Caribbean Hotel Energy Efficiency Action Programme (CHENACT)

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Energy Efficiency and Micro-Generation in Caribbean Hotels Consultancy

Final Report

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LIST OF ACCRONYMS

AC – Air conditioning
BCC – Barbados Community College BDS $ – Barbados Dollars
BHTA – Barbados Hotel and Tourism Association
BLP – Barbados Light and Power
BMFIET – Barbados Ministry of Finance, Immigration, Energy and Telecommunications
BMOE – Barbados Ministry of Environment, Water Resources and Drainage
BMOT – Barbados Ministry of Tourism
BNSI – Barbados National Standards Institute
CARICOM - Caribbean Community
CAST – Caribbean Alliance for Sustainable Tourism
CCCCC –Caribbean Community Climate Change Centre
CARIFORUM - Forum of the Caribbean Group of African, Caribbean and Pacific States
CARILEC – Caribbean Electric Utility Service Corporation
CB – Cost - Benefit
CDB – Caribbean Development Bank
CDE-EU – Centre for Development Enterprise – European Union
CDM – Clean Development Mechanism
CE – Cost-Effectiveness
CER – Certified Emission Reduction
CFC – Chlorofluorocarbon
CFL – Compact Florescent Lamp
CHEMI – Caribbean Hotel Environmental Management Initiative
CHENACT – Caribbean Hotel Energy Efficiency Action Program
CHTA – Caribbean Hotel and Tourism Association
CIGS - Copper indium gallium (di)selenide
CO2 – Carbon dioxide
CO2e – Carbon dioxide equivalent
CPA – CDM Program Activity
CREDP – Caribbean Renewable Energy Development Program
CREF – Caribbean Renewable Energy Forum
CROSQ – Caribbean Regional Organization for Standards and Quality
CSHAE – Caribbean Society of Hotel Association Executives
CTO – Caribbean Tourism Organization
DNA – Designated National Agency
DOE – Designated Operational Entity
EE – Energy efficiency
EER – Energy efficiency rating
EGFL - Enterprise Growth Fund Ltd.
EPC – Engineering, Procurement and Construction
ESCO – Energy Service Company
ESO – Energy savings opportunities
ETS – European Trading Scheme
GDP – Gross Domestic Product
GESS – Green Economy Scoping Study

GHG – Greenhouse gas
GIZ - Die Deutsche Gesellschaft für Internationale Zusammenarbeit
GWh – Gigawatt-hour
IDB – InterAmerican Development Bank
IETA – International Emissions Trading Association
IRR – Internal Rate of Return
kWh – kilowatt-hour
kWhe – Kilowatt-hour equivalent
LED – Light emitting diode
NAESCO – National Association of Energy Service Companies
MOTs – ministries of tourism
MW – Megawatt
NIS – National Insurance Scheme
NPV – Net present value
NSP – National Strategic Plan
OAS – Organization of American States
ODS – Ozone Depleting Substances
OECS – Organization of Eastern Caribbean States
O&M – Operation and Maintenance
PAYE – Pay As You Earn
PMU – Project Management Unit
PoA – Program of Activity
PPA – Power Purchase Agreement
PV – Photovoltaic
RBTT – Royal Bank of Trinidad and Tobago
RE – Renewable energy
RFQ – Request for Qualification
RMP – Refrigerant Management Plan
RN – Room night
SEPF – Sustainable Energy Policy Framework
SFP – Smart Fund Partners
SFTC – Smart Fund Technical Committee
STEP – Sustainable Tourism Enterprise Program
SWECS – Small wind energy conversion system
TA – Technical assistance
TMP – Tourism Master Plan
TOU – Time of Use
UNEP – United Nations Environment Program
UNFCC – United Nations Framework for Climate Change
USAID – United States Agency for International Development
USD – United States dollar
UWI – University of West Indies
VAT – Value Added Tax
VCS – Verified Carbon Standard
WBCSD – World Business Council for Sustainable Development
WRI - World Resources Institute

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EXECUTIVE SUMMARY

The hotel industry is critical to the Caribbean region's economy. More than 2,300 hotels, ranging from large all-inclusive resorts to small owner-operated guesthouses, offer over 240,000 rooms to business and leisure visitors. Between 2008 and 2011, the Caribbean tourism sector has experienced a series of challenges, including declining visitors and visitor spending, increasing global competition, and increasing input costs, particularly for energy. Two organizations, the Caribbean Hotel and Tourism Association and the Caribbean Tourism Organization, represent the interests of the hotel sector and tourism industry, respectively, and are committed to ensuring a sustainable tourism industry.

Energy costs (more specifically electricity rates) in the Caribbean are among the highest in the world, due to its dependence on oil-fired generation; these rates exceed US $0.40 per kilowatt-hour (kWh) in the Eastern Caribbean. Annually, hotels in Barbados with less than 50 rooms spend an average of US $113,500 on electricity; those with between 51 and 100 rooms spend $266,450; hotels between 101 and 200 rooms spend $313,000, and those with more than 200 rooms spend an average of $816,000. Detailed energy audits of 46 hotels in Barbados, Dominican Republic, Jamaica, and Trinidad and Tobago revealed the potential for cost-effective energy savings in air conditioning, lighting and other end uses of up to 34.4% of total electricity costs. Typically, hotels can recover their investments in energy efficiency in less than three years. For the participating hotels alone, the investment potential is US $8 million.

Given the predominance of oil-fired generation and high consumption levels of electricity, Caribbean hotels are major contributors to greenhouse gas (GHG) emissions, estimated at more than 3 million tons CO2e per year. Investments of $433 million in cost-effective improvements in energy efficiency could result in annual savings of $271 million (or $1.9 billion over 7 years) in electricity costs and 835 million tons of CO2e per year. The Caribbean has not been an active participant in the global carbon market. Only eight Caribbean countries have established institutions for approving emissions reduction projects, and given the small size of individual hotel emissions credits coupled with the small markets, carbon trading schemes have been limited.

A proposed Caribbean regional program to improve energy efficiency, reduce utility costs, and mitigate greenhouse gas (GHG) emissions in the Caribbean hotel sector should include three major types of activities: 1) raising awareness, 2) creating investment vehicles, 3) providing technical support and capacity building to public and private sector stakeholders; and 4) ensuring a supportive policy framework.

- The ***awareness program*** should encourage:
    - promote cost effective energy efficiency and distributed renewable energy investments by hoteliers,
    - highlight market opportunities for energy efficiency companies,
    - document reliable technologies, effective applications and results from other actual hotel case studies; and
    - associate energy efficiency and renewable energy investments with improved environmental performance, e.g., reduced carbon footprint.

- ***Investment vehicles*** should link:
    - savings with carbon credits,
    - reduced operating costs with competitiveness, and
    - innovative approaches that link payments with performance.

- Technical support actives should strengthen public and private sector organizations in:
    - designing, implementing and verifying performance-based energy savings;
    - registering, administering and brokering carbon credits in international markets;
    - preparing guidelines for professional architects, engineers, and tradespersons as they relate to buildings, appliance and equipment, and hotel/resort operational energy performance.
- A ***comprehensive policy framework*** will need to include:
    - investment incentives,
    - energy efficiency building codes for new construction and retrofit of hotels and resorts
    - equipment standards (referencing those used in export markets such as Europe, North America and Asia), and
    - rating and certification schemes to recognize energy efficiency and GHG management leadership in the hotel industry.

The Caribbean Hotel Energy Efficiency Action (CHENACT) Program's Energy Efficiency and Micro-Generation in Caribbean Hotels Consultancy sought to assess the potential for energy efficiency (and to a lesser extent solar energy) in the Caribbean hotel sector. Using Barbados as a model, CHENACT found that

- hotels are generally not aware of the opportunities for energy savings in their hotels,
- not convinced of the claims of equipment and service providers,
- unwilling to make EE/RE investments in the current tourism and economic climate
- while commercial bank loans are available, they do not target energy efficiency investments.
- the policy framework has not been effective in changing "business as usual" in the design and construction of new hotels, refurbishment of existing hotels, or replacement of energy intensive equipment.
- the "carbon footprint" of the hotel sector is an issue in the region's pursuit of sustainable tourism.

Given the current situation, Tetra Tech (the prime contractor on this study) sought to develop a plan for overcoming the barriers to improving the energy performance and reducing the GHG emissions from the Caribbean hotel sector. CHENACT provides the basis for replicating the Barbados model in other Caribbean islands as well as implementing specific findings and recommendations in Barbados.

This study's proposed action plan consists of three main themes:

- increasing awareness,
- facilitating investment, and
- improving the policy framework.

Below is a summary of the suggested actions and implementation responsibilities accompanying the action plan to achieve CHENACT's goal:

Caribbean Hotel Energy Efficiency Action Program (CHENACT) will improve the competitiveness of small and medium hotels in the Caribbean region through improved use of energy. The purpose is to explore the possibilities of obtaining carbon credits through the Clean Development Mechanism (CDM), promote the compliance with the Montreal Protocol (phasing out of ozone depleting substances) and analyze the possibility to access concessional funds related to greenhouse gas emission reduction

CHENACT Action Plan

Recommended Action	**Organizational Responsibility in Barbados**	**Organizational Responsibility Outside Barbados**
Share findings of energy audits to members	BHTA	CHTA, CSHAE
Promote EE as a means of reducing electricity bills	BLP, BDET, BHTA	CARILEC, CHTA
Support the implementation of a model Hotel Clean Energy Policy	BMOE, BMOT, BMFIET	CTO, CARICOM Energy Unit, OAS
Promote hotel loan application to the Smart Fund	EGFL, BHTA, BMFIET, BMOT	None
Incorporate "carbon neutrality" as a goal of the Barbados Tourism Master Plan (or equivalent).	BMOT, BMFIET, BHTA	CTO, CHTA, CCCCC
Propose revision to the Tourism Development Act (or equivalent) to include additional incentives for energy efficiency (EE) and renewable energy (RE)	BMOT, BHTA	CTO, CSHAE, national hotel associations
Review the experience of the CHENACT PV pilot demonstration and prepare a proposal for expanding to other hotels	BLP, BMFIET, BHTA	CAST
Propose a specific guidelines for adopting the Building Energy Efficiency Code for hotels	BHTA, BNSI	CAST
Develop an energy efficiency rating system for hotels	BHTA, BMOT, BMFIET, BMOE	CHTA, CAST
Adopt an energy-efficient appliance rating system	BHTA, BNSI, BMFIET	CHTA, CARICOM CROSQ
Accelerate a training and capacity building program for EE and RE technologies, applications and practices in the hotel sector	BMOT, BMFIET , BHTA, BCC	UWI, CHTA
Research and advocate for incentives to electric utilities to finance and implement demand-side management programs for the hotel sector	BLP, BMFIET	CARILEC, CARICOM Energy Unit
Investigate CDM Program of Activities for Hotel EE applications	BHTA, BMOE, BMOT, BDOET	CHTA, CTO, CAST, CARICOM Energy Unit
Accelerate the elimination of CFCs and other ozone-depleting substances in the hotel sector	BMOE, BMOT, BHTA	UNEP, CHTA, national health/environment ministries, national MOTs
Identify energy equipment and service providers	BHTA	CHTA

Recommended Action	Organizational Responsibility in Barbados	Organizational Responsibility Outside Barbados
willing to guarantee performance or finance energy savings projects		
Notes: BHTA - Barbados Hotel and Tourism Association, BMOE – Barbados Ministry of Environment, Water Resources and Drainage, BMOT – Barbados Ministry of Tourism, BDOET – Barbados Department of Energy and Telecommunications, BLP - Barbados Light and Power, EGFL - Enterprise Growth Fund Ltd. CHTA – Caribbean Hotel and Tourism Association; CTO – Caribbean Tourism Organization, CAST – Caribbean Alliance for Sustainable Tourism; CSHAE – Caribbean Society of Hotel Association Executives; CARILEC - Caribbean Electric Utility Service Corporation; OAS - Organization of American States; BCC – Barbados Community College; UWI – University of West Indies; CCCCC – Caribbean Community Climate Change Centre		

1 INTRODUCTION

1.1 OVERVIEW OF CHENACT

The Caribbean Hotel Energy Efficiency Action (CHENACT) Program is designed to facilitate investments in hotel energy efficiency, micro-generation from renewable energy systems, and replacement of ozone depleting substances (ODS). CHENACT uses the results of an intensive national hotel clean energy program in Barbados to outline one or more programmatic approaches for the wider Caribbean.

1.1.1 CHENACT Goal and Objectives

The overall goal of the CHENACT is ***to improve the competitiveness of the Caribbean tourism sector through more affordable and predictable energy costs while assisting Caribbean governments to meet their international obligations in emissions of greenhouse gases (GHG) and phase-out of ozone depleting substances (ODS)***.

The objectives of the CHENACT, as stated in the terms of reference, are to:

- Migrate Caribbean hotels toward higher energy efficiency and micro-generation with renewable energies as well as compliance with the phasing out of ODS.

- Analyze existing Caribbean Energy Service Companies (ESCOs) and determine their suitability to provide a competitive and effective service, and assess the current status of Caribbean electric utilities in terms of purchasing power from distributed generation sources.

- Analyze and assess the possibilities of preparing a Clean Development Mechanism (CDM) Program of Activity (PoA) in energy efficiency and renewable energy.

- Validate and disseminate the main findings of these activities.

CHENACT involves a number of parallel but reinforcing tasks with the intention of designing a larger, Caribbean-wide program, based on concentrated work in Barbados. CHENACT's implementation is expected to result in:

- improved hotel competitiveness,
- improved policies for energy self-sufficiency,
- mitigation of climate change through reduced GHG emissions, and
- compliance with international commitments for the phase-out of ODS.

The project's indirect benefits will be the development of the Caribbean energy efficiency and renewable energy industry, and reduced dependency on imported oil[1] (with the exception of Trinidad).

[1] Only Trinidad and Tobago is a net exporter of petroleum products.

1.2 INSTITUTIONAL ARRANGEMENTS

The geographic focus of CHENACT is Barbados and the wider Caribbean region. It should be noted that certain aspects of the CHENACT program will be relevant to different subsets of the Caribbean (see

Table 1).

Table 1 - Membership/Eligibility of Caribbean Countries and Territories

Country/ Territory	Caribbean Regional Organizations								
	IDB	CDE-EU	OECS	CDB	CARICOM /CCCCC	CARIFORUM	CHTA	CTO	CARILEC
Anguilla				◆	□		◆	◆	
Antigua & Barbuda	✯	◆	◆	◆	◆	◆	◆	◆	◆
Aruba	✯						◆		◆
Bahamas	◆	◆		◆	◆	◆	◆	◆	
Barbados	◆	◆		◆	◆	◆	◆	◆	◆
Belize	◆	◆		◆	◆	◆	◆	◆	◆
Bermuda					□		◆	◆	◆
Bonaire							◆	◆	
British Virgin Is.	✯			◆	□		◆	◆	◆
Cancun, Mexico	◆			◆			◆		
Cayman Islands	✯			◆	□		◆	◆	◆
Cozumel, Mexico	◆			◆			◆		
Cuba		◆					◆	◆	
Curacao							◆	◆	◆
Dominica	✯	◆	◆	◆	◆	◆	◆	◆	◆
Dominican Republic	◆	◆				◆	◆		
Grenada	✯	◆	◆	◆	◆	◆	◆	◆	
Guadeloupe							◆	◆	
Guyana	◆	◆		◆	◆	◆	◆	◆	
Haiti	◆	◆		◆	◆	◆		◆	
Jamaica	◆	◆		◆	◆	◆	◆	◆	◆
Martinique							◆	◆	
Montserrat	✯			◆	◆		◆	◆	◆
Puerto Rico							◆	◆	
Saba								◆	
St Barts							◆		
St Eustatius							◆	◆	
St Kitts/Nevis	✯	◆	◆	◆	◆	◆	◆	◆	◆
St Lucia	✯	◆	◆	◆	◆	◆	◆	◆	◆
St Maarten							◆	◆	◆
St Martin							◆		
St Vincent &	✯	◆	◆	◆	◆	◆	◆	◆	◆

Country/ Territory	Caribbean Regional Organizations								
	IDB	**CDE-EU**	**OECS**	**CDB**	**CARICOM /CCCCC**	**CARIFORUM**	**CHTA**	**CTO**	**CARILEC**
Grenadines									
Suriname	◆	◆			◆	◆	◆		◆
Trinidad & Tobago	◆	◆		◆	◆	◆	◆	◆	◆
Turks & Caicos Is.				◆	□		◆	◆	
US Virgin Is.							◆	◆	◆

Caribbean Regional Organization abbreviations: IDB – Inter American Development Bank; CDE/EU – EU funded Centre for Development Enterprise; OECS – Organization of Eastern Caribbean States; CDB – Caribbean Development Bank; CARICOM/CCCCC – Caribbean Community Climate Change Centre; CARIFORUM - EU Economic Partnership Agreement; CHTA – Caribbean Hotel and Tourism Association; CTO – Caribbean Tourism Organization; CARILEC – Caribbean Electric Utility Service Corporation

Member country/territory: ◆; Associate member country/territory: □; Members through CDB: ✯

1.2.1 Executing Agencies and other CHENACT Stakeholders

The Caribbean Tourism Organization (CTO) is the executing agency, and the Caribbean Hotel and Tourism Association (CHTA) and the Caribbean Alliance for Sustainable Tourism (CAST) are the implementing agencies. A number of organizations were involved in the implementation of CHENACT. Table 2 summarizes the roles they were expected to perform under CHENACT.

Table 2 - CHENACT Stakeholders and Involvement

Organization	Role
Caribbean Tourism Organization	Chair Steering Committee Provide meeting space for project meetings Provide statistics on tourism in the region Facilitate review and input on tourism energy policy from Caribbean tourism ministries. Include CHENACT in Sustainable Tourism Conference, Board reports, meetings and other events
Caribbean Hotel and Tourism Association	Request cooperation from member hotel associations in other Caribbean countries Request cooperation from member hotels and other tourism businesses Provide statistics on Hotel members in the region Include CHENACT in all CHTA Board meetings and events Include CHENACT in 2010 Caribbean Hotel Investment Conference, Caribbean Marketplace and Tourism Summit Provide office space, equipment, telecommunications for the implementation of CHENACT Assist with the organization of regional workshops at CHTA meetings
Caribbean Alliance for Sustainable Tourism	Coordinate with Centre for the Development of Enterprise CDE GIZ, UNEP and GoB relative to the implementation of CHENACT

Organization	Role
	Provide Day to day assistance with the implementation of CHENACT Include CHENACT as part of CAST's Operating plan
Ministry of Finance, Investment, Energy and Telecommunications of Barbados	Consult on policies affecting energy efficiency and micro-generation, including but not limited to investment and/or tax incentives Coordinate with Sustainable Energy Framework for Barbados (implemented by Castalia Advisors)
Ministry of Tourism of Barbados, Barbados Tourism Authority	Report statistics on hotels and other tourism businesses Support policy developments affecting the hotel sector
Ministry of Water Resources and Drainage of Barbados	Possibly collaborate on water consumption indices for hotels, and developing "greener" targets for these indices
United Nations Environment Program	Serve as source of expertise and auditor(s) for ozone depleting substances (ODS)
Caribbean Renewable Energy Development Program/GIZ	Compile and disseminate information on distributed renewable energy applications in the hotel sector
Centre for the Development of Enterprises	Support audits, energy policy and financing tasks Serve as a source of information on European energy companies interested in the Caribbean hotel market
Barbados Light and Power	Serve as a source of data on peak demand and electricity consumption for hotels. Coordinate the pilot project design and installation of PV Demonstration models
IDB Sustainable Energy and Climate Change Initiative (SECCI)	Major funding source for CHENACT Provide introductions to multilateral financing institutions (e.g., IFI, The World Bank, Carbon Investment Fund, Global Environmental Facility) Collaborate with parallel funded projects in the Caribbean
Barbados Hotel and Tourism Association	Collect statistics on member hotels Host and co-sponsor training workshops with hotels Encourage and promote member hotels' participation in detailed and walk-through energy audits
Organization of American States	Advise on policies for renewable energy development in the Caribbean, disseminate pilot clean energy policy
Caribbean Electric Utility Service Corporation (CARILEC)	Provide information on electricity prices, interconnection, and power purchase from commercial customers Involvement at events (e.g., conferences for CEOs and engineers)
CARICOM Energy Unit	Promote application of Barbados experience to other CARICOM countries, including regional harmonization on issues such as standards and ratings
Caribbean Community Climate Change Centre	Assistance with Carbon Neutral Program

1.2.2 Beneficiaries of CHENACT

Beneficiaries are defined as entities that receive direct support in the form of technical assistance. More than 75 hotels[2] in Barbados and the wider Caribbean received either a detailed audit or walk-through assessments.[3] In addition, three Barbados hotels are participating in a pilot micro-generation pilot demonstration program. The Government of Barbados (GoB) will benefit from a more competitive hotel industry and reduced expenditures on imported oil through the adoption of a National Hotel Clean Energy Policy and Action Plan. CAST, CHTA and CTO are also CHENACT beneficiaries in that these organizations and their respective members are the target of capacity building activities. Enhanced technical knowledge can also assist in the future programming and information dissemination activities of these organizations.

CHENACT has generated interest in a number of international, regional, and national organizations; government ministries and agencies addressing energy, tourism and environmental matters; hotels and industry associations; electric utilities; energy equipment suppliers and service providers; electric utility consumers; and ultimately tour operators and tourists.

1.3 PURPOSE OF THIS REPORT

The CHENACT final report summarizes the activities and results of a program funded by the Inter-American Development Bank, CHTA/CAST, CTO, European Union Centre for Enterprise Development (CDE), GIZ, United Nations Environment Program (UNEP), and the Government of Barbados (GoB) covering the period April 2009 to March 2012. It contains the findings and recommendations from research, analyses and consultations conducted by Tetra Tech, its principal subcontractor Energy Dynamic Ltd., and consultants Bevin Etienne and Melanie Inniss.

A Project Management Unit was formed; it comprised The Project Manager, the Caribbean Hotel and Tourism Association, Caribbean Tourism Organization and Caribbean Alliance for Sustainable Tourism. The authors wish to thank the following organizations for their contributions to CHENACT: Barbados Light and Power Company, Barbados Ministry of Finance, Investment, Energy and Technology, Barbados Ministry of Tourism, Barbados Ministry of Environment, Water Resources and Drainage, and Barbados Hotel and Tourism Association among others.

This report also serves as a guide for subsequent work on energy efficiency in the Caribbean hotel sector.

[2] Hotels are listed in section 3.3 of this report

[3] Detailed audits and walk-through assessments are being done by Tetra Tech and the CREDP/GTZ program.

2. CHENACT INSTITUTIONAL STRENGTHENING AND OUTREACH

2.1 INSTITUTIONAL STRENGTHENING OF CHENACT COUNTERPARTS

CHENACT's institutional strengthening activities target CTO, CHTA/CAST, BHTA and the Government of Barbados. The institutional strengthening activities within the scope of work consist of workshops, seminars and information dissemination focused primarily on raising awareness about the opportunities for energy efficiency and micro-generation using renewable energy, and the implications of introducing new mechanisms to capture those opportunities (e.g., performance contracting through energy service companies, sale of carbon credits under the United Nations Framework for Climate Change Clean Development Mechanism).

Throughout the project, the CHENACT organized and conducted several events, and is planning a number of others. Table 3 lists the various events at which CHENACT made presentations (these include presentations made by Tetra Tech as well as the CHENACT Project Manager.

Table 3 – CHENACT Participation in Related Events

Event	Sponsor/ Organizer	Dates	Location	CHENACT Involvement
Taste of the Caribbean (incorporating the CHTA Board Meeting)	CHTA	June 2009	Puerto Rico	Meetings with CHTA, CAST and CSHAE
Small Hotels Retreat	CHTA	September 2009	St. Thomas	Meetings with CHTA, CAST CSHAE and hoteliers, Round Table Discussions on EE in small hotels
Caribbean Regional Energy Forum*	CREF	October 2009	Jamaica	Meetings with donors and other RE project managers
CARILEC/ GIZ/SLHTA*	CHENACT	January 2010	St. Lucia	Orientation meetings with partners
Caribbean Market Place*	CHTA	January 2010	Puerto Rico	Meetings with CHTA and hotel members
CAST Governing Council Meeting*	CHTA, CAST	January 2010	Puerto Rico	Presentation and discussion of how CAST can benefit from CHENACT
Sustainable Energy Framework for Bahamas	BHTA	March 2010	Bahamas	Meetings with SEF Bahamas and hotels
BHTA Breakfast Meeting*	BHTA	March 2010	Barbados	Solicit BHTA hotel members to participate in audits
Hotel Clean Energy Training Workshop*	CHENACT	April 2010	Barbados	2-day workshop for hoteliers, government, and private sector
Caribbean Hotel and Tourism Investment Conference*	CHTA	May 2010	Puerto Rico	Meetings with CHTA, hotel developers and Caribbean and US-based financial institutions,

Event	Sponsor/ Organizer	Dates	Location	CHENACT Involvement
				banks and investors.
Sustainable Tourism Conference*	CTO	May 2010	Barbados	Presentation to the CTO Sustainable Tourism Committee
New Electricity Rates for Barbados Hotels Luncheon	BHTA, BLP	May 2010	Barbados	Description of the new electricity tariffs, solicitation of participants for audits and walk through assessments
CARILEC CEO Conference	CARILEC	June 2010	Antigua	Presentation on Barbados pilot program and involvement of BLP
Caribbean Sustainable Energy Forum*	CREDP/GIZ	June 2010	Jamaica	Presentation on performance contracting for hotels and Workshop on ESCO opportunities in the Caribbean
Caribbean Renewable Energy Forum*	CREF	October 2010	Bahamas	Presentation on carbon financing under on the Energy Efficiency – Policy, Regulation and Financing Panel
Latin America and Caribbean Carbon Forum*	World Bank , OLADE, International Emissions Trading Association, UNEP Risø Centre, IDB and UN Conference on Trade and Development	October 2010	Dominican Republic	Clean Hotel Clean Development Mechanism (CDM) Program of Activities
Caribbean Marketplace*	CHTA	January 2011	Jamaica	Meetings with Caribbean hoteliers, national hotel associations, and CHTA executives. Booth with posters, case studies and fact sheets.
Sustainable Tourism Conference*	CTO	April 2011	Bermuda	Presentation on Barbados case study including draft Hotel Clean Energy Policy
Managing the Impact of Global Change on the Energy Business in the Caribbean*	CARILEC	July 2011	Curacao	Presentation on energy efficiency for Caribbean hotels and opportunities for climate change mitigation
Caribbean Renewable Energy Forum*	CREF	October 2011	Barbados	Presentations on the Barbados Case Study and Caribbean Regional Program.

*- Denotes events where Tetra Tech attended, made presentations, and/or organized meetings

- ***Clean Hotel Energy Training Workshop (Barbados)*** – CHENACT organized and presented information to a cross section of hotels, renewable energy companies, engineering companies, and government representatives about hotel energy use, energy efficiency technologies and opportunities, and renewable energy technologies and opportunities. Breakout groups discussed education, awareness and training; standards, rating and certification; policy and finance; and technology and engineering.

- ***Performance Contracting for Energy Efficiency in the Hotel Sector (Jamaica)*** - CHENACT organized and presented information to a cross section of hotels, renewable energy companies, engineering and consulting companies, and government representatives on the size of the clean energy market in the Caribbean, contracting mechanisms, and a case study of a Mexican ESCO. Participants explored the issues and options for energy performance contracting in the Caribbean hotel sector.

- ***Barbados Case Study – A Model for the Caribbean Hotel Sector (Bermuda)*** – Tetra Tech presented at the CTO Sustainable Tourism Conference workshop entitled "Save the Planet, Save Your Money: Cutting Costs through Responsible Resource Use." Its presentation covered the elements of the Barbados case study, including the draft Hotel Clean Energy Policy, estimates of the energy saved and CO_2 emissions avoided from a regional program targeting energy efficiency in hotels.

- ***Workshop for Hotels Receiving Energy Audits and Introduction to the Smart Fund*, *(Barbados)*** – CHENACT organized and presented the common recommendations found in most audit reports, and responded to questions regarding the audit findings and recommendations. We also introduced the Enterprise Growth Fund Ltd (EGFL) and the Smart Fund to the hoteliers, and began the process of identifying those that will need assistance in accessing the Fund.

Financing Energy Efficiency Improvements through the Smart Fund, (Barbados) - CHENACT organized a workshop and conducted one-on-one meetings with audited hotels to guide them in preparing their investment program as part of their loan application to the Smart Fund.

CHENACT has prepared a number of hotel clean energy presentations, case studies and clean energy fact sheets based on the results of the hotel energy audits. These have been distributed at the meetings listed in Table 3. CHENACT also prepared several "Watts-New" features in CHTA's monthly newsletter.

2.2 ENERGY AUDIT PROTOCOL

Tetra Tech developed protocols for both a Detailed Energy Audit and Walk-Through Assessment. Table 4 summarizes the basic characteristics of each.

Table 4 - Characteristics of Detailed Energy Audits and Walk-Through Assessments

Criteria	Walk-Through Energy Assessment	Detailed Energy Audit
Time taken	½ day to 1 day on site, plus ½ day desk analysis	3-5 days on site, plus 3-8 days desk analysis
Audit team	1 person (plus one ODS auditor)	2-3 persons
Report	Completed checklist with recommendations and a simple analysis of energy consumption	Detailed report, 20-50 pages
Energy use data	1 year of energy bills	2 years historical consumption data
Energy sources	Listed	Patterns and costs identified
Utility rate structure	Documented	Explained and analyzed, graphed
Seasonal effects	Occupancy variations only	Consumption patterns analyzed, modeled
Property details	Area, size, rooms, facilities	Identified, listed, and energy indices calculated
Energy-using equipment	Identified, listed, with size or capacity information, age for use in consumption analysis	Detailed lists, measurements, and logs or registers of operation over time
Baseline energy consumption	Estimated consumption	Spreadsheet model of consumption, including operating schedules; energy balance
ODS*	List of equipment, ages, refrigerants used	Identification of equipment; analysis of replacement costs for all equipment, including energy efficiency, capacity or other benefits
Energy efficiency measures	Identify opportunities to improve efficiency through equipment upgrades	For each measure: implementation instructions; implementation cost; energy, cost and GHG savings; payback or financial analysis
Operating and maintenance	Identify opportunities to improve efficiency through adoption of “best practices”	General and specific recommendations to improve O&M measures
RE and MG measures	Identify opportunities for use of solar hot water and solar PV systems	Complete checklist: basic consumption data, physical characteristics (roofs), existing experience (solar heating); potential equipment for dedicated solar PV system
*Performed by a consultant contracted under a separate project funded by UNEP.		

Tetra Tech refined the audit protocol and integrated the UNEP ODS auditor into the schedules for both detailed audits and walk-through assessments. The detailed pre-audit data collection form, participating hotel MOU, and sample audit report were shared with the CREDP/GIZ program and its auditors.

3. BARBADOS CASE STUDY

3.1 OVERVIEW OF THE BARBADOS TOURISM AND HOTEL SECTORS

Tourism is the largest economic activity in Barbados, contributing typically about 15% of the island's Gross Domestic Product (GDP). Institutions and organizations governing or representing Barbados's tourism sector include the Ministry of Tourism, the Barbados Tourism Authority, The Barbados Tourism Investment Inc. (BTI)and the Barbados Hotel and Tourism Association. In addition, Invest Barbados and the Ministry of Finance are involved in providing incentives for the hotel sector. The Ministries covering Energy and Environment govern the energy and environmental policies affecting the hotel sector.

The World Economic Forum ranks Barbados 28th out of 139 countries in terms of the competitiveness of its tourism sector. [4] It ranked in the top quartile in terms of all criteria except policy rules and regulations and price competitiveness in the travel and tourism industry. Of particular importance to CHENACT are the issues associated with financial performance, particularly access to financing and high operating costs (especially utility costs).

Table 5 - Travel and Tourism Competitive Index for Barbados.

Criteria	Rank (out of 139)	Score (1-7 scale)
2011 Index	28	4.8
T&T regulatory framework	**20**	**5.4**
Policy rules and regulations	75	4.4
Environmental sustainability	30	5.1
Safety and security	34	5.5
Health and hygiene	33	6.0
Prioritization of Travel and Tourism	3	6.4
T&T business environment and infrastructure	**21**	**5.0**
Airport transport infrastructure	25	4.4
Ground transport infrastructure	10	5.9
Tourism infrastructure	28	5.2
ICT infrastructure	27	5.0
Price competiveness in the T&T industry	74	4.5
T&T human, cultural and natural resources	**47**	**4.1**
Human resources	48	5.1
Education and training	25	5.4
Availability of qualified labor	103	4.8
Affinity for Travel and Tourism	32	6.5
Natural resources	129	2.1

[4] The Travel & Tourism Competitiveness Report 2011 - Beyond the Downturn. World Economic Forum,4.8 2011.

Criteria	Rank (out of 139)	Score (1-7 scale)
Cultural resources	63	2.5

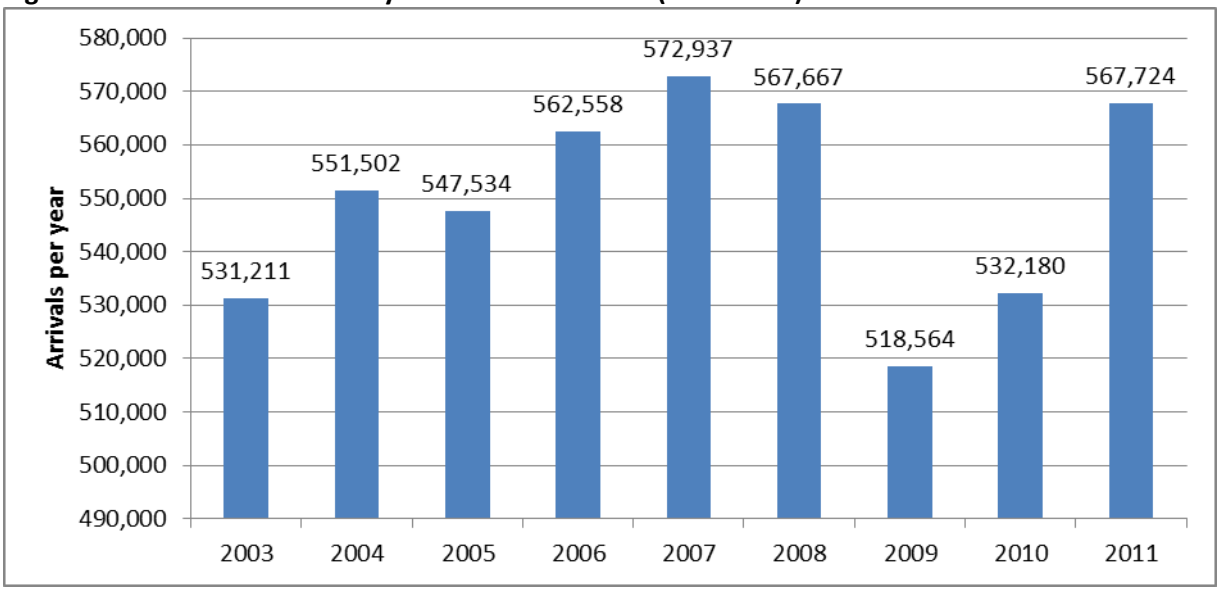
Source: The Travel & Tourism Competitiveness Report 2011 - Beyond the Downturn. World Economic Forum.

3.1.1 Visitor Statistics

As indicated in Figure 1, every year, more than 500,000 people stay overnight in Barbados, a figure that is almost double the number of permanent residents of the island.[5] Like other Caribbean destinations, Barbados suffered a significant loss (downturn) in stay over-visitor arrivals beginning mid-2008. In 2011, visitor arrivals had shown the beginning of a recovery, but were still 7% below peak in 2007.

Figure 2 shows the variation in stay-over visitor arrivals by month. Visitor arrivals are a proxy for hotel occupancy which directly influences hotel receipts and cash flow.

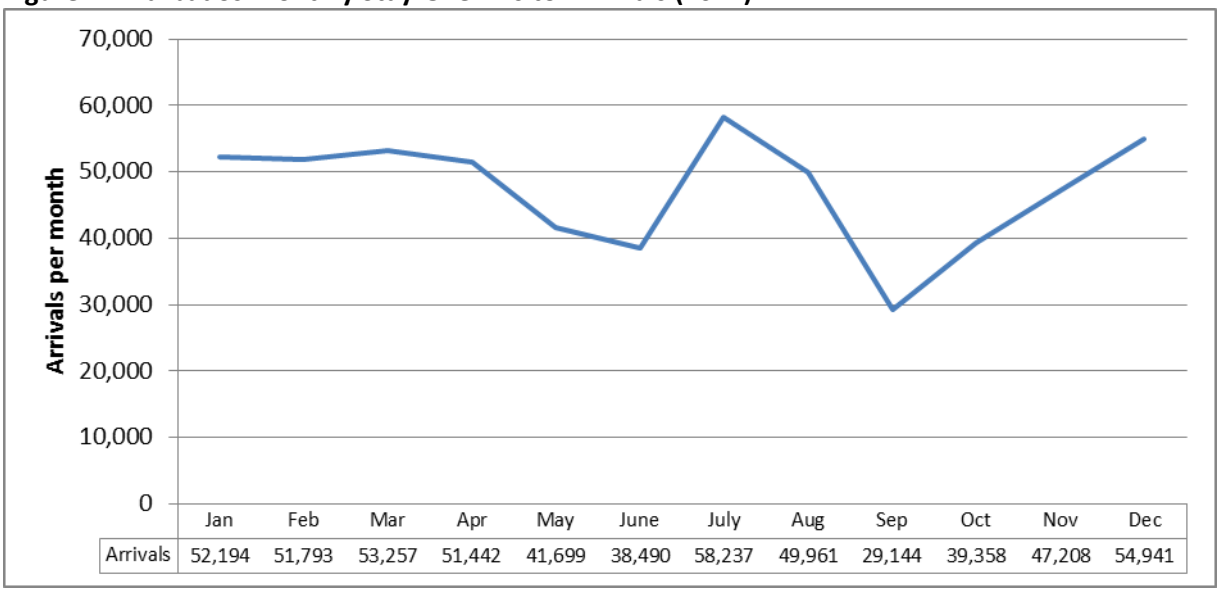
Figure 1 – Barbados Annual Stay-Over Visitor Arrivals (2003-2011)



Source: Caribbean Tourism Organization

[5] During the 2000s, Barbados accounted for approximately 3% of the total tourist arrivals in the Caribbean

Figure 2 – Barbados Monthly Stay-Over Visitor Arrivals (2011)



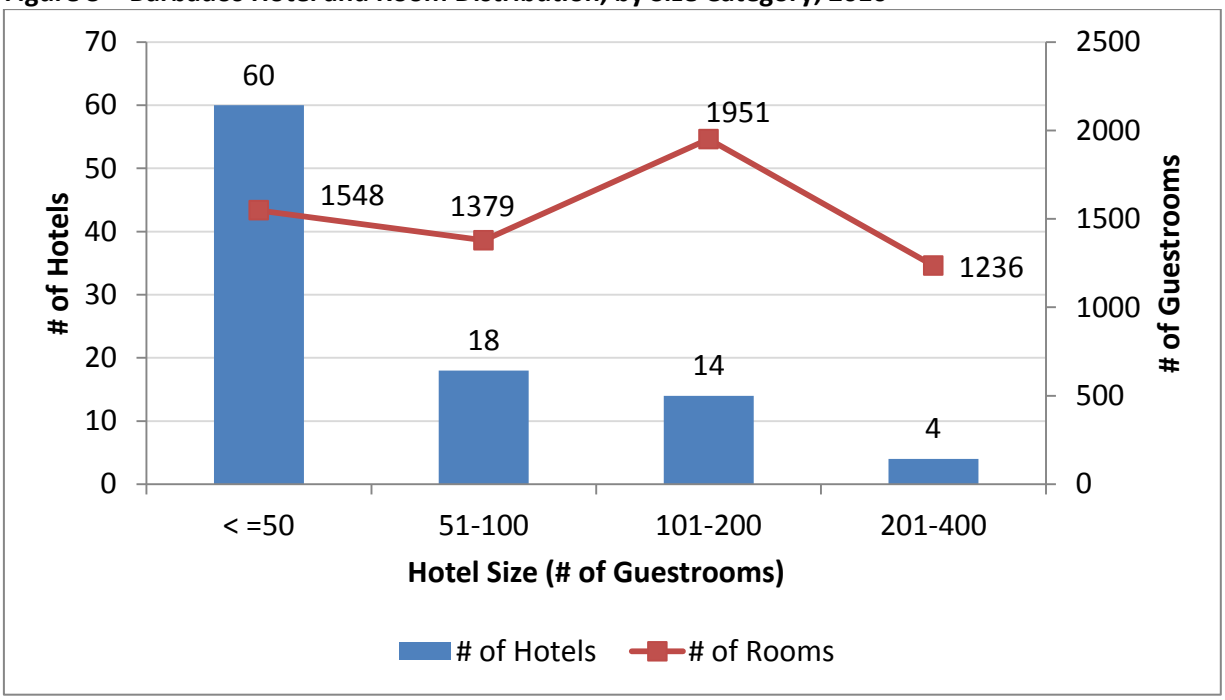
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Arrivals	52,194	51,793	53,257	51,442	41,699	38,490	58,237	49,961	29,144	39,358	47,208	54,941

Source: Caribbean Tourism Organization.

3.1.2 Profile of Hotel Sector

The 96 hotels and guest houses on the island hold 6,114 guestrooms.
Figure 3 provides a breakdown of the number of hotels and guestrooms by size categories.

Figure 3 – Barbados Hotel and Room Distribution, by Size Category, 2010



Source: Barbados Ministry of Tourism

As indicated in
Figure 3, the hotel industry in Barbados is dominated by small and medium sized hotels, where approximately 63% of the total hotels and guest houses in the island have fewer than 50 rooms and 81% of the hotels have fewer than 100 guestrooms. Nevertheless, hotels under 100 rooms account for only 48% of the total available rooms, and 4 large hotels (more than 200 guestrooms) comprise almost 20% of the total available guestrooms for the Barbados hotels.

The real value of tourism's contribution to Barbados is in providing foreign exchange, economic activity associated with hotel investment and visitor spending, and direct and indirect employment. According to the World Travel and Tourism Council, in 2011, the direct contribution of travel and tourism to GDP was US$ 535 million (12.9% of total GDP)[6], to employment was 18,000 (13% of total), and to investment was $199 million (16.2% of total).[7]

Its hotel industry is made up of owner-operated properties, properties that are owned by investment groups, properties owned by hotels chains (e.g. Almond, Fairmont, Marriott, Rex Resorts, Elegant Hotels), and properties owned by the Government of Barbados (e.g., Hilton, GEMS of Barbados, Pommarine).

The majority of hotel businesses in Barbados are represented by the following private sector organizations: the Barbados Hotel and Tourism Association, the Caribbean Hotel and Tourism Association, and Intimate Hotels (representing only small hotel properties).[8]

3.1.3 Hotel Performance and Outlook

In Barbados, like much of the rest of the Caribbean, tourism is in the midst of a second year of decline in terms of economic activity. As shown in Table 5, 2009, 2010, and 2011 were below the levels for 2007 and 2008 in terms of the contribution of travel and tourism to the Barbados economy. The 2008 figures for contribution to GDP and capital investment would have been higher had the global economic crisis not begun. The prolonged impact of this crisis on Barbados's two principal markets – US and Europe – is widely believed to be the principal reason for the downturn.

Table 5 - Travel and Tourism (T&T) Economy Trends (US$ billions) for Barbados

Indicator	2006	2007	2008	2009	2010	2011
T&T Economy GDP	1.713	1.917	1.963	1.787	1.799	1.813
T&T Direct GDP	0.512	0.571	0.564	0.506	0.528	0.535
Source: *Travel and Tourism Economic Impact 2012, Barbados*, World Travel and Tourism						

[6] Direct and indirect contribution to GDP was estimated to be 43.5%.

7 Travel and Tourism Economic Impact 2012, Barbados. World Travel and Tourism Council, 2012.

[8] All BHTA hotel members are automatically members of CHTA. Intimate Hotels (as an association) is a member of BHTA, and some of its members are also members of BHTA/CHTA.

Council, 2012.	

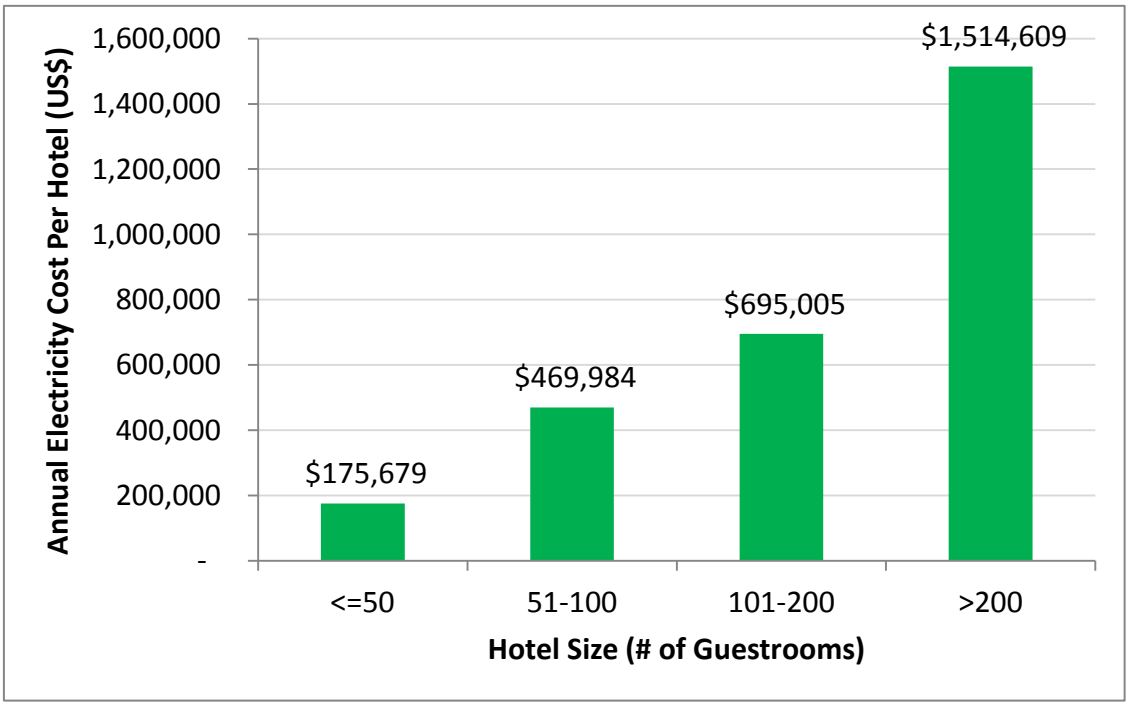
3.2 HOTEL ENERGY CONSUMPTION PATTERNS

3.2.1 Hotel Electricity Consumption

As shown in
Figure 4, annual electricity costs could range from approximately US $175,679 for the average property under 50 rooms, to about $1,514,609 for the largest hotel properties. The estimates are based on the electricity costs reported in 31 hotel energy audits completed for Barbados.

Figure 5 shows a comparison between annual electricity consumption and cost per guestroom for each of the hotel size categories (<50 rooms, 51-100 rooms, 101-200 rooms and > 200 rooms). Figure 6 shows a comparison of total annual electricity consumption versus total electricity cost. These costs will have increased significantly by now since electricity costs have risen from US$ 0.28 per kWh to US$ 0.40 per kWh.[9]

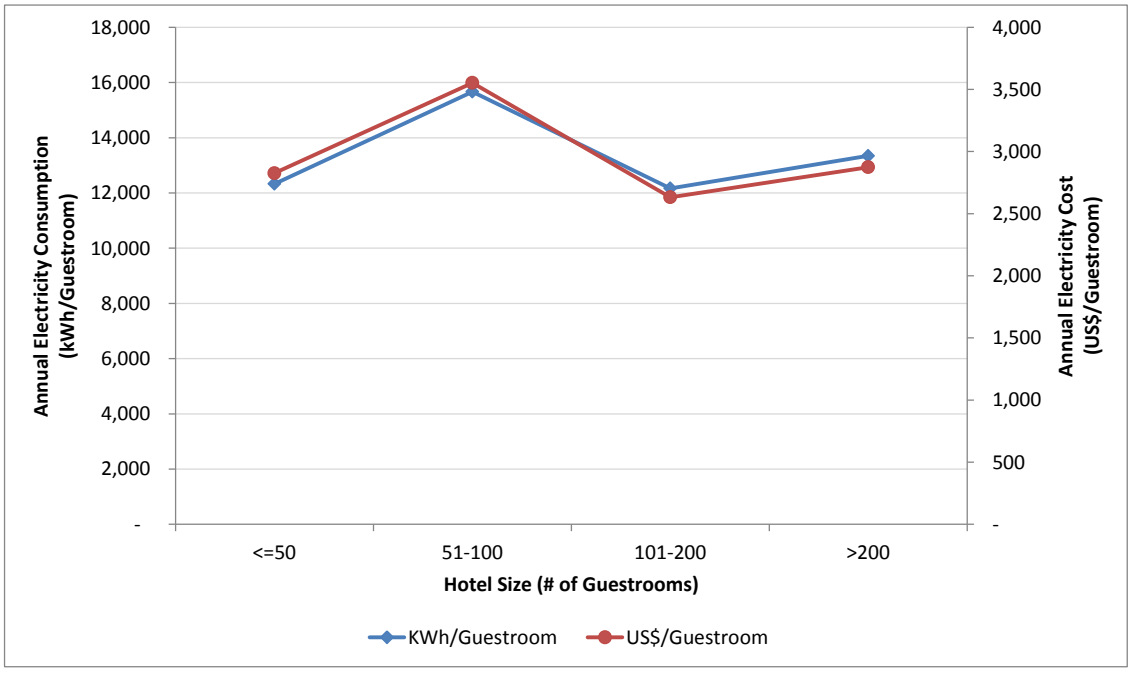
Figure 4 – Estimated Electricity Expenditures for Barbados Hotels, 2011



Source: Tetra Tech analysis based on CHENACT energy audits

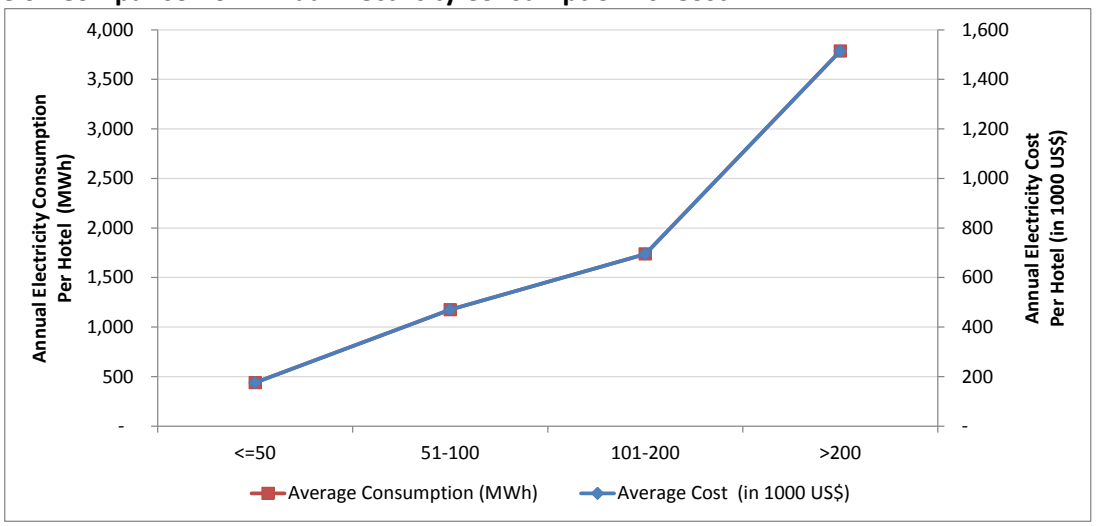
[9] Includes all utility charges divided by total consumption.

Figure 5 - Comparison of Annual Electricity Consumption vs. Cost per Guestroom



Source: Tetra Tech analysis based on CHENACT energy audits

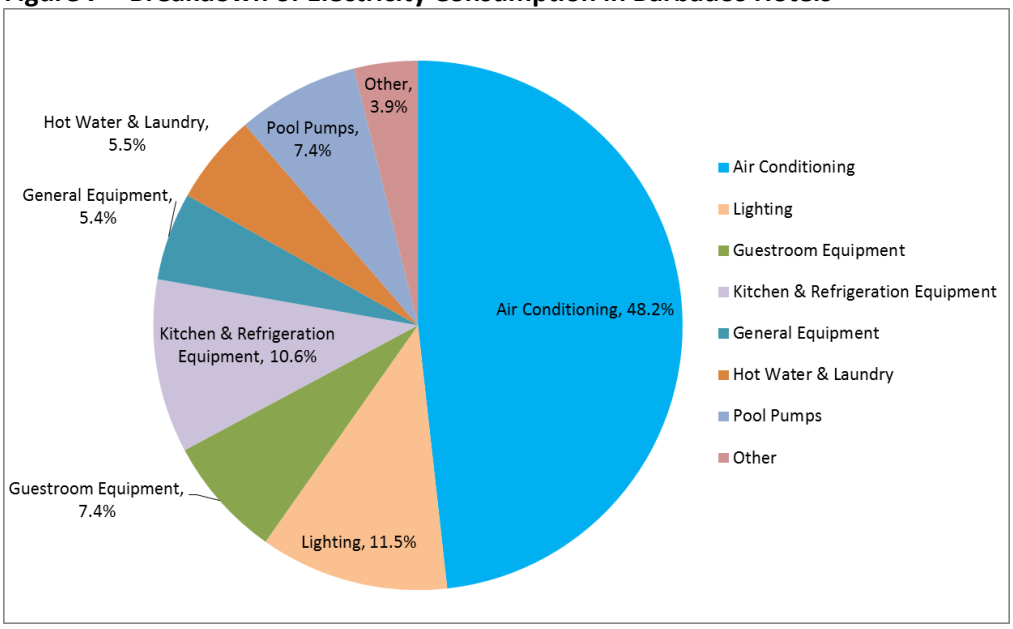
Figure 6 - Comparison of Annual Electricity Consumption vs. Cost



Source: Tetra Tech analysis based on CHENACT energy audits

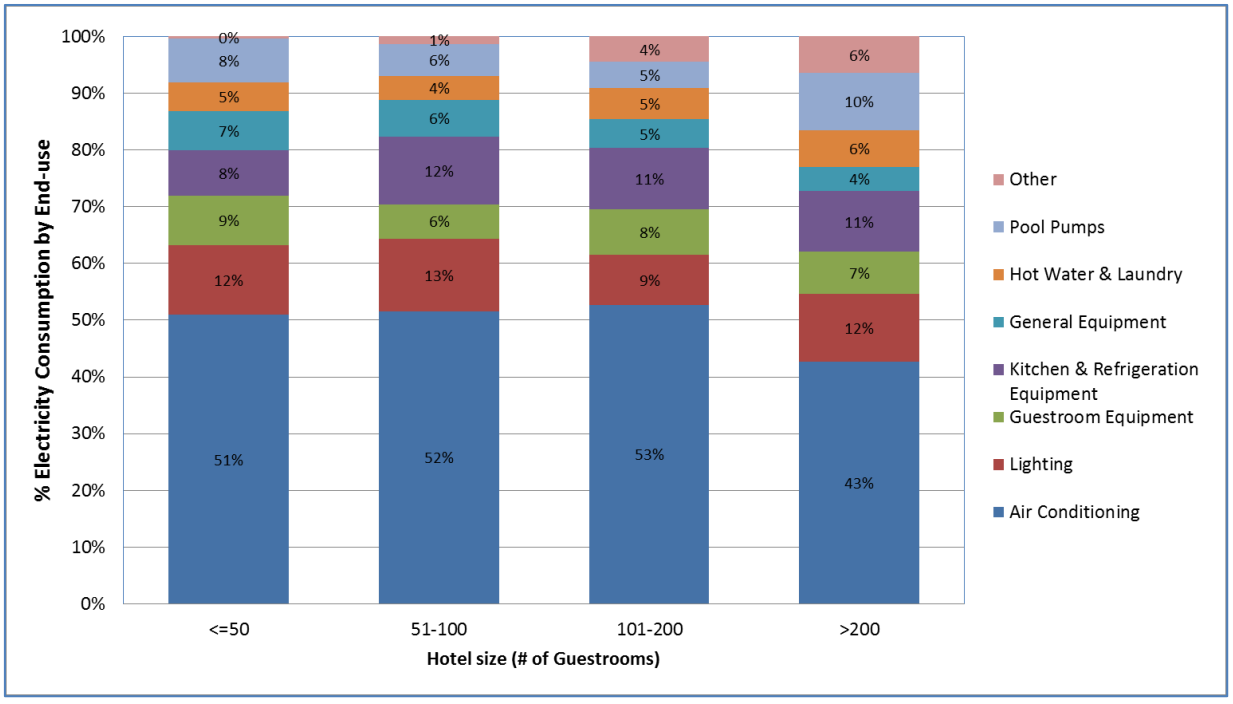
Within hotels, air conditioning is the most significant end-use of electricity, regardless of the size of the hotel. As indicated in the Figure 7, air conditioning accounts for roughly half of total electricity use. Lighting and kitchen and refrigeration equipment each account for approximately 11%. Figure 8 shows the different share of electricity consumption for each of the hotel size categories (<50 rooms, 51-100 rooms, 101-200 rooms and > 200 rooms), based on the results of energy audits conducted for hotels in Barbados.

Figure 7 – Breakdown of Electricity Consumption in Barbados Hotels



Source: Tetra Tech based on CHENACT energy audits.

Figure 8 – Breakdown of Electricity Use by Hotel Size Category



Source: Tetra Tech based on CHENACT energy audits.

Guest room equipment and lighting are also significant electricity consumers. Electricity consumption in categories such as kitchens or hot water is linked to the use of other energy sources such as natural gas for the kitchens and water boilers, or solar water heaters.

A well-known indicator for benchmarking electricity consumption in the hotel sector is consumption per guest night, calculated as the total electricity consumption divided by the number of guest-nights during the period. The latter could be determined as the hotel's occupancy ratio (in terms of guest nights) times the number of rooms, and the number of days in the period.

The average electricity efficiency, expressed as kilowatt hours per guest night (kWh/GN), does not vary significantly depending on the size of the property. Based on the results of the CHENACT energy audits, the smallest properties (up to 50 guestrooms) appear to utilize more electricity per guest night than the largest properties (see Table 6).[10] This is due the fact that energy use in common areas such as lobbies, grounds and hallways is spread across a larger guest population. The smallest properties also have the largest variation of electricity efficiency, ranging from 12 to 118 kWh/GN.

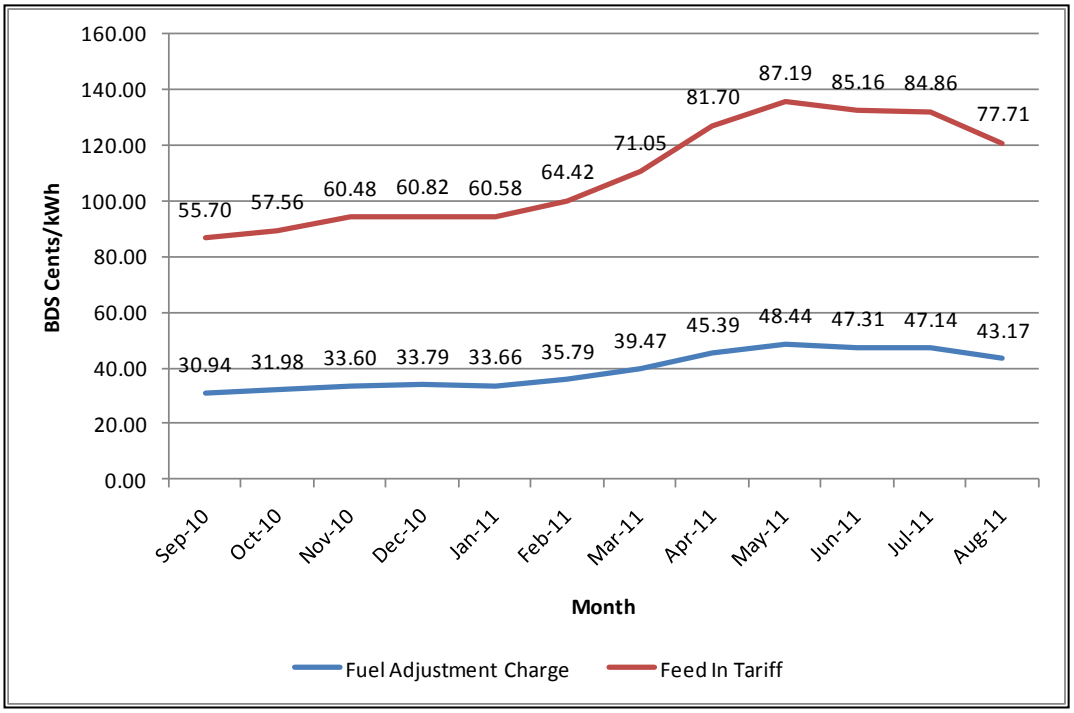
Table 6 – Electricity Efficiency Index for Barbados Hotels

	Hotel Size (# of Guestrooms)			
	<=50	51-100	101-200	>200
High (kWh/Guest Night)	118	87	43	50
Average (kWh/Guest Night)	43	44	32	34
Low (kWh/Guest Night)	12	18	25	22
# of Hotels	13	8	5	4
GN/RN Ratio	1.63	1.79	1.79	1.90
Source: Tetra Tech analysis based on CHENACT energy audits				

Electricity rates in Barbados are highly influenced by fossil fuel prices and their volatility. Figure 9 shows the monthly fuel adjustment charge for the period September 2010 to August 2011. Figure 9 also shows the renewable energy feed-in tariff, calculated at 1.8 times the fuel adjustment charge. The average fuel adjustment charge over the period is 39.22 BDS cents/ kWh, while the average renewable energy feed-in tariff is 70.60 BDS cents/ kWh.

[10] Not all hotels were able to provide "guest night" data, therefore, average room night to guest night ratios were used to provide a common basis for comparison.

Figure 9 - BLP Monthly Fuel Adjustment Charge



Source: Barbados Light and Power data.

Based on the average electricity consumption and number of hotels in each size category, Table 7 provides an estimate of total annual electricity consumption for the hotel sector, as well as the associated CO_2 emissions. The carbon footprint (CO_2 emissions associated with the Barbados hotel sector's electricity consumption) is estimated to be 57,688 tons of CO_2 emissions per year. Note that this does not include emissions associated with other direct uses such as transportation fuel and natural gas consumption, or indirect emissions associated with food and other consumable items and air transportation for visitors.

Table 7 - Electricity Consumption and CO_2 Emissions for the Barbados Hotel Sector

# of Rooms	# of Hotels	Annual Electricity Consumption (MWh)	CO_2 Emissions (Tons)
<=50	60	20,711	14,606
51-100	18	18,450	13,012
101-200	14	26,102	18,408
>200	4	16,536	11,662
Total	96	81,799	57,688

Source: Tetra Tech based on CHENACT energy audits.

3.2.2 Hotel Natural Gas Consumption

Natural gas consumption in Barbados hotels is predominantly for kitchen use, e.g., cooking. At least one hotel has installed a gas-fired air conditioning chiller system. For a representative 96-room hotel, natural gas accounts for 22% of all energy use (on a kilowatt-hour equivalent basis); however, because of the unit cost of natural gas, it only accounts for 7.61% of total energy costs.

3.2.3 Solar Hot Water

Hotels in Barbados, perhaps more than in any other Caribbean island, have installed solar hot water heating systems. The promotion of such systems in Barbados resulted from concessions granted by the Ministry of Finance, which enabled manufacturers to import materials duty-free, and provide consumers with partial or full tax deductions for the cost of the heaters.

It is estimated that over 50 hotels (60%) now use solar hot water heaters. The large-scale integrated designs cover the hotel roof with solar collectors, measuring about 300 m^2, and have large tanks of up to 25,000 liters, some of which allow the heat from the central air conditioning system to be used to preheat the water.

Solar water heating in Barbados is viewed as a relative success when compared to other Caribbean countries due to the high penetration rates and stability of equipment suppliers. Solar water heating companies include Solar Dynamics, SunPower, and Solaris Global Energy (formerly AquaSol).

3.3 CHENACT ENERGY AUDIT RESULTS

A total of 76 hotels in Barbados and other Caribbean countries participated in the CHENACT detailed energy audits and walk-through energy assessments. Note that the term “hotel” refers to all properties offering visitor accommodations.

3.3.1 Hotels Participating in Detailed Audits

Table 8 lists the Barbados hotels that received detailed energy audits. CHENACT has completed all 31 detailed energy audits. Table 9 lists the hotels in other Caribbean countries that received detailed energy audits.

Table 8 - CHENACT Detailed Hotel Audits in Barbados

No.	Hotel Name (Barbados)	Number of Guest Rooms	Status
1	Accra Beach Hotel and Spa	224	Audit Report submitted
2	Allamanda	49	Audit Report submitted
3	All Seasons Resort	48	Audit Report submitted
4	Almond Beach Club & Spa	161	Audit Report submitted
5	Almond Beach Village	435	Audit Report submitted
6	Almond Casuarina	280	Audit Report submitted
7	Amaryllis	146	Audit Report submitted
8	Barbados Beach Club	111	Audit Report submitted
9	Beach View Hotel	36	Audit Report submitted
10	Colony Club	96	Audit Report submitted
11	Coral Mist	32	Audit Report submitted
12	Coral Sands	33	Audit Report submitted
13	Crane	418	Audit Report submitted

No.	Hotel Name (Barbados)	Number of Guest Rooms	Status
14	Crystal Cove	88	Audit Report submitted
15	Divi Southwinds	133	Audit Report submitted
16	Dover Beach	59	Audit Report submitted
17	Fairmont Royal Pavilion	75	Audit Report submitted
18	Mango Bay	67	Audit Report submitted
19	Sandy Lane	114	Audit Report submitted
20	Sandpiper	65	Audit Report submitted
21	Savannah	80	Audit Report submitted
22	South Beach	49	Audit Report submitted
23	Southern Palms	91	Audit Report submitted
24	Sugar Cane Club	44	Audit Report submitted
25	The House	34	Audit Report submitted
26	Time Out at the Gap	76	Audit Report submitted
27	Treasure Beach	35	Audit Report submitted
28	Turtle Beach	164	Audit Report submitted
29	Blue Orchid	35	Audit Report submitted
30	Pommarine	22	Audit Report submitted
31	Blue Horizon	67	Audit Report submitted

Table 9 - CHENACT Detailed Hotel Audits Outside Barbados

No.	Hotel Name (outside Barbados)	Number of Guest Rooms	Status as of March 15, 2012
1	Round Hill (Jamaica)	110	Audit Report submitted
2	Punta Cana (Dominican Republic)	170	Audit Report submitted
3	Tortuga Bay (Dominican Republic)	30	Audit Report submitted
4	Kariwak (Trinidad & Tobago)	24	Audit Report submitted
5	Stone Haven (Trinidad & Tobago)	11 villas	Audit Report submitted

An additional 12 detailed energy audits were conducted in the Organization of Eastern Caribbean States (OECS) under the Caribbean Renewable Energy Development/GIZ Project, the results of which have been included in the CHENACT Caribbean hotel energy efficiency model (see Chapter 5). Table 10 lists the completed hotel audit reports in the OECS countries.

Table 10 – Audits Performed by CREDP/GIZ in the OECS

No.	Hotel Name (outside Barbados)	Number of Guest Rooms	Status
1	Bay Gardens (St. Lucia)	74	Audit Report submitted
2	Blue Horizon (Grenada)	32	Audit Report submitted
3	Le Sport (St. Lucia)	155	Audit Report submitted
4	Tranquility (Antigua)	59	Audit Report submitted
5	Young Islands (St. Vincent)	29	Audit Report submitted
6	Spice Island (Grenada)	64	Audit Report submitted
7	Flamboyant (Grenada)	68	Audit Report submitted

8	Blue Water (Antigua)	110	Audit Report submitted
9	NISBET (St.Kitts & Nevis)	36	Audit Report submitted
10	Ottleys (St.Kitts & Nevis)	24	Audit Report submitted
11	Ocean Terrace inn (St. Kitts and Nevis)	65	Audit Report submitted
12	Grenadine House (SVG)	20	Audit Report submitted

3.3.2 Hotels Participating in Energy Walk-Through Assessments

A total of 30 walk-through assessment reports have been submitted (see Table 11). It should be noted that, as a rule, the hotels participating in these assessments are all small hotels/apartment houses, and many are members of the Intimate Hotels of Barbados group as well as the Barbados Hotel and Tourism Association.

Table 11 – CHENACT Hotel Energy Walk-Through Assessments in Barbados

No.	Hotel Name	Number of Guest Rooms	Status
1	Bayfield House	10	Report submitted
2	Broome Vacation Homes	5	Report Submitted
3	Butterfly Beach	94	Report submitted
4	Chateau Blanc Apts on the Sea	14	Report submitted
5	Cobblers Cove	42	Report submitted
6	Discovery Bay	88	Report Submitted
7	Edgewater Inn	24	Report Submitted
8	Ella Fitzgerald Apartments Holding Ltd.	12	Report submitted
9	Golden Sands	27	Report submitted
10	Halcyon Palm	25	Report Submitted
11	Island Inn Hotel	24	Report submitted
12	Little Good Harbour	21 cottages (39 bedrooms)	Report Submitted
13	Melrose Beach Apts	15	Report submitted
14	Meridian Inn	16	Report submitted
15	Monteray Apartments	23	Report Submitted
16	Nautilus Beach Apts	15	Report submitted
17	Ocean Spray	25	Report Submitted
18	Peach & Quiet	22 suites	Report submitted
19	Pirates Inn	22	Report submitted
20	Plumtree Club	40	Report submitted
21	Round Rock Apts on the Sea	7	Report submitted
22	Sea Foam Haciendas	12 (2-bedrooms)	Report submitted
23	Sunbay Hotel	104	Report Submitted
24	Sunswept Beach	23	Report submitted
25	Travellers Palm	16	Report Submitted
26	Tropical Winds	23	Report submitted

No.	Hotel Name	Number of Guest Rooms	Status
27	Walmer's Lodge Apts	10	Report Submitted
28	Winchelsea Guest House	4	Report submitted
29	Worthing Court	20	Report submitted
30	Yellow Bird	15	Report submitted

3.3.3 CHENACT Hotel Audit Findings

Table 12 summarizes the performance of hotels receiving CHENACT energy audits in Barbados and other Caribbean islands. Table 13 provides the implementation cost, annual savings (in US$ and kWh), payback period (in years), and estimated annual CO_2 emission reduction associated with recommended energy savings opportunities (ESOs) for a CHENACT audit.

Table 12 - CHENACT Detailed Audits – Energy Consumption and Average/Annual? Occupancy

Hotel Property	# of Rooms	Occupancy	Annual Electricity Consumption [kWh]	Electricity Index [kWh/GN]
Accra	224	64%	2,272,800	28.0
All Seasons	48	53%	207,426	11.9
Allamanda	49	66%	391,821	17.9
Almond Beach Club	161	65%	2,278,220	33.1
Almond Beach Village	395	59%	4,888,236	34.2
Almond Casuarina	280	62%	2,997,861	22.1
Amaryllis	145	42%	1,584,480	42.6
Barbados Beach & Club	111	42%	817,176	25.8
Bay Gardens	74	71%	1,229,699	23.9
Blue Horizon Hotel	67	63%	1,007,724	48.0
Blue Horizons Garden Resort	32	50%	228,462	20.0
Blue Orchid	31	60%	278,269	40.9
Blue Water	110	66%	2,097,897	35.1
Colony Club	96	58%	1,433,572	37.2
Coral Mist	32	67%	294,560	27.8
Coral Sands Beach	33	52%	348,480	32.4
Crystal Cove	88	74%	1,532,592	31.3
Divi Southwinds	133	70%	1,821,996	31.4
Dover Beach	59	59%	382,268	17.7
Flamboyant	68	60%	570,952	21
House	34	55%	701,700	59.2
Le-Sport	155	84%	2,947,354	28.9

Hotel Property	# of Rooms	Occupancy	Annual Electricity Consumption [kWh]	Electricity Index [kWh/GN]
Mango Bay	67	79%	764,720	20.0
Nisbet Plantation Hotel	36	49%	617,420	51.1
Ottley's Plantation Hotel	24	25%	347,360	87.4
Pom-Marine	11	30%	427,520	26
Punta Cana	160	72%	4,167,217	58.9
Royal Pavilion	75	68%	2,019,927	60.0
Sand Piper	47	62%	1,106,760	55.5
Sandy Lane	114	68%	14,669,832	204.7
Savannah	80	42%	1,487,520	88.6
South Beach	49	55%	642,480	51.2
Southern Palm Beach	91	55%	911,394	39.3
Spice Island	64	42%	1,034,643	62.3
Sugarcane Club	44	43%	407,840	27.3
The Beach View Hotel	18	70%	233,249	25.5
The Crane	236	64%	4,987,191	49.8
Time Out at the Gap	76	42%	867,680	78.4
Tortuga Bay	30	50%	1,364,900	111.7
Tranquility	59	43%	740,326	27.0
Treasure Beach	35	61%	441,000	70.3
Turtle Beach Resort	164	70%	2,185,692	25.3
Round Hill	65	40%	2,269,729	71.1
Kariwak	24	58%	520,208	54.7
Stone Haven	11 (Villas)	36%	770,240	382
Young Island Resort	29	34%	237,940	18.4

Table 13 - Energy Saving Opportunity List from a Sample CHENACT Hotel Audit for a 50-100 Room Facility

Energy Saving Opportunity Description	Initial Cost ($US)	Annual Cost Savings ($US)	Payback Period (years)	Annual Energy Savings (kWh)	CO2 Saved (Tons/yr)
Clean coils on fridges and freezers	$ 960.00	$2,008.50	0.48	5,356	4.02
Turn off pool's jacuzzi pump at night	$ 100.00	$2,450.63	0.04	6,535	4.90
Install occupancy sensors in bathroom	$ 14,400.00	$6,405.00	2.25	17,080	12.81
Properly insulate refrigerant-carrying copper lines on 30 units	$ 1,395.00	$692.63	2.01	1,847	1.39
Replace guest room mini-split condensers with a VRV system for cheaper cooling and free hot water	$177,300.00	$77,839.88	2.28	207,573	155.68
Replace photocells with timers to save a half hour of lighting power daily	$ 500.00	$879.75	0.57	2,346	1.76
Retrofit incandescent and halogen bulbs to CFLs and LED lights	$ 18,415.00	$70,414.13	0.26	187,771	140.83
Install variable frequency drives on the pool pumps	$ 10,000.00	$11,946.75	0.84	31,858	23.89
Implement corporate utility management Program	$ 12,000.00	$26,879.63	0.45	71,679	53.76
Install guest room controls	$ 48,000.00	$21,372.38	2.25	56,993	42.74
Install an occupancy sensor in the main restaurant	$ 150.00	$985.50	0.15	2,628	1.97
Tint windows in guest rooms	$ 22,100.00	$9,632.63	2.29	25,687	19.26
Replace 7.5 ton packaged unit at staff quarters with a VRV system producing hot water for staff kitchen	$ 12,000.00	$2,372.63	5.06	6,327	4.75

3.4 EXISTING SOURCES OF FINANCING IN BARBADOS

A recent study on the competitiveness of Barbados's tourism sector found that the terms of debt funding are often unsuitable for tourism businesses.[11] Sources of debt from the major commercial banks are often on terms that cannot be serviced from normal trading companies. For example, hotels take more than 15 years to pay back initial investment. Traditional debt financing usually has shorter terms and requires the full amortization of the principal during that term.

3.4.1 Consolidated Finance Company Limited

This is a commercial entity that offers loans according to criteria similar to commercial banks. There is currently only one tourism client in its portfolio and experience shows that very often the proposed projects do not meet the loan criteria. A common deficiency for hoteliers is lack of security since the property is already tied to the hotel's bankers. Hoteliers falling into this category must provide alternative security. Consolidated Finance offers equipment loans for a period of up to 7 years at an interest rate of approximately 9%. There is no maximum amount for loans once the cash flow indicates that loan payments can be made. The anticipated savings obtained through the installation of the equipment can be used in estimating cash flow projections and hence the ability to service the loan.

3.4.2 Caribbean Financial Services Company, CFSC

This is a regionally-owned financial institution with 75% of its portfolio concentrated within the tourism sector in Barbados and the OECS. CSFC specializes in providing development-stage finance, and carries out detailed risk analysis to determine an appropriate finance package. The overall financing package may consist of debt and/or equity financing based on CFSC's primary funding sources (commercial and international development banks). Based on the level of risk and the various sources of the loan funds, the term and interest rate for the loan are determined.

3.4.3 The Enterprise Growth Fund Limited, EGFL

The Enterprise Growth Fund (EGF) is a statutory body, an agent of the Ministry of Finance, established to finance development in various sectors. Its role is to administer funds that may come from a variety sources and/or may be targeted to specific industries. Following the announcement of the establishment of the $10 million Energy Efficiency Audit & Retrofit Fund in 2006, the EGFL drafted some guidelines for the disbursement of this fund. However, the Fund was never capitalized and is now under review with along with the draft energy policy. The CEO of the EGFL also spoke of his desire to raise money for a fund via a government bond. The EGFL currently manages three funds:

- The Tourism Loan Fund offers Moratoriums on principal payments (interest payments only) – 1 yr for loans less than 5 years; 2 years for loans < 5 yrs but < 10 yrs; 3 years for loans > 10 yrs;

[11] *A Study on the Competitive Tourism Environment which Barbados Faces: Its Challenges and Solutions,* op. cit.

- The Small Hotels Investment Fund, financed by the World Bank, offers a five-year moratorium of interest and principal
- The Tourism Industry Relief Fund, financed by the IADB, provides loans to hotels in financial difficulty caused by the global recession. These properties must have audited accounts, and must demonstrate that their business decline corresponds to the reduced visitor arrivals (i.e., commenced in 2008).

EGFL has also been selected to implement the Smart Fund within the Sustainable Energy Investment Program financed by the Inter-American Development Bank.[12]

3.4.4 The Central Bank of Barbados

The Central Bank of Barbados is engaged in a number of activities to support the tourism industry. One of their roles is to carry out due diligence on various financial institutions to determine their suitability to act as financial intermediaries to disburse funds such as the Tourism Loan Fund and the Small Hotels Investment Fund.

The Central Bank announced a credit guarantee scheme in September 2009. It has been reported that the uptake of this facility has been low, with the commercial banks complaining of the high administrative burden. The Central Bank of Barbados announced the extension of the credit guarantee scheme to the tourism and tourism-related sectors to include guarantees of moratoria of principal and interest for a period of six months from September 15, 2009 to March 15, 2010.

Commercial banks and other institutions eligible for use of the scheme may approach the Central Bank to facilitate those customers who previously had viable operations and whose situation is attributable to a downturn in the sector as a result of the global economic crisis.

The cap on the current amount of the total guarantee program is the same as earlier advised: the maximum amount of any guarantee per customer is $450,000 (working capital $150,000, long-term loan facility (fixed assets) $300,000). A cap on total exposure under the new facility will be determined by the Central Bank. The program should assist in the retention of employment in the sector. The Facility may be accessed through commercial banks and eligible financial intermediaries such as Part III Companies and the Enterprise Growth Fund Limited.[13]

3.4.5 Commercial Banks

The approach of commercial banks in Barbados approach to lending is entirely discretionary and dependent on the relative merits of each individual case. However, this is done within the parameters laid down by the Central Bank for lending in the Tourism sector. Lending is based on a risk assessment that takes into account industry risk as well as the individual business risk and the state of the economy as a whole. The type of security held is also a factor as the speed at which the security can

[12] *Barbados - Sustainable Energy Investment Program* (BA-l1020), Proposal for Operation Development, prepared by the Inter-American Development Bank, 2011.

[13] http://www.barbadostourisminvestment.com/legislation_and_incentives.cfm

be liquidated is also considered. The history and experience of the hotel will be considered and special consideration is given to existing clients. Based on this, the amount, period and interest rate are determined within the ranges stated below. Of course the best deal goes to those with the best negotiating skills and historical track record.

The commercial banks operating in Barbados are: First Caribbean International Bank, Royal Bank of Canada, RBTT (a subsidiary of Royal Bank of Canada), Bank of Butterfield, Scotia Bank, and Barbados National Bank (a subsidiary of Republic bank of Trinidad).

3.5 BARBADOS HOTEL CLEAN ENERGY POLICY

Hotel clean energy is defined as meeting hotel and other visitor accommodation energy end-use needs through non-polluting energy conservation, energy efficiency, and on-site renewable energy resources. Given the challenges of designing and operating a hotel entirely energy self-sufficient and reliant on solar, wind and other renewable energy resources, hotel clean energy performance is measured by the energy intensity of hotel facilities and operations, and the resulting carbon (greenhouse gas emissions) footprint.

It is important to note that hotel accommodations in Barbados are part of a much bigger travel and tourism supply chain including air transport, ground transport, and visitor consumption of goods and services while travelling. The Barbados Hotel Clean Energy Policy applies to all visitor accommodations in Barbados. Visitor or non-resident accommodations consist of resorts, hotels, guesthouses, resort condominiums and other vacation rentals. While the focus of the Barbados Hotel Clean Energy Policy is on licensed hotels, the intent is that through the leadership of the Barbados hotel sector, it will apply to all other accommodations as well.

3.5.1 Current Policy Context

Barbadian hotel energy performance is based on a combination of government policies and programs, voluntary industry initiatives, and investor/operator decision making. Hotel energy use is influenced by tourism sector, energy sector, economic development and physical planning (e.g., Physical Development Plan), trade and human resource development policies. Policy instruments include a combination of direct government budgetary spending (e.g., marketing and promotion, infrastructure, security), government-backed financing to the private sector, investment and tax incentives, codes and standards, permits and approvals, and endorsements of voluntary accreditation schemes.

Barbados has chosen to take a “market-based” approach to promoting clean energy in the hotel sector. The effectiveness of these related programs can be evaluated on the basis of their effectiveness in sustained energy intensity improvements within the sector. The following describes the current policy instruments and their influence on hotel energy performance.

National Strategic Plan. The National Strategic Plan advances six strategic goals in pursuit of the national vision for 2025. Goal four of the NSP speaks specifically of “Building a Green Economy: Strengthening the Physical Infrastructure and Preserving the Environment”. The Barbadian

government's National Strategic Plan of Barbados for 2006-25 is designed to rectify this dependency by increasing the country's renewable energy supply, with a particular focus on raising the number of household solar water heaters by 50 per cent by 2025. Solar water heaters are now a widely used renewable energy technology in Barbados, with installations in nearly half of the island's dwelling units.

The Government has entered into a United Nations Environmental Program (UNEP) Partnership for a Resource-Efficient Green Economy in Barbados, with a key plank being the undertaking of a Green Economy Scoping Study (GESS). The green economy calls for an integrated approach that provides new opportunities for economic growth by directing greater investments into sectors that enhance natural capital and generate new sources of employment, while reducing environmental risks. The study would focus on four key economic sectors, namely, tourism, agriculture, housing/building and transport, along with the cross-cutting issues of energy, water and waste.

A Green Economy within the Barbadian context is defined as an integrated production, distribution, consumption, and waste assimilation system that, at its core, reflect the vulnerability of our small island ecosystems as the basis for natural resource protection, policy intervention, business and investment choice, human development programming, and for the facilitation of export market development strategies.

Barbados Tourism Master Plan (2012-2021). The Government of Barbados is developing a policy framework, plan and strategy that will guide and provide specific prescriptions for the future growth and development of the tourism industry in Barbados over the ten (10) year period 2012-2021 in the form of a Tourism Master Plan (TMP). The policy and planning framework will ensure that the tourism industry grows in a manner that is economically, socially and environmentally sustainable and thus able to meet the future needs of Barbadians, visitors, investors and other stakeholders.

The TMP is expected to produce financially viable and environmentally sound strategies, projects and programs for the Barbados tourism sector. It should also provide a balance between economic benefits, the Government's national objectives, the interests of private tourism stakeholders and the host population at large.

The TMP will focus on major strategies, development plans and programs in relation to: 1) infrastructural and product development; 2) the physical environment, including land use patterns and the carrying capacity of the destination; 3) transportation systems and infrastructure needs, both external to and within the destination; 4) the legal, regulatory and institutional framework in relation to the environmental, social and economic dimensions of tourism development; 5) human resource planning, development, education and training; 5) the framework and systems for tourism marketing, promotion and communications, including tourist information services and information technology structures, including e-commerce; 6) private and public sector cooperation and coordination within the hospitality and tourism industry; and 7) the development of inter-sectoral linkages between tourism and other economic sectors.

Tourism Development Act (2002). The Tourism Development Act of 2002 is the principal policy instrument addressing the hotel sector. It applies to the construction of a new hotel; the alteration or renovation of an existing hotel; the conversion of an existing building or buildings into an hotel by

reconstruction, extension, alteration, renovation or remodeling; the furnishing and equipping of a building to be utilized as an hotel; the provision of tourist recreational facilities and tourism related services; the construction and equipping of a new restaurant; the alteration or renovation of an existing restaurant; the construction of a new attraction or the alteration or renovation of an existing attraction; the restoration, preservation and conservation of natural sites; the establishment, restoration, preservation and conservation of monuments, museums and other historical structures and sites; the construction and furnishing of villas; the construction and furnishing of timeshare properties; and the addition to a tourism product of any facilities or services intended to increase or improve the amenities that the tourism product provides.

The Tourism Development Act 2002 provides a tax incentive to investors in tourism projects to write-off capital expenditures and up to 150% of loan interest; there are also exemptions from import duty, value added tax and environmental levy in respect of furniture, fixtures and equipment as well as building materials, supplies and equity financing.

- The owner or operator of a tourism project which is valued at not less than BDS$1.75 million (US$900,000), who borrows funds from a private sector lending institution to upgrade the hotel or restaurant, and incurs expenditure for this purpose in an income year, shall be entitled to deduct 150 per cent of the interest paid on the loan from his taxable income in respect of loan funds not exceeding BDS$7.5 million.
- An investor who obtains a loan to construct, upgrade or refurbish a tourist attraction based on the natural or cultural heritage of Barbados will be allowed to deduct, for tax purposes, 150 per cent of the interest paid on loan funds not exceeding BDS$3 million. This investor will be allowed an income tax credit of 30 per cent on the purchase of plant and equipment costing over BDS$100,000 used to refurbish, upgrade or construct the attraction. If the tax credit cannot all be written off in one year, the excess may be carried forward for a period not exceeding fifteen (15) years.
- The owner of a qualifying tourism project, which has a value of up to $200 million, will be entitled to duty free concessions and (except for restaurants) will be allowed to set off approved capital expenditure against revenues for a period of fifteen (15) years. Hotels with capital expenditure over $200 million are allowed one additional year to write off expenditure, for each additional $20 million up to a maximum of twenty (20) years.
- Where an owner or operator of a tourism product has in an income year incurred expenditure for the purpose of (a) tourism product development; (b) tourism research; (c) the provision of an apprenticeship scheme; or Investment tax credits; (d) the organization and hosting of tourism exhibitions and trade fairs that are approved by the Minister, then in calculating the assessable income of the owner or operator for an income year there shall be deducted an amount equal to 150 per cent of the expenditure incurred.
- Where an owner or operator of a tourism project or a tourism product has in an income year incurred expenditure for the purpose of (a) developing and operating nature trails throughout rural areas of Barbados to be used as tourist attractions; (b) acquiring Green Globe or similar certification; (c) developing linkages between the tourism sector and other economic sectors; (d) developing community tourism programs; (e) developing visitor exchange programs between Barbados and other Caribbean countries; (f) developing computer software that can be used to measure the performance of the tourism industry, and these projects are approved by the Minister, then in calculating the assessable income of that owner or

operator for an income year there shall be deducted an amount equal to 150 per cent of the expenditure incurred.

Barbados Sustainable Energy Policy Framework. In parallel with CHENACT, the Barbados Division of Energy and Telecommunications, Office of the Prime Minister has developed a Sustainable Energy Policy Framework that applies to all sources and uses of energy on the island. The objectives of the Sustainable Energy Policy Framework (SEPF) is to unlock viable investments in renewable energy and energy efficiency to reduce energy costs, improve energy security, and enhance environmental sustainability.

The SEPF states that electricity generation in Barbados could include more renewable energy technologies, and consumption of electricity could be lower thanks to energy efficiency technologies, because most of these technologies are economically viable and could reduce energy costs. The Final Report recommends promoting renewable energy and energy efficiency— these form the core of the Sustainable Energy Framework for Barbados, and include proposed policy principles, regulatory changes, financial instruments, technical measures, and strengthening of institutional capabilities. Projected costs and benefits of the SEF—by promoting renewable energy and energy efficiency technologies that are economically viable, Barbados can reach its Sustainable Energy Matrix in the next twenty years, and therefore reduce electricity generation costs, electricity consumption, CO_2 emissions, and dependency on fossil fuels.

Building Codes. The Barbados National Standards Institute (BNSI) is currently developing a building energy efficiency code. It will apply to all buildings with indoor floor area greater than 100 m2 and air-conditioning. The draft standard includes artificial lighting, air conditioning, and mechanical ventilation. Other aspects that would affect building energy efficiency include insulation, roofing material, landscaping, shading and natural ventilation. It should be noted that the draft Energy Efficiency Code is most applicable to office buildings and does not reflect the building design and operational energy needs of hotels and other accommodations.

Renewable Energy System Inter-Connection and Feed-in Tariffs with BLP. The Barbados Light and Power (BLP) Renewable Energy Pilot Program seeks to encourage customers to employ solar photovoltaic, wind turbine and hybrid (solar and wind) to supply electricity to the national electric grid. The Pilot Program, initiated in 2010, is available to all customers, that is, the Domestic Service (DS), General Service (GS), Secondary Voltage Power (SVP), LP and also includes those utilizing the prospective TOU tariffs. The renewable power source must be located on the customer's own or rented premises under specific terms and conditions. The maximum number of systems connected to the grid will be limited to 200 customers on a first-come, first-serve basis, and the maximum generating capacity of each individual project is 50 kW. All kilowatts per hour (kWh) sold to the grid will be compensated either via a credit at 1.8 times the Fuel Clause Adjustment or 31.5 cents/kWh (US$16 cents/kWh), whichever is greater.

Since January 2008, the average Fuel Adjustment Clause for BLP has been 27.5 cents/kWh (US$ 13.9 cents/kWh). Assuming the renewable energy feed-in tariff were in place since January 2008, the average price (applying the 1.8 multiplier) paid would be 49.5 cents/kWh (US$ 25 cents/kWh). For only 5 of the 28 months, the 31.5 cents/kWh minimum would have applied.

The Fair Trading Commission is the independent regulator of the supply and distribution of electricity. The Utility Regulation Department currently oversees BLP. The Commission is guided by sector policy and seeks to protect consumers by setting fair and reasonable rates; encouraging investment by allowing efficient operators to earn a reasonable return on capital; and promoting efficiency in the provision of the utility service. The Commission is responsible for approving BLP's proposed tariff schedule (e.g., time-of-day, interruptible rates), feed-in tariffs and contract terms for qualifying non-utility renewable energy projects, cost recovery of utility expenditures on energy efficiency and conservation programs (demand –side management), and BLP's establishment of unregulated entities engaging in energy services.

Hospitality Training. The Barbados Hospitality Institute, part of Barbados Community College, is the government's premier hospitality training institution. The Hospitality Institute operates Pommarine Hotel. Its stated aim is to: 1) offer training programs for the Hospitality Industry; 2) ensure that every guest enjoys a stay of unparalleled quality, with attention paid to detail; and combine the College training program with a functioning hotel. Pommarine has participated in a number of regional capacity building programs, including the USAID funded Caribbean Hotel Environmental Management Initiative (CHEMI), and the OAS funded Sustainable Tourism Enterprises Program (STEP). Pommarine Hotel has been certified under the Green Globe environmental management standard which includes energy management. In addition, the University of the West Indies (UWI) offers a degree in Hospitality & Tourism Management in conjunction with the Barbados Community College. The BHTA organizes workshops and seminars for representatives of its member hotels, and some private entities offer courses in green design, solar PV installation, and other topics.

Greenhouse Gas Abatement. In recognition of the potential adverse impacts of climate change resulting from the greenhouse effect, the United Nations Framework Convention on Climate Change (UNFCCC) sets an ultimate objective of stabilizing greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system. This objective does not specify what these concentrations should be, only that they be at a level that is not dangerous. It also acknowledges that there is currently no scientific certainty about what a dangerous level would be.

As a signatory party to the UNFCCC, Barbados has previously prepared a national inventory of greenhouse gases for the years 1990, 1994 and 1997. Based on the findings of the national inventory, Barbados has undertaken the preparation of this Abatement Analysis and Strategy.

The government's GHG abatement strategy for the commercial sectors gives emphasis to the use of energy efficient equipment in lighting, refrigerating and air-conditioning. The Barbados First National Communication to the UNFCC recognized that the hotel sector is already pursuing such initiatives through involvement in programs to achieve "green hotel" certification. The adoption of energy efficiency measures could be encouraged by the GoB through incentives such as reductions in importation duties for such equipment, which could then be passed on to consumers in the form of reduced prices. The development of linkages between the Ministry of Environment and various components of the private construction industry to encourage the design, construction, use and management of energy-efficient commercial and residential buildings will also have long term impacts on GHG emissions.

The Clean Development Mechanism was established by the UNFCC to allow emission-reduction projects in developing countries to earn certified emission reduction (CER) credits, each equivalent to one tonne of CO2. These CERs can be traded and sold, and used by industrialized countries to a meet a part of their emission reduction targets under the Kyoto Protocol. The mechanism stimulates sustainable development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction limitation targets.

The UNFCC also introduced the concept of a Program of Activities (PoA) (often called Programmatic CDM). A program of activities (PoA) is a voluntary coordinated action by a private or public entity which coordinates and implements any policy/measure or stated goal (i.e. incentive schemes and voluntary programs), which leads to anthropogenic GHG emission reductions or net anthropogenic greenhouse gas removals by sinks that are additional to any that would occur in the absence of the PoA, via an unlimited number of CDM program activities (CPAs). It is characterized as: 1) a voluntary action, 2) implementing a policy, measure or stated goal; 3) coordinated by a public or private entity; and 4) resulting in emission reductions or removals that are additional.

Montreal Protocol. The Government of Barbados has put in place a control system to restrict the importation of known ozone depleting substances (ODS) based on its compliance with the Montreal Protocol. Effective January 1, 2010 the phase out of production and consumption of chlorofluorocarbons (CFCs), halons, carbon tetrachloride and several other ODSs became mandatory for Barbados and other developing country parties operating under Article 5 of the Protocol. In November 2007, the Cabinet approved the regulation of ozone depleting substances in keeping with the provisions of the Montreal Protocol which Barbados signed on to in 1993. The results of the CHENACT ODS audits to date indicate that 87% of the refrigerants used in the hotel sector are R22 gas. ODS substances must be phased out under the Montreal protocol and therefore this gas will become either obsolete or extremely expensive in the next 3-5 years. Barbados launched the HPMP (Hydrofluorocarbon Phase Out Management Plan) in May 2012. As a result of the CHENAT Project the hotel sector is in a position to supply the required ODS information.

Barbados' current state of compliance was achieved through the establishment of the Barbados Refrigerant Management Plan (RMP) developed in 2004 allowing for the development of strategies that limit the access to ozone depleting substances by refrigerant servicing enterprises, and targets both the supply and demand sides of these substances. One of the components of the refrigerant management plan was the development of the Import/Export Licensing System to monitor and control trade in ozone depleting substances, such as CFCs, and the types of equipment which use these substances, including refrigerators, automobiles and chillers. The Import/Export Licensing System allows for outcomes such as a more structured way of monitoring those controlled substances which are used in Barbados and take into consideration the varying phase-out schedules of each of the controlled substances.

3.5.2 Proposed Barbados Hotel Clean Energy Policy

CHENACT specifically calls for the development of a hotel clean energy policy that will fit within the Sustainable Energy Policy Framework. The hotel sector in Barbados is a major contributor to the national economic output (GDP) and is a major consumer of electricity, natural gas and water. The 96 licensed hotels in Barbados consume an estimated 89 giga-watt hours (GWh) electricity in 2010, 9% of

the total sales of Barbados Light and Power Company Ltd. (BLP). This corresponds to an estimated 78 thousand tons of CO2 equivalent (CO2e) in GHG emissions. At current prices and consumption levels, electricity accounts for one of the most significant operating expenses for Barbados hotels.

Goal.

The goal of the Barbados Hotel Clean Energy policy is to improve the competitiveness and viability of the Barbados hotel sector through increased energy efficiency and low GHG emissions economic development.

Objectives:

- Increase investment in cost-effective and proven energy efficiency and renewable energy technologies – spending on green hotel design, efficient a/c, refrigeration, water heating solar hot water, appliances, lighting, and PV/ Wind data collected from investment tax incentive filings.
- Improve the energy efficiency index (kWh per guest night) and water efficiency index (m^3 per guest night) of Barbados hotels – reduced kWhe and m^3 per guest night for participating hotels – calculated from baseline (prior 24 months)
- Demonstrate and recognize the leadership of the hotel sector within Barbados (as model for other sectors) and within the Caribbean (as a model for the regional tourism sector) in reducing greenhouse gas emissions associated with economic activity.

Policy Impacts and Outcomes:

- Growth in the Barbados clean energy industry (consultants, engineering companies, equipment suppliers/distributors, service providers) – tax revenue, employment
- Reduced operating costs for Barbados hotels - expenditures on electricity, gas and water, and as a consequence – greater efficiency in the industry
- Improved balance of trade for Barbados through reduced imported energy resources – expenditures on oil imports
- Deferred expenditure by electricity and water utility in production capacity – Barbados Light and Power and Barbados Water Authority capital expenditures
- Greater awareness of and appreciation for energy efficiency and renewable energy among hotel workers and the general public that can be employed in their homes
- Reduced GHG emissions associated with hotel operations – reduction in CO2e associated with reduced energy (electricity and gas) use – calculated based on the difference from business as usual (without policy).

It is hereby proposed that the Barbados Hotel Clean Energy Policy recommendations be incorporated into the Sustainable Energy Policy for Barbados, Tourism Master Plan, Tourism Development Act, proposed Barbados Buildings Act and National Strategic Plan and other policies as appropriate.

3.5.3 Policy Recommendations

Recommendation #1 – Tourism Sector Planning

Clean energy in the hotel sector should be reinforced through the promotion of environmentally-sustainable hotel development and operations in the Barbados Tourism Master Plan (2012-2021). The TMP should include policy support for clean, energy efficient, low carbon hotel development. Specific recommendations include:

- **Establish "lowest carbon footprint" as a goal for the Barbados tourism sector.** Following the Government of Barbados commitment to greenhouse gas abatement, and recognizing the significance of the tourism sector both in terms of carbon (greenhouse gas) emissions and economic development, the TMP should include a strategy and encourage corresponding programs to minimize the "carbon footprint" of the tourism sector, with particular emphasis on hotels and other accommodations. Specifically, hotels should be encouraged to voluntarily participate in national or regional programmatic clean development mechanism (PoA) to attract carbon financing for hotel clean energy investments (see recommendation #11).
- **Institutionalize "best energy/environmental management practices" in hospitality training.** The Barbados Community College Hospitality Institute and Pommarine Hotel, as well as UWI Hospitality & Tourism Management school should position themselves as leaders in academic learning and professional development supporting energy and water resource efficiency (see recommendation #8).
- **Public/private partnership in promoting clean energy in accommodation sector.** Government recognition of "clean energy" hotel operations. The Barbados Hotel and Tourism Association, Barbados Ministry of Tourism, and Barbados Division of Energy and Telecommunications, Office of the Prime Minister all share the common interest of improving energy management in Barbados hotels. The Ministry of Environment is promoting the transition of Barbados to a Green Economy, with the tourism sector as a pilot program. In fact, the Barbados Development Bank and Division of Energy and Telecommunications, Office of the Prime Minister have also expressed their support for incentives and programs to reduce conventional energy use in hotel operations. One mechanism is set benchmarks and a rating system for energy and water intensity (e.g., kWh per guest night, kWh per m2 of building space, m3 of water per guest night) for new hotel development, as well as major hotel expansions and refurbishments (see recommendation #6).

Recommendation #2 – Hotel Clean Energy Investment Incentives

In the amendments to the Tourism Development Act, the Ministry of Tourism should make incentives consistent with the Government's intention to use tax and customs incentives to favour sustainable energy technologies over conventional ones—particularly solar water heaters over electric ones, and energy efficiency lighting and air-conditioning systems. In the design and construction of new or refurbished hotels, the owner or operator must demonstrate that they have considered energy efficient or renewable energy options.

- **Add** – "Where an operator of a tourism product has in an income year incurred expenditure for the purpose of improving the energy efficiency or increasing the use of renewable energy resources, then in calculating the tax payable of that operator, the operator shall receive an investment tax credit that is equal to 30 percent of the capital cost of the equipment, parts and supplies, and the installation thereof" to Part III.

- **Add** – "the installation of all renewable energy, energy efficiency and energy conservation equipment, appliances and devices, and non-ODS refrigeration, freezers, ice-machines and air-conditioning equipment to a tourism product" to Part II, Section 3 (2nd Schedule).
- **Add** – "the energy efficiency rating or other performance measure of the design of new or renovated building structures, energy consuming equipment or appliance, or building materials such as window glazing, roofing materials" to Part II, Section 4.
- **Add** – "all energy consuming equipment or appliances must have an above average energy use efficiency or water use efficiency rating" to Part III, Section 15.
- **Add** – "demonstrate that the building materials and supplies are, or contribute to, energy efficient performance" to Part III Section 19 (1)
- **Add** – "analyzing, designing, installing or maintaining energy efficient equipment or appliances, natural ventilation and daylighting, rainwater catchments and storage, and water treatment and reuse, and solar cooling" to Part IV Section 31
- **Change** – "tourism course" to "tourism and energy and environmental management course" in Part II, Third Schedule.

Recommendation #3 – Hotel Distributed Generation from Renewable Energy Sources

Based on the results of the BLP Renewable Energy Pilot Program, it is recommended that the Fair Trade Commission authorize BLP to extend the Program to all hotels (and other commercial buildings). Given the limited availability of unused land in Barbados for centralized, grid-connected renewable energy projects, roofs of hotels and other commercial buildings offer alternative sites, near load centers, to install solar photovoltaic (PV) and small wind energy conversion systems (SWECS). It is recommended that BLP sign long term standardized power purchase contract and interconnection agreements with the owners of qualifying installations of PV and SWECS for a minimum of 10 years, and preferably 15 years. BLP may impose limits or caps on the number of distributed generation sources and the total installed capacity in order to maintain grid stability.

Other incentives should be considered to address the investment decision making of hotels owner. These include investment tax credits, accelerated depreciation, third-party leasing and tax incentives. It is recommended that BHTA convene its members to explore incentives options and make recommendations to the appropriate authorities.

Recommendation #4 – Hotel Clean Energy Financing

In establishing the Sustainable Energy Investment Program (Smart Fund)[14] and its operations through the Enterprise Growth Fund Ltd., the Division of Energy and Telecommunications, Office of the Prime Minister should ensure that the Technical Assistance (TA) Facility (Energy Audits are available under the CHENACT Project and CHENACT AP) and Energy Efficiency Retrofit and Renewable Energy Retrofit Facility target qualifying Barbados hotels. Two of the Smart Fund Facilities apply to hotels considering energy efficiency and/or renewable energy investments:

- TA Facility to provide a reimbursable discretion grant for, feasibility studies, engineering design studies, and assistance with loan applications (to the Energy Efficiency and Renewable

[14] Smart Fund Operating Guide, prepared for Inter-American Development Bank and Government of Barbados, prepared by Castalia Strategic Advisors, June 17, 2011.

Energy Facility). Qualifying service providers[15] should have relevant experience working with the hotel sector on similar assignments.

- A subsidized loan facility targeting energy efficiency and renewable energy investments - EE Retrofit and RE Finance Facility - targeting hotel businesses with acceptable terms to finance the equipment services identified in an energy audit.
- Borrowers must report annually on the electricity saved (against their baseline), energy intensity index, and GHG emissions reduced.

It is recommended that BHTA, Division of Energy, Office of the Prime Minister, Ministry of Tourism and EGFL organize a workshop to present the new Energy Efficiency Retrofit and Renewable Energy Finance Facility to Barbados hoteliers. The CHENACT project will work with audited hotels to assist with their loan applications to the Smart Fund. CHENACT held a workshop in March with the interested hotels and has assisted them with their spreadsheet/cash flow analysis for presentation to the Smart Fund

Recommendation #5 – Hotel Building Energy Efficiency Standard

In adopting a new Building Energy Efficiency Code, the Barbados National Standards Institute (BNSI) should develop a building energy efficiency standard applicable to different types of accommodations: resort, hotel, villa and guesthouse, and vacation rental apartments. The standard should delineate between mandatory requirements and voluntary guidelines. The standard should address:

- Windows: U-factor (heat transfer), solar heat gain, visible transmittance, air leakage, condensation resistance, shading.
- Exterior doors: air leakage
- Roofing products: insulation, green roofs, reflective paints and coatings
- Appliance efficiency: kitchen, restaurant and bar equipment; laundry equipment; guestroom refrigerators, TVs; office and business centre equipment.
- Lighting: indoor lighting, outdoor lighting, emergency lighting, sign lighting, lighting control devices, ballasts and lumen devices
- Pipe insulation: steam and hot water pipes, chilled water circulation systems
- Water heating: central boilers, on-demand room units, solar hot water heating systems (with and without back up), thermostats and temperature controls,
- Air conditioning: thermostatic controls, shut-off and reset controls, central systems including air-handling, split and multi-split units,
- Pools and spas: pumps, insulation, pump timers

It is recommended that hotels follow the commercial building codes and then have their own separate building energy efficiency guidelines to cover unique design aspects of hotels.

Recommendations #6 – Hotel Efficiency and/or Low Carbon Rating System

- Barbados should support a public-private partnership to develop a hotel clean energy performance rating system for the Caribbean. A model is the U.S. Environmental Protection

[15] Qualifying service providers are defined as “Smart Fund Partners.”

Agency and U.S. Department of Energy Star program for buildings. Each hotel property would get a score is a benchmark that indicates how efficiently buildings use energy on a 1-100 scale. A score of 50 indicates that energy performance is average compared to similar buildings, while a score of 75 or better indicates top performance, and means the hotel could promote an energy efficient, low carbon label.

- The rating system should be based on total energy consumption (kWh equivalent or kWe) of electricity, natural gas, and diesel fuel and should be expressed in terms of occupancy (kWhe per guest night) and in terms of building size (kWe per square meter). Hotel room capacity (number of guest rooms) and amenities (e.g., restaurants, conference facilities) are possible differentiators to ensure that hotels are benchmarked against similar properties.

- Partners in the design and implementation of the hotel energy efficiency and/or low carbon rating system include, but are not limited to, hotel industry, electric utility, Ministry of Tourism, and Division of Energy (MFIET), Office of the Prime Minister, and Division of Environment. It is recommended that a special commission, comprised of the above organizations, develop and administer an Energy Efficiency or Low Carbon rating in order to grant official recognition of participating hotels. It is recommended that the rating system be voluntary for a period not to exceed 2 years, followed by a mandatory program for all licensed hotels thereafter.

Recommendations #7 – Hotel Appliance and Equipment Energy Efficiency Guidance

Given that Barbados imports most appliances and energy-end use equipment, it is recommended that:

- BNSI accredit energy efficiency rating and labelling systems from major source markets: U.S. Energy Star , Canada Energuide , U.K. , Europe , and China .

- equipment manufacturers interested in selling in the Caribbean market obtain independent verification of the performance of the products being promoted to the hotel industry. Energy efficiency appliance rating should be referenced in the Building Hotel Energy Efficiency Standard (Recommendation #5).

- BNSI establish both an appliance and energy-end use equipment testing capability to verify the stated performance of imported equipment. This could be done domestically and/or through a regional institution such as the CARICOM Regional Organization for Standards and Quality (CROSQ).

Recommendation #8 – Hotel Clean Energy Capacity Building

This policy recommendation is targeted at the government, hotel operators, and energy service providers.

- For government, the focus should be institutional strengthening associated with government programs (e.g., review/approval of applications for customs duty exemptions, review/approval of designs for new construction/renovations of hotels, administration of appliance labelling, etc.).

- For hotel operators, the focus should be on facility energy management and should cover both "back of house" operations (e.g., maintenance) and guest services (e.g., voluntary programs for guests to conserve energy and water).
- For energy service providers, including architects, engineers, consultants and contractors, the focus should be on international standards and best practices, new technology installation and operations, energy auditing and modeling, etc.

Recommendation #9 – Incentives for Utility Demand Side Management.

Energy demand management, also known as demand side management (DSM), is the modification of consumer demand for energy through various methods such as financial incentives and education. Usually, the goal of demand side management is to encourage the consumer to use less energy during peak hours, or to move the time of energy use to off-peak times such as night-time and weekends. Peak demand management does not necessarily decrease total energy consumption, but could be expected to reduce the need for investments in networks and/or power plants.

- This recommendation would allow Barbados Light and Power to submit proposed DSM programs designed to reduce the energy consumption and peak demand of hotels and other commercial customers to the Fair Trade Commission to include program costs in the rate base. The FTC must assess the impact of targeted DSM programs utility costs for consumers and profitability of BLP.

- Another option is to allow BLP to establish an unregulated subsidiary authorized to engage in energy management services. BLP has an understanding of hotel and other commercial customer's electricity use and could enter into contracts with hotels to provide energy services on an established fee or performance basis. BLP would need to demonstrate that the unregulated subsidiary is not subsidized by the regulated utility and that other businesses are not adversely affected by the competitive advantage that the BLP subsidiary might have over other businesses offering the same services.

Recommendation #10 – Clean Energy Industry Development

Barbados has an opportunity to encourage the development of a domestic clean energy industry with the associated jobs and investment in one of the fastest growing markets worldwide.

- Following the example set for the solar hot water industry, Barbados should consider amending the Fiscal Incentives Act of 1974 to allow the energy efficiency equipment suppliers manufacturers to benefit from import preferences and tax holidays.

It is expected that the clean energy industry will expand and mature with increased investment in the Caribbean hotel sector.

- Toward this end, it is recommended that businesses (and individuals) that offer energy services (see section 4.3) form a clean energy industry association, and that this organization represent the private sector as it relates to policy reforms, standards and certification, and even registration as Smart Fund Partners (see section 3.5.1). As with other CHENACT Hotel Clean Energy Policy recommendations, developing the Barbados clean energy industry has a broader benefit than serving hotels.

Recommendation #11 – Clean Development Mechanism Program of Activities for Hotels

One of the most important issues addressed by a Clean Development Mechanism Program of Activities (PoA) is the relationship between policies and programs. Programs that stem from mandatory policies and regulations that are not well enforced, or voluntary or market-based policies that use incentives and disincentives to encourage compliance meet the additionality criteria. In support of the PoA, it is recommended that the Barbados Hotel Clean Energy Policy should explicitly address the following:

- State the Government's goal of a sustainable tourism sector, industry and products (link to Recommendation #1 – Tourism Sector Planning)
- Establish objectives related to reducing energy and carbon intensity of hotel operations
- Set a target of 25% reduction in energy use and carbon footprint of the Barbados hotel sector by 2020 as part of Barbados strategy to mitigate greenhouse gas emissions
- Annual voluntary reporting by hotels and other accommodations (link to Recommendations #6 – Hotel Efficiency and/or Low Carbon Rating System)

The policy should explicitly recognize the Ministry of Environment - Barbados Designated National Authority (DNA) - as focal point for CDM rules and administrative processes and communications with the UNFCC CDM Board. The main task of the DNA is to assess potential CDM projects to determine whether they will assist the host country in achieving its sustainable development goals and to provide a letter of approval to project participants in CDM projects. This letter of approval must confirm that the project activity contributes to the sustainable development of the country. It is then submitted to the CDM Executive Board to support the registration of the project or program.

The Barbados Hotel and Tourism Association, alone and in conjunction with the Caribbean Hotel and Tourism Association, should encourage its member hotels to participate in a Hotel Clean Energy PoA at such time as a Coordinating Entity is established and a PoA is registered.

Recommendation #12 – Elimination of CFC and other ODS in the Hotel Sector

The policy calls for increasing awareness, providing technical assistance and training, and incentives/disincentives for the complete phase-out of ODS.

- The Barbados Hotel and Tourism Association, Ministry of Environment, Ministry of Tourism and United Nations Environment Program should develop a targeted awareness campaign for hotel owners and operators regarding the Montreal Protocol and associated Barbados ODS policies.
- Government should fund the air-conditioning and refrigeration industry to provide technical assistance (e.g., audits) and training (e.g., refrigeration replacement).
- Air-conditioning and refrigeration systems and equipment that is non-compliant with Montreal Protocol should be removed from incentives under the Tourism Development Act (see Recommendation #2 – Hotel Clean Energy Investment Incentives).

3.6 MODEL CARIBBEAN HOTEL CLEAN ENERGY POLICY

CHENACT specifically calls for the development of a hotel clean energy policy that will fit within the energy policy framework of the individual country. The hotel sector is a major contributor to the

economic output (GDP) of many countries in the Caribbean and is a major consumer of electricity, natural gas and water in more than 2,269 hotels in the Caribbean.[16]

The goal of the Caribbean Hotel Clean Energy policy is to improve the competitiveness and viability of the hotel sector through increased energy efficiency and low GHG emissions economic development. The main objective of the policy are:

- Reduce GHG emissions associated with hotel operations – reduction in CO2e associated with reduced energy (electricity and gas) use.
- Increase investment in cost-effective and proven energy efficiency and renewable energy technologies – spending on green hotel design, efficient air-conditioning, refrigeration, water heating, appliances, lighting, solar hot water, PV, etc.
- Improve the energy intensity (kWh per guest night) and water intensity (m^3 per guest night) of hotels – reduced kWe and m^3 per guest night for participating hotels.
- Demonstrate and recognize the leadership of the hotel sector (as a model for other sectors) within the Caribbean, as a model for the regional tourism sector.

3.6.1 Policy Impacts and Outcomes

- Growth in the clean energy industry (consultants, engineering companies, equipment suppliers/distributors, service providers) – increase in tax revenue and employment.
- Reduced operating costs for hotels expenditures on electricity, gas and water
- Improved balance of national trade through reduced imported energy resources – reduced expenditures on oil imports
- Programmatic approach to reducing GHG emissions as a possible example for other sectors
- Deferred capital expenditure in production capacity by electricity and water utilities.
- Greater awareness of and appreciation for energy efficiency and renewable energy among hotel workers and the general public that can be employed in residential sector.

3.6.2 Policy Recommendations

Recommendation #1 – Tourism Sector Planning
Clean energy in the hotel sector should be reinforced through the promotion of environmentally-sustainable hotel development and operations. These efforts should include policy support for clean, energy efficient, low carbon hotel development; specific recommendations include:

- Establish “reduced carbon footprint” as a goal for the national tourism sector. Draft a strategy to encourage programs to minimize the “carbon footprint” of the tourism sector, with

[16] Number of hotels included in the regional model developed by Tetra Tech.

particular emphasis on hotels and other accommodations. Specifically, hotels should be encouraged to voluntarily participate in national or regional programmatic clean development mechanism (PoA) to attract carbon financing for hotel clean energy investments (see recommendation #11).

- Institutionalize "best energy/environmental management practices" in hospitality training. The hospitality programs at community colleges, universities and elsewhere should position themselves as leaders in academic learning and professional development supporting energy and water resource efficiency (see recommendation #8).

- Public/private partnership in promoting clean energy in the accommodation sector through recognition of "clean energy" hotel operations. One mechanism is to set benchmarks and a rating system for energy and water intensity (e.g., kWh per guest night, kWh per m2 of building space, m3 of water per guest night) for new hotel development, as well as major hotel expansions and refurbishments (see recommendation #6).

Recommendation #2 – Hotel Distributed Generation from Renewable Energy Sources

It is recommended that :

- The electric utilities be authorized to implement renewable energy pilot programs for hotels.
- The utilities sign long term standardized power purchase contract and interconnection agreements with the owners of qualifying installations of solar photovoltaic (PV) and small wind energy conversion systems (SWECS) for a minimum of 10 years, and preferably 15 years. The utilities may impose limits or caps on the number of distributed generation sources and the total installed capacity in order to maintain grid stability. Other incentives should be considered to address the investment decision making of hotel owners. These include investment tax credits, accelerated depreciation, third-party leasing and tax incentives.

Recommendation #3 – Hotel Building Energy Efficiency Standard

Building energy efficiency codes can be developed for different types of accommodations: resort, hotel, villa and guesthouse, and vacation rental apartments. The standards should delineate between mandatory requirements and voluntary guidelines, and should address:

• Windows • Doors • Roofing and wall products • Appliance efficiency • Lighting	• Pipe insulation • Water heating • Air conditioning • Pools and spas

Recommendations #4 – Hotel Efficiency and/or Low Carbon Rating System

A public-private partnership to develop a hotel clean energy performance rating system for can use the U.S. Environmental Protection Agency and U.S. Department of Energy's Energy Star program for buildings as a model. Each hotel property would get a benchmark score that indicates how efficiently the properties use energy on a 1-100 scale. A score of 50 indicates that energy performance is average compared to similar buildings, while a score of 75 or better indicates top performance, and means the hotel could promote an energy efficient, low carbon label.

The rating system should be based on total energy consumption (kWh equivalent or kWe) of electricity, natural gas, and diesel fuel and should be expressed in terms of occupancy (kWhe per guest night) and in terms of building size (kWe per square meter). Hotel room capacity (number of guest rooms) and amenities (e.g., restaurants, conference facilities) are possible differentiators to ensure that hotels are benchmarked against similar properties.

Recommendations #5 – Hotel Appliance and Equipment Energy Efficiency Guidance

Accredit energy efficiency rating and labeling systems from major source markets: U.S. Energy Star, Canada Energuide, U.K., Europe, and China. Under these programs, equipment manufacturers must obtain independent verification of the performance of the products being promoted to the hotel industry. Energy efficiency appliance rating should be referenced in the Building Hotel Energy Efficiency Standard.

Establish both an appliance and energy-end use equipment testing capability to verify the stated performance of imported equipment. This could be done domestically and/or through a regional institution such as the CARICOM Regional Organization for Standards and Quality (CROSQ).

Recommendation #6 – Hotel Clean Energy Capacity Building

This policy recommendation is targeted at the government, hotel operators, and energy service providers.

- For government, the focus should be institutional strengthening associated with government programs (e.g., review/approval of applications for customs duty exemptions, review/approval of designs for new construction/renovations of hotels, administration of appliance labeling, etc.).
- For hotel operators, the focus should be on facility energy management and should cover both “back of house” operations (e.g., maintenance) and guest services (e.g., voluntary programs for guests to conserve energy and water).
- For energy service providers, including architects, engineers, consultants and contractors, the focus should be on international standards and best practices, new technology installation and operations, energy auditing and modeling, etc.

Recommendation #7 – Incentives for Utility Demand Side Management

- Allow the electric utilities to submit proposed demand side management (DSM) programs, designed to reduce the energy consumption and peak demand of hotels and other commercial customers, to the national electricity regulator. The regulator must assess the impact of targeted DSM programs on utility costs for consumers and the profitability of the utility company.

- Another option is to allow the utility to establish an unregulated subsidiary authorized to engage in energy management services. The utility will have an understanding of hotel and other commercial customers’ electricity use and could enter into contracts with hotels to provide energy services on an established fee or performance basis.

Recommendation #8 – Clean Energy Industry Development

- Encourage the development of a domestic clean energy industry with the associated jobs and investment in one of the fastest growing markets worldwide.

- Consider amending the fiscal incentives to allow energy efficiency equipment suppliers and manufacturers to benefit from import preferences and tax holidays.

Recommendation #9 – Clean Development Mechanism Program of Activities for Hotels
One of the most important issues addressed by a Clean Development Mechanism Program of Activities (PoA) is the relationship between policies and programs. In support of the PoA, it is recommended that a Hotel Clean Energy Policy should explicitly address the following:

- Establish objectives related to reducing energy and carbon intensity of hotel operations

- Set a target of 25% reduction in energy use and carbon footprint of the hotel sector as part of a strategy to mitigate greenhouse gas emissions

- Annual reporting by hotels and other accommodations.

- The national hotel or tourism associations, in conjunction with the Caribbean Hotel and Tourism Association, should encourage its member hotels to participate in a Hotel Clean Energy PoA at such time as a coordinating entity is established and a PoA is registered.

- ***Recommendation #10 – Elimination of CFC and other ODS in the Hotel Sector***
- The policy calls for increasing awareness, providing technical assistance and training, and incentives/disincentives for the complete phase-out of ODS.

- Develop a targeted awareness campaign for hotel owners and operators, in conjunction with the National Ozone unit, regarding the Montreal Protocol and associated national ODS policies.

- Fund the air-conditioning and refrigeration industry to provide technical assistance (e.g., audits) and training (e.g., refrigeration replacement).

- Air-conditioning and refrigeration systems and equipment that is non-compliant with Montreal Protocol should be removed from any incentives programs.

3.7 PILOT DEMONSTRATION

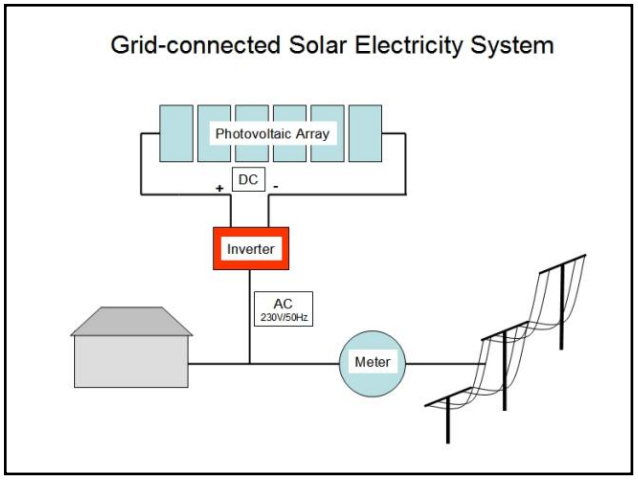
CHENACT includes a pilot demonstration of renewable energy micro-generation installed on the properties of participating hotels. Given the fact that BLP has initiated a renewable energy pilot program with feed-in tariffs, we have proposed to use solar photovoltaic systems as the technology in the pilot demonstration program.
Figure 10 provides a schematic of a grid-connected PV system.

3.7.1 Solar PV System Cost

The costs of PV projects in emerging economies and other market sources appear to vary by approximately +/- 25 percent. This variation is due to site specific factors, owner specific factors, and component/system pricing.

- Site specific factors are usually captured in the Balance of System (BOS) and might include rooftop mounting issues, transportation and shipping cost, shading considerations, interconnection issues or similar.
- Owner specific factors are captured in the Owner's costs and might include permitting issues, legal issues, or owner's management issues.
- Component/system pricing variation is related to market supply vs. demand, market efficiency, timing, etc.

Figure 10 – Schematic of Grid-Connected Distributed Solar Photovoltaic (PV) System



3.7.2 Solar PV Energy Production in Barbados

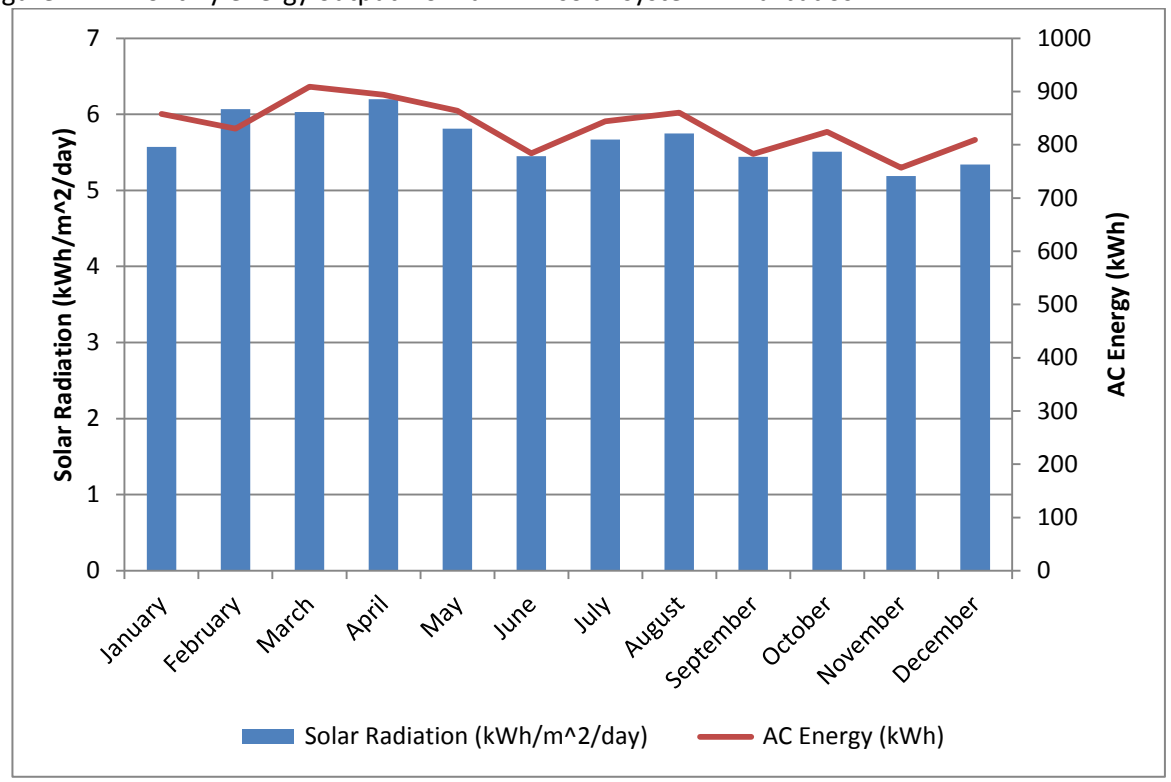
This information was used to determine the performance of a 7 kW PV system in Barbados using NREL's PV Watts online solar performance calculation tool. The results of this software analyses is shown in Table 14. Figure 11 plots solar radiation at the site and the AC energy production of the system.

Table 14 - PV site, system and cost assumptions

Site Information	
City:	Fort-De-France
State:	Martinique
Lat (deg N):	14.6
Long (deg W):	61
Elev (m):	4
Weather Data:	IWEC
System Information	
PV System Specifications	

DC Rating:	7.0 kW
DC to AC Derate Factor:	0.77
AC Rating:	5.4 kW
Array Type: Fixed Tilt	
Array Tilt:	14.6
Array Azimuth:	180
Cost Information	
Cost of Electricity:	0.38 USD/kWh

Figure 11 – Monthly energy output from a 7 kW solar system in Barbados[17]



For this analysis, the following assumptions were made:

- Martinique was chosen as the site location because it is the geographical location nearest Barbados for which PVWatts had solar radiation data.
- A cost of electricity of US$ 0.30/kWh as chosen based on the BLP tariff structure and historical rates.

3.7.3 Solar PV Technology Selection

[17] Information obtained PVWATTS simulation software.

There are various photovoltaic technologies available in today's market with a range of prices for each technology. To obtain the best technology for wide scale adoption in the Caribbean a system level detail should be done starting with the PV modules themselves which are the most costly component in a PV energy generating system. Details such as Band gap, Temperature, and Fill Factor are some of the finer technology details that need to be examined when selecting a PV module. Such details are generally not provided in the technology specification sheet but differences in these details will produce system performance differences when comparing similar PV technologies.

The band gap determines what portion of the solar spectrum a photovoltaic cell absorbs – it is similar to the number of wavelengths that can be absorbed. The higher the band gap, the more the PV technology is capable of harnessing the power contained in the sunlight. Also the higher the band gap the greater the potential of energy capture in high temperature. PV is a direct energy conversion technology, which works better at lower temperatures. As temperature increases the band gap decreases, therefore the higher band gap will allow the PV module to keep producing power at higher temperatures. Thus, knowing the band gap can be an important performance factor given that different latitudes have different wavelengths and the effects of temperature on the band gap.

Fill factor is the ratio of the technology's actual ability to capture available energy to the energy that is theoretically available. More mature PV technologies like mono-crystalline silicon have higher fill factors; newer thin films like CIGS have lower fill factors which will be increasing as the technologies mature. Higher fill factors means more power out of the relatively same cost of manufacturing - more voltage and or amperage and thus more maximum power from the same surface). When comparing PV manufacturing companies' technologies consider current and future band gaps, temperature effects and fill factors.

In order to safeguard investment, the annual performance degradation of modules due to weatherization, and PV cell material degradation should be assessed. The IEC performance degradation Certification for the various technologies along with a historical paper trail and documented test results should be analyzed before making large scale investments in PV modules, especially for the high salinity environment experienced in the Caribbean.

To safeguard investment and help assure long term performance it is important to perform due diligence, risk analysis and bankability evaluations assessing the all the finer system level details and also obtain project performance insurance whenever possible.

The following were the minimum requirements and selection criteria for the hotels participating in the CHENACT pilot program.

Minimum Requirements:

- Approximately 50 square meters of contiguous, unobstructed roof space, preferably south (or southeast/southwest) facing.
- Property is currently open and operating, and is willing to serve as a demonstration (i.e., welcome press and outsiders to see the system and explain its operation)
- Property is not under any pending sale or bankruptcy proceedings

- Roof space must be of sufficiently high standard to ensure that the PV system will survive in the event of a storm or hurricane
- Property is a member of the CHTA
- Property has had a CHENACT Detailed Audit
- Property must have a liability insurance policy for up to B$100,000 in damages (BLP interconnection requirement)
- Property owner/manager must commit to monitor and report on the performance of the PV system, and share this information with other interested parties

Hotel Selection Criteria:

- Property location - preference is to have hotels from different parts of the island, i.e., one each from west, south, east.
- Property has adopted energy efficiency measures or has plans to do so as a result of the CHENACT audit report recommendations
- Property roof space is not shaded or otherwise obstructed from direct sunlight
- Amount property owners are willing to share in the installation cost

Site visits to candidate hotels

Various hotels were visited on island and discussions were held with hotel managers with regards to the pilot project. All of the hotels visited have either had an energy walk through and/ or an energy audit done or scheduled to be done. The objectives of these visits were to:

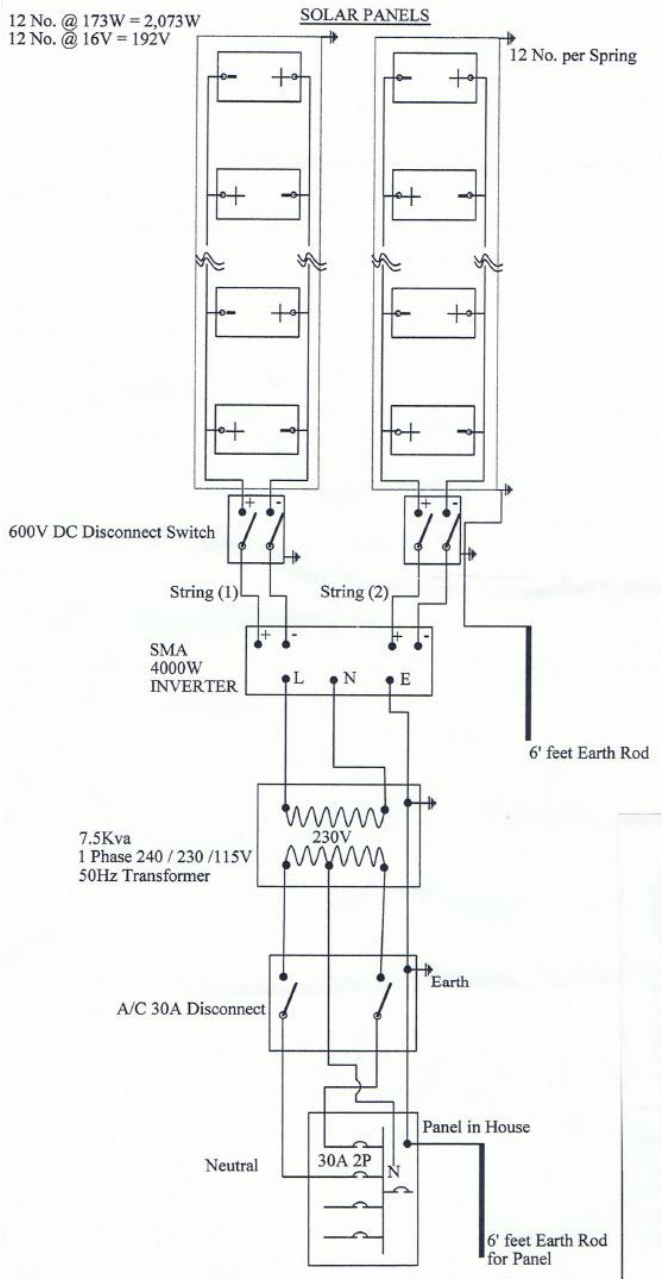
- Inform and sensitize the hotel owners and managers about CHENACT and the overall goal of the demonstration pilot project.
- Identify key hotels and locations that could host the demonstration pilot projects
- Gauge the enthusiasm from the management and to assess the capabilities of technical staff and facility engineers
- Assess the owners and operators energy strategies and their willingness to adopt and implement energy efficient practices and technologies within their resource capabilities.
- Obtain on site specifications and assess space availability and interconnectivity for PV systems.
- Assess constructability issues as it pertains to the development of an onsite PV system.
- Willingness to render site access to the public and energy stakeholders for the sharing of information and education.

The CHENACT received bids for installation of the 3 PV systems of 7kW each for three hotel properties. The demonstration project is currently undergoing implementation.

Meetings were held with Barbados Light and Power (BL&P) renewable energy team to discuss the PV pilot project. BL&P suggested that it will be easier for their larger customers in the hotel sector to have the solar PV system connection done on the load side. This will eliminate the need for Low Voltage meters installations for supply side interconnection since these customers are metered on the High Voltage line. The energy production of the PV system will be metered before the load side interconnection so that BL&P can pay the monthly kWh production of the system. Figure 12 illustrates

a schematic of BL&P acceptable grid tie PV system configuration using grid-tied inverter and single phase 240/230/115V 50Hz transformer.

Figure 12 – Schematic of a BL&P Acceptable Grid Tie PV system .



4. BARBADOS ENERGY SMART FUND

The Government of Barbados has announced its intent to create a fund to stimulate investment in energy improvements. This Smart Fund will provide grants and subsidized loans to promote increased use of energy efficiency (EE) and use of renewable energy (RE). The Government has obtained a US $10 million investment loan with the IDB and the proceeds of this loan will be used to capitalize the Fund. This Fund is designed to overcome some of the key barriers to the uptake of viable energy efficiency and distributed renewable energy generation technologies.

According to the Smart Fund Operating Guide,[18] Barbados hotels will benefit from two of the Smart Fund facilities:

- Technical Assistance (TA) Facility (BDS $1 million). This facility provides grants to businesses for funding pre-investment studies of RE and EE projects, to assess their technical and financial viability and support their implementation (especially with funding by the EE Retrofit and RE Finance Facility). While most hotels received audits under CHENACT, this fund could be used for engineering design and feasibility study for major projects.

- EE Retrofit and RE Finance Facility (BDS $12 million). This facility provides subsidized loans to businesses for financing the implementation of viable RE and EE projects (including, but not limited to, projects assessed by studies funded by the TA Facility).

Customers eligible to apply for Smart Fund support are businesses operating in Barbados (regardless of size of annual sales or revenues, and regardless of line of business), including hotels. Preference will be given to Barbadian small and medium sized businesses. This translates to hotels with 50 rooms or less. In the case of the TA Facility, it is restricted to small and medium sized businesses. In the case of the EE and RE Finance Facility, small and medium sized businesses will be given preference provided they meet all other criteria.

The Enterprise Growth Fund Ltd. (EGFL) serves as the manager of the Smart Fund. The Investment Committee of EGFL, which comprises four directors and the CEO of EGFL, is a sub-committee of the Board with delegated authority to approve or reject all applications for financing received by EGFL and the various funds it manages. The Investment Committee of EGFL functions as the Investment Committee of the Smart Fund, and is in charge of:

- Reviewing the creditworthiness and eligibility of applicants to the Smart Fund facilities
- Approving or rejecting applications for Smart Fund support for facilities
- Preparing (and/or coordinating the preparation of) reports on the Smart Fund
- Determining terms and conditions (including security) of loans and grants
- Requesting an inspection or audit of accounts and records of any approved application, for ensuring compliance with prudent business practices.

[18] *Smart Fund Operating Guide*, prepared for Inter-American Development Bank and Government of Barbados, prepared by Castalia Strategic Advisors, June 17, 2011.

4.1 SMART FUND PARTNERS

The Smart Fund restricts the contractors to be used to Smart Fund Partners (SFP). SFPs are qualified experts in RE and EE projects who assist eligible businesses in:

- Obtaining funding by the Smart Fund through the TA Facility and the EE Retrofit and RE Finance Facility, helping eligible businesses apply for support from these facilities
- Performing audits or feasibility studies, paid by businesses that obtain funding under the TA Facility
- Implementing EE and RE projects, paid by businesses that obtain funding obtained under the EE Retrofit and RE Finance Facility.

SFPs are intermediaries (selected based on their qualifications and experience) between the Smart Fund and those businesses needing qualified assistance. The purpose of SFPs is to help mobilize the Smart Fund's money. SFPs are not executing agencies or sub-executing agencies of the Smart Fund: they are hired directly by businesses that receive support by the Smart Fund.

Assistance by SFPs is not a necessary condition for businesses to obtain Smart Fund support under the EE Retrofit and RE Finance Facility. However, an entity that performs an audit or a feasibility study for a business that obtains funding under the TA Facility must qualify as a SFP – if it is not a SFP already, it must qualify as one before performing the audit or the study. Eligible businesses that do not need any specialized assistance, or who wish to resort to specialized assistance other than that of pre-selected SFPs, may do so and are not in any way penalized for doing so – provided that the entity that wishes to perform the audit or the feasibility study qualifies as SFP at that point. In essence, SFPs represent an important source of assistance, whose quality has been assessed by the Smart Fund. Assistance by SFPs does not guarantee being approved for support by the Smart Fund.

Given the purpose and nature of the SFPs, their number is not closed, nor is the list of approved SFPs exclusive – the list of SFPs may be updated on a rolling basis. SFPs are either selected or not selected based on their qualifications and experience. SFPs may be either individuals or businesses operating in Barbados that are qualified in energy efficiency (EE) or renewable energy (RE).

Required qualifications and experience for individuals are as follows:

- Education: university degree in electrical or mechanical engineering, or diploma in the electrical or mechanical field
- Experience: at least ten (10) years of proven experience in assessing, projecting, designing, installing, and maintaining electrical systems and appliances, in particular:
    - Efficient lighting
    - Air conditioning
    - Refrigeration
    - Electromotive devices
    - Solar water heaters
    - Solar photovoltaic systems
    - Wind energy systems.

Required qualifications and experience for businesses are as follows:

- Employing staff that complies with the education and experience required for individuals
- Having a good financial standing
- Qualifying as a small or medium-sized business consistent with the definition by the Central Bank of Barbados:
    - A business incorporated under the Companies Act and approved as a small business in accordance with the Small Business Development Act,1999-23 or
    - A business that meets the following criteria: gross sales/revenues up to and not exceeding BDS $5 million per year, stated or paid-up capital up to and not exceeding BDS $2 million, majority (over 50%) Barbadian-owned, and not controlled by another business whose reserves and/or capital or non-Barbadian ownership exceed the criteria above.

4.2 TECHNICAL ASSISTANCE (TA) FACILITY

Projects eligible for support under the TA Facility consist of pre-investment EE audits, and RE studies. Audits and studies eligible for support are identified by 1) criteria on eligible EE and RE technologies to be assessed and 2) criteria on eligible types of EE audits and RE studies. Criteria on eligible EE and RE technologies are those described for the EE Retrofit and RE Finance Facility (see Section 3.2.3). Criteria on eligible types of EE audits and RE studies are as follows:

- EE audits – these are defined as detailed assessments of the technical and financial viability of installing EE equipment and materials at business premises, and adopting EE actions (EE equipment, material, and actions are collectively identified as “EE measures”). The result of an EE audit is a detailed audit report that describes and assesses:

    - Baseline energy consumption patterns and key energy end-uses of the business involved in the audit
    - Detailed capital, installation, and operation and maintenance costs of each EE measure proposed to achieve energy savings
    - Proposed financing of EE measures considered through equity and debt instruments
    - Savings expected to be achieved through proposed EE measures, in energy terms (kWh saved per year and over life cycle) and in monetary terms (BD$ saved per year and over life cycle, net present value of measures, payback period of measures).

Preliminary audits, also known as “walk-through audits,” are not eligible for support by the TA Facility.

- RE studies – these are defined as any study that prepares a project for generating electrical and/or thermal energy from renewable sources, under a technical, financial, or environmental point of view. RE studies eligible for support include technical and economic feasibility studies, studies on the financial structuring of a RE project, environmental impact assessments for a RE project, and generally any study that is necessary for assessing the

technical, economic, financial, environmental viability of RE projects, thus allowing them to be financed and implemented.

The terms and conditions for grants awarded under the TA Facility are as follows:

- Size of grants: grants to pay for EE audits and RE studies may amount to a maximum of BDS $40,000, depending on the project. Grants are awarded to cover the entire cost of the approved EE audit or RE study

- Deposit (counterpart funding and management fee): EGFL determines the size of a deposit that the applicant should make (in cash or in kind) to the account of the TA Facility, as a prior condition to approval and disbursement of the grant to pay for the EE audit or RE study. The value of the deposit may be up to 50% of the grant amount, depending on EGFL's assessment of project risk, project size, and creditworthiness of the applicant.

The percentage of the total grant amount that EGFL determines for the applicant's deposit includes a management fee, in an amount to be determined in the Management Agreement between EGFL and the Government. This management fee is charged by EGFL to the applicant, and accrues to EGFL's own account at the time of each grant disbursement.

The remaining part of the deposit (after subtracting the management fee) is treated in one of three ways depending on the project outcome:

- If the project assessed by the EE audit or RE study is deemed viable, and ultimately implemented with a loan from the EE Retrofit and RE Finance Facility, the remaining part of the deposit is fully reimbursed to the applicant by being subtracted from the principal of the loan
- If the project assessed by the EE audit or RE study is deemed not viable and is not implemented, the remaining part of the deposit is fully reimbursed to the applicant in cash
- If the project assessed by the EE audit or RE study is deemed viable, but ultimately not implemented, or is implemented but without a loan from the EE Retrofit and RE Finance Facility, the deposit is not reimbursed to the applicant, and definitely accrues to the account of the TA Facility's account to be used for funding other EE audits or RE studies for other successful applicants

Only one grant may be awarded to any business. However, a SFP may be hired by more than one business to perform an audit or study under the TA Facility.

Businesses that receive a grant for funding an EE audit or RE study commit to using the funding only for purposes agreed with EGFL, and agree to random inspections by independent auditors hired by the Smart Fund to verify that the use of funding is appropriate and terms and conditions are respected. The grant agreement details rights and duties of parties regarding inspection.

4.3 EE RETROFIT AND RE FINANCE FACILITY

The EE Retrofit and RE Finance Facility provides subsidized loans (loans with terms below those of the commercial market) to finance the implementation of EE and RE projects. Projects eligible for a loan under this facility may or may not have received a grant for doing an EE audit or RE study under the TA Facility. Projects that are well-structured at the application stage may be approved without the need for further studies. This facility operates on a revolving basis – that is, proceeds from repayment of loan capital and interest are used to finance other projects.

Eligible customers are businesses operating in Barbados (regardless of size of annual sales or revenues, and regardless of line of business), including hotels, are eligible to receive funding under the EE Retrofit and RE Finance Facility, with priority is given to Barbadian small and medium-sized businesses.

Projects eligible for support under the EE Retrofit and RE Finance Facility are of two types:

- *Energy efficiency and conservation projects.* Energy efficiency projects are projects that save electrical or thermal energy by reducing the intensity of its use (that is, reducing the energy consumed given a constant level of output). Energy conservation projects are projects that save electrical or thermal energy by avoiding its unnecessary use.

- *Distributed-scale renewable energy projects.* Renewable energy projects are projects that generate electrical or thermal energy using renewable sources available in Barbados (such as the sun and wind). This facility supports "distributed scale" renewable energy projects, which are those that generate energy at the customer's premises, close to where it is consumed. Eligible distributed RE projects include both those connected to the grid for purposes of re-sale of excess electricity and those not connected to the grid. The Smart Fund establishes no special limit on installed capacity (kW) of eligible systems.

Project costs eligible for loans are defined on a turnkey basis – that is, capital costs (both material and labor costs) directly related to implementing an EE or RE project.

Given the types of eligible EE and RE projects described above, eligible technologies are those that are technically viable (that is, EE and RE technologies that are proven) and economically viable (that is, EE and RE technologies that decrease energy costs in Barbados). Experimental or non-proven technologies, and technologies that increase energy costs, are not eligible for support.

The Smart Fund Technical Committee (SFTC) conducts a technical and economic review of technologies based on the following criteria:

- Energy efficiency and conservation technologies:

    - Efficient lighting technologies (compact fluorescent lamps—CFLs, T8 fluorescent lamps, occupancy sensors, T5 high output lamps, magnetic induction street lights, and other efficient lights).

- Appliances (excluding refrigerators): assumed to be technically and economically viable provided they comply with a "certificate" issued by the BNSI.

- Refrigerators (for residential and commercial use): provided they comply with certificate issued by BNSI.

- Power monitors for energy conservation: always viable and eligible for funding.

- Other energy saving equipment (including insulating material, coatings): based on a case-by-case assessment by the SFTC.

- Distributed-scale renewable energy technologies:

  - Solar water heaters: solar water heaters that are manufactured in Barbados are assumed to be always technically and economically viable thanks to the country's proven and successful experience with this technology. Solar water heaters not manufactured in Barbados (or only assembled in Barbados) are subject to a case-by-case assessment by the SFTC, using the Smart Fund Assessment Tool as it deems appropriate.

  - Hybrid solar photovoltaic (PV)/thermal systems: based on a case-by-case assessment by the SFTC, using the Smart Fund Assessment Tool as it deems appropriate. Systems connected to the grid must also meet the technical requirements published in BL&P's Requirements for Grid Interconnection of Renewable Generation Systems.

  - Small solar photovoltaic (PV) systems: based on a case-by-case assessment by the SFTC, using the Smart Fund Assessment Tool as it deems appropriate. Again, systems connected to the grid must also meet the technical requirements published in BL&P's Requirements for Grid Interconnection of Renewable Generation Systems.

  - Small wind systems: the SEFB found small wind systems to be not economically viable (and far from being so). Therefore, normally small wind systems are not eligible for funding. However, the SFTC may consider the potential eligibility of small wind systems on a case-by-case basis if their capital costs undergo a significant decrease, using the Smart Fund Assessment Tool as it deems appropriate. Again, systems connected to the grid must also meet the technical requirements published in BL&P's Requirements for Grid Interconnection of Renewable Generation Systems.

  - Other RE systems: other RE technologies are not deemed to be viable at distributed scale, and therefore not eligible for funding. The SFTC may consider technical and economic viability of other RE technologies in the future, in case technical and economic conditions change.

Terms and conditions under the EE Retrofit and RE Finance Facility

- Size of loans and loan amount per applicant: the maximum loan size is BDS $1,500,000, which is also the maximum loan amount that may be provided to any single applicant. The maximum amount of loan per applicant may be provided through more than one loan.

- Interest rate: the rate of interest on loans is calculated at the same rate charged by the IDB to the Government, increased by a spread of a variable per annum percentage amount (as established by a Management Agreement.

- The loan cannot to be used to refinance existing debt.

- Loans are provided for implementing EE measures and/or RE systems at eligible businesses, in accordance with eligibility criteria.

- Loan repayment periods: All loans are to be fully repaid within a 10-year period, which may include a moratorium on interest payments. Repayments are to be based, as far as practicable, on the energy cost savings derived from the implementation of the project. EGFL may give consideration, and grant approval, to extending the period should circumstances so suggest and on the non-objection of the Government

- Loan security: security on loans generally takes the form of a first legal mortgage, as normally required by EGFL. However, the Smart Fund may take second mortgages in instances where the market realization value of the underlying security is adequate to liquidate all prior charges and the Smart Fund‘s exposure.[19]

- Statutory payments: prior to disbursement of a loan, applicants must ensure that all National Insurance Scheme (NIS), Value Added Tax (VAT), and Pay As You Earn (PAYE) taxes are current, or that satisfactory arrangements have been made (and proof provided to EGFL) to discharge their obligations to the relevant entities. A default on these arrangements may result in the Fund placing a call on applicants to repay any funds outstanding.

- Cost overruns: budget overruns or changes in project scope are the responsibility of the borrower.

- Inspection: EGFL is empowered to ensure that the proceeds of any loan are used only for the purposes for which the loan was granted, with due attention to considerations of economy and efficiency, and in accordance with oversight arrangements described in Section 4. Borrowers accept terms and conditions on random inspections by independent auditors hired by the Smart Fund by signing a loan agreement

- Disbursements to pay for equipment, material, and services are made:

[19] At the CHENACT workshop with audited hotels and EGFL, the security requirements are being reconsidered to consider the debt service coverage as the basis for assessing a hotel’s ability to repay their loans from the Smart Fund.

  - To the supplier, where items are procured locally, and as far as is practical
  - To the borrower, where items are to be imported directly by the borrower.

- In all instances the amount of disbursements should reflect the cost of the retrofits and equipment as indicated in pro forma invoices.

- Where the plant and equipment is being imported directly, the borrower is required to provide evidence that the appropriate funds have been remitted to the supplier within thirty days of receiving disbursement from the Smart Fund.

4.4 CHENACT SMART FUND APPLICATIONS

In order to leverage the Barbados Energy Smart Fund to finance the implementation of energy conservation measures recommended in the CHENACT audit reports, a workshop was organized to familiarize the hotels participating in the CHENACT project. The objective of the workshop was to familiarize the hotel property owners about the Fund and assist them develop high quality loan application packages. An application seeking the Fund loan should consist of the following:

- A letter of intent outlining the key elements of the project and the amount of loan sought for implanting the project demonstrating financial attractiveness of the investment.

- A project idea note detailing the major findings and recommendations of the energy audit of a property. The project idea description needs to include
  - current energy cost and usage;
  - energy end-use by each equipment category such as lighting, air-conditioning, pool pumps etc.;
  - list of recommended energy efficiency improvement measures including energy and cost savings estimates, initial investment costs and payback period on the investment;
  - provide a detailed cash flow analysis of the project indicating profitability in terms of internal rate of return (IRR), net present value (NPV) and net profit. As well as a yearly cash flow as shown in Table 15 and Figure 13.

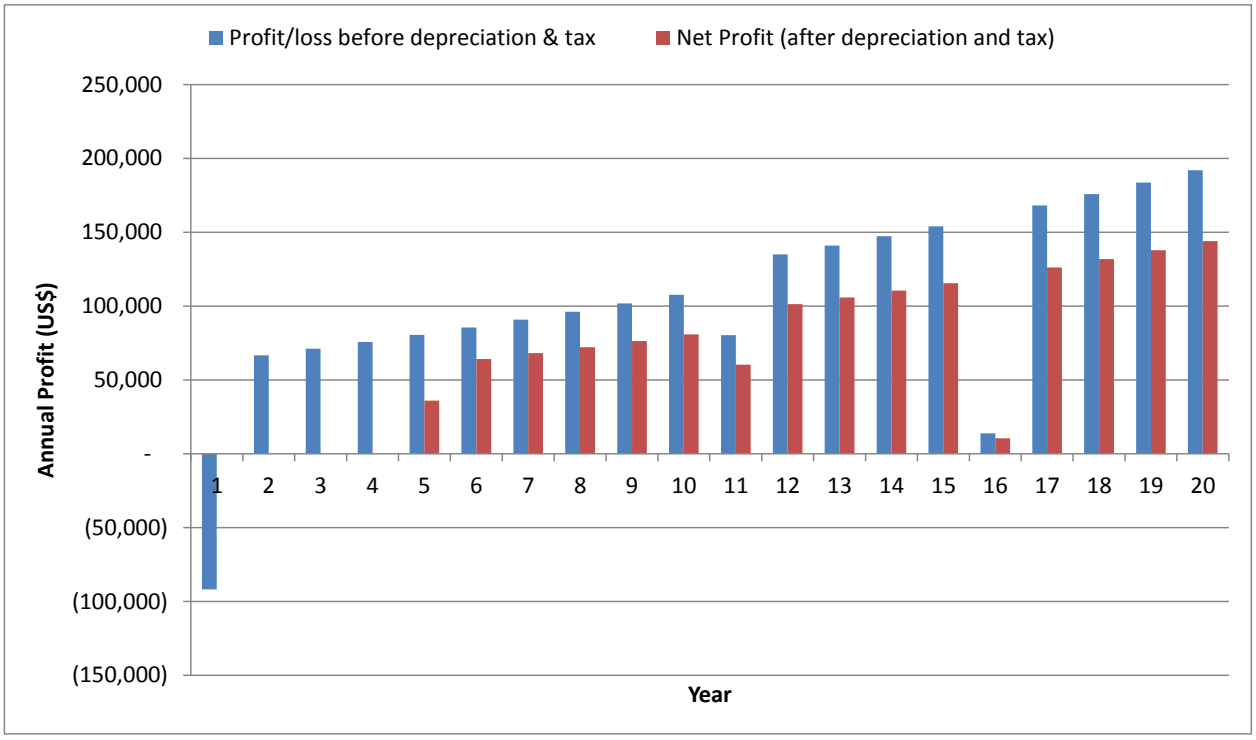
- The electricity and gas bills for twelve months preceding the application date.
- Company statements including financial statements—income statement and balance sheet for the three years immediately preceding the year of application; Certificate of Incorporation; Notice of Address or Notice of Change of Address of the registered office; Notice of Directors or Notice of Change of Directors; Articles of Incorporation and Bylaws.

- Copies of permits and approvals received that are required for the project implementation.

Table 15 - Profitability indicators for an EE retrofit project

HOTEL INVESTMENT AND PROFITIBILITY INDICATORS			
	US$	BB$	
Initial Investment	154,182	308,364	
Annual Electricity Saved (kWh)	233,392	233,392	
Year 1 Electricity Cost Saved	87,522	175,044	
Project Simple Payback Period (years)	1.8	1.8	
Internal Rate of Return (IRR)	127%	127%	
Loan Amount	154,182	308,364	
Annual Debt Repayment (after moratorium period)	15,418	30,836	
Total Interest Payment	29,680	59,360	
Total Net Profit (after interest, depreciation and tax) at present value	387,043	774,086	

Figure 13 - Annual cash flow analysis for an EE retrofit project



On March 26, 2012 the workshop was organized at premises of BHTA. Representatives from six hotels participating in the CHENACT project attended the workshop. In addition, representatives from EGFL attended the workshop. The participating hotels were:

1. Amaryllis Beach Hotel

2. The Crane Resort and Private Residences
3. Dover Beach Hotel
4. The Mango Bay Hotel
5. Divi Southwinds Hotel
6. South Beach Hotel

After the workshop, the CHENACT team provided one-on-one assistance to each hotel property (except the Mango Bay Hotel) to generate applications for the Fund and developed customized project cash flow and profitability analysis for each property.

The Amaryllis Beach Hotel had already retrofitted a water chiller system based on the recommendations of the CHENACT energy audit for the property. Therefore, the Amaryllis did not intend to seek an additional Fund loan to implement the remaining energy conservation measures recommended in the audit report.

The CHENACT team developed the Fund loan applications for the remaining four hotel properties, the key parameters are provided in Table 16.

Table 16 - CHENACT hotel properties receiving Energy Smart Fund application support

CHENACT Hotel	Estimated Energy Saving over baseline (%)	Loan Amount Requested (BB$)	Profitability – IRR & (Payback Period in years)
Crane Resort & Private Residences	53.7%	985,699	Very High (0.43)
Divi Southwinds Hotel	24%	1,016,512	50% (3)
Dover Beach Hotel	43%	278,352	89% (2.1)
South Beach Hotel	35.7%	308,364	127% (1.8)

5. ENERGY SERVICES INDUSTRY

The CHENACT Project includes an assessment of the Caribbean Energy Service Company (ESCO) Industry to serve the hotel industry. In the U.S., the ESCO has become synonymous with one or more of the following concepts.[20]

- Performance contracting: putting own capital or profits at risk to guarantee or share client savings
- Multi-year contracting
- ESCO or third-party financing.

The concept of ESCO has been around for 30 years, more successful in large countries but limited experience in small markets. The U.S. ESCO industry began in the late 1970s in response to rising energy prices, and has installed more than $20 billion in projects to date. A recent survey of the US ESCO industry found: 2006 revenues were estimated to be US$3.6 billion; growth in the industry has come from government supported state and federal contracting mechanisms; the industry is made up of diverse corporate and ownership structures (e.g., subsidiaries of large building equipment and control manufacturers; oil/gas companies; regulated electric and gas utilities; non-regulated energy suppliers; engineering firms; independent companies); and individual ESCO companies range in size from small regional or local businesses to large national or even global companies.

Within Europe, most ESCOs have been founded either by large companies or as subsidiaries of large companies (equipment manufacturers, facility management companies, energy utilities).[21] The objectives for these companies do not necessarily focus solely on exploiting the financial opportunity of energy savings; other factors also act as strong drivers for offering energy services, such as selling energy, financing sale of their equipment, retaining a large energy customer or acquiring a new customer by adding value via energy services to the supply of otherwise homogenous commodities such as electricity or gas. Most ESCO projects in Europe have been based on the shared savings concept. “Chauffage” (supply of energy) contracts are also commonly used.

5.1 CONTRACTING MODELS

Energy performance contracting is an arrangement where the remuneration of a project promoter (ESCO) is defined by the results of the projects developed and implemented. There are 2 major types: 1) shared savings contract and 2) guaranteed savings contract (most popular approach in North America). A third type - power or energy sales agreement - has emerged with the advent of distributed power generation and combined heat and power (CHP) systems have become economically viable at smaller scale technologies. Finally, lease (or lease-purchase) contract.

[20] The National Association of Energy Service Companies (NEASCO) defines as a company that provides energy-efficiency and other value-added services and for which performance contracting is a core part of its energy-efficiency service business.

[21] “Liberating the Power of Energy Services and ESCOs in a Liberalised Energy Market,” Paolo Bertoldi Mark Hinnells, and Silvia Rezessy, European Commission DG JRC, University of Oxford and Central European University

5.1.1 Shared Savings Contract

In a shared savings contract the ESCO guarantees the cost of energy saved; the cost savings are split for a pre-determined length of time in accordance with a pre-arranged percentage; this division is dependent on the cost of the project, the length of the contract and the risks taken by the ESCO and the consumer.

Figure 14 – Illustration of the Shared Savings Scheme

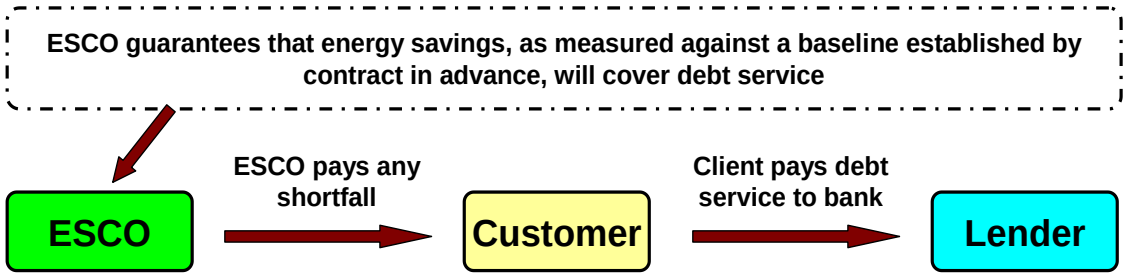
The advantage of the shared savings contract model is that customers with low credit ratings can participate in energy performance contracting. As the name indicates, the customer payments to ESCO represent a prescribed share of the savings achieved during the period. The shared savings contract represents off-balance sheet financing for the customer, i.e., it does not show as debt or liability in the accounts of the customer.

The shared savings contract shifts the risks of financing to ESCO. Since there tends to be high upfront costs associated with installing energy efficiency equipment and systems, the ESCO must provide financing from its own resources (equity and debt) or from different types of leasing arrangements. In other words, the ESCO must have sufficient funding available to internally capitalize the agreement, or have the capability to provide collateral for a loan. The shared savings contact might be attractive to equipment suppliers who would view the contract as a form of supplier credit.

5.1.2 Guaranteed Savings Contract

In a guaranteed savings contract the ESCO guarantees a certain level of energy savings; the performance guarantee is the level of energy saved. In the shared saving contract, the ESCO assumes the performance and credit risk; in the guaranteed savings contract, the client assumes the credit risk, while the ESCO assumes the risk for the savings.

Figure 15 – Illustration of the Guaranteed Saving Scheme



Many ESCOs can participate in the guaranteed savings contracting, since they don't need significant financial backing. At least in the U.S., the guaranteed savings approach is more common, well-known, and greater experience. It is simpler contractually in that as long as a minimum performance level is met, the customer repays the loan based on established payment schedule. Again, in the U.S. where this type of EPC is common, the customer is usually is able to get lower interest rates.

On the other hand, the guaranteed savings contract results in on-balance sheet financing for the customer in the form of equity, debt, leases, etc. In this case, loan conditions depend more on the customer creditworthiness than on the quality of the energy project.

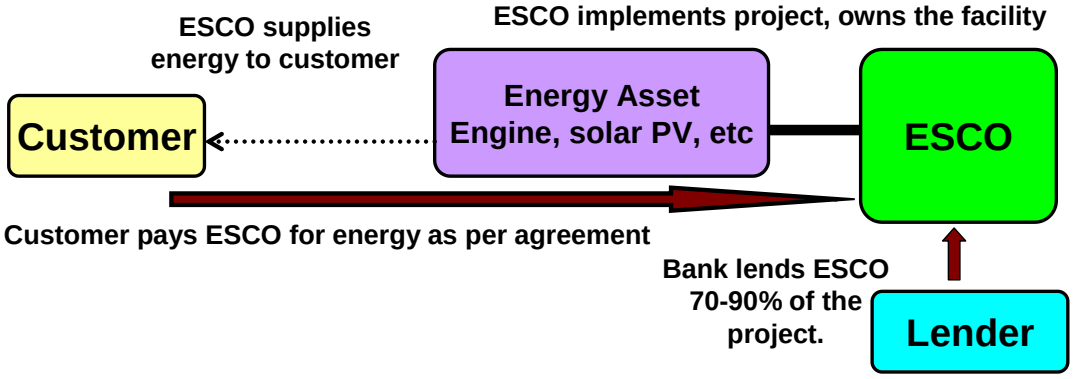
5.1.3 Power/Energy Purchase Agreement

The third type of performance contract is the power or energy purchase agreement. A Power Purchase Agreement (PPA) is a legal contract between an electricity generator (provider) and a power purchaser (host). The power purchaser purchases energy, and sometimes also capacity and/or ancillary services, from the electricity generator. Such agreements play a key role in the financing of independently owned (i.e. not owned by a utility) electricity generating assets. However, it can also apply to an end use such as a hotel or industry.

Under the PPA model, the PPA provider would secure funding for the project, maintain and monitor the energy production, and sell the electricity to the host at a contractual price for the term of the contract. The term of a PPA generally lasts between 5 and 25 years. In some renewable energy contracts, the host has the option to purchase the generating equipment from the PPA provider at the end of the term, may renew the contract with different terms, or can request that the equipment be removed.

One of the key benefits of the PPA is that by clearly defining the output of the generating assets (such as a solar electric system) and the credit of its associated revenue streams, a PPA can be used by the PPA provider to raise non-recourse financing from a bank or other financing counterparty. Commercial PPA providers can enable businesses, schools, governments, and utilities to benefit from predictable, renewable energy.

Figure 16 – Illustration of the Power/Energy Purchase Agreement Scheme



Applied at the end-user level, the Power/Energy Purchase Agreement is a simpler contract between the power/energy producer and the consumer, and single cost for customer based on an easy to

meter output, e.g., kilowatt hour or kWh. It is a good option for equipment manufacturers who know their equipment and have confidence in its performance. It can also be applied on a relatively small scale such as some renewable energy systems where the output represents just a small percentage of the end user's or customer's total consumption. In Europe, it is commonly referred to as "chauffage". The disadvantage to this type of agreement is that the ESCO must be creditworthy. Since the agreements tend to be long term (e.g., greater than 10 years), the producer must have a good understanding of life cycle and O&M costs. Also, the type of agreement is limited to utility equipment: energy generation, steam, water treatment, chilled water, etc.

5.1.4 Leasing (or Lease-Purchase) Contract

Under a lease (or lease-purchase) agreement, the Customer agrees to make a fixed payment to the ESCO for a fixed term. In addition to designing, operating, and maintaining the improvements, the ESCO guarantees that energy and maintenance savings from the project will exceed the payments to the ESCO. The net effect is similar to that under a shared savings plan. Please note that as a financing source, under a lease-purchase agreement, the ESCO may seek secondary repayment sources through the collateralization of Customer buildings, furniture, fixtures, and equipment. In the savings contract the ESCO guarantees a certain level of energy savings; the performance.

5.2 BENEFITS AND PITFALLS ASSOCIATED WITH ENERGY PERFORMANCE CONTRACTING

Energy performance contracting is a method for purchasing energy-saving improvements in buildings. Energy performance contracting has three distinguishing features:

- A single procurement is used to purchase a complete package of equipment and services in which one contractor (ESCO) is accountable for design, purchase, installation, maintenance, and operation of the equipment to ensure optimum performance;
- The package of services includes financing of all the project costs, so no upfront money is needed[22]; and,
- An energy performance contract is structured so that payments to the ESCO are contingent upon the actual or stipulated level of savings achieved (or energy reduced). In theory, the savings produced by the project are greater than its cost. As such, a performance contract pays for itself. Since payments to the ESCO are contingent on the savings achieved, it is in the contractor's interest to maximize the energy savings. This translates into increased dollar savings for Hotel owners.

5.2.1 Comparison of Energy Performance Contracting with Conventional Contracting

A conventional process to purchase energy efficiency improvements can require four separate solicitations and contract awards. First, a Hotel owner solicits engineering services for an energy study or audit. After reviewing the completed study, the Hotel owner selects the improvements to be implemented and solicits proposals for engineering design services. Once the designer completes a plan and specifications, the Hotel owner issues one or more invitations to bid to select contractors

[22] Or used to guarantee bank financing in the Guaranteed Savings scheme

who will install the improvements. Finally, the Hotel owner invites bids to request preventive maintenance services for any equipment the facility is not maintaining with in-house staff.

Energy performance contracts replace the conventional collection of solicitations and contracts with a single proposal covering all aspects of the project and one contract with the selected proposer. The process begins with an evaluation of a facility's potential for efficiency improvements conducted by the Hotel owner staff. If the potential seems promising, the Hotel owner prepares a Request for Qualifications (RFQ). The RFQ's purpose is to select at least two Energy Service Companies (ESCOs) to prepare proposals for the provision of energy efficiency equipment and services to the Hotel owner in response to a Request for Proposal (RFP). After receipt of a favorable proposal, the Hotel owner directs the winning ESCO to develop a comprehensive Energy Study[23] of energy efficiency opportunities at the facility. Said proposal becomes the basis for the contract between the Hotel owner and the ESCO. The contract specifically addresses compensation, liability, the accountability of services, and the ESCO's guaranty of savings at the facility.

After receiving the notice to proceed, the contractor furnishes, installs, and commissions the efficiency improvements and begins performing maintenance and repairs that continue for the duration of the contract term. Hotel owner staff monitors the ESCO's day-to-day performance during the construction process in the same manner they would monitor a large repair and maintenance project. After construction is completed and accepted, Hotel owner/ staff monitor ESCO performance concerning equipment maintenance and repair, standards of service and comfort, and level of energy savings achieved.

5.2.2 Benefits of Energy Performance Contracting

Energy performance contracting may offer Hotel owners several benefits. First, it allows Hotel owners to proceed with projects that tight budgets may otherwise prevent. The ESCO finances all of the project costs, including up-front engineering, construction, and maintenance services, allowing projects to proceed without capital improvement or repair funds. The Hotel owner receives new and improved lighting, cooling, and other equipment and the cost of this equipment is either fully or partially offset by reduced utility bills. After the equipment cost has been paid off, the Hotel owner owns the equipment and retains all of the savings from reduced utility bills.

Even if the payments to the ESCO offset much of the energy savings in the short run, upgrading equipment allows all of the non-energy benefits, such as improved comfort and reliability, to be realized immediately.

Energy performance contracting streamlines the purchasing process for energy efficiency projects, reducing the cost and time required to bring energy-saving projects on line. A single company takes responsibility for designing, building, financing, and maintaining all necessary improvements. The ESCO often employs a team of consultants and subcontractors to accomplish this but one company is

[23] The cost of the Energy Study is included in the work financed by the ESCO. If the Customer chooses not to use the ESCO to complete the project, the Customer shall reimburse the ESCO for the preparation of the Energy Study.

still accountable for the ultimate success of the project. This single-source accountability often makes the project easier to manage than a conventional construction project. Streamlining the procurement process in this way makes it possible for Hotel owners to implement more comprehensive projects, reduces the time and cost to manage projects, and gives on-site Hotel owner/staff and users the opportunity for more input into the project design and better control of the final product. As a result, efficiency improvements acquired through performance contracts often work better, last longer, and enjoy stronger long-term support from Hotel owner administrators, maintenance staff, and building users than other energy efficiency projects.

Energy Performance Contracting, as its name implies, with proper contractual language, shifts much of the risk associated with an energy efficiency project from the Hotel owner to the ESCO.

5.2.3 Pitfalls of Energy Performance Contracting

The pitfalls of implementing an energy performance contract are also well documented. Although the concept and process are proven, some ESCOs have taken advantage of customers by failing to explain or inform them of the key technical and financial decisions that need to be made by the hotel owner. Instead, in such cases, the ESCO made the decision without customer involvement and simply crafted the performance contract to favour the company and not the customer. A summary of major pitfalls includes:

- **Energy Baseline Development** - It is crucial that the hotel owner participate in establishing the energy baseline, instead of the ESCO establishing the baseline on its own.
- **Energy Baseline Adjustment** - It is also important that the hotel owner agree on the definitions and methodology for making any future adjustments to the energy baseline. The hotel owner can include a provision that requires third party opinions on adjustments.
- **Operational Savings** - Operational savings include those savings that are not energy. They can be labour or material savings that result from the implementation of a particular energy conservation measure. For instance, if a hotel has new lights installed in all classrooms, no labour or materials will be necessary in these areas for changing out lamps or ballasts for a fairly well defined time period. Any claimed operational savings should be carefully examined and verified by the hotel owner before agreements are signed. In some cases (such as the case with labour savings) the savings may never actually be realized and will not show up in the budget.
- **Cost Avoidance** - This term applies to implementing measures that will allow Hotel owners to avoid future costs, but does not save hard dollars compared to past budgets. For instance, if a hotel knows that it needs to replace a boiler within the next ten years, it will need to appropriate capital dollars to do so. However, if the hotel installs a boiler under the performance contract today, it will avoid spending the future capital outlay on the boiler. When ESCOs propose the inclusion of cost avoidance in calculating savings, Hotel owners are actually spending the money today and must budget for the lease payment each of the next years. Hotel owners should not include these “cost avoidance” savings in their calculations unless they have a stream of future capital dollars that can be earmarked toward the project.
- **Excessive Finance Charges** - There have been instances where ESCOs inflated the interest rate on the funds borrowed to generate additional profits. Hotel owners should check the rates

against local banks or other national institutions to make sure they are competitive. Hotel owners may be able to arrange their own financing at lower rates.

- **Required Maintenance Agreements** - Some ESCOs have required that the preventive maintenance on a facility(ies) also be outsourced to that ESCO. As such, they tie the maintenance agreement to the guarantee agreement. Typically, these maintenance agreements are very expensive in relation to the value provided. Often, the argument for the maintenance agreements by the ESCOs is that if the maintenance is not performed by their staff, they cannot assure that the guaranteed savings will occur. Not all ESCOs agree with this position. In many cases, there are ESCOs willing to guarantee savings while providing training for maintenance staff so they can handle maintenance requirements. In general, hotel maintenance staff can provide better value than any third party except in highly specialized cases.
- **Lack of Local Facilities Control** - There have been abuses in the performance contracting business where ESCOs have required that any afterhours building usage changes must be telephoned to offices in faraway cities for the ESCO to program. Not all ESCOs agree with this position. There are many ESCOs willing to guarantee the savings while providing local control for Hotel owner maintenance staff. The objective of the performance contract should be to increase comfort and control and not manage the facilities.
- **Terms of Savings Reconciliation Versus Budget Cycle** - Several standard ESCO performance contracts are written to allow the ESCO to carry over savings that occur in early years to offset losses in later years. Once the excess savings occur (excess is everything over the guaranteed amount of savings), the hotel owner should be free to use these savings in the current fiscal year. All savings should be reconciled on an annual basis and should stand alone on that basis.
- **Quality Control** - Some performance contracts have been poorly defined. When this occurs, the Hotel owner may see less or lower quality products. Before entering into any contract, hotel owners should require the ESCO to provide a detailed definition of both products and services being proposed and have both the proposed services and the products reviewed by an engineering consultant.
- **Excessive Guarantee Costs** - In some cases, the risk of failure to meet savings projections does not warrant or justify the cost of the guarantee. For example, if it costs $10,000 to guarantee a particular energy conservation measure that saves $20,000, it might be better to put $10,000 in the bank and hope that the ESCO did not miscalculate the savings by 50%. Most projects do not miss the projected savings by a significant percentage.
- **Cream Skimming** - Sometimes, ESCOs specialize in or promote energy savings projects with fast payback measures. These provide immediate returns to the Hotel owners but “skim the cream” and prevent other opportunities of achieving energy savings from occurring. For example, if a performance contract focuses only on lighting, a measure with a short payback period, this may eliminate the opportunity to achieve savings through combining lighting with longer term payback items. By bundling several types of measures together, the quick payback items are leveraged to pay for longer term payback items.

5.2.4 Types of Equipment and Services to Include in an Energy Performance Contract

Energy-savings performance contracts are used to purchase a wide variety of building equipment and services. Energy-efficient lighting, air conditioning systems, energy management control systems,

motor replacements, and variable-speed drives for pumps and fans are commonly implemented improvements. Generally, an ESCO will include any improvement expected to recover its own cost (including maintenance and interest expense) in energy savings over the term of the agreement. This means that longer payback items, such as adding ceiling insulation or replacing windows, usually do not qualify unless they are bundled with fast payback items.

In addition to equipment installation, the ESCO may propose various repair and maintenance services. Often ESCOs propose repairs to existing systems, such as reinstallation of damaged or missing controls or repair of leaks in chilled water piping.

Generally the ESCO assumes responsibility for preventive maintenance and repairs to all new equipment installed. Also, as noted earlier, the ESCO may offer to take responsibility for maintenance and even operation of existing equipment. For example, the ESCO may offer to provide remote monitoring and adjustment of temperature set-points with a computerized temperature control system.

Because any installed equipment is ultimately owned by the Hotel owner, the ESCO should always provide documentation for all installed equipment, including as-built drawings and operating manuals. The ESCO should train the on-site Hotel owner staff to operate and maintain the equipment. In some cases, ESCOs budget for Hotel owner personnel to attend training programs provided by equipment manufacturers.

5.3 PROFILE OF THE CARIBBEAN ENERGY SERVICES INDUSTRY

We have defined the Caribbean energy services industry as those companies involved in one or more services associated with delivering energy savings to clients. The industry is composed of a wide range of companies that deliver alone, or in combination, value added energy services to end users. Caribbean energy companies are typically involved in one or more of the following:

- Dissemination of information on energy technologies and products
- Studies such as audits and feasibility studies
- Engineering design (for more complex systems)
- Equipment supply (including manufacturers' representatives)
- System integration (combining technologies and equipment)
- Electrical, plumbing, and ventilation/air-conditioning contracting
- System installation and commissioning
- Operation and Maintenance (O&M) contracting
- Technical training
- Supply of spare and replacement parts

Few, if any, Caribbean based companies offer the full range of energy service project development and implementation capabilities. None offer financing at the project level, only at the equipment or system level (e.g., supplier credit). There are a few cases where "performance contracting" has been offered where revenues are determined solely on the basis of energy savings. Companies currently operating in the Caribbean are typically small businesses that supplement their in-house staff with

specialized consultants. Contracting is done on a “fee for service” basis. Energy equipment is procured through Caribbean equipment distributers or agents, or directly by the hotel owner.

While Caribbean-based companies offer most, if not all, of the energy efficiency project development inputs listed above, what appears to be lacking is integration of multiple technologies or systems, performance-based contracting, and financing. One exception is Optima Energía. Primarily focused on the hotel industry, the company has completed over 100 turnkey projects in hotels in Mexico, saving their clients 50 percent on fuel, electricity and water costs. Clients include both international and national chains such as Dreams Hotels (AM Resorts), Pueblo Bonito, Ritz Carlton Cancun, Desire Los Cabos, Crowne Plaza Acapulco, Holiday Inn Cancun, and Omni Cancun, among others.

5.4 CARIBBEAN HOTEL ENERGY PERFORMANCE CONTRACTING MARKET

CHENACT has estimated the Caribbean hotel energy efficiency market to be $585 million and another $303 million in operations and maintenance over a 7 year period (see Section 6.4.3). Given the high cost of electricity, the high percentage of electricity (and water) utility costs to total operating costs, the relatively uniform set of cost effective energy efficiency improvements, the limited technical engineering staff in hotels, the preference for top line (revenue generating) investments, and skepticism about the claims of equipment vendors regarding expected savings, Caribbean hotel sector would appear ideal for energy performance contracting.

However, a number of factors have, and continue, make the market less attractive to established ESCOs and those wishing to get into the energy performance contracting business. The Caribbean hotel market is fragmented into as many as 34 distinct country/territory/island markets with differences in hotel room capacity, languages, legal and regulatory frameworks, trade and investment incentives, energy prices, and composition of the local energy services industry. Because hotel properties are often located in resort areas remote from city centers and trade centers, servicing ESCO customers is expensive compared to servicing large customers in city centers (e.g., office buildings). Many hotel properties in the Caribbean are small, owner-operated business that have limited purchasing power and are not, by themselves, priority customers for ESCOs. Energy performance contracts tend to be longer in duration (e.g., 10 years or more) and hotel ownership turnover can be seven years or less. Also, Caribbean hotels do not have uniform operating conditions. There are seasonal fluctuations in occupancy that affect equipment use and energy savings. Hotel owners may decide to add operations or outsource existing operations (e.g., laundry), essentially altering the baseline. That could increase demand and offset savings from other hotel operations.

To the extent that energy performance contracting does take off in the Caribbean hotel sector, it will mostly likely concentrate on large properties, hotel chains, and country markets with low contract risk. Alternatively, it could target specific EE projects that offer significant savings and are relatively easy to monitor and verify.

5.5 CARIBBEAN ESCO DEVELOPMENT STRATEGY

We believe that ESCO development should not be a primary objective of CHENACT. Over time, competition and maturation within the energy services industry, including new entrants, will result in

bundling of equipment, services and financing. However, the following actions under CHENACT will begin to open the market for energy performance contracting in the near term:

- Increase information about energy-efficiency projects, e.g., investment, savings, return on investment, etc.
- Encourage the bundling of energy services moving toward turnkey projects, e.g., studies, engineering design, procurement, installation, commissioning, operation and maintenance, and performance monitoring.
- Compile and disseminate information on energy efficiency equipment performance in hotel applications and analyses the variables affecting expected verses actual performance. This will require a committee of hotel engineers /Maintenance managers who are prepared to share and compare information on projects that they have implemented.
- Encourage electric utilities to diversify their services to include demand side management in addition to generation and sales of electricity.
- Develop standardized "baseline" calculation methodologies that reflect historical energy consumption and variations in occupancy (will also be relevant for CDM)
- Develop standardized contracts for energy performance contracts for hotel applications
- Standardize measurement and verification methodologies for energy savings (will also be relevant for CDM)
- Conduct ESCO demonstration projects in different countries and building types to increase familiarity and experience with energy performance contracting. This is best done with established ESCOs from the USA and Europe that are interested in entering the Caribbean market.

All of these actions will contribute to opening the energy efficiency market in the Caribbean hotel sector.

6.1 CARBON OFFSETS AND VOLUNTARY CARBON MARKETS

A carbon offset is a reduction in emissions of carbon dioxide or greenhouse gases made in order to compensate for or to offset an emission made elsewhere. Carbon offsets are measured in metric tons of carbon dioxide-equivalent (CO_2e) and may represent six primary categories of greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydroflourocarbons (HFCs), and sulfur hexaflouride (SF_6). One carbon offset, also known as a Certified Emissions Reduction (CER), represents the reduction of one metric ton of carbon dioxide or its equivalent in other greenhouse gases.

Carbon offsetting has gained some appeal and momentum mainly among consumers in western countries who have become aware and concerned about the potentially negative environmental effects of energy-intensive lifestyles and economies. The Kyoto Protocol has sanctioned offsets as a way for governments and private companies to earn carbon credits which can be traded on a marketplace. The protocol established the Clean Development Mechanism (CDM) [24], which validates and measures projects to ensure they produce authentic benefits and are genuinely "additional" activities that would not otherwise have been undertaken. Organizations that are unable to meet their emissions quota can offset their emissions by buying CDM-approved Certified Emissions Reductions.

There are two markets for carbon offsets. In the larger, compliance market, companies, governments, or other entities buy carbon offsets in order to comply with caps on the total amount of carbon dioxide they are allowed to emit. This market exists in order to achieve compliance with obligations of Annex 1 Parties under the Kyoto Protocol, and of liable entities under the EU Emissions Trading Scheme. EU Allowances (traded under the EU Emissions Trading Scheme, ETS) remain the largest segment by far, with 84% of the total value of the carbon market. Taking secondary CDM transactions into account, the value of the market driven by the ETS reached 97% of the global market value. In 2006, about $5.5 billion of carbon offsets were purchased in the compliance market, representing about 1.6 billion metric tons of CO_2e reductions.

In the much smaller, voluntary market, individuals, companies, or governments purchase carbon offsets to mitigate their own greenhouse gas emissions from transportation, electricity use, and other sources. For example, an individual might purchase carbon offsets to compensate for the greenhouse gas emissions caused by personal air travel. Many companies offer carbon offsets as an up-sell during the sales process so that customers can mitigate the emissions related with their product or service purchase (such as offsetting emissions related to a vacation flight, car rental, hotel stay, consumer good, etc.). The voluntary carbon market, in 2010, reached a record 131 million tons of carbon dioxide equivalent ($MtCO_2e$) worth at least $424 million.[25]

[24] http://cdm.unfccc.int/

[25] "Back to the Future: State and Trends of the Voluntary Carbon Markets 2010," published today by Ecosystem Marketplace and Bloomberg New Energy Finance.

The Verified Carbon Standard (VCS) is the most prominent among third-party standards in 2010 with 34% of transaction volumes. The second-largest volume of credits transacted in 2010 (15.5 MtCO2e) came from projects validated by Climate, Community and Biodiversity (CCB) Standards. Projects using the Climate Action Reserve protocols transacted the third-largest volumes (13.4 MtCO2e) in the voluntary market. In 2010, the volume-weighted average price of credits transacted on the voluntary over the counter (OTC) offset market fell slightly to $6/tCO2e from $6.5/tCO2e in 2009, due to a handful of large, low-priced trades – among other reasons. The price, in 2010, for energy efficiency credits ranged from $2 to $35, with a volume weighted average of $8 per ton.

6.2 CDM AND BUILDING ENERGY EFFICIENCY

Despite the obvious need and opportunities for reducing energy consumption in buildings, the potential remains largely untapped in most countries. Out of more than 3,000 Clean Development Mechanism (CDM) projects in the pipeline (as of May 2008) only six seek to reduce energy demand in buildings[26]. One of those, the 150-room ITC Limited – Hotel Sonar Bangla Sheraton and Towers in Kolkata, India, was registered and is estimated to generate 2,987 metric tonnes CO_2 equivalent per annum, or 29,870 tCO_2e over the 10 year life of the CDM project.[27]

The most important reasons for the limited success of CDM building energy efficiency projects include:

- **Many small individual reduction opportunities:** As opposed to many other sectors, the buildings sector does not present a few big emission reduction options, but requires many small interventions in great quantities with only limited interaction among stakeholders involved in different phases of a building's lifetime. Furthermore, different aspects of the buildings, such as architecture, engineering, building management, building function, occupant profiles etc. are often poorly or not at all coordinated. There is therefore no natural incentive for, or convergence of interest in, a life-cycle approach to managing energy use in buildings.
- **Split economic interests**: The parties typically making decisions about building design (designers and investors) are seldom the ones who would benefit from energy efficiency improvements and associated costs reductions (owners and users).
- **Lack of information and understanding** (at all levels) of the importance of the building sector in relation to climate change. Lack of know-how about how to reduce energy use in buildings and about what indicators to use for comparing the relative performance of a building or multiple buildings.

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[26] The Kyoto Protocol, The Clean Development Mechanism, And The Buildings And Construction Sector, United Nations Environment Programme, A Report Prepared For The UNEP Sustainable Buildings And Construction Initiative, (2008)

[27] UNFCC CDM Registry - Project 0686: Improvement in Energy Consumption of a Hotel. November 2006.

- **High perceived business risk** and underestimation of the life-cycle cost benefits from energy efficiency investments in buildings. Lack of track record from real projects, including risk-benefit analyses. Energy costs are often a comparatively small part of the overall costs for a building. The economic incentive provided by reduced energy costs is therefore often weak.
- The **CDM's additionality requirement** means that a project must prove that GHG emissions are reduced below those that would have occurred in the absence of the CDM project. Because of the fragmentation of the building market it can be almost impossible to prove what building design would have been selected in the absence of the CDM project. Investment costs (rather than life cycle costs) as well as architectural, cultural and other considerations often decide what design and technologies are used in a building. There is also considerable uncertainty about how to interpret another aspect of the additionality requirement: that CDM projects must at least meet national standards and regulations, unless these are systematically not enforced. The question is how to prove that such standards and regulations are not systematically enforced.

A number of the CDM's features respond to the challenge of realizing energy efficiency projects in buildings. These include:

- The potential of a programmatic CDM to implement similar measures in a large numbers of buildings, thereby creating the opportunity to move from a one-by-one approach to large, coordinated common approaches.
- The quality assurance and green features associated with CDM projects, which reduce the investment risks and should attract financing for energy efficiency projects in buildings.
- The provision of standardized and documented methodologies, facilitating replication of projects as well as transparency and accountability.
- The requirement for monitoring, which provides standardized tools for active energy performance management.

For energy efficiency in buildings to benefit from CDM, UNEP recommends that following would be relevant to CHENACT:

1. Allow energy efficient building CDM projects to use Performance Based Indicators, i.e., energy use per m^2, for project validation, monitoring and verification. The restriction of bundling different measures in the same project would be removed as it would be the overall efficiency of the building, and not the technology, that decides the success of the project. Uncertainties about what measures could be included in a CDM project would be removed. Any measure resulting in reduced energy consumption/reduced greenhouse gas emissions would be recognized, allowing flexibility in such factors as design, use of building materials, user behavioral improvements, etc. Performance based indicators would also encourage the continuous pursuit of energy efficiency throughout the crediting period, as all measures resulting in emission reductions could be credited, even if they were adopted at a later stage after the project was registered.

2. Supplement technology-based methodologies for verification and monitoring with statistical management tools, and replace direct and constant monitoring with sampling. This would reduce overhead costs in projects with a large volume of smaller individual measures, each of

which is too small to justify separate monitoring and verification.

3. Develop common performance-based baselines for different types of buildings to support and allow performance-based energy efficient building CDM projects. Such baselines would most likely be best established by the National Designated Authorities and would need to take into account local factors such as climate, building type, availability of materials and technologies.

4. Allow the CDM to generate CERs in projects that aim to meet national standards for energy efficiency in buildings. Such an arrangement would encourage countries to establish such standards and would provide a de facto incentive to energy efficient building projects in countries where the enforcement capacity of standards is low.

5. Strengthen the role and capacity of Designated National Authorities to help promote the CDM more widely and to be able to manage rapidly increasing volumes of demand side energy efficiency projects.

In summary, there is great potential to improve the CDM in ways that would encourage the development of more energy efficiency projects in buildings for the CDM, and at the same time would more directly support the sustainable development benefits generated by such projects. There is an urgent need for governments to establish national policies that promote energy efficiency in the building sector, both for the benefit of improving the CDM's effectiveness, and as a strategy for reducing national energy demand and GHG emissions, regardless of what support may be achieved through the CDM.

6.3 CDM PROGRAM OF ACTIVITIES

A CDM Program of Activities (PoA) (also called Programmatic CDM) consists of multiple, small, similar GHG emission reduction projects, each referred to as CDM Program Activities (CPAs). PoA is a voluntary coordinated action by a private or public entity which coordinates and implements any policy/measure or stated goal (e.g., incentive schemes and voluntary programs), which leads to anthropogenic (i.e. man-made) GHG emission reductions or net anthropogenic greenhouse gas removals by sinks that are additional to any that would occur in the absence of the PoA. A PoA is characterized as: 1) a voluntary action, 2) implementing a policy, measure or stated goal, 3) coordinated by a public or private entity, 4) resulting in emission reductions or removals that are additional.

One or more CPAs can be included under a PoA at the time of registration and additional CPAs can be added at any point in the life of the PoA. A CPA is a single, or a set of interrelated measure(s) applied within a designated area defined in the baseline methodology. A PoA is distinct from a bundle of small-scale projects, because it is possible to add new CPAs to a PoA without undertaking the validation process afresh. No registration fee is necessary on CPAs, which are subsequently added for validation.

A PoA can involve CPAs in multiple countries, in which case a separate letter of approval would be required from each participating government's Designated National Authority (DNA). The physical boundary of a PoA may extend to more than one country provided that each participating non-Annex

I host country confirms that the PoA, and thereby all CPAs, assists it in achieving sustainable development.

6.3.1 PoA Coordinating Entity

A PoA requires the designation of a coordinating/managing entity that serves as the single point of contact with the UNFCCC. The coordinating entity obtains letters of approval for the implementation of the PoA from each Host Party and Annex I Party involved in the PoA, i.e., the DNA in each country. The coordinating/managing entity can be either a private or public entity with sufficient scope and control over all anticipated CPAs.

6.3.2 Advantages of the PoA Approach

The principal advantage of the PoA Approach is overcoming the high proportional transaction costs associated with small projects. Extending a clean technology or practice to smaller units under the CDM mechanism results in higher proportional registration and monitoring and verification costs (costs per Certified Emissions Reduction or CER) than do individual projects generating larger amounts of CERs. Once a mitigation activity is recognized as a PoA, replicating identical CPAs under the umbrella program would be simpler for each individual CPA. This would help in scaling up of the best of the mitigation practices. A PoA approach reduces regulatory/practical hurdles considerably with simplification of the registration process.

While multiple projects can be “bundled” into a single CDM project, individual projects implemented or taken up at different time scales cannot be taken up as a single bundled CDM project activity (CPA). PoA allows bundling of CPAs at different points of time in the lifetime of the program.

A Programmatic CDM faces less regulatory risks (risks related to UNFCCC regulation) than conventional CDM projects. The advantage is that the PoA can be registered at the concept level without detailing in advance all its constituent activities. Under the PoA approach, regulatory risk is handled earlier in the process, reducing risk to investors purchasing the CERs. Buyers of CERs are typically interested in acquiring carbon credits in larger quantities than those resulting from small CPAs. Therefore, a PoA aggregating the CERs of many small CPAs will attract more “carbon financing” than the individual CPAs.

6.3.3 Demonstrating Additionality

In the context of a Program of Activities (PoA), the requirement of additionality means that both the PoA itself and each CDM Program Activity (CPA) would not have been implemented, or would not have been implemented to the same extent, without registration under the CDM.

In relation to assessing additionality for the PoA, the coordinating/managing entity must demonstrate that in the absence of the CDM (i) the proposed voluntary measure would not be implemented, or (ii) the mandatory policy/regulation would be systematically not enforced and that non-compliance with those requirements is widespread in the country/region, or (iii) that the PoA will lead to a greater level of enforcement of the existing mandatory policy/regulation.

Additionality must also be considered at the level of individual CPAs. The criteria for demonstration of additionality for each CPA must be outlined in both the Program of Activities Design Document (CDM-POA-DD) and in the CPA Design Document (CDM-CPA-DD). Essentially, this is aimed at ensuring that each CPA will produce credible emission reductions or abatement. Evidence must be included within the PoA Design Document (CDM-POA-DD) to show that all CPAs will produce net greenhouse gas emissions abatement or sequestration.

6.3.4 Applicable Methodologies for CHENACT

Based on the scope of CHENACT interventions, there are two UNFCCC methodologies that apply to the recommended electricity consumption interventions:

AMS-II.C: Demand-side energy efficiency activities for specific technologies (version 13)
This methodology comprises activities that encourage the adoption of energy-efficient equipment/appliances (e.g., lamps, ballasts, refrigerators, motors, fans, air conditioners, pumping systems) at many sites. These technologies may replace existing equipment or be installed at new sites. The aggregate energy savings by a single project may not exceed the equivalent of 60 GWh per year for electrical end use energy efficiency technologies. For fossil fuel end use energy efficient technologies, the limit is 180 GWh thermal per year in fuel input.

For each replaced appliance/equipment/system the rated capacity or output or level of service (e.g., light output, water output, room temperature and comfort, the rated output capacity of air-conditioners etc.) is not significantly smaller (maximum - 10%) than the baseline or significantly larger (maximum + 50%) than the baseline.

If the energy efficient equipment contains refrigerants, then the refrigerant used in the project case shall be CFC free. This methodology credits emission reductions only due to the reduction in electricity consumption from use of more efficient equipment/appliances.

The project boundary is the physical, geographical location of each measure (each piece of equipment) installed.

Specific energy consumption in the baseline (MWh/unit) or *EER* is calculated as total annual electricity consumed in the baseline divided by total quantity of annual output in the baseline. Data from at least three years prior to project implementation shall be used in the calculations, e.g., water supply from a pumping station (records of output can be used in lieu of actually monitored baseline data). For facilities that are less than 3 years old, all historical data shall be available (a minimum of one year data would be required).

AMS-II E. Energy Efficiency and Fuel Switching for Buildings (V 10)
This category comprises any energy efficiency and fuel switching measure implemented at a single building, such as a commercial, institutional or residential building, or group of similar buildings, such as a hotel, district or university. This category covers project activities aimed primarily at energy efficiency; a project activity that involves primarily fuel switching falls into category III.B.1 Examples include technical energy efficiency measures (such as efficient appliances, better insulation and optimal arrangement of equipment) and fuel switching measures (such as switching from oil to gas).

The technologies may replace existing equipment or be installed in new facilities. The aggregate energy savings of a single project may not exceed the equivalent of 60 GWh per year.

This category is applicable to project activities where it is possible to directly measure and record the energy use within the project boundary (e.g. electricity and/or fossil fuel consumption). This category is applicable to project activities where the impact of the measures implemented (improvements in energy efficiency) by the project activity can be clearly distinguished from changes in energy use due to other variables not influenced by the project activity (signal to noise ratio).

The project boundary is the physical, geographical site of the building(s). The energy baseline consists of the energy use of the existing equipment that is replaced in the case of retrofit measures and of the facility that would otherwise be built in the case of a new facility.

Each energy form in the emission baseline is multiplied by an emission coefficient. For the electricity displaced, the emission coefficient is calculated in accordance with provisions under category I.D. For fossil fuels, the IPCC default values for emission coefficients may be used. Thus, fuel-switching measures that are part of a package of energy efficiency measures at a single location may be part of a project activity included in this project category.

If the energy efficiency technology is equipment transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered. In the case of retrofit measures, monitoring shall consist of: (a) Documenting the specifications of the equipment replaced; (b) Calculating the energy savings due to the measures installed. In the case of a new facility, monitoring shall consist of: (a) Metering the energy use of the building(s); (b) Calculating the energy savings of the new building(s).

The following conditions apply for use of this methodology in a project activity under a program of activities (PoA). In case the project activity involves fossil fuel switching measures leakage resulting from fuel extraction, processing, liquefaction, transportation, re-gasification and distribution of fossil fuels outside of the project boundary shall be considered.

In case the project activity involves the replacement of equipment, and the leakage effect of the use of the replaced equipment in another activity is neglected because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified. This will require the assistance of the Sanitation Service Authority in Barbados, currently under the Ministry of Environment, Water Resources and Drainage.

AMS-I F Renewable electricity generation for captive use or mini-grids (version 1)

This category comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to user(s). The project activity will displace electricity from an electricity distribution system that is or would have been

supplied by at least one fossil fuel fired generating unit i.e., in the absence of the project activity, the users would have been supplied electricity from one or more sources listed below:

- A national or a regional grid (grid hereafter)
- Fossil fuel fired captive power plant
- A carbon intensive mini-grid.

For the purpose of this methodology, a mini-grid is defined as small-scale power system with a total capacity not exceeding 15 MW (i.e., the sum of installed capacities of all generators connected to the mini-grid is equal to or less than 15 MW) which is not connected to a national or a regional grid.

Project activities or project activity components supplying electricity to a grid shall apply AMS-I.D. Project activities for standalone off-the-grid power systems supplying electricity to households/users included in the boundary are eligible under AMS-I.A.

This methodology is applicable for project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity ("greenfield" plant); (b) involve a capacity addition, (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).

In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.

In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW. If the unit added has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW. *Combined heat and power (co-generation) systems are not eligible under this category.*

In case electricity produced by the project activity is delivered to another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the electricity will have to be entered into specifying that only the facility generating the electricity can claim emission reductions from the electricity displaced.

The physical, geographical site of the renewable generation source delineates the project boundary.

6.3.5 Defining a Representative CPA

The CHENACT audits have identified a menu of energy conservation measures targeting air conditioning, lighting, hot water, and other electrical loads in hotels. Since the applicable technologies as well as the combination of technologies will differ from hotel property to hotel property, several CPAs may need to be included in the PoA registration in order to define the scope of the PoA. In addition, as new technologies become more cost effective, e.g., compact fluorescent lighting

replacing incandescent lighting, LED lighting replacing compact fluorescent lighting, the most viable CPAs will likely change.

We recommend that the following technologies and services be included in the Clean Hotel CDM Program of Activities:

- **Air conditioning retrofit - installation of inverter type variable refrigerant volume mini-split air conditioning systems**
- **Guestroom energy controls – occupancy sensors, programmable thermostats**
- **Public area lighting controls – occupancy sensors**
- **Individual lamp replacement – compact fluorescent lamps (CFL) and Light Emitting Diode (LED) lamps**
- **Fluorescent tube lamps – T8 tube lamps with electronic ballasts and Light Emitting Diode (LED) tube lamps**
- **Solar hot water heating systems**
- **Energy efficient freezers, refrigerators, cool rooms**
- **Energy efficient computer monitors and guest room televisions**
- **Timers on pumps and motors**
- **Photo-sensors and timers for outdoor lighting**
- **Energy Management Systems**

6.3.6 Process for developing (PDD) and registering PoA for Caribbean hotel sector

The following steps are required before an individual CPA can generate CERs:

1. Define the geographic scope of the PoA based on:
    a. Countries that have established a DNA (i.e., **Antigua and Barbuda, Bahamas, Barbados, Belize, Mexico (Cancun, Cozumel, Playa Del Carmon), Dominica, Dominican Republic, Guyana, Jamaica, Suriname, Trinidad and Tobago**)
    b. DNAs that confirm that a Hotel Clean Energy Program assists in achieving "sustainable development"
    c. Define the EE/RE technologies and associated methodologies to be included in the PoA, noting that AMS-II E Energy Efficiency and Fuel Switching for Buildings allows for a combination of energy efficiency technologies, including solar hot water (as a fuel switching technology).
2. Seek representative volunteer hotel property(ies) that will serve as the CPA in the registration of the PoA.
3. Estimate the size of the PoA in terms of the cumulative CERs generated by all future CPA participating in the PoA.
4. Establish the PoA Coordinating Entity (e.g., a joint venture between a carbon broker and CAST)
5. Prepare the Program of Activities Design Document (CDM-POA-DD).
6. Validation of PoA by Designated Operational Entity (DOE)
7. Application for Registration with UNFCCC CDM.

6.4 OTHER GHG MONITORING AND VERIFICATION STANDARDS

6.4.1 Verified Carbon Standard

The Verified Carbon Standard (VCS)[28] is a greenhouse gas accounting program used by projects around the world to verify and issue carbon credits in voluntary markets. VCS was founded in 2005 by business and environmental leaders who identified a need for greater quality assurance in voluntary markets. The VCS founding partners - the Climate Group, the International Emissions Trading Association (IETA) and the World Economic Forum - convened a team of global carbon market experts to draft the first VCS requirements. The World Business Council for Sustainable Development (WBCSD) joined the effort soon after.

Validation/Verification Body (VVB) are the organizations approved by the VCS Association to act as a validation/verification body in respect of providing validation and/or verification services in accordance with the VCS rules. Independent validation of projects and verification of emission reductions are key to VCS quality assurance. Third-party verification is the core of quality assurance, and under the VCS Program, all projects must be validated and all emission reductions must be verified by approved validation/verification bodies.

VVBs must be approved to validate and/or verify to VCS criteria and they must sign an agreement with the VCS Association. More than two dozen professional VVBs are currently approved under VCS. Most are approved for multiple VCS sectoral scopes, and some have expertise in particular areas like Agriculture, Forestry and Other Land-Use.

Entities in good standing under VCS-approved GHG programs - the UN Clean Development Mechanism (CDM) and California's Climate Action Reserve - are approved to work under the VCS Program. VVBs accredited under ISO 14065 for scope VCS by the American International Standards Organization (ANSI) are also approved to validate and/or verify to VCS criteria.

There are no VCS methodologies currently that address energy efficiency and distributed renewable energy system applicable to Caribbean hotels[29]. Projects may develop new methodologies for use under the VCS Program in cases where no existing methodology meets their needs.

The VCS Methodology Approval Process offers project proponents a pathway for developing new methodologies when no existing methodology addresses their needs. Project proponents may also develop new modules or tools, discrete components that set out procedures for specific tasks, such as assessing additionality or setting performance or technology benchmarks.

Under the Methodology Approval Process, or MAP, proposed methodologies are assessed and validated by two separate and independent validation bodies, or VVBs. The first VVB is contracted by the methodology developer and, to ensure independent review, the second is contracted directly by the VCS Association.

[28] http://www.v-c-s.org

[29] Note that there is VM0008 - Methodology for Weatherization of Single and Multi-Family Buildings.

6.4.2 ISO 14064 Carbon Inventory Standard

ISO (International Organization for Standardization) is the world's largest producer of International Standards for business, government and society. The newly developed standard ISO 14064 provides an internationally agreed framework for measuring GHG emissions and verifying claims made about them so that "a tonne of carbon is always a tonne of carbon". They thus support programs to reduce GHG emissions and also emissions trading programs. ISO 14064 is emerging as a global benchmark on which to base such programs.

ISO 14064 is used for greenhouse gas (GHG) voluntary quantification and emissions reductions. ISO 14064 applies to monitor, calculate, report and verify the carbon emissions, helping the enterprises and organizations to establish their carbon emissions management system and to take targeted emission reduction measures. GHG Inventory is defined by a government or enterprise as a unit to calculate the greenhouse gas (GHG) emission directly or indirectly from different sections during its operation and activity in production within a period of time.

ISO 14064 is consistent and compatible with the GHG Protocol, published by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). ISO, the WRI and the WBCSD have signed a Memorandum of Understanding to work together to promote their GHG accounting and reporting standards. The Verified Carbon Standard (VCS) specifically integrates the principles of ISO 14064 and uses the validation and verification requirements of ISO 14064. ISO 14064 comprises three standards, respectively detailing specifications and guidance for the organizational and project levels, and for validation and verification. They can be used independently, or as an integrated set of tools to meet the varied needs of GHG accounting and verification. They are:

- ISO 14064-1:2006, Greenhouse gases – Part 1: Specification with guidance at the organization level for the quantification and reporting of greenhouse gas emissions and removals.
- ISO 14064-2:2006, Greenhouse gases – Part 2: Specification with guidance at the project level for the quantification, monitoring and reporting of greenhouse gas emission reductions and removal enhancements.
- ISO 14064-3:2006, Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions.

7. MODEL HOTEL CLEAN ENERGY PROGRAM FOR THE CARIBBEAN

7.1 CARIBBEAN REGIONAL HOTEL SECTOR PROFILE

The Caribbean hotel market, based on 2010 data from Smith Travel Research, comprises 25 countries and territories (markets) with a total of 2,269 hotel properties and 241,058 hotel rooms. Table 17 shows the number of hotel properties, the total number of hotel rooms, and the average hotel size for selected tourism destinations in the Caribbean (it is important to note that the information from STR is voluntary and therefore incomplete at best, however it is the best research currently available).

- The top six markets have more than 10,000 hotel rooms each, have an average hotel size of 147 rooms, and account for 1,182 properties (55% of the total) and 173,241 rooms (73% of the total);
- Five markets have between 5,000 and 10,000 rooms each, have an average hotel size of 86 rooms, and account for 426 properties (20% of the total) and 34,910 rooms (15% of the total);
- Five markets have between 2,000 and 5,000 rooms each, have an average hotel size of 69 rooms, and account for 285 properties (13% of the total) and 19,660 rooms (8% of the total); and
- Eight markets have less than 2,000 rooms each, have an average hotel size of 34 rooms, and account for 267 properties (12% of the total) and 9,062 rooms (4% of the total).

Table 17 - Caribbean Hotel Market Overview

Country/Territory	Hotel Properties	Hotel Rooms	Average Hotel Size (no. of rooms)
Anguilla	23	658	29
Antigua / Barbuda	61	4,452	73
Aruba	37	7,338	198
Bahamas	162	16,471	102
Barbados[1]	96	6,114	64
Bermuda	30	2,416	81
British Virgin Islands	35	1,199	34
Cayman Islands	83	4,767	57
Cuba	168	41,054	244
Dominica	29	677	23
Dominican Republic	259	64,208	248
Grenada	56	1,773	32
Guadeloupe	163	11,148	68
Haiti	42	1,636	39
Jamaica	261	24,668	95
Martinique	77	5,888	76
Montserrat	9	249	28
Netherlands Antilles	119	9,881	83
Puerto Rico	175	15,692	90
St Kitts / Nevis	32	1,841	58

Country/Territory	Hotel Properties	Hotel Rooms	Average Hotel Size (no. of rooms)
St Lucia	72	4,983	69
St Vincent / the Grenadines	49	1 ,029	21
Trinidad / Tobago	85	4,185	49
Turks / Caicos Islands	44	3,042	69
US Virgin Islands	102	5,689	56
TOTAL	**2,269**	**241,058**	**106**

[1] Based on CHENACT hotel data.

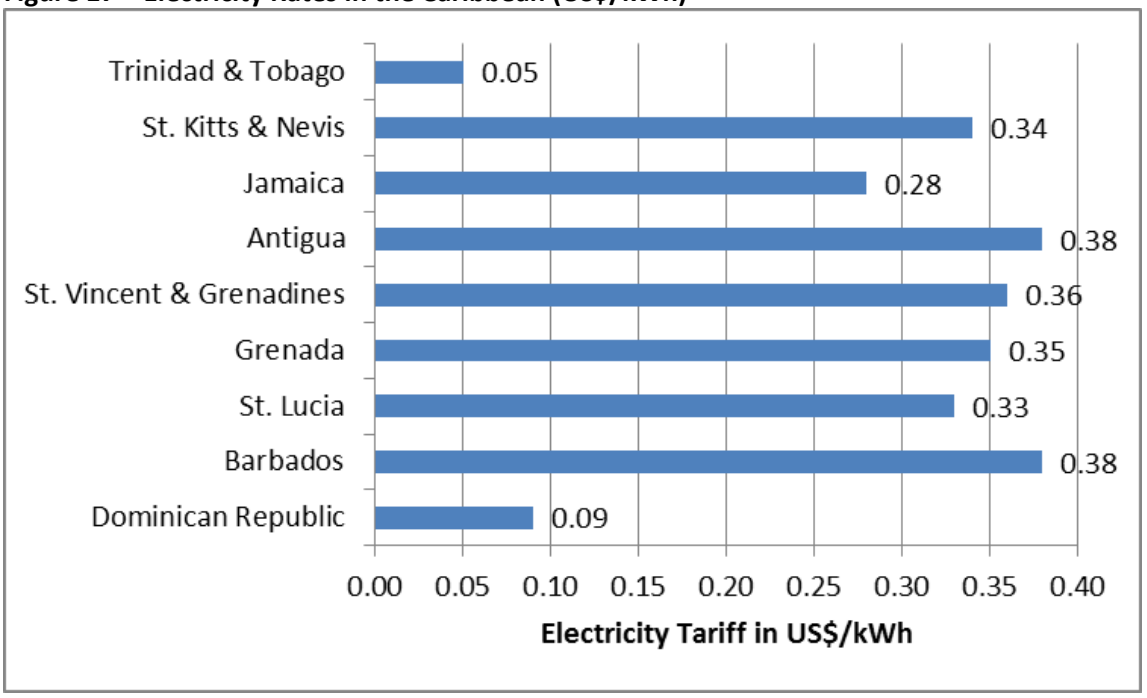
Source: Smith Travel Research, 2010.

7.2 CARIBBEAN HOTEL ENERGY USE

7.2.1 Utility Tariffs

Caribbean electric utility rates for commercial customers range from US$ 0.05 to US$0.46 per kilowatt hour (kWh), and are some of the highest rates in the world because of the generation mix and small utility systems. Figure 17 shows the average commercial electricity tariff for selected Caribbean countries/territories based on CHENACT energy audits[30].

Figure 17 – Electricity Rates in the Caribbean (US$/kWh)

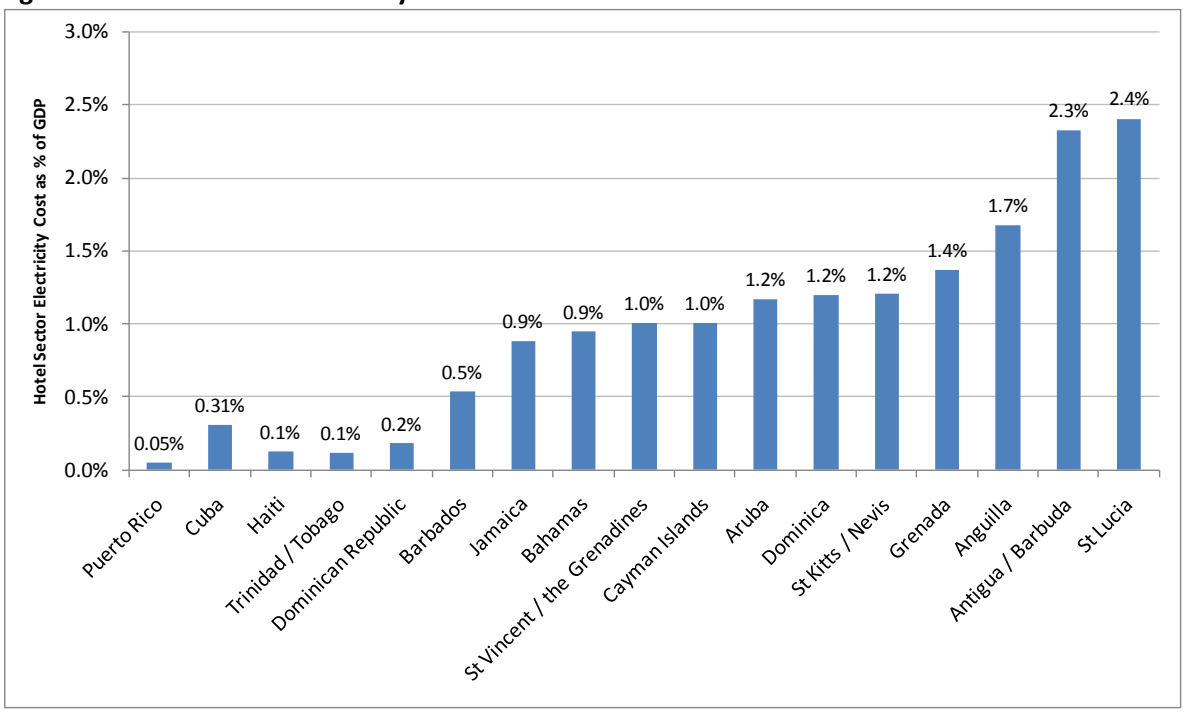


[30] Electricity tariff for Trinidad and Tobago has been obtained from the CARILEC tariff survey of 2010.

Note that Dominican Republic electricity prices are for Punta Cana only which generates and sells electricity to hotels and other customers in the area. In other parts of the country, electricity prices can be as high as 0.25 US$/kWh.

In Figure 18, the hotel sector electricity cost to GDP is shown for different Caribbean countries. The hotel electricity cost for smaller countries/territories is about 2.5% of the GDP. However, for larger islands, this is less than 0.5% of the GDP. The national hotel sector electricity cost to GDP relationship is indicative of the importance of tourism to the country.

Figure 18 - Hotel Sector Electricity Cost to GDP in the Caribbean



7.2.2 Energy Audits in the Caribbean Region

Detailed energy audits were conducted for small to medium sized hotel properties around Barbados and the Caribbean region in order to better understand energy demands in the hotel industry. Guest rooms, lobbies, kitchens and restaurants were all examined independently. Gardens, pools and other amenities were also targeted. As guest satisfaction is top priority for hotel management, the proposed energy savings measures are meant to enhance, not compromise, the guest experience. The electricity consumption of the audited facilities is shown in for each hotel Table 11. The results are aggregated from these detailed energy audits to generate indices such as number of rooms, average hotel occupancy, and electricity consumption in kWh per room night:

- Number of rooms: 4,023
- Average occupancy rate: 57%
- Average electricity consumption: 52.5 kWh/GN
- Annual electricity consumption: 72,766,093 kWh.

The energy saving measures proposed in the CHENACT audits are replicable and are often recommended for several of the audited facilities. Among the most common of these energy savings measures are lighting retrofits. These retrofits included the replacement of incandescent lamps with LED or CFL, as well as the retrofit of T12 fluorescent tubes with LED lamps. Air conditioners are also frequently targeted for retrofit, replacing current units with highly efficient variable flow mini-split units.

Other common energy saving measures include: high efficiency pool pumps, the use of occupancy sensors, timers and controls to reduce running hours for equipment in guest rooms, kitchens and lobbies, solar hot water systems and solar PV systems for outdoor lighting. Some measures require little up-front cost, such as a corporate utility management program, which is meant to foster good energy conservation practices among hotel staff. A listing of the energy saving measures identified across all the CHENACT audits is given in Table 18. With the implementation of the recommended energy saving measures, the hotels' electricity consumption can be reduced by about 34.4% from the current level.

Table 18 - Summary of the recommended energy saving measures

Equipment Retrofit Categories	Energy Saving Measures	% Savings (equipment)
Lighting	Incandescent to CFL	75%
	Incandescent to LED	85% - 91%
	T12 to LED	59% - 66%
Air Conditioning	Inverter based high efficiency (VRV) air conditioning units with hot water recovery	27%
Pool Pumps	Efficient Variable frequency drive (VFD) pool pumps	24%
Solar Hot Water	SHW units for hot water	27%
Exhaust Fans	Exhaust fans with variable speed drives and timers	86%
Facility-wide Categories	**Energy Saving Measures**	**% Savings (total facility electricity consumption)**
Maintenance	Automated door closers	2%
	Corporate Utility Management Program	5%
Control	Occupancy sensor on lights/exhaust fan	0.2%-1.3%
	Guest room energy controls (equipment is turned off when unoccupied)	up to 16%
	Timer on lights/exhaust fan	up to 3%
Solar PV	Solar Photovoltaic (PV) system to power outdoor lighting	5%-8%
Window Film	Low emissivity (low-e) window film	5%-10%

7.2.3 Electricity Savings and Investments

A database of the recommended energy saving measures based on each of the 31 energy audits for Barbados hotels was constructed. It was then organized into 11 categories of energy saving

opportunities (ESOs) such as lighting, air-conditioning, controls etc., as shown in Table 19, to obtain the energy savings, required investment, annual reduction in electricity cost and CO_2 abatement corresponding to each ESO category . Overall, the hotels participating in the CHENACT project will reduce their electricity consumption by ~14 GWH annually, which will result in an annual energy cost savings of US $5 million.

Table 19 - Electricity saving potential and investment for the CHENACT project

Energy Saving Categories	Annual Electricity Saving (kWh)	Annual Electricity Cost Savings (US$)	Investment (US$)	Payback (Years)	CO2 Emissions Reduction (Tons/yr)
Air Conditioning	5,758,592	2,651,330	4,357,667	1.6	4,060
Control	1,286,120	610,678	973,035	1.6	907
Exhaust Fan	54,829	22,679	31,631	1.4	39
Lighting	1,414,415	611,705	425,299	0.7	997
Maintenance	2,958,992	418,264	351,264	0.8	2,086
Other	36,512	150,544	220,035	1.5	26
Pool Pumps	327,203	132,619	74,908	0.6	231
Pumps	139,643	54,201	26,388	0.5	98
SHW	802,343	202,545	203,485	1.0	566
Solar PV	601,964	257,212	915,860	3.6	424
Window Film	596,523	238,653	443,161	1.9	421
Total	13,977,138	5,350,430	8,022,733	1.5	9,854

Source: Tetra Tech, based on CHENACT energy audits.

Implementing the suite of ESOs will require an investment of US$ 8 million yielding a simple payback of 1.5 years. This will also help in reducing the annual CO_2 emissions by 9.8 thousand tons.

The CHENACT Project is primarily focused on hotel properties in Barbados (with 31 energy audits) and in some other Caribbean territories (17 audits from 8 other Caribbean countries). The potential for energy savings across Barbados is much higher than estimated by the CHENACT Project because there are actually 96 hotels comprising 6,114 guest rooms.

7.2.4 Investment Attractiveness of the Hotel Energy Efficiency Project

Benefit-Cost and Cost-Effectiveness (BC and CE) tests for the CHENACT project were developed to demonstrate the investment attractiveness of hotel energy efficiency projects. The BC analysis estimates the net present value (NPV) and the “internal rate of return (IRR) as the financial indicators for the project. NPV compares the value of a dollar today to the value of that same dollar in the future, taking inflation and returns into account. If the NPV of a prospective project is positive, it should be accepted. However, if NPV is negative, the project should probably be rejected because cash flows will also be negative. IRR is the rate of growth a project is expected to generate. Generally speaking, the higher a project's internal rate of return, the more desirable it is to undertake the project.

The following assumptions were made for this analysis:

- Exchange rate for US$ to BB$: 2
- Barbados electricity tariff rate: 0.75 BB$/kWh
- Electricity price escalation: 4.5%[31]
- Discount rate: 12%[32]
- Model life cycle: 7 Years[33]
- Annual Maintenance: 15% of energy cost savings

The results shown Table 20 indicate that the CHENACT project is highly attractive financially. The NPV and the IRR for the project are US$ 14.4 million and 112% respectively.

Table 20 – CHENACT project financial indicators

CHENACT Project Financial Indicators	
NPV	US$ 14,399,500
IRR	112%

A cost effectiveness analysis was also performed for the CHENACT Project. For this analysis, the NPV was calculated for each category of ESO, and then compared to the initial investment required for that measure. The NPV and NPV-investment ratio for each measure are presented in Table 21. An ESO is considered cost effective if its NPV and NPV-Investment ratio are positive. The NPV and the NPV-Investment ratios for all ESO categories are positive.

Table 21 - Results of Cost-effectiveness Analysis

ESO Category[34]	NPV (US$)	NPV-Investment Ratio
Air Conditioning	7,758,312	1.78
Controls	1,817,626	1.87
Exhaust Fan	72,008	2.28
Lighting	2,370,053	5.57
Pool Pumps	531,132	7.09
Pumps	221,298	8.39
SHW	722,100	3.55
Solar PV	259,541	0.28
Window Film	647,429	1.46

[31] Barbados inflation rate used as proxy for annual electricity cost escalation.

32 IADB discount rate.

33 Based on industry standard life (in hours) and 10 hours of daily operation. For example a T8 tube with 24,000 hours life will last for 6.6 years if put on 10 daily.

[34] For both benefit-cost and cost-effectiveness analysis we combine the ESOs “Pool Pumps” and Other Pumps” into one category and exclude the “Maintenance” and “Other” categories from the analysis.

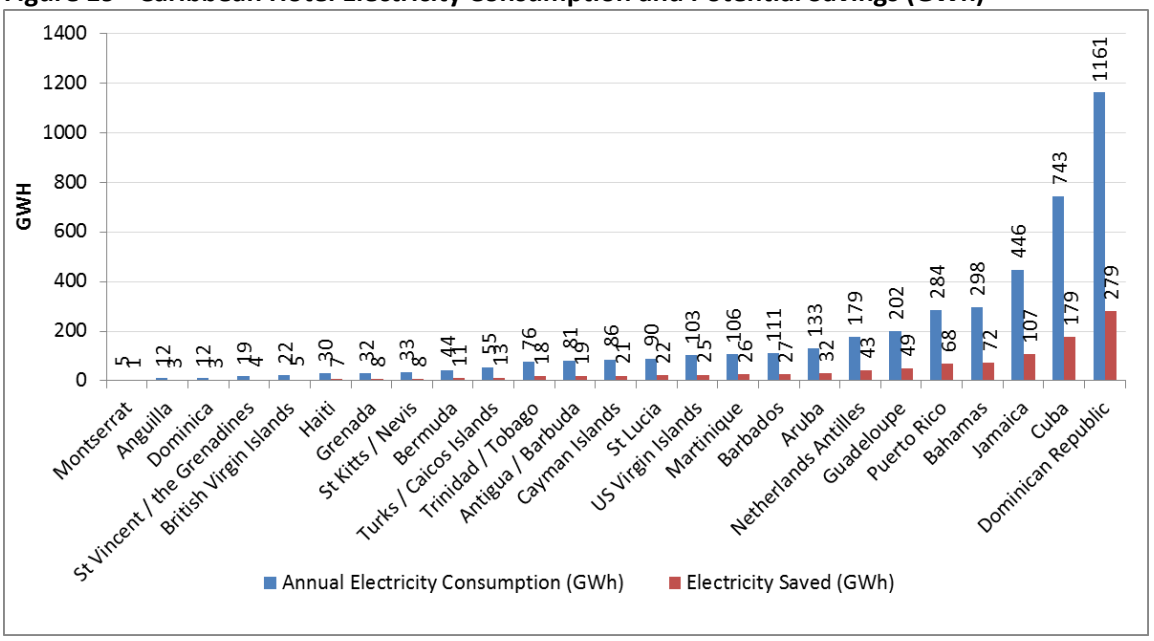
Another test of cost-effectiveness is whether purchasing electricity at the current utility tariff rate of 0.38 US$/kWh is more attractive than the levelized cost of electricity achieved through energy saving opportunities. Here also, the levelized cost of electricity is negative (-) 0.31 US$/kWh. This implies that a consumer (or hotel property owner) will net 0.31 US$/kWh for each unit of electricity saved instead of paying 0.38 US$/kWh (or 0.75 BB$/kWh) for its purchase from grid.

7.3 CARIBBEAN HOTEL CLEAN ENERGY EFFICIENCY MARKET

It is assumed that the annual energy consumption exhibited by the audited hotel sample in Barbados will be similar for a larger population of hotels across the twenty-five Caribbean countries/territories. For each territory, the ratio of guestroom capacity in the territory to that of the audited properties in Barbados is obtained. This ratio is multiplied by the total annual electricity consumption of the 44 audited properties to obtain the extrapolated results for hotel electricity consumption for each Caribbean territory. Based on the audited sample, the extrapolated results for electricity savings, required investment, energy cost savings, and CO_2 emissions reduction is found for each country.

The annual electricity consumption for the hotel sector in the Caribbean region is 4,360 GWh. This consumption is spread across 2269 hotels comprising 241,058 guestrooms. As noted earlier, with the implementation of the recommended energy saving measures, hotel electricity consumption can be reduced by about 34% from the current level. Overall, 1,049 GWh of electricity consumption can be saved annually in the hotel sector and CO_2 emissions reduced by 835 thousand tons. In Figure 19 and Table 22 the breakdown of these estimates for each territory is provided.

Figure 19 - Caribbean Hotel Electricity Consumption and Potential Savings (GWh)



Source: Tetra Tech, based on CHENACT energy audits.

Table 22 - Electricity consumption, saving, CO_2 emissions reduction, investment in EE by Caribbean Country/Territory

Territory Region	# of Hotels	# of Rooms	Annual Electricity Consumption (GWh)	CO2 emissions (1000 tons)	Electricity Saved (GWh)	Energy Cost Saving (US$)	Investment Required (US$)	CO2 Emissions Reduction (1000 Tons)
Montserrat	9	249	5	3	1	0.4	0.7	0.8
Anguilla	23	658	12	8	3	0.9	1.4	2.0
Dominica	29	677	12	9	3	1.4	2.2	2.1
St Vincent / the Grenadines	49	1029	19	13	4	1.7	2.7	3.2
British Virgin Islands	35	1199	22	15	5	2.0	3.1	3.7
Haiti	42	1636	30	21	7	2.5	4.0	5.1
Grenada	56	1773	32	23	8	2.8	4.4	5.4
St Kitts / Nevis	32	1841	33	23	8	1.9	3.1	5.6
Bermuda	30	2416	44	39	11	3.9	6.3	7.4
Turks / Caicos Islands	44	3042	55	39	13	5.0	7.9	9.3
Trinidad / Tobago	85	4185	76	64	18	0.7	1.2	13.8
Antigua / Barbuda	61	4452	81	57	19	7.8	12.4	13.7
Cayman Islands	83	4767	86	61	21	6.8	11.0	14.6
St Lucia	72	4983	90	65	22	7.2	11.4	15.3
US Virgin Islands	102	5689	103	87	25	10.4	16.6	17.5
Martinique	77	5888	106	75	26	9.6	15.4	18.1
Barbados	96	6114	111	78	27	10.0	16.0	18.8
Aruba	37	7338	133	106	32	8.0	12.8	22.5
Netherlands Antilles	119	9881	179	126	43	15.6	24.9	34.2
Guadeloupe	163	11148	202	142	49	18.2	29.1	34.2
Puerto Rico	175	15692	284	200	68	14.3	22.9	48.2
Bahamas	162	16471	298	210	72	21.5	34.4	50.5
Jamaica	261	24668	446	337	107	36.5	58.4	90.9
Cuba	168	41054	743	524	179	53.6	85.7	160.8
Dominican Republic	259	64208	1161	819	279	27.9	44.7	237.6
TOTAL	2,269	241,058	4,360	3,144	1,049	271	433	835

Source: Tetra Tech, based on CHENACT energy audits.

7.4 BARRIERS TO ENERGY EFFICIENCY AND MICRO-GENERATION INVESTMENTS WITHIN THE HOTEL SECTOR

7.4.1 Issues Affecting Hotel Investment in EE and RE Technologies

The current economic climate and associated financial performance of the region's hotel sector has reduced hoteliers' interest in and ability to make investments of any kind. While a few new hotel developments are attracting capital, many planned expansions and refurbishments have been deferred. Hoteliers are unlikely to borrow commercially for EE and RE investments, preferring investments that increase revenue potential, including marketing.

Commercial financing is available for hotels with a good balance sheet or for those owned by investors with sufficient collateral. However, banks will only lend to existing customers (i.e., where the bank is their primary lender) and will require that the hotel demonstrates adequate debt service coverage.

Based on past experience, hoteliers are uncertain about the stated energy savings and payback potential of new investments. Many EE technologies have been introduced into the Caribbean over the past decade, however, poor quality products have left hoteliers sceptical of the performance and product lifetime claims of manufacturers and distributors. This has resulted in hoteliers discounting the reported savings potential and payback period.

With the exception of larger hotels with experienced engineering staff, hoteliers do not believe they have the in-house technical expertise to operate new, sophisticated energy efficient and renewable energy technologies. Among those that have implemented new technologies, failure to put in place preventative maintenance has resulted in reduced equipment life and system performance.

The financial attractiveness of investment in the clean energy program in the Caribbean are examined for three alternatives:

a) Hotels of different sizes or number of guestrooms.

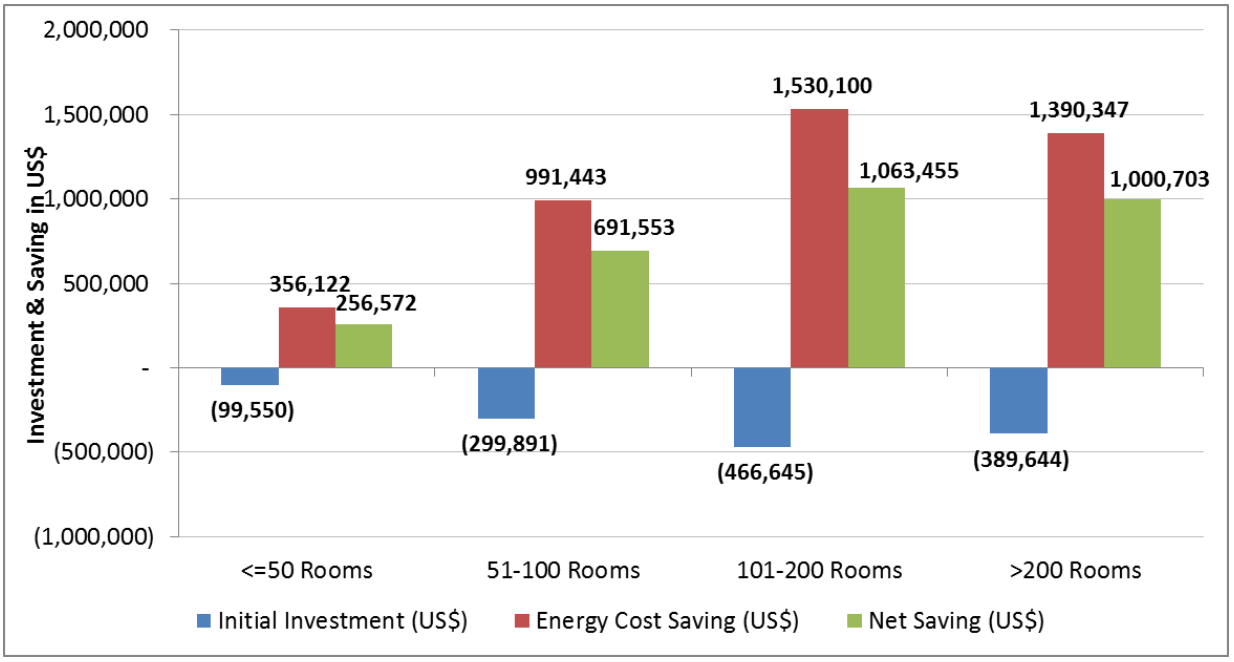
b) Equipment and services market size for different Caribbean territories.

c) A typical 100-guestroom hotel for different Caribbean territories.

7.4.2 Investment Attractiveness in the Caribbean Hotel Sector

Capital expenditure for investment in the hotel clean energy program is estimated for different hotel sizes based on the CHENACT audit results. As shown in Figure 20, for hotels sized up to 50 guestrooms, an investment of US$100,000 will yield a return of US$ 356,122 (at net present value) over a period of seven years. Similarly, for a 101-200 guestroom hotel, an investment of US$ 466,645 will result in revenue of US$ 1.5 million (at net present value) and an overall savings of US$ 1 million in seven years.

Figure 20 - Investment and Returns on Hotel Clean Energy Program



Source: Tetra Tech, based on CHENACT energy audits.

7.4.3 Equipment and Services Market Size for different Caribbean territories

The projected estimate for demand in the energy efficient equipment market for all the Caribbean territories, based on the CHENACT audits, is about 316[35] million US$ worth of investment. Three equipment categories alone, air conditioning, controls and lighting equipment, will require 77% or US$ 244 million investment across the hotel sector in the Caribbean as shown in Table 23.

Table 23 - Estimated EE Equipment Market Size

Equipment	Electricity Saving (GWh)	Cost Saved (US$ - Million)	Investment (US$ - Million)	Payback Period
Air Conditioning	340	105	185	1.8
Control	76	24	41	1.7
Exhaust Fan	3	1	1	1.5
Lighting	83	24	18	0.7
Pool Pumps	19	5	3	0.6
Pumps	8	2	1	0.5
SHW	47	8	9	1.1
Solar PV	36	10	39	3.8
Window Film	35	9	19	2.0
Total	648	190	316	1.7

Figure 21 shows the estimated annual O&M market size for maintenance of the EE equipment. It is assumed that 15% of the total electricity saved due to the implementation of EE equipment will be spent in the upkeep of the installed equipment. In the 1st year the total O&M expenses are estimated at US$ 38.5 million which increase to US$ 48.5 million by the 7th year. This indicates that the hotel EE action presents a financial critical mass for a few O&M service providers that render the maintenance services.

[35] Note that the investment in Table 20 is shown as US$433 million which is more than that shown in Table 21. For Table 21, investments in maintenance and other equipment have been excluded.

Figure 21 - Operation & Maintenance Market Size

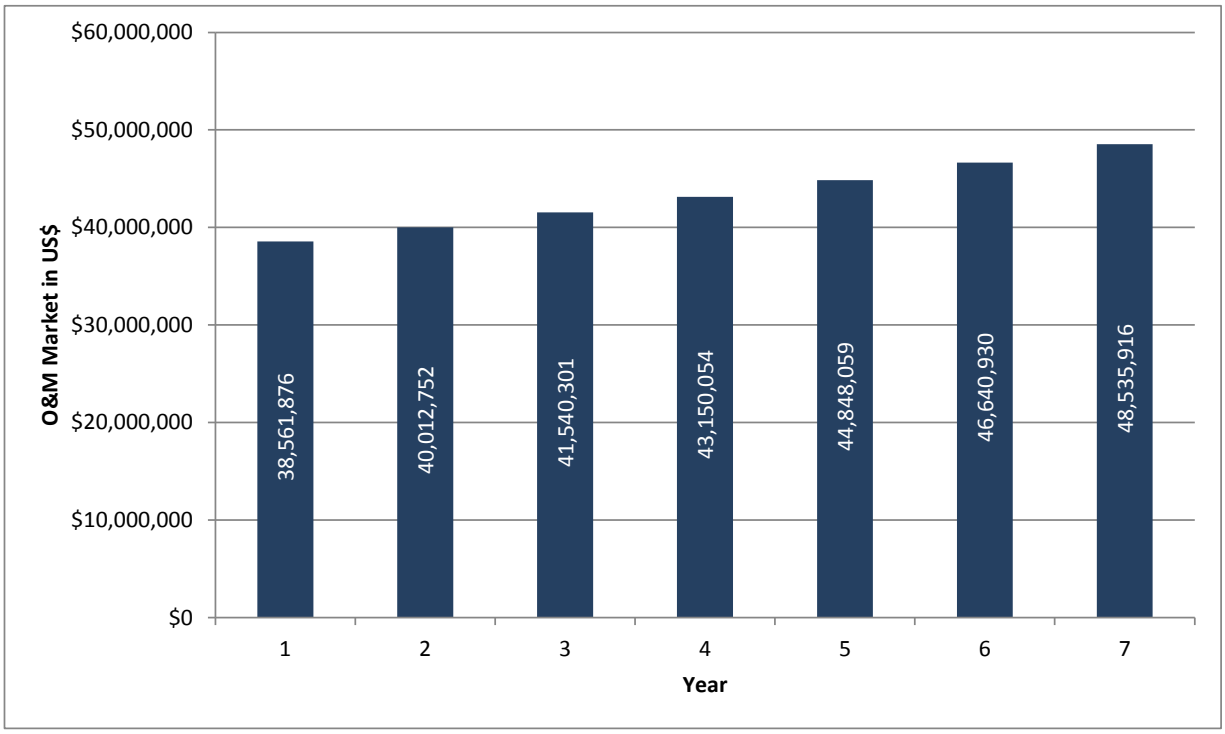


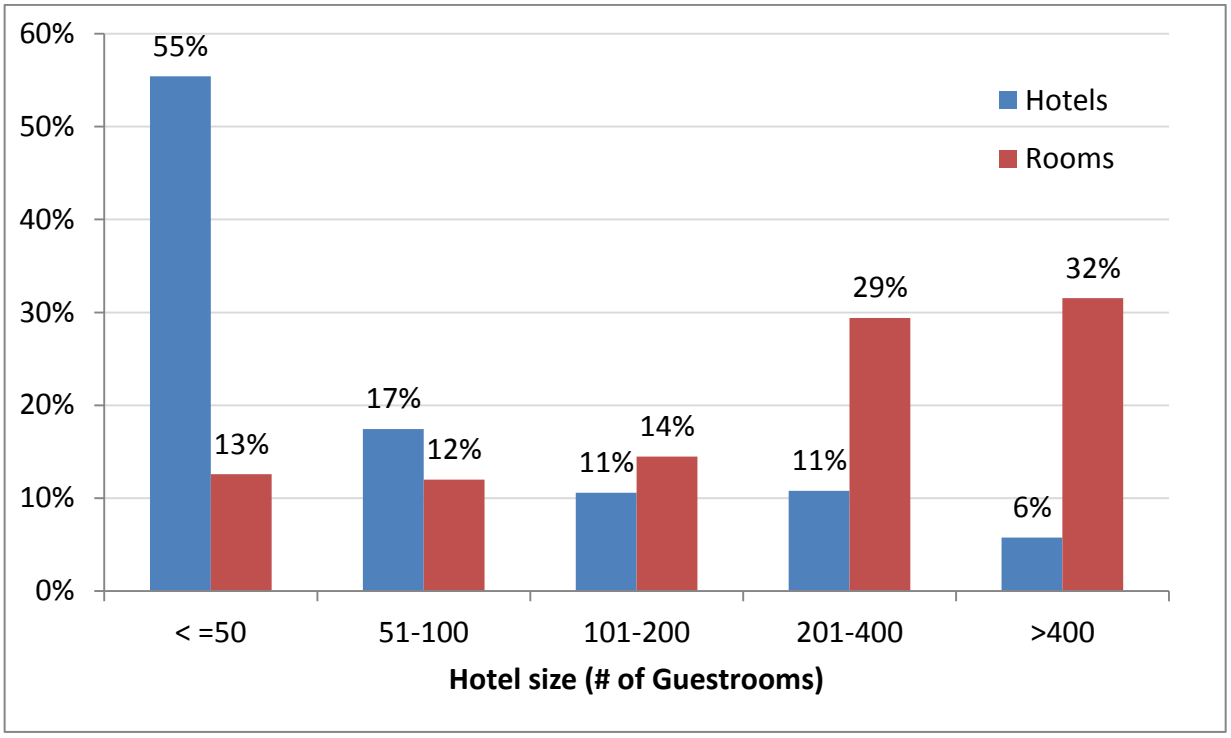
Table 24 - Investment in Hotel EE Action for Different Caribbean Territories by Hotel Size

Territory/Year	Investment in US$ by Hotel Size (# of Guestrooms)				
	< =50	51-100	101-200	>200	Total
Dominican Republic	1,337,047	3,263,364	6,316,940	48,949,525	59,866,875
Cuba	2,495,075	3,241,919	13,331,307	95,766,674	114,834,975
Jamaica	12,036,964	11,811,885	9,694,242	44,657,549	78,200,640
Bahamas	6,704,814	5,700,630	5,155,182	28,511,543	46,072,170
Puerto Rico	4,840,221	4,029,602	5,641,051	16,214,349	30,725,223
Guadeloupe	6,082,910	6,492,789	7,868,623	8,659,662	29,103,984
Netherlands Antilles	5,495,705	6,292,870	7,269,058	14,318,558	33,376,191
Aruba	456,871	1,419,563	1,710,935	13,517,319	17,104,688
Barbados	3,464,014	3,085,837	4,365,821	2,765,841	13,681,513
Martinique	2,999,684	2,200,813	3,845,548	6,325,704	15,371,749
US Virgin Islands	6,633,766	4,295,892	8,325,494	3,023,180	22,278,332
St Lucia	3,150,731	2,938,426	3,003,041	6,239,925	15,332,122
Cayman Islands	4,479,946	3,147,654	2,439,970	4,599,944	14,667,515
Antigua / Barbuda	4,001,816	3,102,993	3,848,905	5,650,281	16,603,995
Trinidad / Tobago	452,768	431,883	270,020	406,149	1,560,820
Turks / Caicos Islands	1,720,445	2,245,194	730,993	3,245,089	7,941,722
Bermuda	924,185	2,239,973	-	3,143,272	6,307,430
St Kitts / Nevis	1,129,055	1,124,566	242,421	1,636,344	4,132,386
Grenada	3,447,231	986,841	-	1,517,184	5,951,257
Haiti	2,695,539	2,300,671	342,653	-	5,338,863
British Virgin Islands	1,634,293	1,166,979	328,947	-	3,130,219
St Vincent / the Grenadines	3,334,039	311,791	-	-	3,645,830
Dominica	2,187,386	716,262	-	-	2,903,648
Anguilla	994,300	907,588	-	-	1,901,888
Montserrat	650,062	-	-	-	650,062
TOTAL	83,348,867	73,455,984	84,731,152	309,148,094	550,684,097

Also shown in Table 24 is the investment required for different hotel sizes by Caribbean territory. Larger hotels with more than 200 guestrooms constitute only 17% of the total number of hotels (see Figure 22) but account for 56% of the total investment required for the EE action. Moreover, EE upgrades to hotels in only eight Caribbean territories (i.e., Dominican Republic, Cuba, Jamaica, Bahamas, Puerto Rico, Guadeloupe, Netherlands Antilles and Aruba) represent more than 75% of the total investment.

Therefore, the initial pilot projects aimed at demonstrating the success of EE actions in the hotel sector should be targeted for larger hotels in few countries.

Figure 22 – Caribbean Hotel and Room Distribution, by Size Category (% of total)

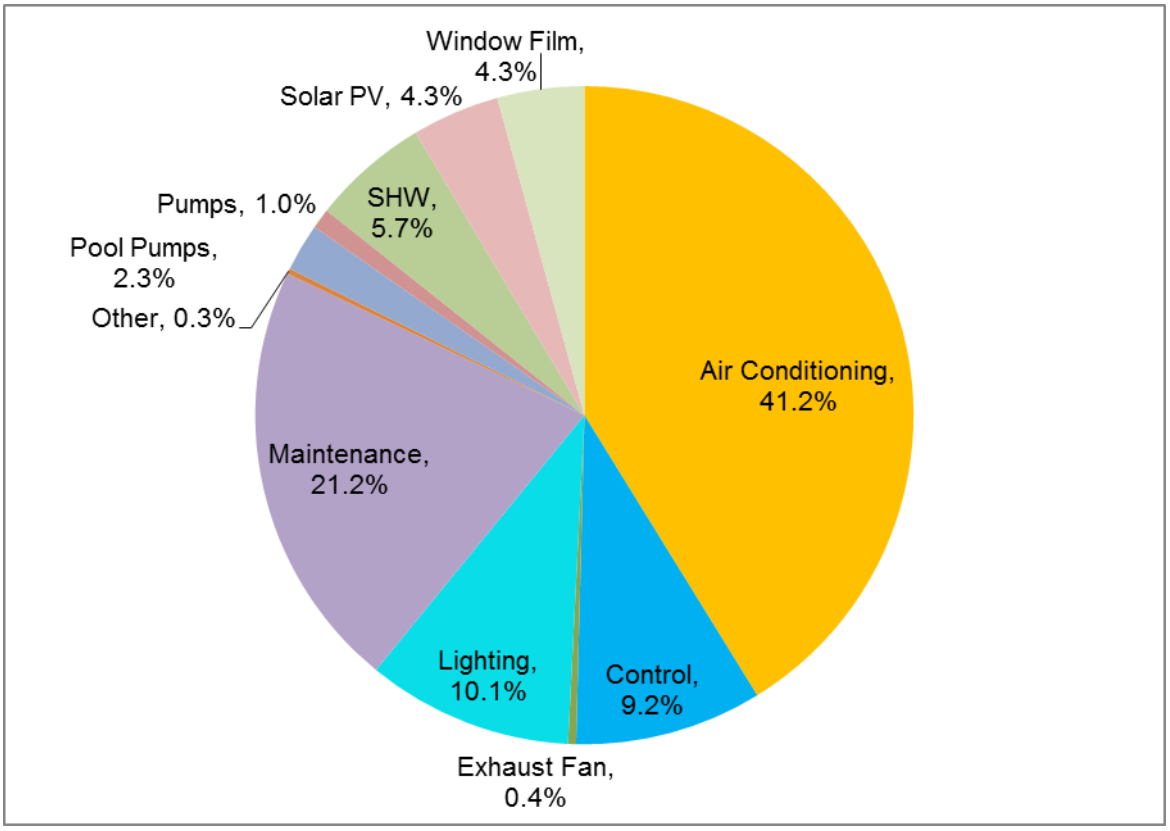


7.4.4 Investment for a 100-Guestroom Hotel

Here we demonstrate the investment attractiveness for a typical 100 guestroom hotel for different territories in the Caribbean.

- The electricity consumption for a 100 guestroom hotel is estimated by scaling down the electricity consumption of 4,023 guestrooms among the 44 hotels audited under the CHENACT project.
- The energy savings distribution for end-use equipment is estimated based on the recommendation of energy conservation measures according to the 44 CHENACT audits as shown in Figure 23.

Figure 23 - Electricity savings distribution by end-use



- Once the per cent distribution of electricity savings by end-use is obtained, these fractions are applied to the total estimated electricity consumption of a 100-guestroom hotel to obtain the electricity savings achieved from each end-use.

- The investment required to achieve the electricity savings, the annual electricity cost savings, and the operating expenses are captured to obtain the annual costs/benefits.

- The annual costs and benefits are escalated by 4.5% to reflect the annual electricity price escalation and then discounted by a factor of 12%.

Table 25 - Investment Attractiveness for a 100-guestroom hotel in Selected Countries

Caribbean Territory	Electricity Tariff Rate (US$/kWh)	Simple Payback (years)	Net Present Value (NPV)	Internal Rate of Return (IRR)
Dominican Republic*	0.09	6.5	(22,916)	7.2%
St. Lucia	0.33	1.8	447,764	140%
Grenada	0.35	1.7	486,988	161%
Barbados	0.38	1.5	545,823	200%
Antigua	0.38	1.5	545,823	200%

Note: Electricity tariff rate for Dominican Republic is based on the private utility at Punta Cana.

As shown in Table 25, the attractiveness of investment in energy efficiency improvement measures in a typical 100-guestroom hotel in the Caribbean region is sensitive to electricity tariff.

In Punta Cana, Dominican Republic, where the electricity tariff is under 10 US cents /kWh, the investment in the energy efficiency improvement measures in the hotel sector is less attractive. However, such investments become financially attractive when the electricity tariff is 25 US cents/kWh or more. For Barbados and Antigua, with a 38 US cents /kWh electricity tariff, the IRR on investment in hotel energy efficiency improvement is 200%.

8. CHENACT COMMUNICATIONS STRATEGY

The CHENACT Communication Strategy is designed to facilitate the understanding, appreciation and adoption of energy efficiency and distributed renewable energy by Caribbean hoteliers. It supports technical assistance, training and policy related activities under the project.

8.1 CHENACT CONSTITUENCY GROUPS

CHENACT has several constituency groups that it must work with for implementation of its project activities. Tetra Tech has defined three categories of constituency groups: 1) CHENACT Project Partners, 2) CHENACT Beneficiaries, and 3) CHENACT Stakeholders.

8.1.1 CHENACT Partners

CHENACT Partners are organizations that have either contributed financially to the project or have similar projects or mandates. These include:

Caribbean Tourism Organization (CTO)

Caribbean Hotel and Tourism Association (CHTA)

Caribbean Alliance for Sustainable Tourism (CAST)

Inter-American Development Bank (IDB)

Ministry of Finance, Investment, Energy and Telecommunications of Barbados

Ministry of Tourism of Barbados

Ministry of Environment, Water Resources and Drainage of Barbados

United Nations Environment Program (UNEP)

Caribbean Renewable Energy Development Program/GIZ

Centre for the Development of Enterprises (CDE)

Barbados Light and Power (BL&P)

Barbados Hotel and Tourism Association (BHTA)

Organization of American States (OAS)

Caribbean Electric Utility Service Corporation (CARILEC)

Caribbean Society of Hotel Association Executives (CSHAE)

Caribbean Community Climate Change Centre (CCCCC)

CARICOM

8.1.2 CHENACT Beneficiaries

CHENACT Beneficiaries are defined as those entities that receive direct support in the form of technical assistance. Approximately 61 hotels in Barbados, 5 in the wider Caribbean, and 12in the OECS received either a detailed energy audit or a walk-through assessment. Those Barbados hotels that participate in a micro-generation pilot demonstration program also benefit. The Government of

Barbados (GoB) benefits directly through the assistance to prepare a National Hotel Clean Energy Policy and Action Plan, through input on the design of a Clean Energy Fund. CAST, CHTA and CTO are also CHENACT beneficiaries in that they are the target of capacity building activities.

8.1.3 CHENACT Stakeholders

CHENACT holds the potential to be of interest to a number of international, regional, and national organizations; government ministries and agencies addressing energy, tourism and environmental matters; hotel businesses and industry associations; electric utilities; energy equipment suppliers and service providers; electric utility consumers; tour operators and tourists.

8.2 STATUS AND NEED FOR COMMUNICATIONS

It is critical that communication and outreach is designed into future CHENACT activities. It builds on the understanding of energy and environmental issues in the Caribbean tourism sector. This strategy was developed based on discussions with the CHENACT PMU and several of its project partners.

8.2.1 Communications Objectives

The CHENACT communication objectives are three fold:

1. To promote the program. A substantial portion of the activities to be conducted under CHENACT depends on the participation of various constituency groups such as hoteliers and energy service providers. Information has to be provided to these groups on the project and its activities, how they can participate, and the potential benefits from their participation.
2. To inform and educate CHENACT stakeholders on new or unfamiliar concepts and approaches such as distributed generation, performance contracting and Programmatic CDM.
3. To disseminate the project's findings and recommendations. Much of the work under CHENACT was conducted in Barbados on a pilot basis with analysis and applications for the wider region. The various findings have to be shared with a wider audience outside of Barbados. Regional organizations such as CHTA, CTO, CSHAE, CCCCC and CARILEC are critical mechanisms for disseminating CHENACT findings and recommendations.

8.2.2 Communication Challenges

It is advisable that any communication is of a targeted nature, utilizes existing communication channels, and coordinates with established communications mechanisms of partner organizations. It is not recommended that CHENACT invest in or undertake exhaustive public awareness and outreach, however, the importance of constant promotion to the Hotel Sector is of prime importance.

Additionally, the narrow focus of CHENACT on energy use in hotels, and the technical nature of some of the activities, causes news on CHENACT to be of low interest to the general public. All communication pieces need to be linked to a specific target audience with a clear and consistent message. Any communication to the general public would need to be presented in terms which are accessible to the layman and clearly demonstrates the applicable benefits.

8.2.3 Key Messages to be Delivered

There are 4 key messages to be conveyed with the communication material prepared by the PMU.

Message one: The CHENACT PMU is making progress on its project activities. This message should be targeted to CHENACT project partners and should focus on project results.

Message two: BHTA hotel members can reduce their energy costs and access funds for energy retrofits by participating in the CHENACT program. This message should revolve around the benefits of the CHENACT activities for the CHENACT beneficiaries and should be targeted at the hotels and its associations. The message should include information on the benefits of the detailed energy audits, the energy walk-through and the demonstration program. One key aspect of this message is that a greater level of participation requires a greater level of commitment to implement recommendations.

Message three: The Barbados hotel sector is a leader in improving energy management and a strong advocate for sustainable energy policies. The Hotel sector is leading the way in reducing its carbon footprint and in the phase out of ODS. This message is targeted to the general public of Barbados and other stakeholders and it should position CHENACT to show what the benefits are to Barbados.

Message four: There are significant and attractive investment opportunities to improve the competitiveness of the Caribbean hotel sector though the integration of higher energy efficiency and micro-generation with renewable energies. This message is targeted at regional organizations, national governments (other than Barbados), and donor organizations with the intent of extending and expanding CHENACT activities across the region.

8.3 POSSIBLE COMMUNICATIONS CHANNELS TO BE USED

Given the limited time frame of CHENACT, the common interests of specific organizations and their members, and number and variety of project activities, TETRA TECH recommends that most communication is done through existing channels at CHENACT project partners such as:

- CTO to reach national tourism ministries
- CHTA to reach hoteliers and other partners
- CSHAE to reach non-CHTA member hotels
- CARILEC to reach the utility industry

The PMU should also consider other organizations who work in the same field such as:

- The Caribbean Information Energy System (CEIS)
- Caribbean Information Platform on Renewable Energy (CIPORE)

The following are the recommended communication channels and tools to cascade the 4 key messages to the CHENACT target audiences. Many of these channels and tools are already in use by the PMU.

8.3.1 Monthly Report

Description: A report that tracks progress and updates on project activities.

Strategy: The CHENACT PMU is currently responsible for preparing a monthly report that goes to the counterparts of CTO and CHTA.

8.3.2 Fact Sheet

Description: A fact sheet can be used by the CHENACT PMU as a quick way to explain the program and its activities to its stakeholders. The fact sheet should be no more than 1 to 2 pages and should be updated on a monthly basis, printed on an as needed basis and should be the one communication product that is used at all CHENACT activities and functions.

Strategy: There should be 2 kinds of CHENACT Fact sheets

1. Institution focused: that describes the entire program, the project objectives, activities, and key results to be achieved and briefly highlights the contributing partners.
2. Hotelier focused: that describes the activities in the CHENACT program that are hotelier focused and the potential benefits. It should be presented as frequently asked questions.

8.3.3 E-Bulletins

Description: The e-bulletin would be used as a "newsflash" to communicate a summary of results to the CHENACT steering committee members.

Strategy: Given the number of project partners, this provides a way for the CHENACT PMU to provide consistent, standard and regular updates to the CHENACT Steering Committee and other interested parties committee members on the progress of the project. It should be no more than 1 page, highlighting accomplishments during the past month and with a section on upcoming activities. It can be sent as text embedded in an email to the committee members and as an attachment as well.

8.3.4 BHTA Breakfast Meetings

Description: Breakfast meetings are organized by the BHTA for its members as a way to share key and timely information.

Strategy: The CHENACT PMU should use the breakfast meetings as an orientation session to explain the CHENACT program in more detail with a particular focus on the detailed energy audit program and to convince them to sign up. The PMU should organize these meetings under the banner of the BHTA, inviting the hoteliers that have an interest in the audits and who are more likely to commit to the program. The PMU's presentation should provide details on the methodology of the audits, what the hotels can expect, how to sign-up, what the hotels should have to provide and the benefits that can accrue to them. The PMU should also answer any questions. The breakfast meetings can also be used to explain the walk-through.

8.3.5 BTHA Monthly, Quarterly and Annual Meetings

Description: The BTHA hosts a general membership meeting every quarter, as well as an Annual General Meeting. Typically there is a guest speaker and other general announcements.

Strategy: The CHENACT PMU can use the BHTA meetings in 3 ways to disseminate its messages:

1. as a guest speaker providing in depth information on CHENACT;

2. by making a short announcement on the program and by highlighting the hotels that have already signed up and solicit others to participate; and

3. by placing the Hotelier focused CHENACT fact sheet at the various tables and then interacting with the invitees to explain the fact sheet and answer questions.

8.3.6 Press Releases

Description: A press release can be prepared when the PMU has a story that is newsworthy, it has a success it wants to highlight, a finding that it wants to share, or an issue it wants raise in the public arena. It should make use of the success stories and testimonials from hotels that have gained positive results from the energy audits A press release is different from a media advisory which is an invitation to the media to cover an event.

Strategy: A press release has a very wide dissemination and therefore they should be written from the widest target audience's perspective, that is the general public. CHENACT Partners have well established media networks which should be tapped to reach the target audiences. The press release should:

- Answer the "so what" question or clearly indicate why the information is newsworthy
- Have a quote from a hotelier, ministry official or CHENACT representative
- Contain a standard paragraph that describes CHENACT
- List a contact for more information
- Be dated and have a city and country of release
- Coincide with related events where media is invited (where possible).

CHENACT PMU should prepare media advisories in advance of any workshops that it would like the press to be present and cover. Typically the media covers opening remarks and may return to do a wrap up at the end of the workshop. The advisory should be no more than one page and include the date, time, venue, description of event, the list of speakers to be covered and a point of contact to confirm their participation or direct questions. The PMU should advise the speakers of the presence of the media and ask them to have copies of their remarks where possible, which can be shared with the media.

8.3.7 Stories in Partner's Newsletters

Description: Several of the CHENACT partners have newsletters that reach a wide audience. CTO's newsletter is disseminated monthly and reaches ministers and directors of tourism, national statistics offices and other tourism stakeholders. CHTA's newsletter is disseminated monthly to its hotelier and national hotel association membership, its allied membership and other strategic partners. The

BHTA's newsletter is disseminated weekly to its 400 members and other strategic partners. The newsletters from the other CSHAE members shall also be used

Strategy: The CHENACT PMU can share its news via these newsletters. The newsletter pieces should be short, written from the perspective of the hotelier (or government in the case of CTO) and should be the same for all the three newsletters. This duplication should provide reinforcement of the message in the public domain. The newsletter pieces could be on the benefits of the detailed energy audits and how to sign up, on the energy walk-through, on progress in the number of detailed hotel energy audits and energy walk-throughs conducted and on the selection and start of the demonstration project. The CHENACT PMU should aim to have a story in each newsletter on a monthly basis again to reinforce the message.

8.3.8 Features on Partner's Websites

Description: The two key partners of CHENACT, the CTO and CHTA both have extensive websites which draw a wide variety of visitors seeking information on tourism in the Caribbean. Both websites feature upcoming events section and a news section.

Strategy: The CHENACT PMU can use these websites to share project information in three ways to: 1) publicize upcoming events; 2) share news; and 3) share final reports and documents such as the ESCO Assessment and Strategy.

8.3.9 Presentations (or participation) at Relevant Conferences

Description: There are several conferences held in the Caribbean that have as its target audience, one more or more of the CHENACT project constituency groups.

Strategy: The CHENACT PMU can take advantage of these conferences which draw together its various constituencies to meet its communication goals. It can participate in the following ways:

- set up a booth to share information and engage with attendees
- have CHENACT information included in the conference material
- have a spot on the agenda to make a presentation
- hold a CHENACT project activity at the event
- attend the event and conduct one-on-one meetings with key participants

In all cases, the CHENACT PMU needs to determine the following before participating in a conference:

- Who is the target audience to be reached by participating at the conference?
- What is the objective for participating in the conference? Is it to raise awareness on the project, share project results or solicit participation in project activities?
- What material needs to be prepared in order to meet the objective of participating in the conference?
- How can the PMU measure whether that objective has been met e.g., via signup sheets, feedback forms?

8.3.10 Targeted Mailings

Description: Email communication to targeted groups with a narrow message.

Strategy: For some of the activities under CHENACT, the PMU should reach very specific constituency groups such banks and other financial institutions or energy service providers and equipment suppliers. In those cases, it is best to do a targeted one page generalized letter which presents all the relevant information in a frequently asked questions format. The PMU can reach a larger audience than its own network by disseminating the targeted letter electronically as both an attachment and embedded in an email to relevant associations and networks and asking them to forward it onto their membership.

8.3.11 BLP Bill Stuffers for Hotel Customers

Description: Insert in monthly electricity bills sent to hotel customers.

Strategy: Since electricity is the most significant source of energy supply to hotels and BLP has introduced a new rate structure for commercial customers, information accompanying the monthly BLP bill should reinforce the importance of energy efficiency to manage energy costs. Detailed energy audits identify common recommendations for improving hotel energy management. An insert with tips for reducing electricity demand and use would be an effective way of raising the visibility of CHENACT to Barbados hotels.