minimizing dependence on fossil fuels. The programme was initiated by the Ministry of Finance, Investment, Telecommunications and Energy, and includes energy efficiency initiatives in Caribbean hotels.

The programme is set to receive support from the Inter-American Development Bank (IDB), which will provide the Government of Barbados technical assistance to improve energy use in public buildings, in the residential sector and in small and medium-sized enterprises, as well as to explore opportunities for renewable energy.

A further objective of the programme is to strengthen institutions in the area of energy efficiency, bioenergy, carbon credits and dissemination of successful projects.

The Global Environment Facility (GEF) will also fund pilot energy efficiency and renewable energy programmes, with IDB serving as the executing agency.

2. Key actors in energy efficiency and their effective roles

The main actors in the area of energy efficiency in Barbados, and their effective roles, are as follows:

a. Governmental institutions

Government ministries: A number of ministries have received funds to promote energy efficiency, and some are executing small energy projects to demonstrate to the public the benefits of replicating these experiments.

Energy Committee of the Ministry of Finance, Investment, Telecommunications and Energy: The role of this Committee is to identify and implement energy efficiency projects and to remove bureaucratic barriers that could stand in the way of various projects. The Committee has been operating for one year, with few demonstrable results.

Division of Energy: Some years ago, this division of the Ministry led a major diagnostic exercise to stimulate the industry. This encouraged the commercial sector to follow suit. It has increased awareness on energy use.

b. Regulatory entities

Fair Trade Commission (FTC)

The Commission is currently working with the national electric utility to implement electricity rates that encourage people to install their own generation facilities. The effectiveness of the effort will depend on the actual rates ultimately determined, and on users' ability to create enough installed capacity to sell electricity to the company.

c. Firms

Retailers

A number of vendors produce and sell energy-efficient products in Barbados. There is no explicit plan to encourage the purchase of energy-efficient equipment, beyond the "incentive" provided by the lack of availability of a particular product manufactured by competing companies.

Retailers are not sensitive to the need for energy efficiency, and do not see themselves as playing a role in this regard.

d. Non-governmental organizations (NGOs)

Barbados Association of Energy Professionals (BAEP)

This group is of recent creation, with energy efficiency being its primary raison d'être. It also has other commercial interests for which it seeks to produce an impact on energy efficiency. BAEP has been effective in mobilizing energy professionals in Barbados and throughout the region, and has plans to become more active in research and training in Barbados. However, its economic resources are insufficient for the tasks facing it, since it receives no support from government or from private sector institutions.

e. Universities

University of the West Indies, Cave Hill Campus

This campus houses a group dedicated to energy issues. Faculty members include Professors Leo Moseley, Upindrantah Singh, Osaretin Sunday and S. Popuri.

f. Energy efficiency firms

The following companies in Barbados focus on energy efficiency: Aquasol, Energy Management Solutions, Solar Dynamics and Sun Power.

Barbados has long been a leader in solar water heaters, and has recently been recognized as one of the five countries in the world with the highest penetration of this technology. Currently, a solar water heater is automatically installed in every new housing unit built. This technology generates a highly significant reduction in peak electrical demand for the local electric company.

g. Consulting firms

E&D Consulting Solutions, Clarke Energy Associates and the Solar Transport Project

These companies offer a range of energy services for government, the local electric utility, and the private and residential sectors.

E&D Consulting Solutions

E&D Consulting was formed in response to the growing need to bring down costs and raise benefits in an increasingly competitive market, as reflected in its motto: "Implementing solutions to create greater efficiency".

E&D provides two main types of services: (a) consulting on the use of conventional energy and the implementation of renewable energy measures for buildings, offices and residential units, along with conducting energy audits as part of an overall energy management programme; and (b) consulting on telecommunications issues.

Eighty percent of the firm's revenue is derived from services that it exports. It has two international contracts, one with the United Nations Development Programme (UNDP), the other with the World Bank. The firm plans to extend its offering of energy services to other Caribbean islands by late 2009.

Clarke Energy Associates (www.clarkeenergyassociates.com)

Clarke Energy is a consulting firm that specializes in developing renewable energy and energy efficiency projects, as well as in energy policy planning and planning for electric companies.

Its president, Dr. Roland Clarke, before forming the firm, was manager of the Caribbean Renewable Energy Development Programme[1] (CREDP) from 2002 to 2008. This programme was conducted under the auspices of the Caribbean Community (CARICOM).

Clarke Energy Associates specializes in consulting, training and the development of renewable energy projects, energy efficiency projects, energy policy and production planning for electric companies.

The technical services that if offers include:

- Feasibility studies.
- Project analysis, including economic/financial analysis, risk analysis, sensitivity analysis and studies on greenhouse gas reductions.
- Avoided-cost analysis, simulation of production costs for electric companies and price forecasting for the electricity market.
- Demand side management (DSM) analysis.
- Energy audits.
- Project management.
- Regulatory strategies for renewable energy and energy efficiency.

Clarke's principal clients are:

- Natural Resources Canada, RETScreen.

[1] Programme objective: "To reduce barriers to the increased use of renewable energy, thus reducing the dependence on fossil fuels while contributing to the reduction of greenhouse gas (GHG) emissions".

- Renewable Energy and Energy Efficiency Partnership (REEEP).
- The Government of Barbados.
- The Caribbean Community (CARICOM) Secretariat, Caribbean Renewable Energy Development Programme (CREDP).
- The World Bank.

Solar Transport Project

This firm focuses primarily on developing electric vehicles based on solar energy (2005), and on developing solar hot water heaters.

The firm's president, William Hind, also serves, since February 2002, as head of the Energy Efficiency and Renewable Energy Unit, Barbados Ministry of Energy and Environment.

In his governmental capacity, Mr. Hind coordinates the government's energy efficiency and renewable energy programmes; makes recommendations regarding tax policies to reduce the tax burden for generating systems using renewable energy sources, for efficient equipment in housing and for vehicles with low fuel consumption; and develops energy audit policy for the residential sector. He has also developed energy efficiency and renewable energy policies for the Government of Barbados, and has identified funding sources for the country's Renewable Energy Centre.

3. Resources and funding mechanisms for energy efficiency programmes

The government has committed relatively few resources to projects relating to activities by government itself. Other funding sources include the Inter-American Development Bank (IDB), which has an initiative to promote energy efficiency in hotels and to strengthen institutional capacities in areas such as the formulation of appropriate frameworks for the development of sustainable energy sources.

The funding required by energy efficiency programmes depends, to a great extent, on their scope. Conducting preliminary studies, along with the reconditioning of houses and businesses, could require as much as US$ 300,000.

This is due to the age of the facilities, the local environment and other external costs. However, energy efficiency programmes can be introduced gradually, as funds become available, e.g., to encourage the use of energy-efficient lighting throughout the island.

The hotel energy efficiency programme is monitored by the Caribbean Alliance for Sustainable Tourism (CAST), and disbursements are made by IDB.

4. Results of energy efficiency programmes to date

No energy efficiency programmes, in the traditional sense, have been implemented in Barbados. There are a few projects to increase the efficiency of energy use, but these are not widespread or national in scope. Numerous efforts have been undertaken by both the public and private sectors, with varying degrees of success.

Success stories in these sectors include: (a) a government-initiated audit project, headed by Barbados Port Inc., which led to the retrofitting of lighting and air conditioning equipment, along with oversight of the reconditioning of businesses and housing; (b) a government ministry, which conducted a major redesign and improvement of its lighting system; and (c) a number of hotels, which

implemented cogeneration and gas compressor systems, with excellent results (energy savings on the order of 50%).

The government commissioned a number of energy audits at its largest facilities in 2007. A few consulting projects are also underway to recondition new buildings for more efficient energy use.

5. Lessons learned

Positive

- Energy efficiency measures generate expectations of reduced cost for owners.
- When funding is available, good returns on investment encourage the implementation of energy efficiency measures.
- Energy efficiency actions align well with environment-friendly initiatives, making it easier to gain acceptance for the former.

Negative

- Obtaining funding is often a challenge.
- The most promising technologies are not readily available.
- Some clients do not seek professional advice before implementing technical energy efficiency solutions, often resulting in wasted resources. This occurs because of lack of knowledge on the part of clients, or as a result of the shortcomings of sales personnel.
- Some solutions are evaluated solely on the basis of their financial benefits, without taking environmental factors into consideration.

II. Grenada

1. Recent advances in policy, regulatory and institutional frameworks

a. The energy context

In 2007, 92% of the energy needs of the transportation, industrial, residential and commercial sectors was supplied by imported oil. Biomass from bagasse, wood and other plant residues represented 8% of the gross energy supply.

In light of this economic, as well as environmental, vulnerability, Grenada has encouraged the capitalization of its natural resources through the use of renewable energy sources such as wind and solar energy.

In the area of biomass-based energy production, the annual bagasse production in 2007 was the equivalent of 3,800 barrels of oil. In addition, residues from nutmeg processing have become a potential energy source, and could be used as fuel in steam turbine plants in the next decade.

Grenada is currently participating in various regional integration efforts, such as PETROCARIBE and CARICOM, in an attempt to strengthen its energy sector.

Nearly 100% of the country's electricity is produced by the private firm GRENLEC, using imported fuel. In 2008, GRENLAC sold 195.9 GWh, with peak demand of 39.4 MW. Projections call for annual growth of 4% in the latter figure. Solar energy in 2008 was responsible for 184,161 kWh.

All vehicles on the road in Grenada, Carriacou and Petite Martinique use diesel or imported gasoline. Neither hybrid nor natural gas vehicles are yet in evidence.

Geothermal feasibility studies have demonstrated the presence of a small solfatara on Mount St. Catherine, with a number of small offshoots in the radial cracks at the centre of the volcano.

The government, along with other stakeholders from across the society, has developed a sustainable energy plan, with the following objectives:

- To maximize energy efficiency and the use of renewable and alternative energy.
- To promote conservation and efficient energy use at all levels of the economy, in order to achieve optimal use of renewable and non-renewable energy sources.

b. The institutional context

The Ministry of Agriculture, Lands, Forestry, Fisheries, Public Utilities and Energy is responsible for renewable energy issues.

The domestic electricity firm GRENLAC provides energy to nearly 90% of the population on the island, as well as servicing Carriacou and Petite Martinique. The company is owned by the Government of Grenada, the firm WRB and company employees and small shareholders.

The Marketing and National Importing Board (MNIB) oversees the energy sector and related policymaking.

The government has placed priority on developing and implementing an energy policy that will contribute to the country's sustainable development. With this objective, an inter-ministerial Energy Committee is to be formed to work jointly with the Division of Sustainable Development on designing and implementing energy conservation plans.

c. The legal context

Although energy efficiency is not the subject of any specific laws in Grenada, it is one of the four principal objectives of the country's Sustainable Energy Policy.

2. Key actors in energy efficiency and their effective roles

The Ministry of Agriculture, Lands, Forestry, Fisheries, Public Utilities and Energy, through GRENLEC, the national electric utility.

This agency has a very limited role in promoting and developing energy efficiency.

3. Resources and funding mechanisms for energy efficiency programmes

The programme to replace incandescent lighting with compact fluorescent lighting was funded with resources from the Petrocaribe programme. These funds were used to pay for technical assistance from Cuba, and to acquire energy-saving lighting.

4. Results of energy efficiency programmes to date

a. Programme to replace incandescent lighting

In 2007, as a part of Cuba's international management scheme, which operates in a number of Caribbean countries (with all members of PETROCARIBE being beneficiaries), 133,253 incandescent bulbs were replaced with energy-saving bulbs.

The results are reflected in the following indicators:

- Incandescent bulbs replaced: 133,253.
- Reduced power per bulb replaced: 38.3 watts.
- Housing units visited: 23,205.
- Per-household energy reduction: 33 kWh/month.

- Reduction in country's maximum demand: 1,891kW (in terms of energy: 10,152 MWh/year).
- The economic benefits obtained from saved generating capacity are on the order of US$ 2,269,669, with the fuel savings totalling 23,440 tons of imported fuel annually, worth US$ 1,182,691, for total annual savings of US$ 3,452,369 (in 2007 dollars).
- In terms of environmental benefits, the replacement reduces CO2 emissions on the order of 6,690 tons/year, valued at some US$ 28,100.
- The country has also developed energy strategies to safeguard its energy security and independence, as well as the environment, through green energy.

b. Energy efficiency programme

With regard to energy efficiency, the Government of Grenada proposes:

- To create an Energy Efficiency Unit within the Energy Division of the Ministry of Agriculture, Lands, Forestry, Fisheries, Public Utilities and Energy.
- To develop and execute a programme for energy efficiency in the public sector.
- To create energy efficiency standards for mechanical ventilation, air conditioning, lighting, and water heating equipment/systems in institutions, businesses and industry. The standards are to apply to building design, as well as interior equipment. Separate standards will apply to residential buildings.
- To implement mandates to regulate vehicle controls, in order to ensure a given level of efficiency.
- To implement labelling for equipment indicating energy efficiency levels.
- To enforce conditions on the efficiency of certain imported vehicles.
- To make energy audits mandatory for large public- and private-sector consumers.
- To recommend economic incentives and penalties for specific sectors: tourism, industry and agriculture.
- To provide tax and economic incentives for efficient energy use.

Although enforcement of these activities will, in itself, produce environmental benefits, Grenada also proposes:

- To promote public transportation as the population's first choice (revise National Transportation Plan).
- To develop a building construction code that includes energy efficiency standards.
- To promote water conservation.
- To promote the use of science and technology as a means of reducing the energy required for different activities.

5. Lessons learned

The savings from replacing incandescent bulbs with energy-efficient bulbs, although promising, require ongoing monitoring by authorities, in order to ensure that the energy-saving bulbs are replaced by similar ones when they reach the end of their useful life. Moreover, measures must be implemented to permit entry into the country of relatively low-cost energy-saving devices, so as to avoid competition between energy-efficient lighting and incandescent lighting.

III. Guyana

1. Recent advances in policy, regulatory and institutional frameworks

While there are no regulations, standards or laws to promote energy efficiency in Guyana, certain actions implicitly promote more efficient energy use. These include:

- Replacement of incandescent bulbs with energy-efficient bulbs.
- Disconnecting electrical and electronic equipment when not in use.
- Issuing a brochure with tips on saving energy in household electrical appliances, building designs, private vehicle use and lighting.

Energy policy (including energy efficiency policy) is defined and determined by Guyana's Energy Agency. The guidelines set forth in the 1994 document "Energy Policy in Guyana", which can be viewed on the Agency's website, are still in force. Currently, a study on investment strategy and policy for Guyana's electricity sector is being prepared.

The Agency has a Division of Energy and Energy Statistics, whose activities include managing the agreement with Petrocaribe, analysing oil imports on an ongoing basis, overseeing the database and managing the energy sector's economic activities. The Division serves as the link with the National Energy Information System (Sistema de Información Energética Nacional, or SIEN) of OLADE, and with the Caribbean Energy Information System (Sistema de Información Energética del Caribe, or CIES), and it participates in projects executed by both.

The Division's functions and responsibilities include:

- Managing the agreement between Guyana and Venezuela (Petrocaribe).
- Overseeing the agreement between Guyana and Trinidad Oil, as well as all other types of agreements.
- Monitoring the importation of oil products under these agreements, as well as of other imports not covered by the provisions of these agreements.
- Providing information to the Ministry of Finance on the Guyana-Venezuela agreement (Petrocaribe).

- Communicating with Petróleos de Venezuela supervisors in Guyana regarding the arrival of products, pursuant to the Petrocaribe agreement.
- Collecting, compiling and storing all energy-related information, including information on:
  - Wholesale prices.
  - Retail prices.
  - Monthly FOB/CIF price reports.
  - Price integration reports.
  - Oil company stocks.
  - Estimated and real values and volumes under the Petrocaribe agreement.
  - Other mandated energy reports.
  - Preparing and analysing information on energy supply and demand in Guyana.
  - Communicating with SIEN and CIES on energy issues and on participation in projects executed by those two organizations.
  - Facilitating payment for oil imports.
  - Researching energy technologies at the local and international levels.
  - Developing a database of renewable energy technologies and disseminating information, as appropriate.
  - Developing energy conservation programmes.
  - Conducting relevant studies on renewable energy in order to compile information and recommend the most appropriate project designs.
  - Monitoring activities related to energy efficiency and energy optimization in government agencies and private sector entities.
  - Joining actively with other agencies to promote renewable energy sources, such as clean technologies, capable of contributing to a reduction in greenhouse gas emissions.
  - Collaborating with other agencies to reduce the effects of climate change and provide assistance in developing mitigation and adaptation plans.
  - Developing renewable energy projects and generating reports to attract investment and funding.

Energy efficiency initiatives receive government support. Information on activities with energy-saving potential is published through four agencies: the Guyana Energy Agency (GEA), Guyana Power & Light (GPL), the Office of the Prime Minister (OPM) and the Environmental Protection Agency (EPA).

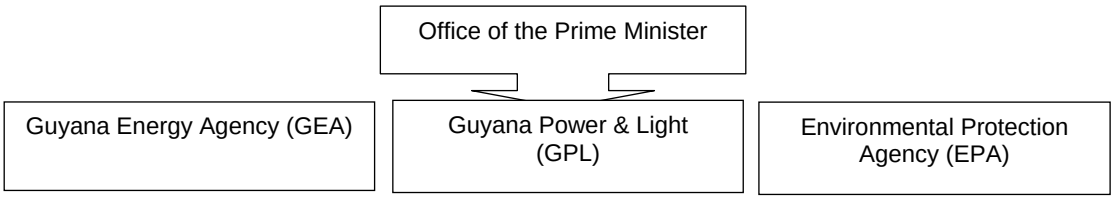
There is a bagasse-based cogeneration project for producing approximately 20 MW.

According to the GEA, the design of an energy efficiency programme should take into account the country's socioeconomic characteristics and conditions. Generally, economic resources are not available to subsidize the purchase of energy-efficient equipment. Thus, it is a challenge to ensure access to such equipment.

Public awareness campaigns have been conducted to highlight the importance of rational energy use and to provide information on ways to accomplish this. The campaigns have employed newspaper, radio and TV ads, as well as press conferences and pamphlets.

Energy efficiency activities within the GEA come under the institutional scheme outlined in the figure below.

FIGURE 2
INSTITUTIONAL SCHEME WITH RESPECT TO GUYANA'S ENERGY



Source: Guyana Energy Agency (GEA).

2. Key actors in energy efficiency and their effective roles

Government agencies: Guyana Energy Agency (GEA). Programmes to disseminate information and promote public awareness on energy efficiency.

Regulatory entities: Environmental Protection Agency (EPA). This agency has no direct relation to energy efficiency; its only link with this issue is with regard to emissions reductions generated by energy savings projects.

Firms: Guyana Power and Light Inc., the electric utility, has programmes to promote awareness of efficient and rational use of electricity.

3. Resources and funding mechanisms for energy efficiency programmes

Energy efficiency efforts receive financial support from the government and from the Inter-American Development Bank—the latter for rural electrification projects.

The GEA estimates that developing an energy efficiency programme of national scope would require approximately US$ 100,000.

Three institutions are currently managing funds: the Office of the Prime Minister (OPM), Guyana Power & Light Inc. (GPL) and the Guyana Energy Agency (GEA).

The programmes are monitored by the Office of the Prime Minister through its Ministry of Finance, which controls disbursements.

4. Results of energy efficiency programmes to date

Reduction of demand, as a result of replacing incandescent bulbs with compact fluorescent bulbs. [Editor's note: quantification of demand reduction not given.]

5. Lessons learned

Positive:

- Good results from the light bulb replacement effort mentioned in section 4, above ("Results...").
- Disseminating information provides an opportunity to commit the society to energy efficiency initiatives.
- An improvement in user awareness has provided users better options for the purchase of household electrical appliances.

Negative:

- Disseminating information on how to improve efficiency in the society is expensive.
- The society lacks sufficient resources to make the change to more energy-efficient equipment in households and with respect to private vehicles, although there is recognition of the long-term benefits of such changes.
- There are no incentives for energy efficiency projects.

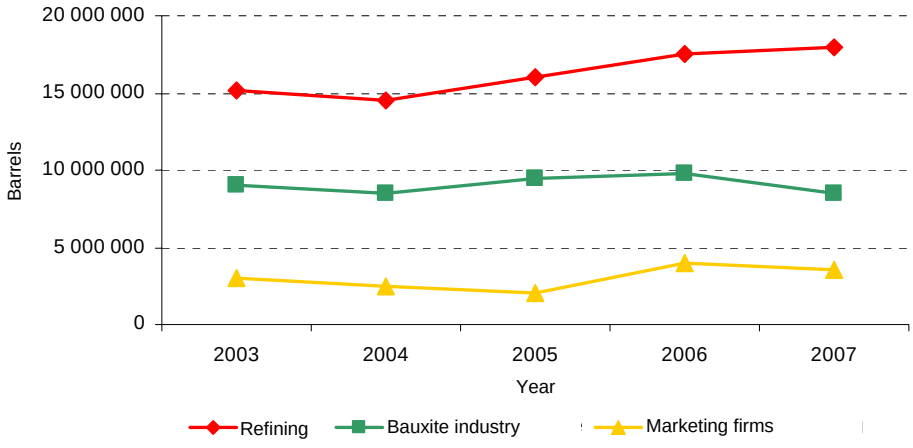
IV. Jamaica

1. Recent advances in policy, regulatory and institutional frameworks

a. Fossil fuels

Imports are needed in order to meet Jamaica's fossil fuel needs, and the country depends almost entirely on oil. Due to a lack of domestic refining capability, over 50% of oil derivatives must be imported. Oil imports in 2007 totalled 29,900 million barrels, 3% less than the previous year. Of these, a total of 8,600 million barrels, valued at US$ 445 million, were used by the bauxite industry, whose electrical plants consume vast amounts of energy.

FIGURE 3
TOTAL OIL IMPORTS, 2003-2007



Source: Ministry of Energy, Mining and Telecommunications (MEMT), 2008.

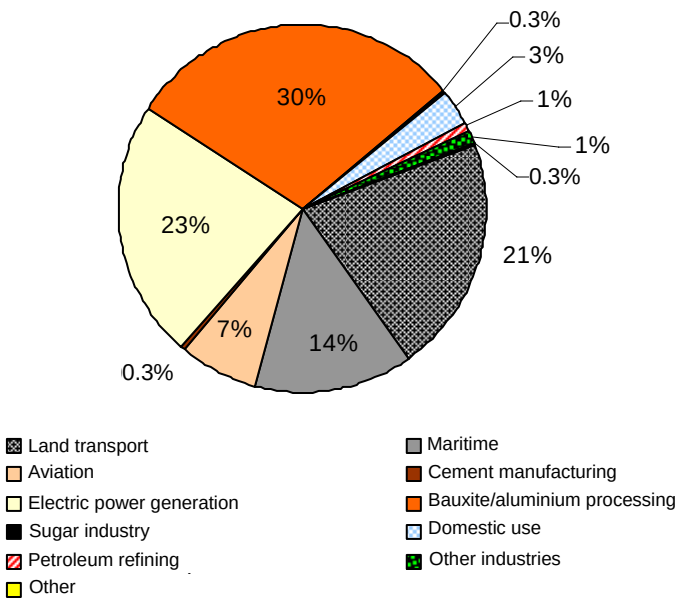
The price of oil derivatives products has also risen considerably in recent years as a result of the deterioration of Jamaica's currency against the dollar. The nominal prices of all oil derivatives were more than 10% higher in 2007 than in 2006.

When world oil prices peaked in mid-2008, one litre of unleaded gasoline sold for over J$ 70, or around US$ 1 per litre. The decline in oil prices seen since then will reduce pressures on Jamaica's energy market, but forecasts call for continuing upward movement as the world economy recovers and resources become scarcer.

Driven by the interest in saving energy, as well as by the economic slowdown, oil consumption fell from 27.68 million barrels of oil equivalent (BOE) in 2006 to 27.62 million in 2007 (a drop of 0.2%). Thus, annual per capita consumption totals approximately 10 barrels, or around 1,600 kilowatt hours. Fuel oil continues to be the oil product most consumed. The 2007 volume of 17.5 million barrels represents an increase of 2.9% over the previous year.

Extraction and processing of bauxite and aluminium are energy intensive, and the energy used accounts for approximately 30% of the island's oil derivatives consumption (see figure 21).

FIGURE 4
OIL CONSUMPTION BY ACTIVITY, 2003-2007



Source: Ministry of Energy, Mining and Telecommunications (MEMT), 2008.

Electric power generation for the public grid (i.e., for all users except those with their own generating capacity, such as bauxite firms) is responsible for 23% of oil consumption, while highway transportation, the second largest consumption category, accounts for 21%. Transportation overall (roads, railways, maritime and air) represents approximately 42% of the demand for oil.

b. Electricity

In April **2001, following a reform of electricity legislation**, a new license was granted to Jamaica Public Service Company Limited (JPSCo), which has been the island's largest provider of electricity since it was established in 1923. The new license was granted for 20 years (until 2020). Under this policy, JPSCo is required to provide reasonably priced service that is sufficient, secure and efficient, by modern standards, to all areas of Jamaica, meeting demand and contributing to the country's

economic development. Although the company continues to have a monopoly on electrical transmission and distribution, the production regime has been liberalized to permit private parties to generate electricity for themselves or for the public grid.

The portion of Jamaica's **generating capacity** that constitutes the public supply of electricity is on the order of 1,000 megawatts (as of 2008), including nearly 200 megawatts provided by independent producers (see table 1). Bauxite producers, sugar refineries and some industrial firms of other types operate their own generating facilities, feeding their surpluses into the JPSCo transmission network.

TABLE 1
INSTALLED GENERATING CAPACITY OF GENERATING PLANTS IN JAMAICA

Entity	Approximate Generating Capacity	
	MW	%
JPSCo	621.0	61.0
IPPs	205.0	20.1
Bauxite Companies	150.0	14.7
Sugar Companies	23.0	2.3
Other industries, Hotels	18.0	1.9
Total	1,018.0	100.0

Source: Ministry of Energy, Mining and Telecommunications (MEMT), 2008.

The JPSCo electrical system includes **24 generating plants**. Over 50% of its production facilities have been in operation for over 30 years, and their efficiency level is therefore low. Except for 5% of the renewable energy generated in Jamaica (3% of which is hydroelectric, 2% wind-generated), electrical production relies on imported oil (of which 63% is heavy fuel oil and 32% is diesel, in the case of JPSCo). The company produces electricity almost entirely at thermal plants, with only 20% of its production being hydroelectric. The two main independent producers operate only thermal plants. The increase in maximum demand in the public system has flattened in recent years, and between 2007 and 2008 there was even a downward curve (-622 megawatts).

Specific heat consumption has seen some improvement since the oldest units were retired in 2003 and 2004, but it continues to be high, at an average of 10,215 kilojoules/kilowatt hour, or 9,560 BTUs/kilowatt-hour in 2008, in both JPSCo facilities and those of independent producers, putting efficiency at 35%. Specific heat consumption at JPSCo was 11,257 kilojoules/kilowatt hour (32% efficiency), while the figure for independent producers was 8,136 kilojoules/kilowatt-hour (44.4% efficiency).

Of particular note is **the low yield of JPSCo's oldest oil-fuelled steam turbine plants**, whose efficiency is only 27%, as compared with similar plants in the United States, which operate at 36% efficiency. Modern combined-cycle electric plants can achieve efficiencies of more than 55%, and even new large coal-fired plants operate at well over 40%. Much greater overall efficiency can be achieved through cogeneration, which uses some or nearly all of the residual heat from other processes.

To reduce specific heat consumption even further, the Office of Utilities Regulation (the public utilities regulator) would be well advised to establish more stringent standards. In the Philippines, electricity sector regulations were established requiring operators to ensure that their specific heat consumption was below 10,850 BTUs/kilowatt hour (31.5% efficiency) at oil-fired plants, and below 9,773 BTUs/kilowatt hours (35% efficiency) at coal-fired plants. JPSCo has proposed a reduction to 10,700 kilojoules/kilowatt hour (10,111 BTUs/kilowatt-hour), to occur between July 2009 and June 2014.

TABLE 2
EFFICIENCY OF ELECTRICAL PLANTS IN THE JPSCO NETWORK

Entity	Efficiency	
	BTU/kWh	(% of Energy Input)
Oil-fired steam	12,723	26.8
Combined cycle	8,390	40.7
Gas turbines	13,972	24.4
JPSCo low-speed diesel	9,122	37.4
JPPC low-speed diesel	7,937	43.0
JEP Medium-speed diesel	8,135	41.9

Source: Ministry of Energy, Mining and Telecommunications (MEMT), 2008.

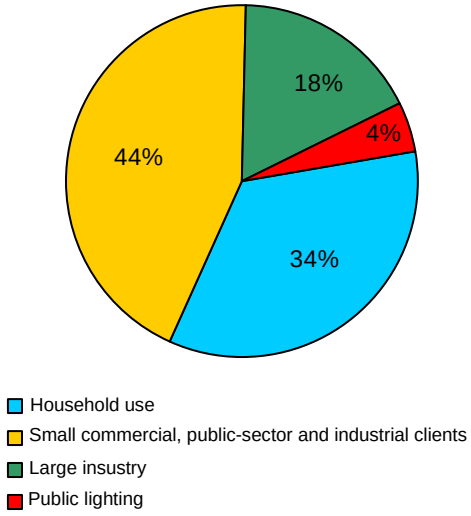
Fuel is the greatest cost item for JPSCo, totalling J$ 47,500 in 2008. Oil prices rose 52% in 2005, 20% in 2006 and 70% in 2008. Reducing average specific heat consumption by 100 BTUs/kilowatt-hour would produce an annual saving of some 66,500 barrels of oil. Put in different terms, each 100-kilojule/kilowatt-hour reduction would produce an annual saving of approximately US$ 3,500 at today's oil prices.

Net electric power generation for the public grid increased slightly from 2007 to 2008, as well as over the last five years generally. The rise is even more clearly reflected in electricity sales, which grew only 1.1% annually in the 2004-2008 period. Total production (net generation) was approximately 4,111 gigawatt hours in 2008, of which 30% came from sources other than JPSCo. At the beginning of 2009, the company's officials predicted that net generation of electricity for public use would fall in 2009 (by 4.7%) and in 2010 (by 2%), and would then rise to 4,073 gigawatt hours by 2014, when 3,328 gigawatt hours would be sold. The residential sector buys 38% of the electricity generated (under the residential rate, or "rate 10"). This projection is much more conservative than previous ones, such as the considerably higher 2007 projection produced by Acres Management Consulting.

As of the end of 2008, JPSCo had approximately **590,000 clients**, of which 525,000 (approximately 89%) were residential customers. Around 63,000 clients were small business, public-sector and industrial consumers with relatively low levels of electricity consumption. Only 116 industrial and other clients are large consumers.

Most electricity in 2007 was consumed by small commercial, public-sector and industrial clients (1,400 gigawatt hours), followed by residential users (1,100 gigawatt hours) and large industrial clients (560 gigawatt hours). Residential (rate 10) use accounted for approximately 34% of annual consumption, while large-scale (rates 40 and 50) users accounted for 18%. The cement sector consumed 3% of the total. It should be noted that industry is by far the largest consumer of electricity in Jamaica, if one includes self-production from mining sector generation.

FIGURE 5
DISTRIBUTION OF JPSCO ELECTRICITY SALES IN 2007



Source: Ministry of Energy, Mining and Telecommunications (MEMT), 2008.

Between 2002 and 2007, average electricity consumption per household was between 2,050 and 2,500 kilowatt hours per year. This figure is based on electricity sold. Given that electricity theft has increased, actual average consumption would appear to have declined in the last few years. Jamaica's inhabitants paid an average of J$ 19 per kilowatt hour in 2007, or US$ 0.277. In mid-2008, as the result of a higher fuel surcharge, the average domestic rate rose to an unprecedented level of US$ 0.38 per kilowatt hour, then declining as the world oil market stabilized. The average electricity rate for all client groups in 2008 was US$ 0.306, of which US$ 0.204 was due to fuel costs, with US$ 0.102 attributable to other costs. Thus, at the peak, the fuel (i.e., the flexible) component accounted for two thirds of the cost to the consumer.

Jamaica's rates are still at the low end of rates in Caribbean island nations, although they are much higher than in Trinidad and Tobago and in countries like the United States and Mexico.

2. Key actors in energy efficiency and their effective roles

Ministry of Energy, Mining and Telecommunications

The Government of Jamaica (GOJ) has recognized that the country's imported-energy bill can be reduced by a combination of energy-efficient practices and renewable energy technologies. In addition to establishing an official energy policy in 1996, the Ministry of Energy, Mining and Telecommunications (MEMT) has, in recent years, promoted these concepts through public education programmes, including:

- coordinating discussion of programmes in educational institutions and communities;
- disseminating information in the media;
- distributing pamphlets with energy saving advice; and
- distributing an energy-saving manual.

In addition, MEMT has established energy efficiency activities within its own departments, in connection with creating and running the Demand Side Management (DSM) Programme operated by

JPSCo, the country's principal energy utility company. Under the DSM, which dates back to 1994, a number of GOJ properties associated with ministries and other public agencies have undergone energy audits, to determine ways of saving energy through retrofitting. Some of the audited properties (e.g., those of the Ministry of Finance) have begun the retrofitting process, but lack of funding has limited the success of the initiative.

In an effort to provide better information on the amount of energy wasted in Jamaica's public buildings, two case studies were evaluated and presented, both based on energy audits conducted under the DSM programme. The first covers the buildings in the Ministry of Finance complex, while the second concerned Bustamante Children's Hospital.

DSM energy audits are designed to:

- Identify current energy consumption trends in the principal facilities.
- Investigate and identify possible inefficiencies in energy use.
- Recommend possible energy efficiency measures to reduce operating costs and improve the efficiency of energy-consuming equipment.

Jamaica Public Service Company Limited (JPSCo)

JPSCo has been the country's principal electricity provider since it was established in 1923, and in 1978 it received an exclusive 39-year license to provide electricity to the entire island. The enterprise was privatized in 2001, when a United States company acquired 80% of its equity, with nearly 20% remaining in the hands of the government. In 2007, the private-sector shares were sold to Marubeni Caribbean Power Holdings, Inc., a subsidiary of the Japanese firm Marubeni Corporation. In March 2009, Marubeni officials signed an agreement to transfer 50% of that company's Caribbean shares, including JPSCo, to the Abu Dhabi National Energy Company (TAQA).

Petroleum Company of Jamaica (PCJ)

In an effort to consolidate and strengthen the government's work on energy efficiency—in particular, the DSM programme, which operated from 1994 to 2001—PCJ created a National Energy Efficiency Unit (NEEU) in September 2003. NEEU was given a broad mandate that included developing and coordinating the government's energy efficiency programme and encouraging private investment in renewable energy. The unit's efforts focus on six main programmes, which are described below.

Residential-sector programme

The main thrust of the residential programme is to promote solar water heaters, proper installation and efficient use of electrical appliances, and wider use of compact fluorescent bulbs. One of the principal objectives of this component of the programme is to facilitate the installation, and more widespread use, of solar hot water heaters in residential buildings to replace electric water heaters. There are currently only 7,000 installed solar hot water heaters in Jamaica, compared with over 40,000 in Barbados.

Small businesses programme

The commercial component of the NEEU programme targets hotels, office buildings, banks, supermarkets, etc. A major portion of the energy that these businesses consume is used for air conditioning and lighting. Thus, the use of electronic "ballasts" and high-efficiency fluorescent bulbs is being encouraged. The emphasis with regard to air conditioning is on timers, which can reduce the amount of hours the systems are in operation. Retrofitting is also being promoted as a means of reducing power from refrigeration, along with correcting deficient systems designs and improving installation practices.

Programme for industrial and commercial users

Many large industrial facilities in Jamaica consume both electricity and heat. These are outstanding candidates for cogeneration. Cogeneration technology is now being encouraged, particularly for small users (under 2 MW).

Public-sector and government programme

Details of electrical spending by government in public-sector buildings show that 47% of this expenditure is by the National Water Commission (NWC), while 14% is for public lighting and 9% for hospitals. The public sector programme therefore focuses on these major users, with special emphasis on lighting and water heating for air conditioning, steam generation and (in the case of the NWC) pump water.

Energy fund (proposed)

The PCJ National Energy Efficiency Unit (NEEU) has been conducting a public awareness and education programme, as well as helping to establish an Energy Efficiency Fund. The hope is that the fund, which is still under discussion, will be able to provide special low-interest funding for users and private-sector operators.

Public education

In an effort to cover several areas that have been identified as vital to creating public awareness of energy efficiency issues, the National Energy Efficiency Unit launched a number of radio and TV initiatives under the motto "Conserve today or tomorrow we pay". Seminars held on energy conservation between May 2004 and May 2005 trained 102 science professors from 53 tertiary technical institutions. The NEEU recently initiated a new public education campaign at the national level to promote energy efficiency.

Jamaica Bureau of Standards (JBS)

The JBS is currently involved in two main areas of energy efficiency:

- Use and labelling tests.
- Finalizing and publicizing the Energy Efficient Building Code (EEBC).

A solar energy laboratory was established in the mid-1980s as part of a joint programme involving the United States Agency for International Development (USAID) and the Government of Jamaica. Drawing on participation by a large number of government agencies, the objective was to improve the country's capacity to develop energy efficiency and renewable energy projects. The laboratory was designed to be able to evaluate the functioning of most components, including the collectors and storage tanks associated with solar water heaters. After the laboratory was put into operation, the JBS conducted random tests of the water heaters of local manufacturers and distributors, and then made recommendations.

The EEBC was established in 1994 by JBS as a national professional code. It was prepared primarily by JBS, though it reflected the views of numerous local and international experts on the conceptual design of low energy-consumption buildings.

University of the West Indies (UWI)

Most of the UWI's work in energy efficiency and renewable energy technology is carried out in the School of Engineering at the Trinidad campus. The School of Pure and Applied Sciences, at the Mona campus, has been a leader in persuading other schools and entities at the university to not only recognize the need for energy efficiency, but also to implement their own measures to make their

equipment and lighting systems energy efficient. The most recent initiative by the School of Pure and Applied Sciences will create a new graduate programme on energy efficiency and renewable energy.

University of Technology, Jamaica (UTech)

This institution has been offering training in energy-related areas for a considerable time at its Energy Centre, which was established in 1983 when the university was still a college. The School of Engineering has a limited number of options for undergraduate electrical and mechanical engineering students who wish to take energy-related courses. In mechanical engineering, a course entitled "Energy Production Systems" offers a 60-hour module, of which approximately 50% is devoted to renewable energy and energy conservation. Interest in all of these areas has diminished recently with the decline of the Centre.

University Centre for Environmental Development (UWICED)

The Centre was created in the early 1990s by the University of the West Indies (UWI), as a response to growing concerns in the global community about threats to the world's environment. UWICED is funded in part by UWI, but revenues are used to maintain it, using subsidies and loan funds for projects approved by international and regional bilateral agencies. UWICED has assumed a leading role in the region in promoting energy research. Its links with regional energy-related organizations such as OLADE, the Caribbean Programme of Action for Climate Change (CEPACC) and the Caribbean Energy Information System (CIES) have allowed it to play a role in designing and executing many regional projects.

Ministry of Transport and Works

The Ministry's initiatives include:

- Incorporating energy efficiency and environmental management in a corporate plan for the Ministry.
- Planning for energy audits in its buildings.
- Initiating a plan to retire old and inefficient buses from service—limited, so far, by the logistical problems of disposing of the old vehicles.

Ministry of Agriculture

This Ministry's initiatives include:

- Oversight of lighting and air conditioning systems.
- Retrofitting used irrigation pumps to achieve the highest possible level of efficiency in irrigation systems.
- Special debit cards to reduce gasoline purchases for Ministry vehicles.

Ministry of Environment and Territory

This Ministry's initiatives include:

- An Environmental Management Guide developed for the Ministry by the Environmental Action Programme (ENACT), including material on energy efficiency.
- Development of new measures to combat climate change.

3. Resources and funding mechanisms for energy efficiency programmes

The Inter-American Development Bank recently (12 June 2009) approved a non-reimbursable technical cooperation project designed to support the Jamaican government in developing energy efficiency projects, and to provide it with technical assistance in preparing a loan request for this purpose. The principal features of the operation as it is now being carried out are summarized below.

TABLE 3
INFORMATION ON ENERGY EFFICIENCY PROJECT IN JAMAICA

Project description:	Support for the Government of Jamaica to improve energy efficiency, and technical assistance for preparing a loan request for an energy efficiency project in Jamaica.
Stage:	
Financial information	Total cost—historic: US$ 437,500 Country counterpart financing—historic: US$ 87,500
IDB financing	Financing type: non-reimbursable technical cooperation. Fund: MSC Reporting currency: USD (United States Dollar). Reporting date: 30 June 2009. Approved amount—historic: US$ 350,000. Cancelled amount—historic: US$ 0. Undisbursed amount—historic: US$ 350,000 Disbursed to date—revalued: US$ 0.
Roles and responsibilities	Executing agency: Ministry of Energy and Mining.

Source: Inter-American Development Bank (IDB), 2009.

Early this year (March 2009), the Inter-American Investment Corporation (IIC)[2] launched the GREENPYME programme, about which the following information is available:

GREENPYME promotes the adoption of energy efficiency measures, the use of renewable energy and clean technologies in small and medium-sized enterprises (SMEs) in Latin America and the Caribbean.

On 9 March 2009, the Inter-American Investment Corporation (IIC), which is the only multilateral development institution with a mandate to support and fund Latin American and Caribbean SMEs, announced a technical assistance programme in the area of energy efficiency and renewable energy in those countries where there is major potential for energy savings in such firms.

The purpose of the programme is to provide knowledge, tools and technical and financial support for SMEs, so that they can implement energy efficiency measures and adopt clean technologies and, by thus lowering their energy costs, improve their competitiveness and sustainability while improving their environmental impact.

[2] The Inter-American Investment Corporation is a multilateral financial institution and a member of the Inter-American Development Bank (IDB) Group. It provides financing (in the form of capital investments, loans, guarantees and other instruments) and consulting services to private enterprises of Latin America and the Caribbean. In 2008, CII had US$ 1.5 billion in assets and approved 64 operations, channelling US$ 300.55 million to small and medium-sized enterprises in the region. The mission of ICC is to promote the economic development of its member countries in the region, stimulating the formation, expansion and modernization of private enterprises, particularly those of small and medium size.

Firms working with GREENPYME can receive assistance in conducting energy audits, and can obtain consulting services and technical viability analyses. Participation in the programme can also facilitate access to funding from IIC in the form of loans and capital investments. According to the Chief of the organization's Technical Assistance and Strategic Partnerships Division, "there is a real need for this innovative technical assistance programme because SMEs in Latin America and the Caribbean still consume a large amount of high-cost energy inefficiently. That cost can be key to business viability."

GREENPYME receives financial support from various donors, in particular the Korea-IIC Development Trust Fund to assist SMEs. These resources make possible a range of activities in collaboration with local strategic IIC partners (commercial banks, universities, chambers of commerce and business groups) and are also used to promote the sustainability of SMEs through energy efficiency and the use of renewable energy.

In November 2008, GREENPYME entered the scene with three training seminars on energy efficiency in Jamaica and Belize, co-sponsored by IIC and Scotiabank. Two more workshops were held in the Bahamas with co-sponsorship from the Royal Bank of Canada and the Bahamas Hotel Association, and one in Trinidad and Tobago, co-sponsored by Scotiabank.

4. Recent advances in energy efficiency

a. Electricity loss

Loss of electricity increased considerably, to a peak of 23.2% in 2007, then declining to the still-high level of 22.9%. Although 9.9% of this is attributable to technical losses, the remaining 13% is due primarily to an increase in illegal connections or unpaid bills (non-technical losses), most likely a consequence of the increase in electricity rates and the growing number of low-income households. The decline in residential (rate 10) sales in the last two years is further confirmation of this situation.

Some of the negative growth may also be attributable to more sensible and rational use of electricity. In 2007, non-technical losses totalled J$ 4.8 billion (US$ 70.6 million), of which only J$ 2 billion (US$ 24.4 million) could be recovered through rates. To further reduce the loss of revenue, JPSCo management has decided to take additional measures to prevent electricity theft.

Accordingly, the company is implementing **advanced metering infrastructure for commercial clients determined to be in a high-priority category**. The first phase, completed in April 2008, installed 1,700 smart meters, along with the necessary infrastructure, at a cost of approximately J$ 100 million (US$ 1.4 million). The second phase, which is to be completed in the next two years, calls for installing 4,300 additional meters. This will provide automatic metering for JPSCo's 6,000 largest commercial clients, which account for approximately half of the energy consumption. These measures will improve the company's ability to monitor clients' consumption on the national grid in real time, and thus increase the ability to detect non-technical losses

JPSCo officials anticipate that the implementation of various initiatives will reduce losses to 18.3% by June 2014, with a reduction of 3.2% in non-technical losses and 1.4% in technical losses. Given average specific energy consumption of 10,000 BTUs/kilowatt hour, a 1% reduction in (technical) losses (equivalent to 40 gigawatt hours) would produce an annual saving of 74,000 barrels of oil. Eliminating non-technical losses assumes, primarily, an improvement in the "sales" component of the equation, but not major reductions in energy consumption.

b. Efficiency standards and labelling of appliances

Most imported energy-consuming appliances sold in Jamaica are not as energy-efficient as they might be. Consumers are often unaware of long-term operating costs and differences in energy consumption between models of similar size with similar features.

Salespeople also lack the information and skills needed to help customers choose an electrical appliance not only on the basis of its design and functions, but also for its specific energy consumption. Current policy does not prevent low-efficiency appliances from entering the country, nor does it provide incentives or measures to promote the purchase of items that consume less energy.

Jamaica's Bureau of Standards (BSJ) introduced mandatory labelling for refrigerators in 1990. In practice, the label, which is similar to that used in the United States, is almost never used, and consumers are unaware of its significance. In a relatively small country that does not produce its own appliances, it is nearly impossible to create the facilities needed to test appliances and certify them under national labelling standards or to enforce minimum energy performance standards, given that the country's market is highly dispersed and includes a wide range of items. A further problem is that the labels and minimum efficiency performance standards (MEPS) have not been made uniform. Even if the standards were to require certain items to carry labels or meet certain energy consumption standards, effective customs controls would be nearly impossible.

One possible solution to the dilemma brought about by the small size and dispersion of the market—and by the fact that BSJ has limited testing capacity—would be a unified regional effort, perhaps in the framework of the Caribbean Community (CARICOM), taking an approach similar to that used for the region's common labelling standards for pre-packaged products. The appliance markets of the various CARICOM countries are nearly identical, since they depend almost entirely on imports from foreign manufacturers.

c. Lighting

Lighting accounts for a **large proportion of electrical consumption** in many sectors. In most Jamaican households, lighting is the second largest category of electricity consumption after refrigeration. In many offices, the energy consumed for lighting is comparable to that used for computers and other office equipment, and is exceeded only by the amount of electricity used in air conditioning. According to World Bank estimates, the demand for electrical lighting in the developing countries increased at an annual rate of 3.6% over the last decade.

New construction and growing levels of lighting will contribute to further increases in countries such as Jamaica. Most Jamaican homes and many small stores still use tungsten filament incandescent bulbs or halogen bulbs, due to their low purchase cost. However, these methods convert less than 10% of the electrical energy into light, while the remaining portion is converted to heat. Although the efficiency of incandescent lamps (tungsten filaments) varies, it is generally lower than that of compact fluorescent bulbs (also known as "energy saving" lights) that can be used instead.

A compact fluorescent bulb can provide 6,000 to 20,000 hours of lighting, at least five times more than a traditional bulb. Thus, its lifetime cost is lower, especially where, as in Jamaica, the price of electricity is high.

Most offices and service-sector storefronts in Jamaica use linear (tubular) fluorescent bulbs, but these are often not the most efficient bulbs of their type. The 40-watt T12-model tubes can be replaced by 36-watt T8s or T5 bulbs, and the associated fixtures can be replaced with equipment that reflects most of the light and directs it to places where it is required for work, or where objects are being displayed. Magnetic regulators also are not optimally efficient and could be replaced with electronic devices.

c.1 Improving the quality of compact fluorescent bulbs

There have been efforts in recent years to encourage the use of compact fluorescent bulbs in various funding programmes around the world. In 2008, the Cuban government distributed bulbs of this type to Jamaica's poorest households. Despite the efforts, many such initiatives have not been sustainable. Many clients have expressed disappointment with low-quality compact fluorescents, which provide less intense light after being used a short time, or fail long before fulfilling their expected lifetime.

Once compact fluorescents have gained a significant share of the market, the Jamaican government should consider a total prohibition on importing incandescent bulbs. This idea was first proposed in Australia, and has been adopted by the Government of Ireland. In 2006 and 2007, Cuba implemented a complex programme for the gradual elimination of incandescent bulbs, which consisted of prohibiting their sale and replacing installed incandescent bulbs with compact fluorescents.

c.2 Outdoor public lighting

Public lighting can also be a source of concern, since it constitutes a drain on public budgets. In 2007, 90,000 bulbs used for public lighting in Jamaica consumed 66 gigawatt hours of electricity. In cooperation with JPSCo, the government is reducing energy consumption by replacing mercury vapour bulbs with more energy-efficient types of lighting.

d. Transportation

In 2005, Jamaica's transportation sector (including maritime and air transport) used on the order of 9.5 million barrels of oil—one third of the country's total consumption. The amount of oil used for road and rail transport is comparable to the volume used to generate electricity for the public grid (i.e., excluding self-generation by the bauxite and other industries). The demand for oil is constantly rising.

Between 2004 and 2005 there was a particularly pronounced increase of nearly 1.5 million barrels. Almost two thirds of the total was used for road and rail transport, although rail plays a secondary role in this regard. The remaining amount was divided equally between air and maritime transport.

The road sector's consumption is divided almost equally among 87-octane unleaded gasoline, 90-octane unleaded gasoline and diesel, which is used primarily for buses and trucks, since there are relatively few diesel passenger cars. Reliable statistical information is not yet available to show how the transportation sector and fuel consumption were affected by the marked increase in oil prices before and during the first half of 2008. Preliminary data suggest that oil consumption fell approximately 10%.

It can be assumed that Jamaican drivers, like drivers in most industrialized countries, reduced the distances they drove. In the last quarter of 2008, prices at the refinery declined from more than J$ 70 per litre (for 90-octane gasoline) to a mere J$ 50 per litre.

d.1 The vehicle fleet

In March 2006, some 537,000 vehicles of all types were registered in Jamaica. This included 374,000 automobiles and 128,000 trucks. In 2005, over 74,000 vehicles were registered for the first time. Barely one quarter of all the automobiles and light commercial vehicles (including pickup trucks and sport utility vehicles) were new, while the rest were second-hand imports, primarily from Asia. The number of used-vehicle imports dropped considerably in the late 1990s, when standards were established to limit maritime shipping of older automobiles, and import tariffs were increased.

A new import policy, which has been in effect since July 2004, further limited the age of vehicles imported (three years for automobiles and four years for light commercial vehicles). Despite high import duties for automobiles with large engines, Jamaican buyers do not necessarily turn to smaller automobiles, and they place less importance on engine size and fuel consumption than on other features. The cost of annual licensing also depends on engine size and does not take fuel consumption into account. Small automobiles with average specific consumption of under 6 litres per 100 kilometres are still uncommon. The average consumption of passenger automobiles overall is 10 litres or more per 100 kilometres.

d.2 Rail system

Although Jamaica has 334 kilometres of track operated by the Jamaica Railway Corporation (JRC), only 92 kilometres are currently being used—for the bauxite industry—and no passenger trains are in service. The system has the capability of using 292 kilometres, with the longest route being the 181-kilometre stretch between Kingston and Montego Bay. The second major line, between Spanish Town and Port Antonio, would require extensive work to be returned to service, and the Bog Walk Junction to Port Antonio section (87 kilometres) would need to be rebuilt. In addition to the public rail system, some bauxite industry firms operate their own railway systems, which total roughly 100 kilometres.

It may not be economically viable or reasonable to restore the entire railway system to service for regular passenger transport. Given Jamaica's relatively short distances, a modern bus-based system could be as rapid and efficient as railways and have greater flexibility.

e. Energy efficiency in buildings

The construction sector is one of the principal end users of energy in Jamaica. This is markedly true in the case of commercial buildings and service facilities that have refrigeration systems and major artificial daytime lighting needs. Taking into account climatic factors during the designing and building process could contribute greatly to reducing the electricity needed for refrigeration and lighting, and thus decrease energy consumption.

Since Jamaica's average temperature is relatively high and solar radiation is intense, pleasant interior conditions can be achieved, in part, through architectural solutions that exploit building design, selection of materials and use of natural ventilation and light-control devices. In most cases, however, additional technical measures are needed to produce satisfactory interior conditions for all climatic situations.

e.1 Jamaica's Energy Efficiency Building Code (EEBC)

Jamaica's national standards agency introduced an initial Energy Efficiency Building Code (EEBC) in 1994, following the model of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). The code is a voluntary set of guidelines, and there is no mandate that its requirements be met as a condition for obtaining a building permit.

Annual energy saving from compliance with the EEBC was estimated at 30% for large office buildings and up to 36% for smaller buildings. The estimated reduction of the maximum refrigeration burden was 24% and 29% of the reference figures, respectively.

In cases where the strongest efficiency measures are implemented, improvements could save more than 50% of the reference figures, exceeding even the EEBC requirements. The EEBC standards were highly effective in terms of cost at the time the Code was published, when 1.2 years was the period projected for recovering the investment involved in implementation for the largest office buildings, with 2.6 years being the corresponding time period for smaller office buildings. Compliance with EEBC standards is ensured in a number of ways, including the following:

- The regulatory approach: All elements of a building, including the exterior, natural and artificial lighting, air conditioning and ventilation, electric power and water heating, must meet specific standards. The code also offers the alternative of using system performance criteria for the building exterior, based on overall thermal transmission values, which are separate for roofs and walls, allowing for some flexibility in design.
- The energy budget or cost of energy approach: The consumption or energy costs are calculated for the entire building, with each value required to be below a specified maximum.

Both methods require extensive knowledge on the part of architects, builders and the agencies responsible for granting building permits and enforcing compliance. Given an absence of greater

detail, it may be assumed that the EEBC has contributed, in the best cases, to promoting awareness among architects and engineers. However, this has had little impact, to date, on actual building and remodelling processes. The agencies responsible for permits lack the personnel and knowledge needed to evaluate the energy consequences of architectural designs.

The National Standards Office has begun the process of updating the EEBC, based on the stricter standards promulgated by ASHRAE in the United States in 2004. This update will apply to all commercial buildings and the largest service facilities consuming energy for air-conditioning and lighting, but will not establish standards for residential construction.

5. Lessons learned

It is clear that disseminating more specific information for professionals (e.g., in the form of manuals or guides) and for the general public (in the form of one-page fliers) could be useful in achieving greater energy savings on lighting in Jamaica. Consumers should be informed of the different types and qualities of compact fluorescent bulbs available on the market, and on how to dispose of them properly when they are discarded. Given that these devices contain small quantities of mercury, a reliable system for collecting and recycling them should be in place.

Architects, lighting designers and other professionals should be informed of the tools and means available for effectively designing lighting systems that consume the least amount of electricity possible. All government and community entities should set a precedent by purchasing only high-quality compact fluorescents for lighting. As in other sectors of consumption, major sustainable results could be achieved by combining different measures within the framework of a programme focused on medium-term savings and clear objectives, such as a 20% reduction in the electricity used for lighting from the reference value in a given period.

These measures could include regulatory initiatives, voluntary projects and promotional activities directed at households, the commercial and services sectors and public institutions. An analysis should be conducted on exempting compact fluorescent lamps from import tariffs and other taxes. Through competitions to spotlight the best implementations, and with the dissemination of accompanying information, public and professional attention would be focused on different aspects of large-scale lighting.

Specific training courses, possibly in collaboration with the University of the West Indies or Jamaica's University of Technology, could promote the training of architects, planners, technical personnel, those in charge of energy resources research and large consumers of electricity (including hotel managers). The government, and perhaps JPSCo, could encourage the marketing of energy-efficient bulbs by purchasing them in large quantities, which would allow them to obtain lower prices for end consumers (particularly public institutions). The Green Light programmes in Europe, and similar programmes in Australia and New Zealand, are notable models in this respect.

In 2005, the Jamaican government published the draft of a national transportation policy that included a chapter on energy saving and environmental protection. Although most of the policy recommendations regarding more energy-efficient transportation are good, they have yet to be implemented. Despite some past progress, it is clear that the public transportation system needs improvement and strengthening.

Broader acceptance by users and by owners of private vehicles can only be achieved through modernization of the transportation fleet, providing daytime and night-time service that functions regularly in metropolitan areas, unified bus routes, a common ticketing system that allows for transferring between different lines, preferential treatment via separate road lanes in places where there is traffic congestion, and priority signal controls at traffic lights.

Buses must be comfortable, safe and easily accessible to users of all ages, the disabled, and those travelling with small children or baggage. Many buses used in Kingston today are more suited to travel in outlying areas than to urban service. A stronger relationship between passengers and the public transportation system can be promoted through prepaid monthly or annual passes, which are especially attractive for people who use the same route to travel to work on a regular basis.

Passes that are purchased by companies or employers, which then sell them to their staff at preferential prices, have been successful in some European countries. Altering traffic patterns, especially in congested urban areas, also necessitates discouraging the use of private vehicles, e.g., by reducing the amount of parking available and by charging for parking on public streets within the city centre. Since the current system of import duties and licenses is not having any visible effect in turning consumers away from large vehicles that clearly are intensive energy consumers, tariffs should be revised and increased for the most expensive segment of vehicles, while offering greater incentives for purchasing smaller and more efficient models.

This objective could also be achieved by increasing fuel taxes (currently J$ 7.7 per litre for 90-octane gasoline) to favour automobiles that consume less fuel. Fuel prices in Jamaica are mid-range for the region's countries. In November 2006, the average retail price of gasoline was US$ 0.82 per litre, as compared with US$ 0.63 in the United States, US$ 0.70 in Panama, US$ 0.89 in Grenada and US$ 1.11 in Barbados.

Since engine size is only an approximate indicator of fuel consumption, the government could also evaluate the possibility of implementing duties based on emissions of anhydrous carbon dioxide—at least for all imported vehicles—since these emissions are directly related to fuel efficiency. Consideration could also be given to exempting highly efficient automobiles (e.g., those that consume less than 120 grams of anhydrous carbon dioxide per kilometre, equivalent to a yield of 5 litres per 100 kilometres) from licensing fees for a set period, in order to promote the introduction of this type of automobile to the market.

On the other hand, the oldest and most inefficient automobiles could be prohibited from using the streets, with incentives to encourage their gradual elimination (scrapping) through a single payment, perhaps in combination with a preferential pass for public transportation. Automobile dealers should provide their clients information on fuel consumption and anhydrous carbon dioxide emissions for new and used automobiles. Moreover, customs officials should require that this information be provided with all automobiles entering the Jamaican market. Most automobile manufacturers in the world market already have this information and apply standard sets of tests (such as those in use in the European Union).

It is also advisable that the government (or government agencies) report vehicles' fuel consumption through targeted campaigns that cite data widely available on the Internet, and that they compel automobile dealers and importers to provide equivalent data in all of their marketing activities.

The European Union anticipates that labels for automobiles, similar to those on household electrical appliances, will lead to a reduction in fuel use of between 4% and 5% as consumer awareness increases. As a later step, the Jamaican government, preferably in coordination with other countries in the region, could consider introducing its own automobile label citing comparisons, e.g., comparing a vehicle's anhydrous carbon dioxide emissions with the average for similar vehicles on the market. This could increase consumer awareness of the environmental impacts of automobile use.

Poorly functioning engines use more fuel and produce unnecessary emissions that pollute the air. Thus, certified facilities should inspect vehicles periodically—more often for old vehicles than for new. Some case studies in Brazil have shown that simply changing air filters in bus engines considerably reduces fuel use.

Jamaica's Transport Authority, which is responsible for the functioning of a fleet of over 20,000 buses used in public transportation, should continually monitor each vehicle's fuel use and purchase only new, highly energy-efficient buses equipped with modern fuel-saving technology.

Investment plans could help to select the buses to replace, based on excessive fuel costs that make them uneconomical compared with new vehicles.

Public awareness campaigns on energy efficiency in transportation, as well as driver training programmes, can promote more conscious behaviour and better understanding of the issues, but, compared to regulation, these measures are merely cosmetic in nature. Adding ethanol to gasoline, to replace the octane enhancer MTBE, has more to do with diversifying resources than with boosting energy efficiency. Initially, ethanol will be imported primarily from Brazil, until the domestic sugar industry is able to produce sufficient quantities at reasonable and competitive prices.

The effect of this on consumer prices will be minimal, especially if oil prices remain around US$ 50/barrel or less. A significant effect on the national economy can only be expected with higher oil prices, and with the introduction of much larger quantities of ethanol, preferably from local production. Moreover, nearly one half of fuel consumption in the transportation sector is attributable to diesel vehicles. This segment includes trucks, buses and, reportedly, a high percentage of ships. The percentage of consumption in the form of diesel could even increase if government policy induces a rise in the number of diesel automobiles imported into the country.

Thus, the government must also address the fuel consumption of diesel engines, especially in vehicles used for public transportation (passenger traffic) and for transporting products. The introduction of biodiesel from domestic production is still at a very early stage, and much research and preparatory work will be necessary before substantial quantities can be placed on the market. In addition to measures targeting the vehicle fleet, infrastructure improvements could reduce the energy intensiveness of the transportation sector.

This includes improving the pavement of streets and highways (especially in rural areas and outlying urban areas) to make roads safer for smaller vehicles, and changing urban planning schemes, which should favour intra-urban development with short-distance roads over new shopping centres and housing in peri-urban areas, which often are accessible only by individual modes of transportation. The possibility of introducing higher parking fees in the central areas of cities, and restricting the space available for parking, in order to further encourage the use of public transportation could also be assessed.

The ideal option would be to establish general energy performance standards for buildings, with energy consumption indicators that apply to building exteriors and to certain technical equipment used for providing energy, since this would give designers more freedom to choose among different ways of meeting the requirements. Currently, it is preferable to set standards in terms of individual efficiency requirements (normative values) for each of the main components of a building. Applying energy efficiency standards to all types of buildings in Jamaica is problematic. Strict enforcement would require the minimum EEBC standards to be legally binding and mandatory.

Given the complexity of the code, compliance at this stage can only be ensured by building designers, and effective pre-construction controls by local authorities is not feasible. Energy inspection of a building, once finished, is useful only with regard to the most visible elements, since failures in insulation generally cannot be detected. A more flexible alternative could be to select the largest and most energy consuming buildings for more thorough inspection, and to designate inspectors (or private independent auditors) at the national level to carry out the inspections.

A more promising approach could be to reward buildings whose energy performance significantly exceeds the minimum standards required by the EEBC (which could be verified through certification by independent experts). This would be a strong incentive with respect to buildings of high public value, such as tourist complexes, hospitals, educational institutions, etc. Construction of such buildings could also be encouraged by facilitating easier access to credits (and perhaps lowering the cost of credit for such cases). Best practices and demonstration buildings should also be encouraged, and should receive extra financial and promotional support to increase the chances of their appearing on the market. The modified version of the code should include provisions on solar water heaters—an element absent from the 1994 version.

Consideration should also be given to making installation of these heaters mandatory, in order to ensure that a specified amount of solar water heating is present in all facilities with significant hot water use, such as hotels, restaurants, hospitals, sports centres and certain industrial facilities. Mandating solar hot water heaters is a common practice in Spain (where it is required for new residential buildings), Israel, Mexico City and in other countries and regions. To prevent poorly functioning, low-cost equipment from entering the market, complete solar radiation collectors or complete systems (including equipment for the storage phase) should be certified under international standards.

A similar approach could be adopted for air conditioning systems powered by solar energy, if such equipment proves reliable and cost-competitive. Moreover, new-building designs should always allow for subsequent installation of solar systems on flat or sloped roofs, and should provide for adequate hot or cold water pipes inside the building.

During a certain period, decentralized cogeneration systems for buildings that generate heat and electricity could be an attractive option, especially if the security of the energy supply requires a degree of independence from the central network. The heat from the exhaust gases could be used directly to produce hot water or for air conditioning systems. More attention must be given to existing buildings, particularly with respect to roof insulation, use of hermetically sealed windows, additional measures for light control, greater use of natural lighting and seals to prevent loss of air (where air conditioners are present).

In this context, it would be useful to evaluate the possibility of conducting mandatory studies on energy use (audits of buildings), at least for constructions with significant electricity or other energy consumption. Improvement can be encouraged by preferential loans and information campaigns on all energy-related aspects of building.

V. Suriname

1. Recent advances in policy, regulatory and institutional frameworks

There are no standards, regulations or laws on efficient energy use in Suriname, nor are there explicit mechanisms to promote energy efficiency programmes or projects. Implicit policies that encourage energy efficiency include:

- Purchasing more hydroelectric energy from the aluminium company Suralco when it is available.
- Using heavy fuel oil or heavy vacuum gas oil from the national oil company to generate electricity when the aluminium company cannot provide hydroelectric power.
- Installing efficient bulbs in the residential sector (this, however, was a one-time project underwritten by Cuban cooperation).
- Encouraging the installation of electricity from renewable sources in rural villages.

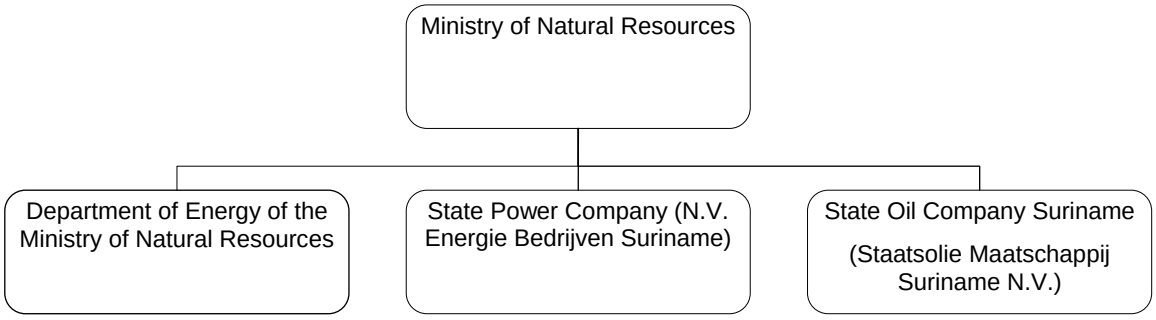
In terms of explicit energy efficiency policy, the government has determined that only automobiles that are less than five years old may be imported, since these consume less fuel and therefore generate less greenhouses gases.

In periods of extremely high oil prices, the Suriname government was unable to continue justifying the subsidies given to the public electric utility (the State Power Company—N.V. Energie Bedrijven Suriname) or those provided for the transportation sector.

The operative policy was that if diesel could not continue to be provided free of charge to rural villages, due to high fuel purchase and transportation costs, inhabitants would have to pay market prices or contend with fewer hours of electricity.

There is no official agency in Suriname responsible for energy efficiency issues. The institutional scheme is outlined in the figure below.

FIGURE 6
ENERGY SECTOR SCHEME



Source: Government of Suriname.

The three entities reporting to the Ministry of Natural Resources (two public enterprises and an office in the Ministry of Natural Resources) have their own energy efficiency programmes, which are approved by the Ministry.

2. Key actors in energy efficiency and their effective roles

a. Governmental institutions

Ministry of Natural Resources: responsible for overall energy policy. The Ministry coordinated the one-time project of installing efficient bulbs donated by Cuba.

Department of Rural Electrification of the Ministry of Natural Resources: responsible for supplying electricity to rural villages in the country's interior, which have their own energy efficiency programmes.

b. Companies

b.1 State Power Company (NV-EBS)

This company is solely responsible for supplying electricity and gas in the cities. It has its own policy to promote energy efficiency, including, for example, replacing the diesel used in electric generators by heavy gas oil. There are also programmes to reduce losses in transportation and distribution systems.

As mentioned above, when a surplus of hydroelectric power is available from the aluminium producer Suralco, it is purchased.

b.2 State Oil Company

This company is single-handedly responsible for exploring and exploiting oil in Suriname. It has a crude oil refinery that produces diesel, heavy fuel oil and bituminous asphalt. It is expanding, with a view to producing light fuels for automobiles and thus reducing imports.

The company also has a license to produce electricity, an arrangement under which it is required to sell it to the electric company NV-EBS. The refinery's generators use their own heavy fuel oil.

c. Non-governmental organizations

DRESS: This organization is promoting the use of renewable energy by developing a plan to install 15 MW of small hydroelectric plants to supply electricity to the mining (gold) industry in the country's interior.

Other NGOs are installing photovoltaic systems in rural villages. These include the Catholic organization Pater Ahlbrinck Stitching (PAS), environmental organizations, and service clubs such as the Rotary Club. The main use for this electricity produced from photovoltaic panels is for lighting and water pumps.

d. Universities

Anton de Kom University of Surinam: This institution is involved in designing and developing renewable energy projects for the rural sector. It also provides assistance to public enterprises in the fields of electricity, oil, etc., for studies such as those designed to minimize losses in electric power generation, transportation and distribution. It also assists NGOs with renewable energy projects.

e. Consulting firms

There are a number of consulting firms, but none is devoted exclusively to developing energy efficiency projects.

There are no regulatory entities or energy services companies (ESCOs) in Suriname.

3. Resources and mechanisms to fund energy efficiency programmes

The funds available in Suriname from international entities (United Nations Development Programme, the European Union, the Inter-American Development Bank, the Organization of American States) are primarily associated with supporting the development of renewable energy projects—with an emphasis on reducing greenhouse gas emissions—and economic development projects focused on reducing poverty in rural areas.

In 2008, a study was conducted to evaluate Suriname's electricity sector and to examine alternatives for modernizing it. The study was conducted at the request of the Ministry of Natural Resources and was sponsored by IDB.

The energy companies, State Power and State Oil, are using loans from financial institutions such as the Royal Bank of Trinidad & Tobago (RBTT) and from the Surinam government, as well as from the Government of India.

Since there is no national energy efficiency programme in operation or being designed, it is impossible to determine what quantity of resources would be required to develop such a programme.

The Ministry of Natural Resources manages the funds used for energy efficiency purposes. In some cases, the Ministry of Planning and Development Co-operation participates. The Energy Department of the Ministry of Natural Resources monitors energy efficiency projects. Disbursement of loans is overseen by the Ministry of Finance, but daily monitoring is handled by the Ministry of Resources finance department.

4. Results of energy efficiency programmes to date

The Cuban-sponsored programme of replacing bulbs reduced energy consumption in some residential areas by 10%. (Editor's note: explanation of how this result was measured is not provided).

5. Lessons learned

Positive:

- The use of electrical generators operating on heavy fuel oil instead of diesel has been highly successful, and all new generators ordered are of this type.
- The programme of replacing incandescent bulbs with compact fluorescents in the residential sector is considered to have been a success.
- Suriname believes that the large-scale use of hydroelectric energy has made it possible to avoid major problems in times of high oil prices.

Negative:

- Lack of coordination of energy efficiency programmes between companies and the Energy Department of the Ministry of Natural Resources.

The project for replacing incandescent bulbs with efficient bulbs, conducted with Cuban assistance, was not sustainable, due to the fact that it did not include any national energy efficiency programme.

VI. Trinidad and Tobago

1. Recent advances in policy, regulatory and institutional frameworks

In Trinidad and Tobago, no energy efficiency programme is in operation or being designed, nor are their any specific—let alone binding and mandatory—laws or regulations to promote rational energy use.

The country believes that developing substitutes for conventional energy sources is not a matter of urgency, since there is no threat of a supply shortage. It has left the development of renewable energy initiatives to the private sector.

However, the government has agreed to incorporate the issue in its sustainable development goals in the medium term.

2. Key actors in energy efficiency and their effective roles

Trinidad and Tobago has a Ministry of Energy and Energy Industries (www.energy.gov.tt), which is the government agency responsible for managing and developing the country's oil and mining resources.

The Ministry's website describes its principal activities, none of which are related to actions, projects and/or programmes for efficient energy use in the country. The website also describes the Ministry's strategic objectives, none of which include energy efficiency or rational use of resources.

The ministry has 16 divisions or units, of which only one—the Department of Energy Planning and Research—makes reference (as a research issue) to seeking opportunities for the development of renewable energy. There is no mention whatsoever of energy efficiency in the Energy Planning area.

There is very little development of non-conventional energy in Trinidad and Tobago—only some incipient work on thermal solar energy, biomass and wind energy. Electrical production from renewable sources does not yet play any role in the country's energy balance sheet.

3. Resources and funding mechanisms for energy efficiency programmes

Since there are no energy efficiency programmes either in operation or being designed, no funds are allocated for such purposes.

4. Results of energy efficiency programmes to date

There are no national energy efficiency programmes in Trinidad and Tobago.

5. Lessons learned

Not applicable, since there have been no energy efficiency programmes.

Annex 1

Suriname

TABLE A1.1
TABLE OF RATES IN SURINAME

Sector (2007)	Rates. Average in US$/kWh.
Residential (103,651 clients); total consumption 3.733 kWh /year. Max. 25 KVA.	0.055, including reduced rates for those paying flat rates.
Small businesses, churches, social institutions (10,946 clients); consumption 13,094 kWh /year). Max. 25 KVA.	0.084 including reduced rates for those paying flat rates.
Large businesses, industry (1,127 clients); consumption 234,899 kWh/year. Max. > 25 KVA or high voltage connections.	0.078 including surcharges per KVA, low power factor and reduced rates for those paying a flat rate.

Note: For more information, see: www.nvebs.com

Source: NV-EBS (NV Energie Bedrijven Suriname—Electric Energy Company of Suriname).