

# OVERVIEW

## CARICOM:

The Caribbean Community (CARICOM) consists of developing small island States and low lying coastal States, all of which exhibit unique and peculiar characteristics, including, *inter alia*, varying topographies, limited natural resources, small populations and fragmented markets with different energy product specifications.

## Climate Change:

Climate Change has now advanced globally as a priority matter for decision makers. Caribbean countries are recognized as being among the most vulnerable to global climate change and the consequences of global warming are projected to adversely affect the countries in the Caribbean. These effects include:

- Higher average air and sea temperatures;
- Rising sea levels; and
- Other changing weather patterns, such as *stronger and more frequent* hurricanes, and *more frequent* flooding and drought periods.

# OVERVIEW

## Fossil Fuel:

**All CARICOM Member States depend *heavily* on fossil fuels to supply their energy demand.**

The fifteen CARICOM Member States could be classified into the following broad groupings based on their import and export capabilities of petroleum derived products:

### **1. HYDROCARBON PRODUCERS**

**(i) Net energy exporters of petroleum, petroleum related products and natural gas. Trinidad and Tobago is the only major producer and net energy exporter within the region.**

**(ii) Other energy producers, such as Suriname, Barbados and Belize, which are producers of crude oil that supply some of their domestic needs but are overall net importers.**

### **2. NON-HYDROCARBON PRODUCERS**

**All other CARICOM Member States are non-producers of hydrocarbons; they are net importers.**

# Consumption of Petroleum Products

## **Primary Energy Consumption:**

**Primary consumption of petroleum products within CARICOM in 2007 totalled 220.46 million boe, with Trinidad and Tobago accounting for 148.96 million boe.**

**•Meanwhile total primary energy consumption per capita in CARICOM for 2007 was 319.38 boe, with Trinidad and Tobago accounting for 120.83 boe of the total.**

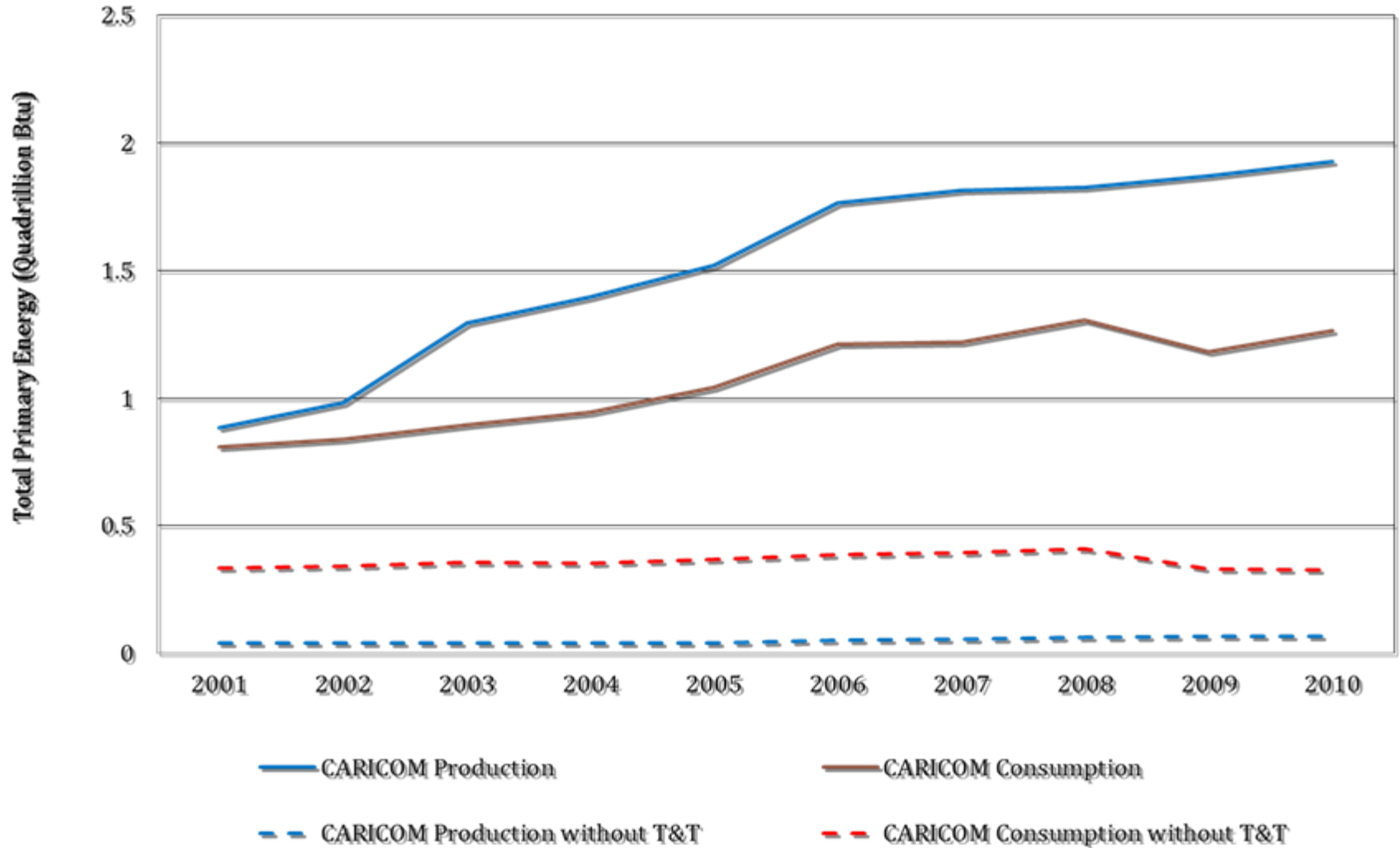
## **Petroleum Products:**

**Consumption of petroleum products within CARICOM, totalled 224,000 boe per day with Jamaica leading at 77,000 boe per day, followed by Trinidad and Tobago with 43,000 boe and the Bahamas with 36,000 boe per day respectively.**

**•Distillates and residual fuel oils accounted for 57% of all the petroleum products consumed in 14 of the 15 CARICOM Member States in 2008.**

# CARICOM Energy Production and Consumption Trends

Source: CARICOM Sustainable Energy Roadmap and Strategy (2013)

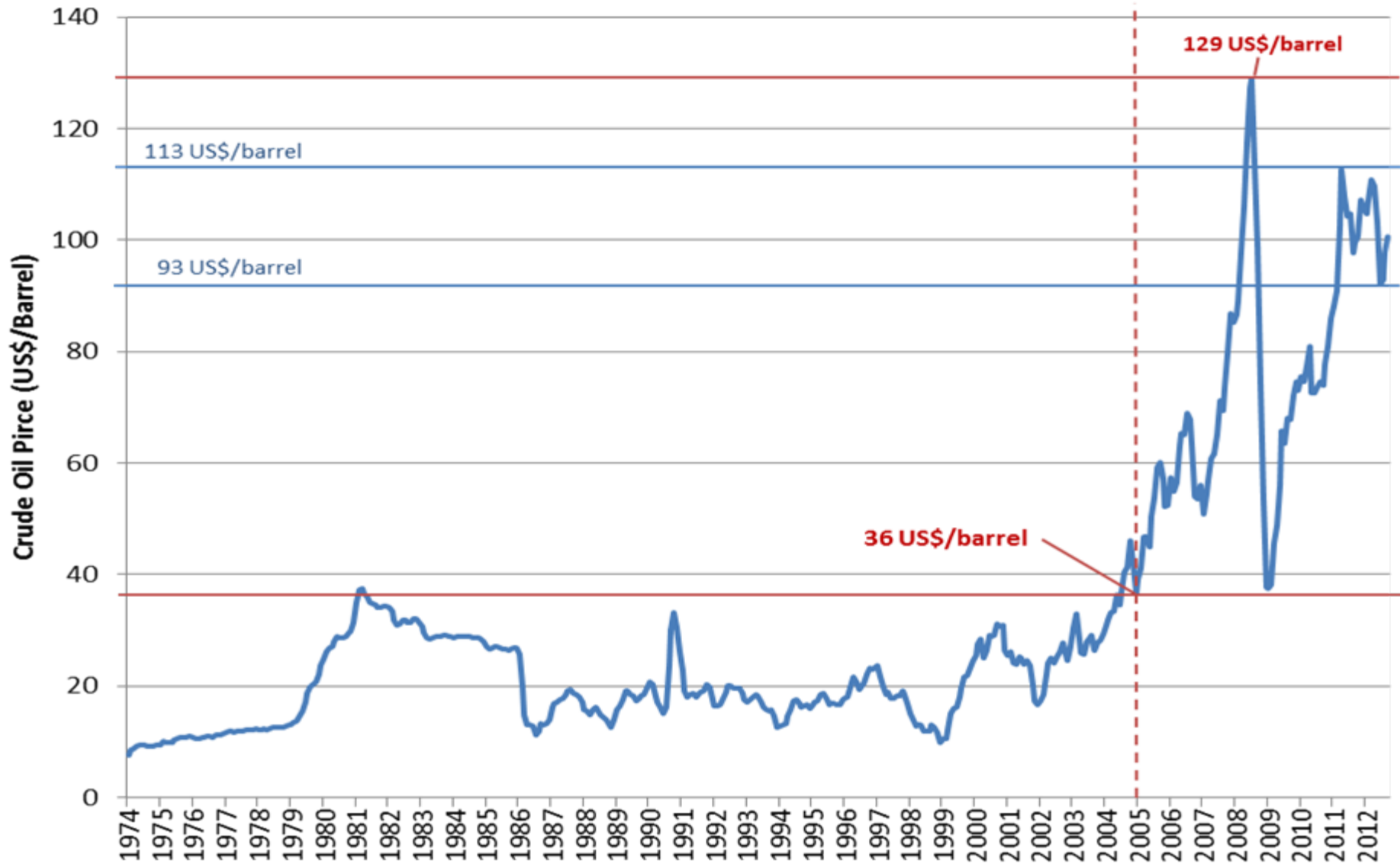


**CARICOM (excluding Haiti and Montserrat) Annual Liquid Fuel Consumption (2011)**  
**Source: SIDS DOCK. Capacity Building Strategy (2013)**

Country	Liquid Fuel Consumption (ooo's barrels)			
	Total	Power Generation	Transportation	
			Gasoline	Diesel Oil
Antigua and Barbuda	1,251.1	560.2	304.5	386.4
The Bahamas	9,408.2	4,750.2	1,692.0	2,966.0
Barbados	2,726.3	1,241.6	811.7	673.0
Belize	1,148.9	142.9	354.7	651.3
Dominica	328.8	74.9	106.4	147.5
Grenada	647.8	202.5	163.4	281.9
Guyana	3,403.0	744.0	747.5	1,911.5
Jamaica	14,602.9	6,225.9	4,398.0	3,979.0
St. Kitts & Nevis	548.8	187.4	132.1	229.3
St. Lucia	1,390.2	456.4	351.4	582.4
St. Vincent & The Grenadines	666.5	155.6	167.3	343.6
Suriname	2,073.4	493.0	634.6	945.8
Trinidad and Tobago	5,056.6	18.7	3,101.3	1,936.6
<b>Total CARICOM</b>	<b>43,252.5</b>	<b>15,253.3</b>	<b>12,964.9</b>	<b>15,034.3</b>

# Refiner Acquisition Cost of Crude Oil, Composite (1974-2012)

Source: U.S. Energy Information Administration, Energy Review (December 2012)



# TRANSPORT

**Transportation's impacts in the Caribbean are sometimes overlooked because of the sector's complexity and the general lack of available data on its status.**

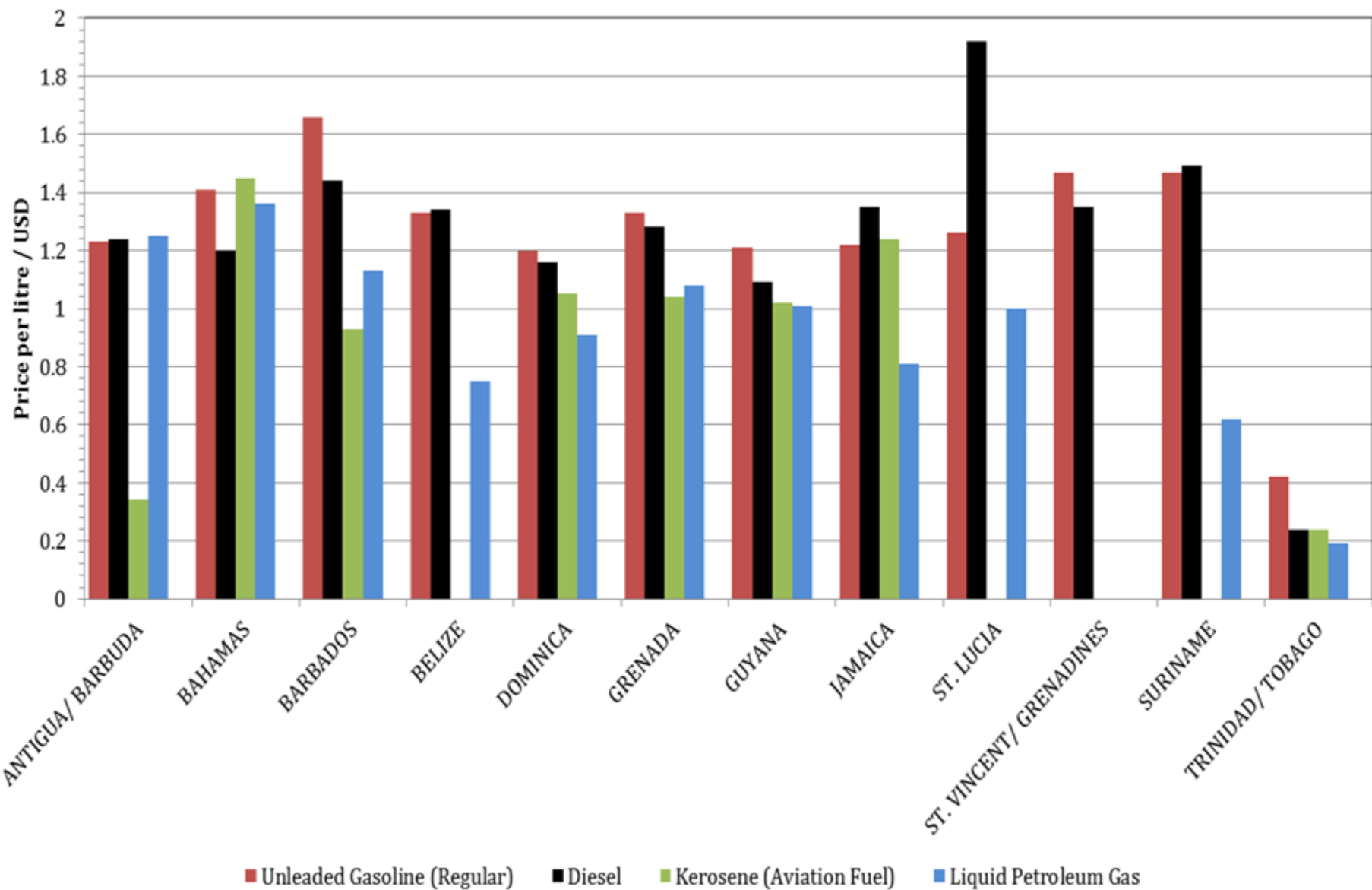
**•In addition to substantial fuel requirements and significant greenhouse emissions, the sector can have negative effects on local pollution, noise, congestion, health, and safety if it is not well designed and regulated.**

**•These impacts influence the overall costs of goods and services in the region and have been recognized as one of the “most important barrier[s] to development for small islands”.**

**•Detailed information about vehicle and fuel use in the transport sector is mostly disorganized or uncollected, making analysis and planning difficult. To address the significant gaps in transportation data across the region, extensive research and stakeholder collaboration are needed to fully assess the impacts of various transport options, *especially the large volume of recreational transport associated with the tourism industry in some countries.***

# Retail Prices for Petroleum-derived Liquid Fuels (USD per litre), February 2013

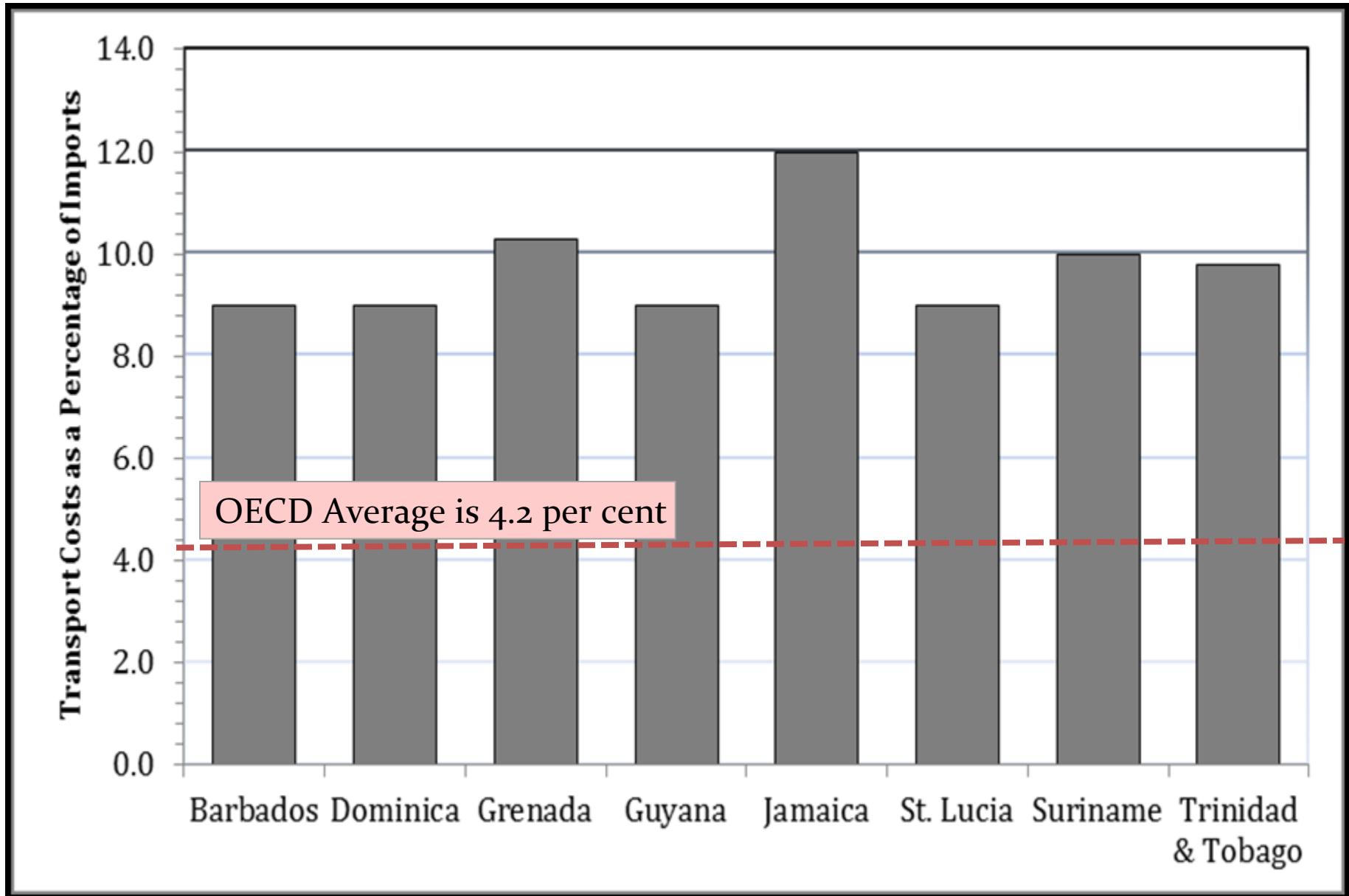
Source: CEIS (2013)





## Transport Costs as a Percentage of Imports for Select CARICOM States

Source: CARICOM Energy Unit (2012)



# ELECTRICITY

## Electricity Consumption:

Electricity consumption increased in CARICOM Member States over the period 1998 - 2007. The contribution of renewable energy in CARICOM is miniscule compared to the vast potential available; renewable energy contributed about 9% to the total primary energy consumed between 1998 to 2007.

## Electricity markets in selected CARICOM Countries:

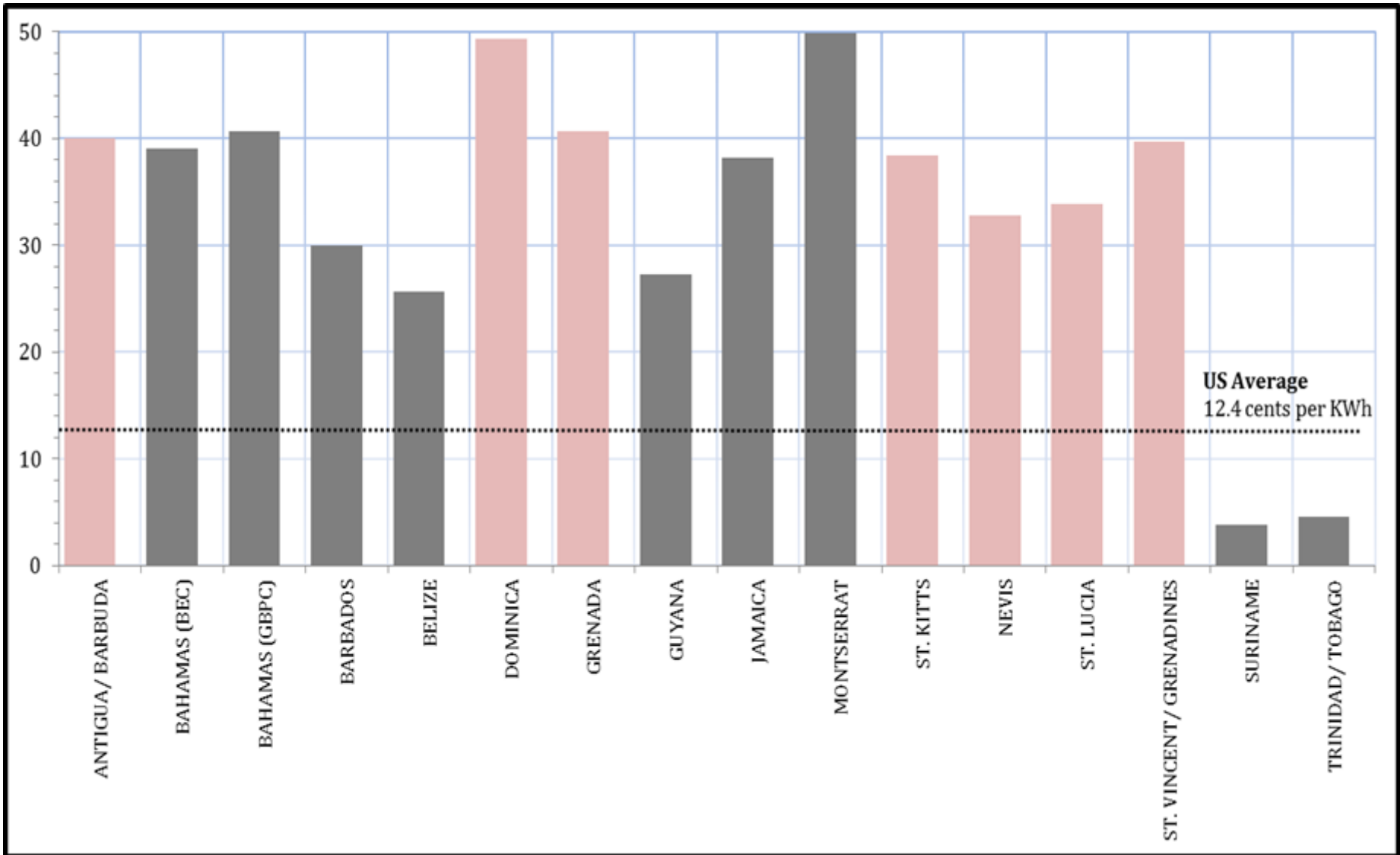
The electricity market is characterized by a mix of state-owned and private or partially private utilities. All of the utilities within CARICOM are vertically integrated except for Trinidad and Tobago where generation is unbundled from transmission and distribution.

## Electricity Costs:

Caribbean electricity prices rank *among the highest in the world*, largely because of high operating costs linked to rising fuel prices, inefficient T&D networks, and the inability to benefit from economies of scale given the small market size of individual island states and small populations in the large mainland territories. Geographic remoteness, steep topography, and other characteristics typical and adds to costs. Even so, electricity tariffs vary widely throughout the CARICOM region.

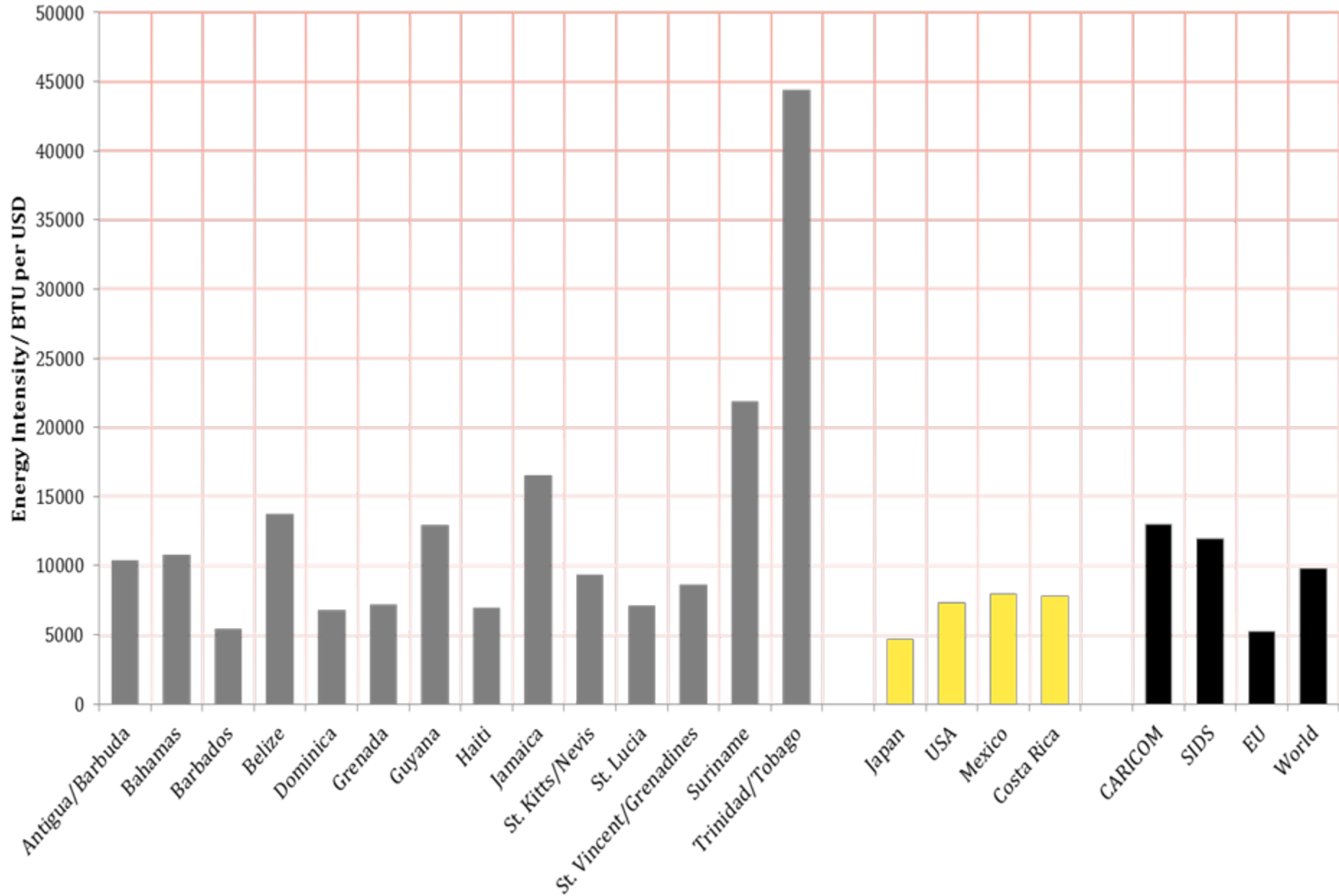
# Average Retail Prices for Electricity (US cents per kWh), 2012

Source: CARILEC (2013)

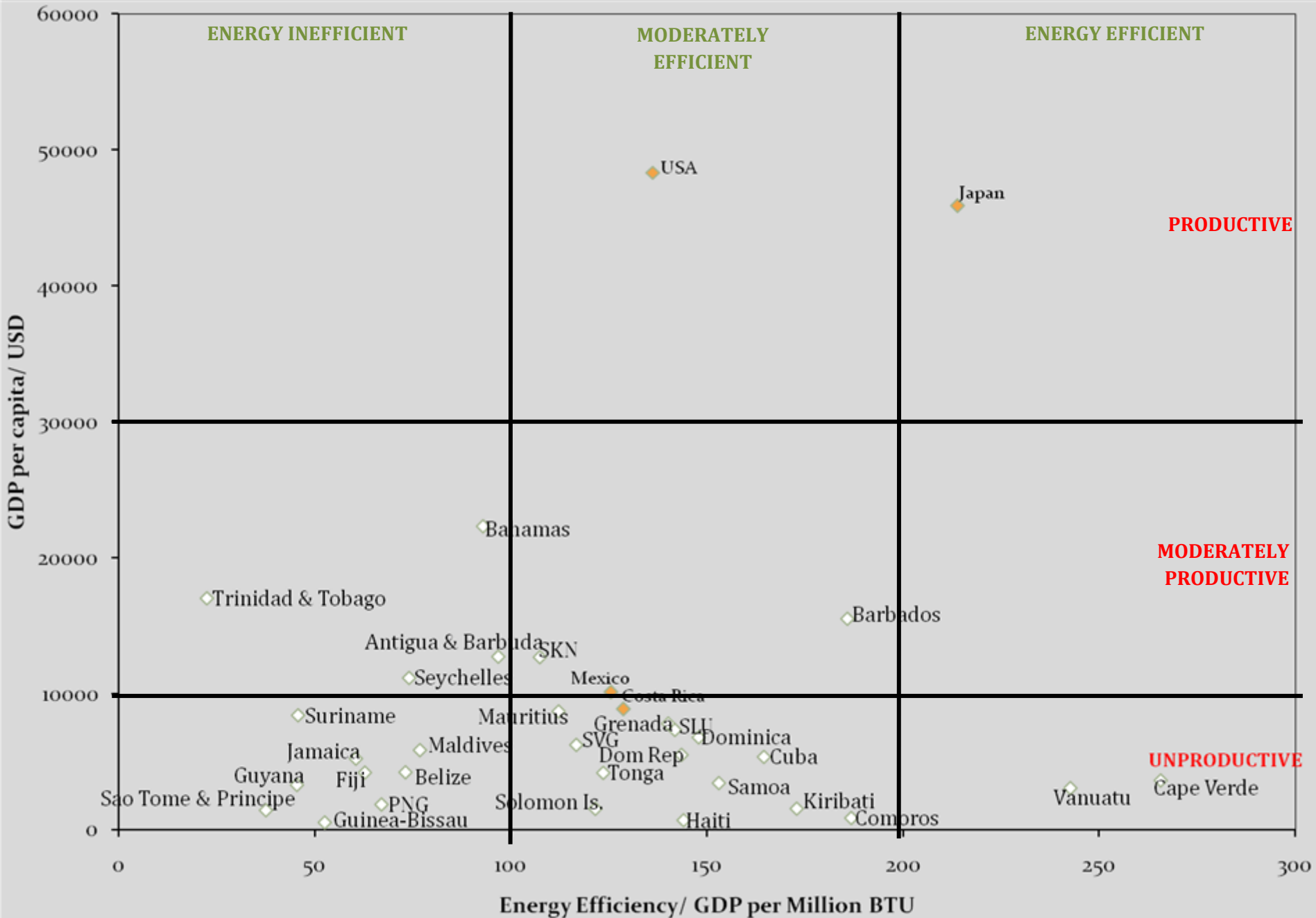


# Energy Intensity, CARICOM States (2012)

Source: UN Statistics Database



# SIDS Energy Productivity Chart



# Predicted Climate Change Effects

- **Hotter temperatures, sea-level rise and increased hurricane intensity.**
- **Increased hurricane damages, loss of tourism revenue, and infrastructure damages.**
- **Estimated cost under BAU is US\$22 billion annually by 2050 and US \$46 billion by 2100, i.e. 10 per cent and 22 per cent of GDP respectively**

# Within the Caribbean

- **Caribbean population is largely concentrated in coastal areas**
- **Much of the infrastructure may not be able to withstand significantly stronger winds, deeper incursions forceful ocean surges**
- **Accelerated erosion of coastal beaches, land and protective mangroves**
- **More frequent and longer droughts**
- **Coral reef habitats are stressed by warmer waters**

## SIDS-appropriate Sustainable Energy Supply Technology, Caribbean

Technology	Solar PV	Wind	Hydro - <i>Run-of- river</i>	Geo. <i>Binary</i>	Biomass- <i>Gasification</i>	Biomass- <i>Anaerobic</i>	Biomass- <i>Liquid biofuels</i>	OTEC	Ocean – <i>Current</i>
Countries	<b>Caribbean</b>								
Antigua and Barbuda	X	X			X	X		X	X
Bahamas	X	X			X			X	X
Barbados	X	X			X	X		X	X
Belize	X	X	X		X	X	X *		
Dominica	X	X	X	X	X	X		X	X
Dominican Republic	X	X	X		X	X	X *	X	X
Grenada	X	X	X	X	X	X		X	X
Jamaica	X	X	X		X	X	X *	X	X
St. Kitts and Nevis	X	X		X	X	X		X	X
St. Lucia	X	X	X	X	X	X		X	X
St. Vincent and the Grenadines	X	X	X	X	X	X		X	X
Suriname	X	X	X		X	X	X*		
Trinidad and Tobago	X	X	X		X	X		X	



# Estimated “Commercially Developable” Renewable Energy Potential in CARICOM

Source: CARICOM Sustainable Energy Roadmap and Strategy (2013)

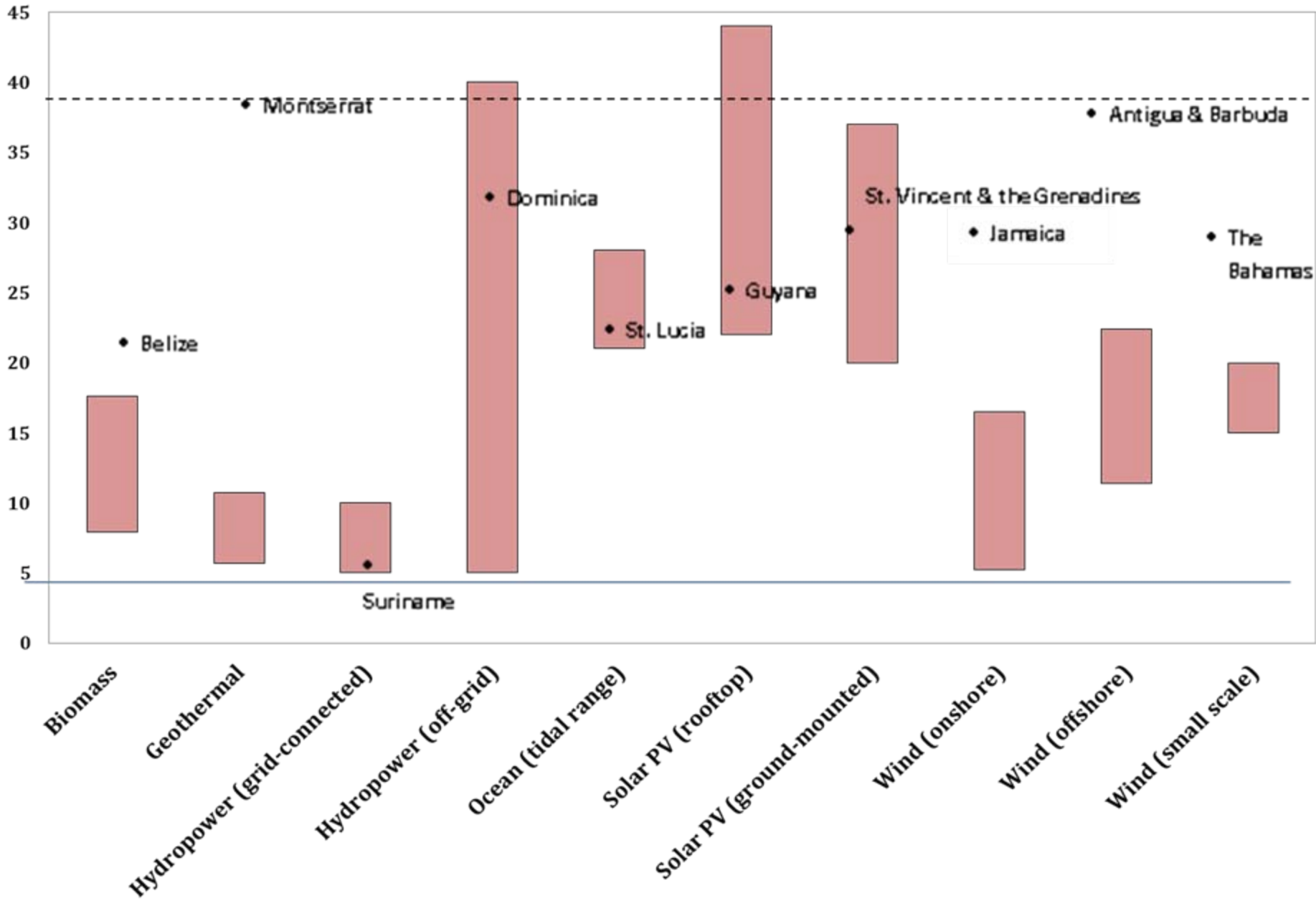
COUNTRY	ESTIMATED “DEVELOPABLE” POTENTIAL FOR RENEWABLES/MW						Total
	Geothermal	Hydro	Solar PV	Wind	Waste	Other	
Antigua & Barbuda	None	None	27	400	Negligible	Unknown	427
The Bahamas	None	None	58	15	20	Unknown	93
Barbados	None	None	26	10	40	Unknown	76
Belize	None	Limited	50	20	32	Unknown	102
Dominica	300	17	45	30	Negligible	Unknown	392
Grenada	200	1	20	5	Negligible	Unknown	226
Jamaica	None	113	650	70	45	Unknown	878
St. Kitts & Nevis	300	None	16	5	Negligible	Biomass: 10	331
St. Lucia	170	1	36	40	Negligible	Unknown	247
St. Vincent & The Grenadines	100	10	23	8	Negligible	Biomass: 4	145
Suriname	None	700	100	None	14	Biomass: 200	1,014
Trinidad & Tobago	None	None	308	50	5	Unknown	363
<b>Total</b>	<b>1,070</b>	<b>842</b>	<b>1,359</b>	<b>653</b>	<b>156</b>	<b>214</b>	<b>4,294</b>

<sup>[1]</sup> Belize already generates around 40 per cent (ca. 32 MW) of its electricity from hydro-power sources.

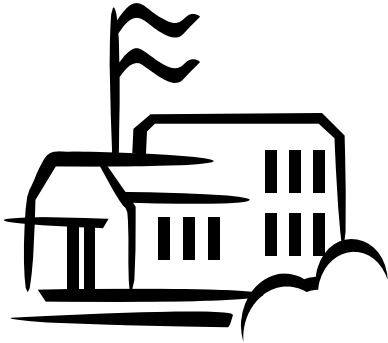
<sup>[2]</sup> EBS (2010). Projections based on 4 MW of rice husk in Nickerie and 10 MW of sugarcane bagasse in Wagenigen.

# Average Power Generation Cost for Renewables

*CARICOM Electricity Tariffs are compared*

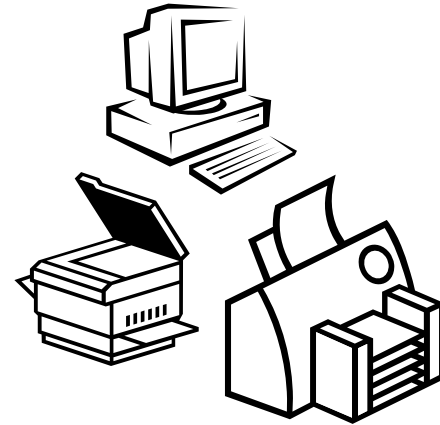


# Some Opportunities for Efficient Energy-use



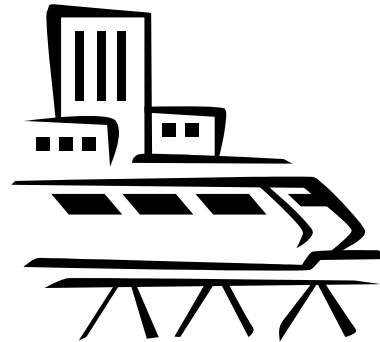
Buildings,  
**up to 30%**

- Building envelope
- Lighting efficiency
- HVAC efficiency



Office equipment,  
**up to 35%**

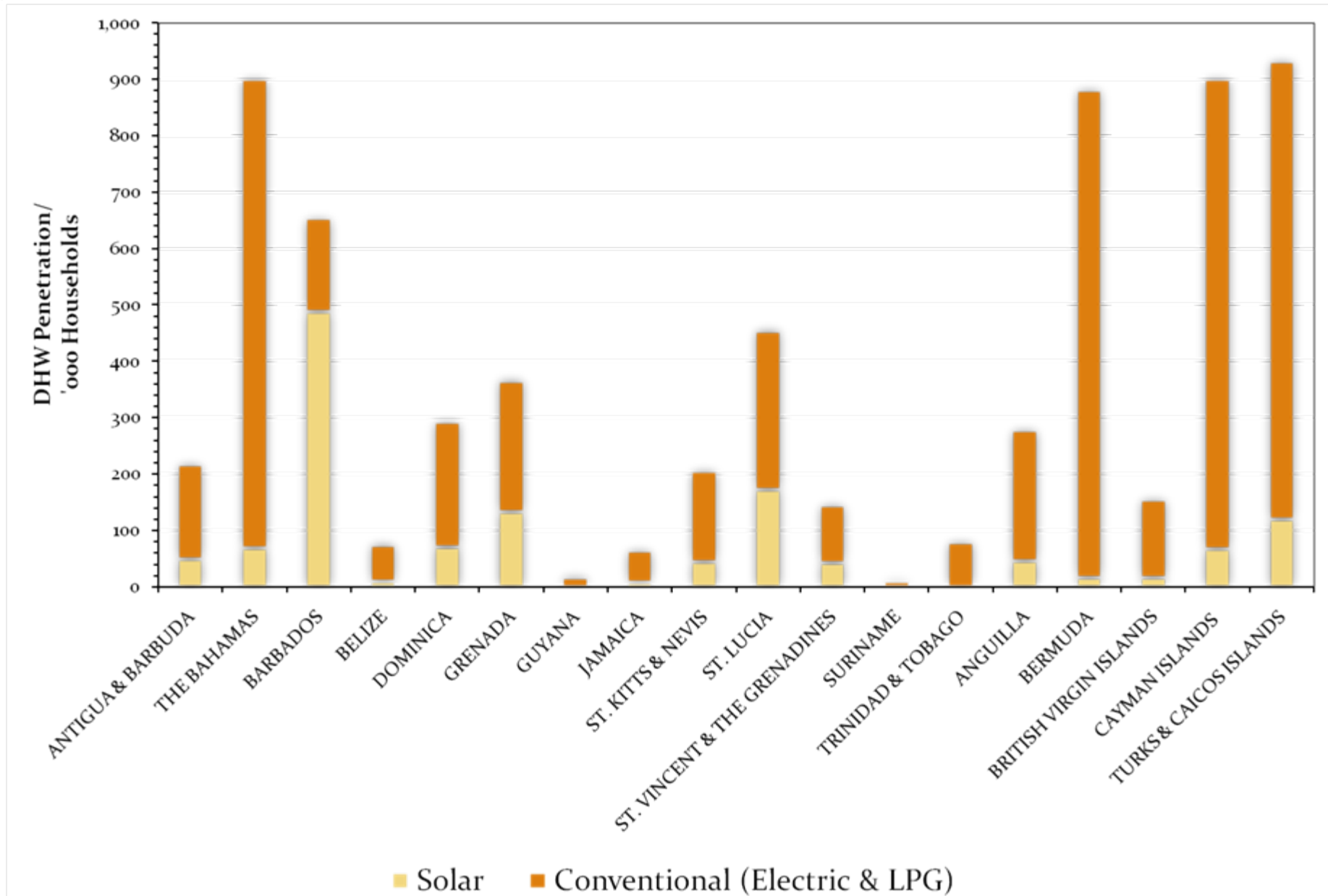
- Computers, printers, etc.
- Photocopiers
- Energy management systems



Transport,  
**up to 20%**

# Water Heating Penetration, Domestic

Source: CARICOM/EU Study (2011)



# Some R3E Barriers in CARICOM

- There is an **over-focus** on “large-scale” RE generation.
- There is **not enough focus** on the transport sector.
- The process of **energy planning** is **predominantly driven by the electric utility**.
- The **utility regulator typically lacks resource and capacity** to with which to conduct “realistic” assessments and make judicious recommendations.
- There is a **lack of cross-sector harmonization**.
- There are significant **benefits to be derived from *energy efficiency* and “*avoided generation*”** applications.

## Split-Incentive Barrier



# Barriers to RE Project Financing

**Barrier:**  
Lack of Capacity

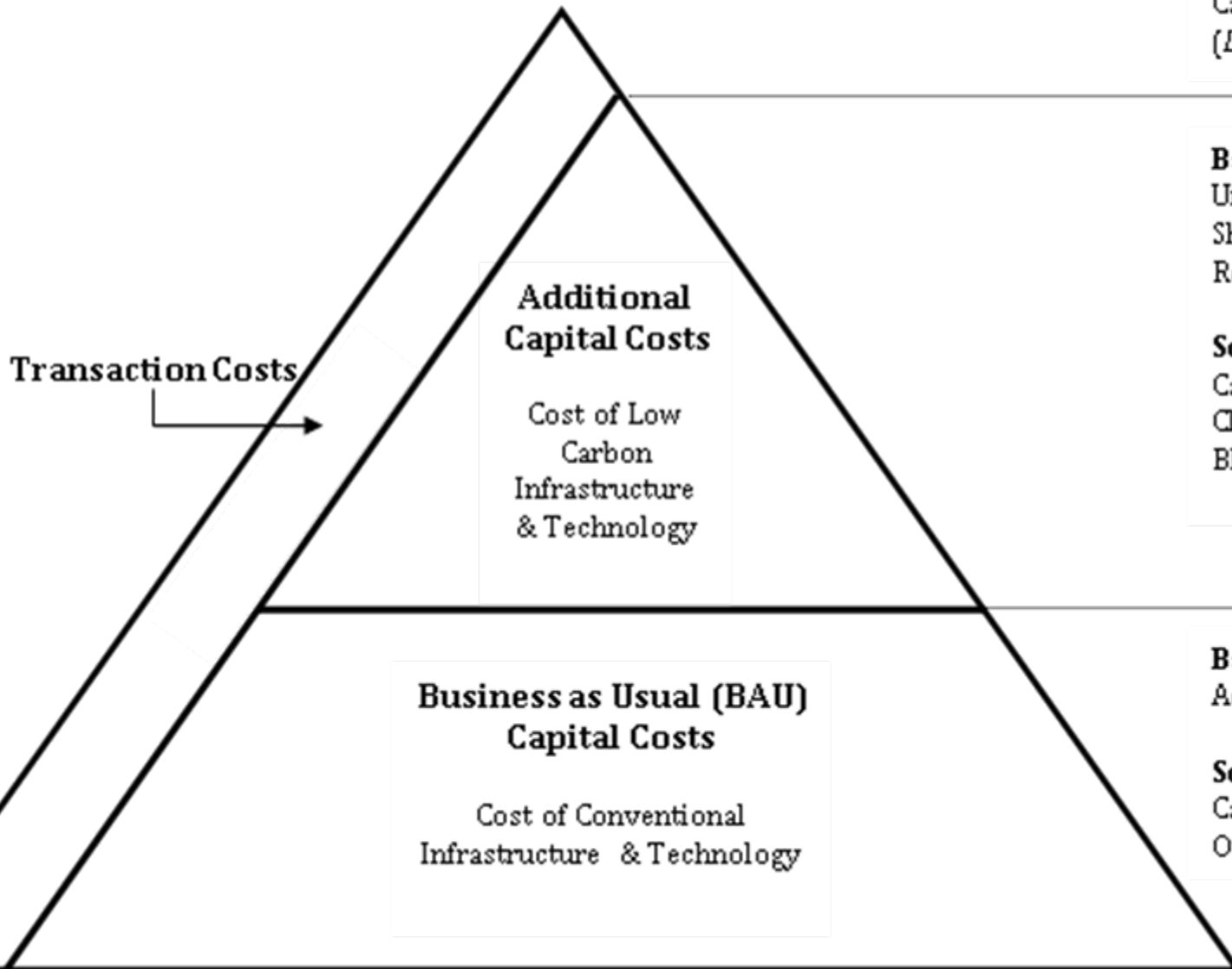
**Solution:**  
Capacity Building  
(*Learning by doing*)

**Barrier:**  
Unattractive  
Short-term Financial  
Returns

**Solutions:**  
Carbon Markets;  
Climate Green Funds;  
Blended Grant-Loans

**Barrier:**  
Access to Finance

**Solutions:**  
Capital Markets;  
Overseas Assistance



# CARICOM EE Policies Status

COUNTRY	ENERGY EFFICIENCY
Antigua and Barbuda	Improve <u>energy efficiency</u> by <b>30% over 15 years</b>
The Bahamas	None
Barbados	Reduce <u>electricity consumption</u> by <b>22% compared to BAU by 2029</b>
Belize	Improve <u>energy efficiency and conservation</u> by at least <b>30% by 2033</b> (proposed)
Dominica	None
Grenada	None
Guyana	None
Haiti	None
Jamaica	Reduce <u>Energy Intensity</u> from <b>21,152 to 6,000 BTUs per USD of GDP by 2030</b>
Montserrat	None
St. Lucia	None
St. Kitts and Nevis	Reduce <u>projected electricity demand</u> <b>20% by 2015</b> (resulting in peak demand of 45.7 MW)
St. Vincent and the Grenadines	Reduce <u>projected increase in peak demand</u> by <b>5% by 2015 and 10% by 2020</b>  Reduce <u>electricity generation</u> by <b>15% by 2020</b>
Suriname	None
Trinidad and Tobago	None

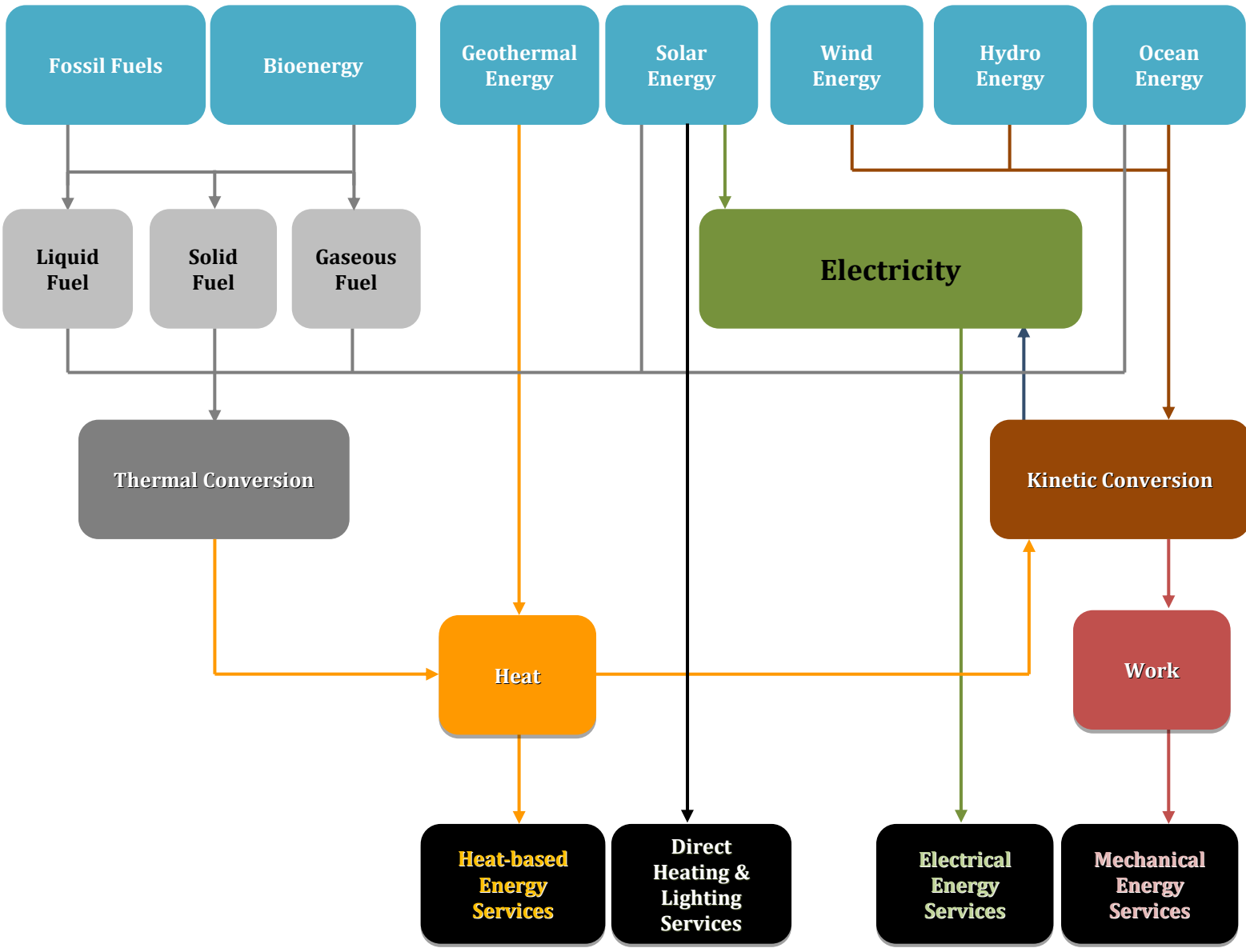
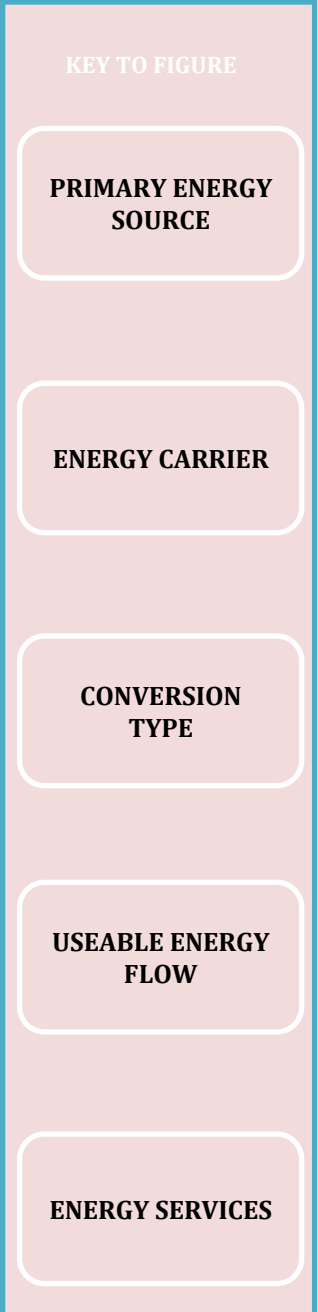


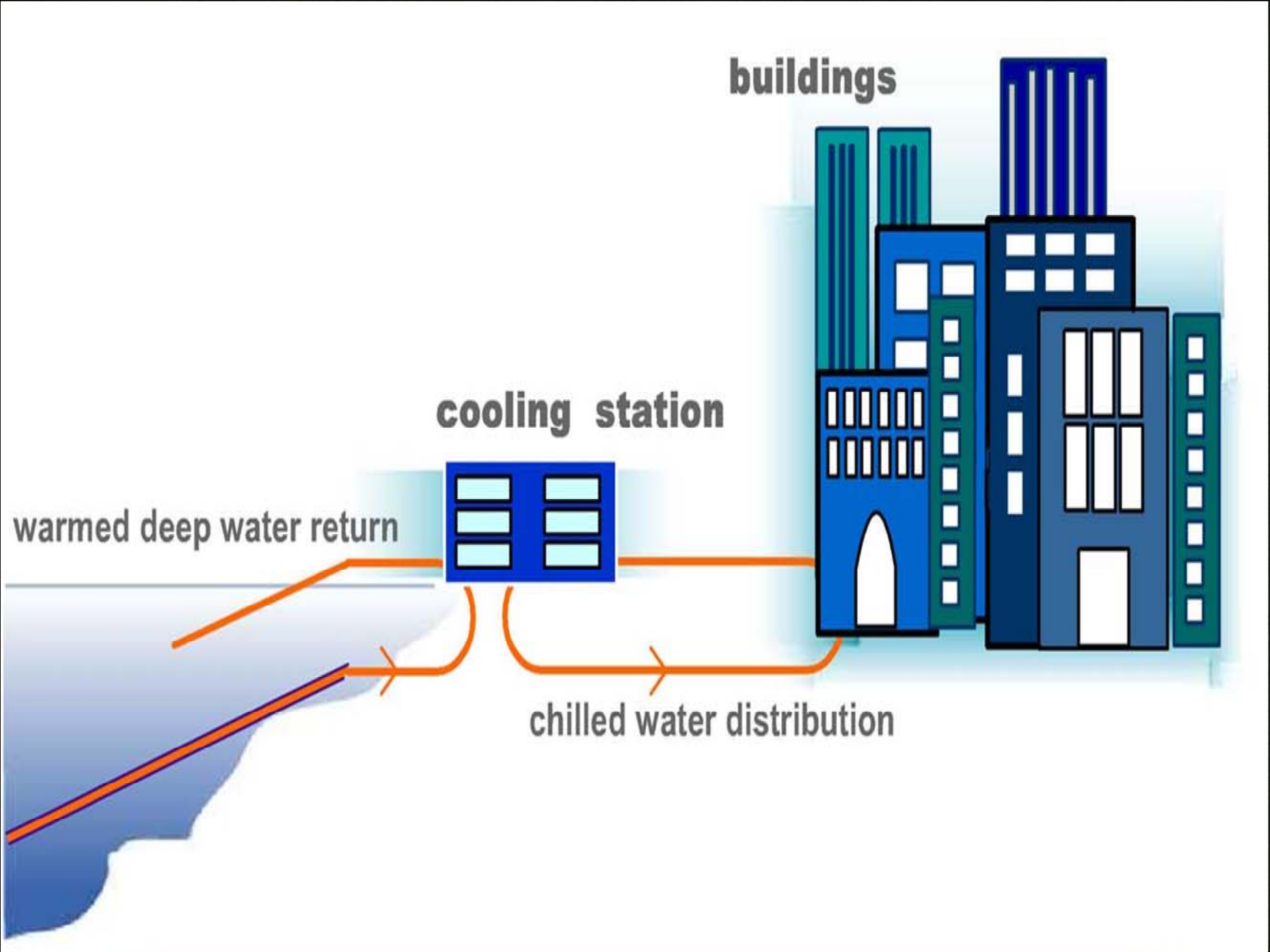
# CARICOM EE Support Status

	National Energy Efficiency Standards	Tax Credits	Tax Reduction/Exemption	Public Demonstration	Prohibited Use/ Import of Incandescent Bulbs	Appliance Labelling Standards
Antigua & Barbuda	Under Review					
The Bahamas						
Barbados		X	X			Under Review
Belize						
Dominica	Under Review	Under Review		Under Review		
Grenada						
Guyana			X	X	X	
Haiti						
Jamaica	Under Review		X			X
Montserrat						
St. Kitts & Nevis						
St. Lucia			Under Review			X
St. Vincent & the Grenadines			Under Review			
Suriname	Under Review				Under Review	
Trinidad & Tobago	Under Review		X	Under Review	Under Review	Under Review

Crude Oil Price (US\$)	Percentage of Petroleum Import Reduction					
	Base Case Annual Expenditure by SIDS (Billions US\$)	Resulting Level of Savings From 10 Percent Reduction (Billions of US\$)	Resulting Level of Savings From 20 Percent (Billions of US\$)	Resulting Level of Savings From 30 Percent Reduction (Billions of US\$)	Resulting Level of Savings From 50 Percent Reduction (Billions of US\$)	Resulting Level of Savings From 60 Percent Reduction (Billions of US\$)
30	9.24	0.924	1.844	2.772	4.62	5.544
40	12.32	1.232	2.464	3.696	6.160	7.392
50	15.40	1.540	3.080	4.620	7.700	9.400
60	18.48	1.888	3.776	5.664	9.440	11.328
70	21.56	2.156	4.132	6.468	10.78	12.936
80	24.64	2.464	4.928	7.392	12.32	14.784
90	27.72	2.772	5.540	8.316	13.86	16.632
100	30.80	3.080	6.160	9.240	15.40	18.480
110	33.88	3.388	6.776	10.164	16.94	20.328
120	36.96	3.696	7.392	11.088	18.48	22.176
130	40.04	4.004	8.008	12.012	20.02	24.024
140	43.12	4.312	8.624	12.936	21.56	25.872
150	46.20	4.620	9.240	13.860	23.10	27.720

Various paths of energy from source to service; lines indicate possible energy pathways.





**buildings**

**cooling station**

warmed deep water return

chilled water distribution