



International Center for Environmental Studies and Sustainable Development (CIEMADeS)

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Electricity Interconnection within CARICOM: Barriers / Constraints and Proposed Solutions to 'Greening'



WHAT IS THE CARIBBEAN COMMUNITY?

Inter-governmental Organization

Established by the Treaty of Chaguaramas

Treaty signed on July 4th 1973 - effective August 1, 1973

Common Market transformed into Caribbean Single Market and Economy

Revised treaty signed in July 2001

Common Market established

CARICOM's objectives *inter alia* are:

Foster regional integration and collaboration

Promote enhanced trade and economic relations among Members



CARICOM MEMBER STATES

Total land area –
465,000 km²

Total population –
16.7 million

GDP / per capita –
ranges from:
US\$ 21,529
(Bahamas) –
US \$733 (Haiti)*

Type of
economies:

- Agricultural
- Service oriented
- Industrial



* Source: IMF 2009



CARICOM ENERGY SITUATION

Vast potential for renewable energy deployment

Heavy reliance on fossil fuel for electricity generation and general energy use

All CARICOM countries are Net importers of petroleum except Trinidad and Tobago

Fuel accounts for about 40% of national budget

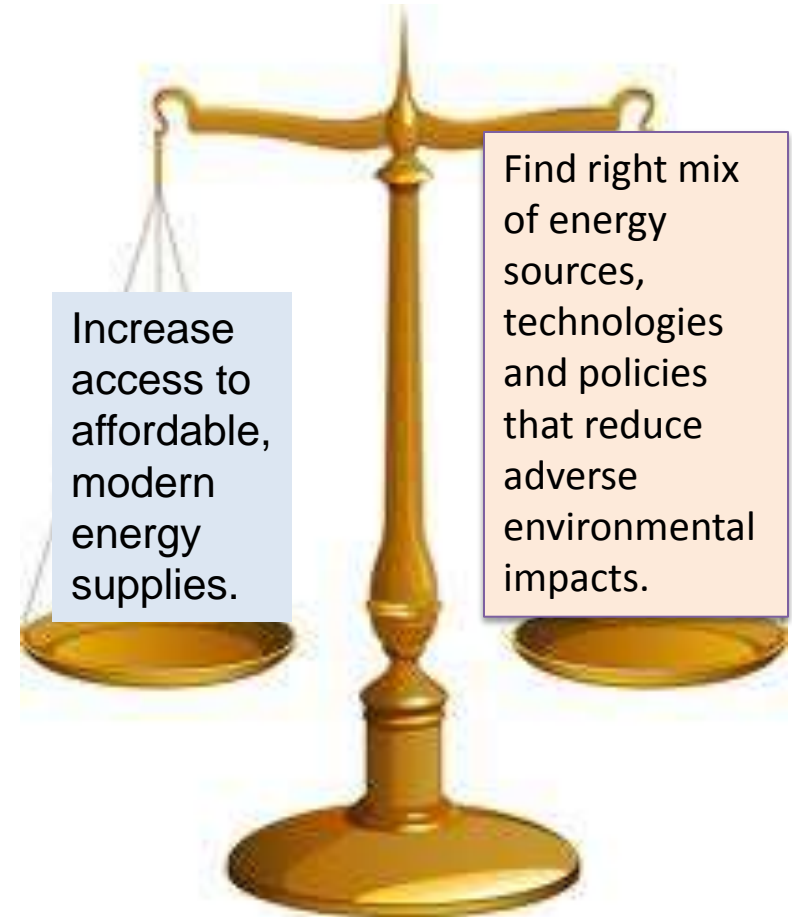
Volatility of oil prices is a threat!!!

GROWING ENERGY DEMAND



ENERGY AND CLIMATE CHANGE

- Energy is key to economic and social development – 2 billion people around the globe live in energy poverty.
- Energy can contribute to environmental problems in the way it is exploited, transported and used.





ENERGY AND CLIMATE CHANGE

- CARICOM countries are carbon producers – however miniscule.
- Need to contribute to the reduction of CO₂ as part of the global programme to address the issue of climate change – clean energy.
- Resources available to support sustainable energy development as part of the Climate Change agenda.
- Need to position Climate Change issues to access these resources:
 - to enhance mitigation;
 - facilitate development of low carbon development in Member States – *'Greening of the Caribbean'*.



MAJOR CLEAN ENERGY RESOURCES IN CARICOM – ELECTRICITY GENERATION

NATURAL GAS:

- Trinidad and Tobago is a major producer of natural gas.
- Production far exceeds the domestic consumption.
- **Liquefied Natural Gas** is exported to overseas markets including Puerto Rico and Dominican Republic.

GEOHERMAL:

- Most OECS countries.
- Grenada's potential is estimated at 400 MW - little or no major exploration.
- Montserrat - feasibility study potential completed.
- St. Kitts and Nevis - exploration activities underway. Potential estimated at 300 MW .
- Dominica - estimated potential of 100 MW . Started drilling slim hole exploratory wells.

HYDROPOWER:

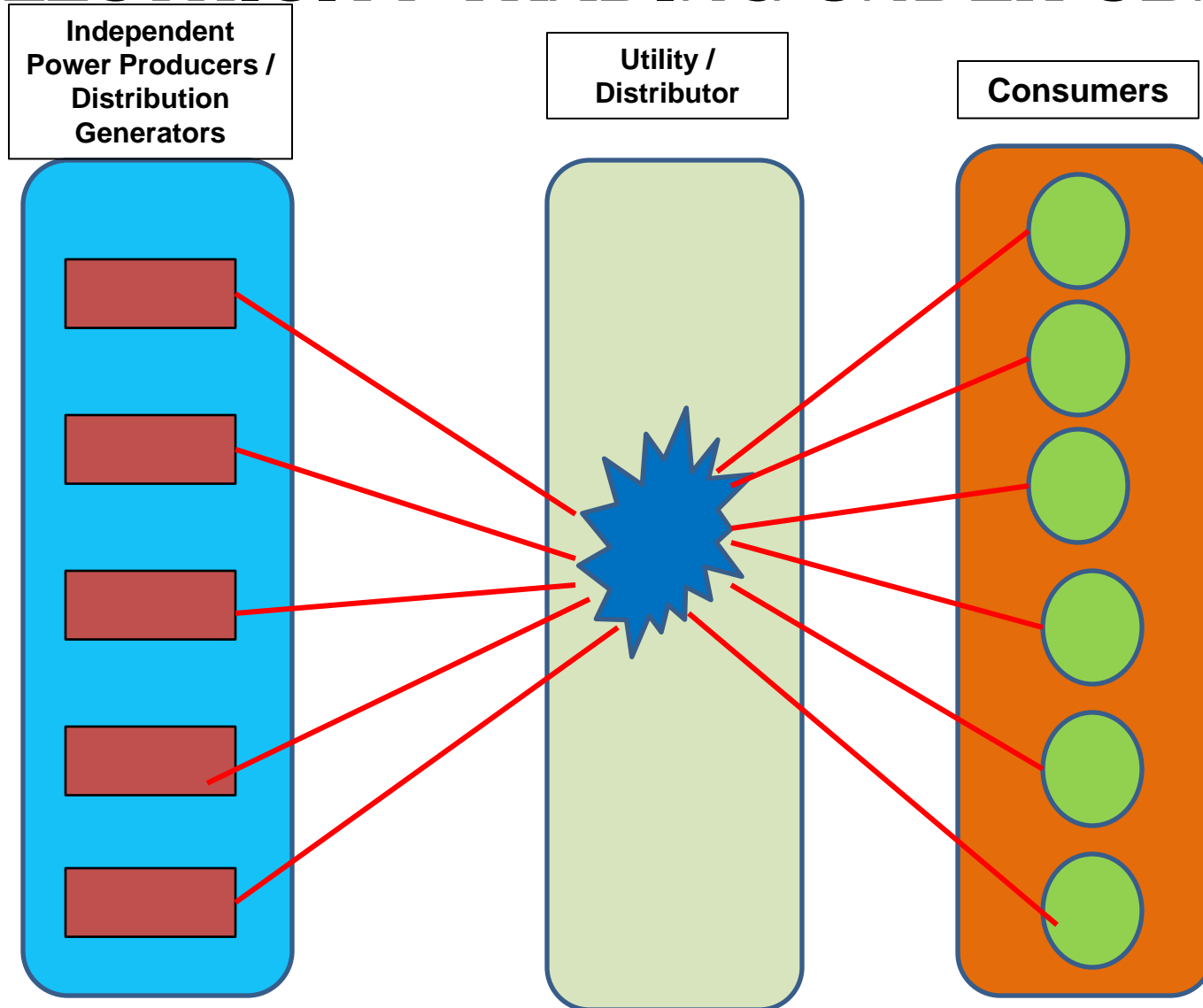
- Guyana has 7000 MW potential, enough to supply the entire CARICOM.
- In Belize has over 32 MW on the grid.
- Suriname generates between 450 MW - 650 MW.
- Haiti has installed capacity of 47.1 MW.
- Dominica, St. Vincent & the Grenadines.

WIND:

- 20 MW Wigton wind farm in Jamaica with 18 MW expansion.
- 2.2 MW wind farm commissioned in Maddens, Nevis in August 2010.
- 3 MW windfarm at Munroe, Jamaica supplies the grid.
- Wind assessment ongoing in a number of the CARICOM Member States.



ELECTRICITY TRADING UNDER SBM



The Red line represents electricity trade



CONSTRAINTS TO RE DEPLOYMENT

**Some renewables
not viable on a
small scale or on a
standalone country
basis:**

Small market
size, low density
consumption;

Low purchasing
power;

Relatively low
industrial
demand.

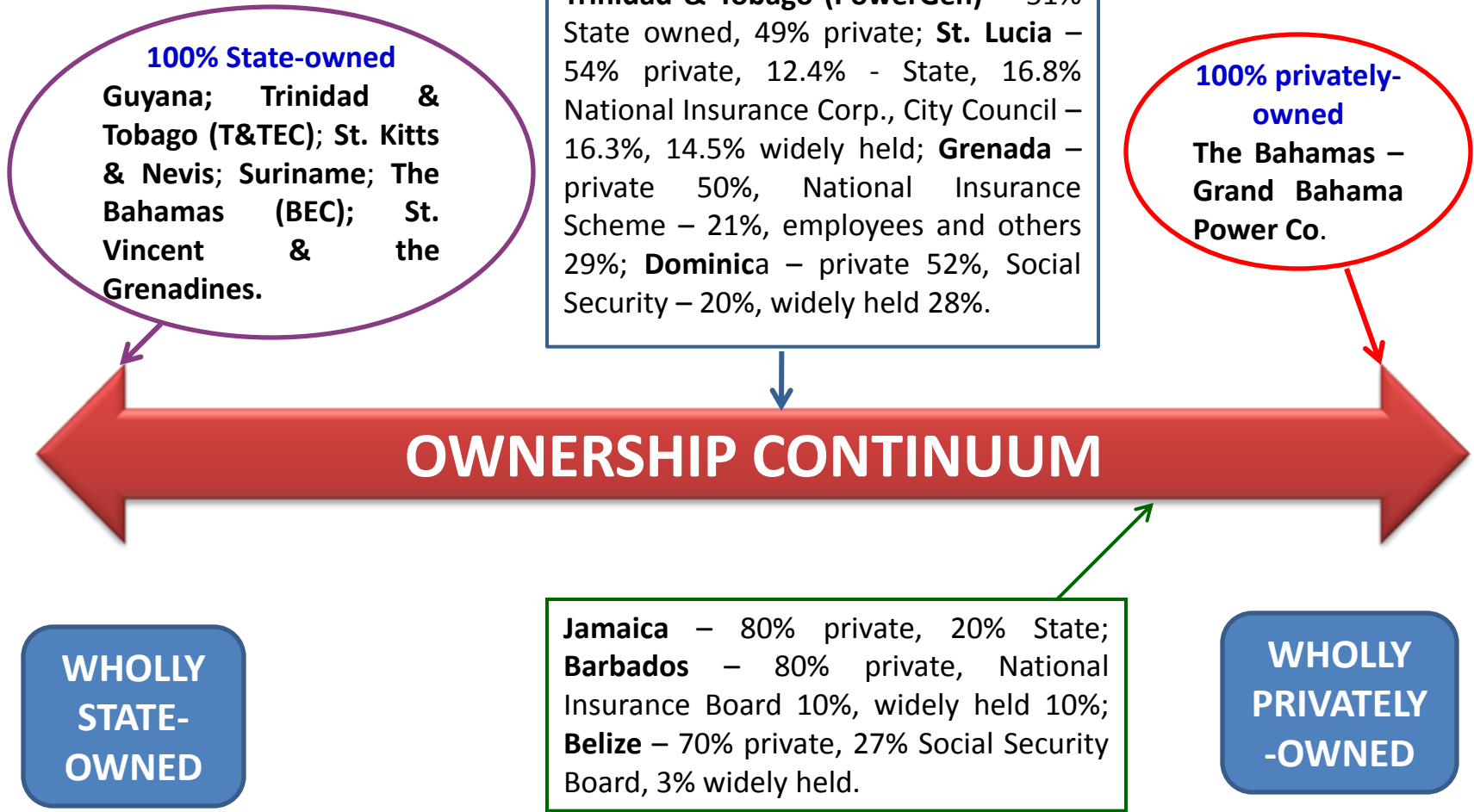


STATUS OF SECTOR LAWS

- ◆ Many of the existing laws are archaic – date back to over 50 years (**the Bahamas - 1959 Electricity Act; Barbados – 1899 Electric Light & Power Act; Jamaica – 1893 Electric Lighting Act; Trinidad & Tobago – 1946 Electricity Commission Act**).
- ◆ Do not include any provisions that:
 - promote competition in generation,
 - allow for self generation,
 - foster renewable energy development,
 - cater for grid connection at distribution end,
 - energy efficiency,
 - technical and safety issues, and
 - cross border purchase and supply of electricity.
- ◆ Legislative reform needed.



MARKET STRUCTURE OF ELECTRIC UTILITIES IN CARICOM





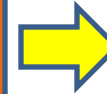
CURRENT APPROACHES TO REGULATION

Independent Regulator

GOVERNMENT
(sets policy and gives policy directions)

Barbados
Belize
Dominica
Guyana
Jamaica

INDEPENDENT REGULATOR
(tariff setting – retail and bulk; setting and monitoring quality of service and performance standards; licensing new entrants; setting rules for interconnection; ensuing protection of the environment; etc.)



UTILITY
(comply with licence obligations)

Line Ministry

REGULATOR
(lower levels of independence; limited scope of authority; inadequate resources)

GOVERNMENT
(sets policy and gives policy directions)

Antigua and Barbuda
The Bahamas
Grenada
St. Kitts & Nevis



St. Lucia
St. Vincent & the Grenadines
Suriname

UTILITY
(comply with licence obligations)



BENEFITS OF ENERGY INTEGRATION

- Lower energy prices and increased system reliability (i.e. the n-2 rule - generating plants in operation must at all times be able to carry the full load)
 - This requires significant spare capacity, creating burden on the small utilities and consumers as this translates to high electricity prices.).
- Security of energy supplies.
- Economies of scale.
- Strengthen regional cooperation integration and energy trade (Art. 15 (2) (f) – Revised Treaty).
- Reduce cost of investments.



Benefits cont'd

- Enhance economic feasibility of large-scale RE developments.
- Reduce consumption of fossil fuels and CO₂ emissions.
- Enhance universal access to electricity in Member States which have unserved population.
- (Revised Treaty promotes regional harmonisation and energy integration).



Relevant provisions of Revised Treaty

- **Article 52 (8):** For the purpose of this Article, "production integration" includes: *(a) the direct organisation of production in more than one Member State by a single economic enterprise;*

(Endorsement for the integration of Member States through transmission lines for distribution of electricity produced in one country?)

- **Article 74:** *The COTED shall promote the modernisation of government bureaucracies by, **inter alia**: (b) removing impediments and improving the regulatory framework for economic enterprises at national and regional levels;*

(Backing for independent regulatory structure at the national and regional levels to enhance commercial enterprises including electricity generation)



BARRIERS TO INTEGRATION OF TRANSMISSION FACILITIES

Non-existing inter-island/country transmission infrastructure.

- Need for a regional CARICOM strategy for integrating electricity markets.

Lack of financing by utilities / lack of confidence by investor.

- Requires commitment from policy and decision makers, public and private sector and multilateral organizations.

Absence of legal and regulatory framework to support energy integration – predictable, transparent and non-discriminatory.

- Revise national laws to facilitate connection of non-domestic sources of electricity supplies to the national grid.
- Improve national and regional institutional regulatory regime. Significant regulatory oversight will be required to set rules and operational criteria.

Absence of Inter-Governmental and other inter-parties Agreements.

- Bilateral Agreements for cross border supply and purchase of electricity as contemplated by the Revised Treaty required.
- Multiparty agreements required amongst IPPs, utilities and other parties.



BARRIERS TO INTEGRATION OF TRANSMISSION FACILITIES

Lack of technical and organizational capacity to develop commercial agreements.

- Need for pooling of resources and sharing of information on systems requirements, load profile, generation cost, avoided cost etc.

Inadequate assessment of the technical and economic feasibility of transmission facilities (submarine cables and overhead transmission lines).

- Regional approach should be taken to leveraging support from multilateral and other international partners and the private sector in conducting more detailed assessments and analysis.

Diluted responsibility for energy sector management at decision and strategic making level in some Member States.

- Institutional reform needed particularly for the creation of dedicated Energy Ministries that could focus attention on the establishment of required infrastructure.



CARICOM ENERGY POLICY

Draft Policy developed by Task Force and submitted to Heads of Government in 2007.

Requested Energy Pricing Study to determine price build up and structure of pricing.

Study commenced in February 2010 – completed November 2010.

***Gap analysis* conducted.**

Key recommendations for revision presented to Council of Technical and Economic Development (COTED).

Draft CARICOM Policy currently being revised to take account of gaps.

Revised draft policy to be considered by Senior Energy Officials in May 2011.

Tabled before Community Council in May 2011.

Revised draft Policy to be presented to Conference of Heads of Government in July 2011.



CARICOM ENERGY POLICY Cont'd



Universal access to sustainable and secure supplies of energy



Diversification of energy sectors as a foundation for economic development



Optimization of domestic production of energy in an environmentally sound manner



Relationship between energy and international competitiveness of regional industries



Efficient and reduced use of energy in all sectors

Five pillars which underpin the regional policy



CARIBBEAN SUSTAINABLE ENERGY ROAD MAP & STRATEGY

BASELINING

- Map and assess existing sustainable energy initiatives in all Member States (including efficiencies and conservation in transportation, electricity and industrial sectors).
- Review sustainable energy policies, plans, regulatory framework and legislation.
- Conduct Gap analysis of policy, capacity, awareness/awareness, financing.

TOOLS DEVELOPMENT

- Mechanism to support the development of the C-SERMS (possibly Platform comprised of multidisciplinary and multi-stakeholders)
- Regional Energy Balance Model for tracking progress, forecasting and monitoring the performance of the sector.

STRATEGIES AND TARGETS

- Establish short, medium and long term targets for RE, EE and BE
- Identify areas for necessary policy, regulatory and legislative reforms
- Identify areas for improvement in information and awareness, financing mechanism, R&D and innovation



C-SERMS TIMELINE

PHASE 1

- Existing initiatives and Projects Mapped
- Policies, Plans and Regulatory and Legislative Framework reviewed to determine gaps
- Capacity, Information / Awareness, Financing assessed to determine areas for strengthening
- Platform designed and Operationalised
- Energy Modeling Framework and Data Requirements Assessed.
- First Level C-SERMS Developed with preliminary targets

IDB Grant Fund of US
\$400,000

2011 - 2012

PHASE 2

- Wide scale RE and EE assessments conducted
- Detailed gap analysis conducted
- Energy Balance Model and Framework Implemented
- Second Level C-SERMS Developed with Comprehensive strategies and Actions and more concrete targets

Government of the
Federal Republic of
Germany has
committed €4.5 M
for the period 2011
- 2014

2012 onwards



C-SERMS cont'd

C-SERMS will:

- define a strategic and targeted approach to increasing the contribution of renewable energy, energy efficiency and bio-energy in the energy mix.
- provide the basis for firm commitments by Government of the region, and development partners in achieving this objective.
- be a dynamic and living document to be refined and updated over time.
- set achievable short, medium and long-term targets (2015, 2020, 2025).
- Provide guide for investors and financiers.



PROPOSED INTEGRATION INITIATIVES WITHIN CARICOM

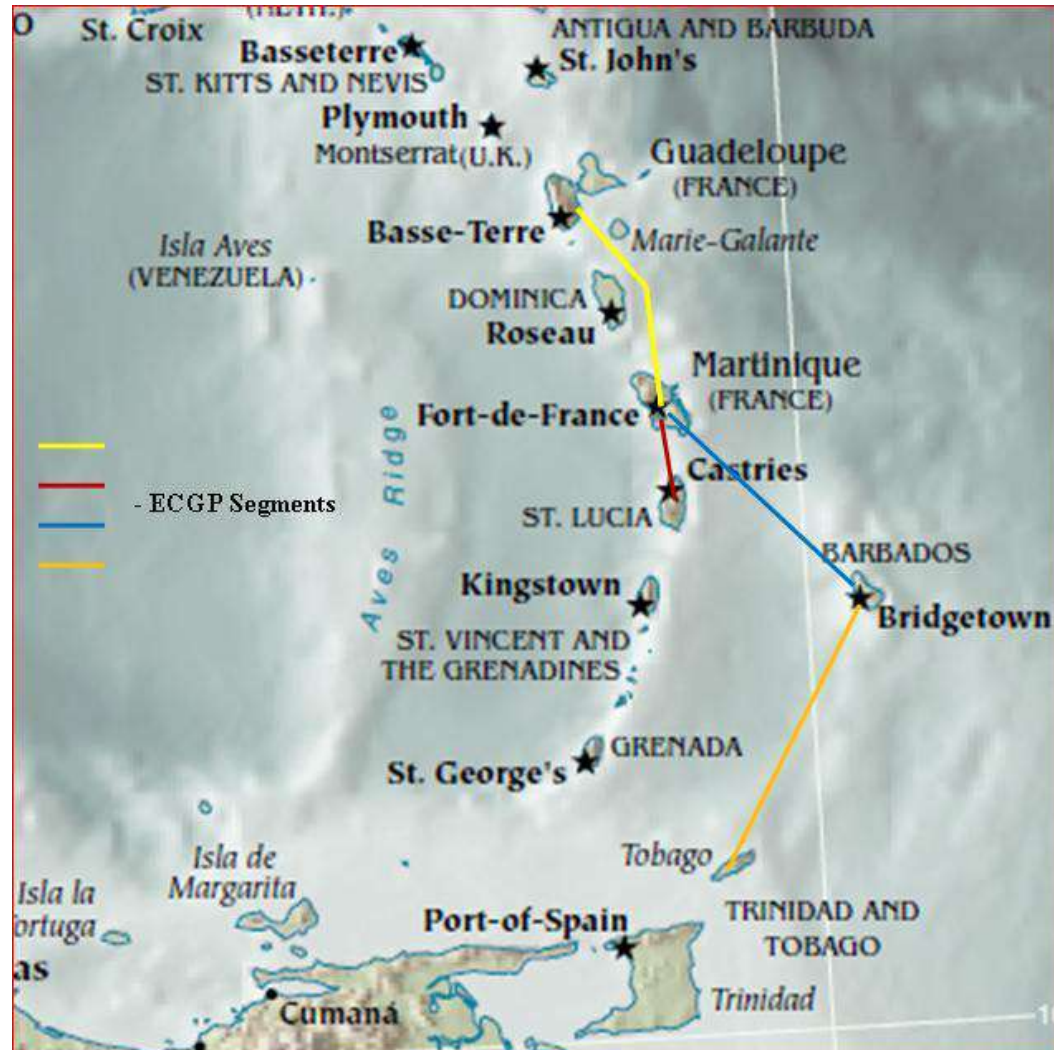
Adopted from the 2010 Study conducted by the World Bank titled: "*Caribbean Regional Electricity Generation, Interconnection, and Fuels Supply Strategy*".

Gas Market

Eastern Caribbean Gas Pipeline:

- Tobago, Barbados, Martinique, St. Lucia, Guadeloupe
- 1,000 km
- Pipeline gas half as costly as distillates
- Highly economic

Source: Franz Gerner – World Bank





Regional Initiatives cont'd

Electricity Market I

Dominica Interconnections

Geothermal

- Dominica-Martinique
 - 100 MW,
 - 70 km,
 - US\$588/kW
 - Highly economic
- Dominica-Guadeloupe
 - 100 MW,
 - 70 km,
 - US\$588/kW
 - Highly economic



Source: Franz Gerner – World Bank



Electricity Market II

Nevis - St. Kitts/Nevis-US VI/Nevis-Puerto Rico

Source: Franz Gerner – World Bank

Regional Initiatives cont'd

Nevis – Puerto Rico

- **Geothermal**
- 400 MW,
- 400 km,
- US\$ 1,790/kW
- Highly economic

Nevis – St. Kitts

- **Geothermal**
- 50 MW,
- 5 km,
- US\$328/kW
- Highly economic

Nevis – US Virgin Islands

- **Geothermal**
- 80 MW,
- 320 km,
- US\$ 3,540/kW
- Marginally economic





Regional Initiatives cont'd

Electricity Market II

Dominican Republic – Haiti Land Connection

Source: Franz Gerner – World Bank



- HFO steam plant 250 MW,
- 560 km, US\$1,900/kW
- Uneconomic **unless from lower cost energy source**



Regional Initiatives cont'd

Electricity Market IV Northern Caribbean Interconnection



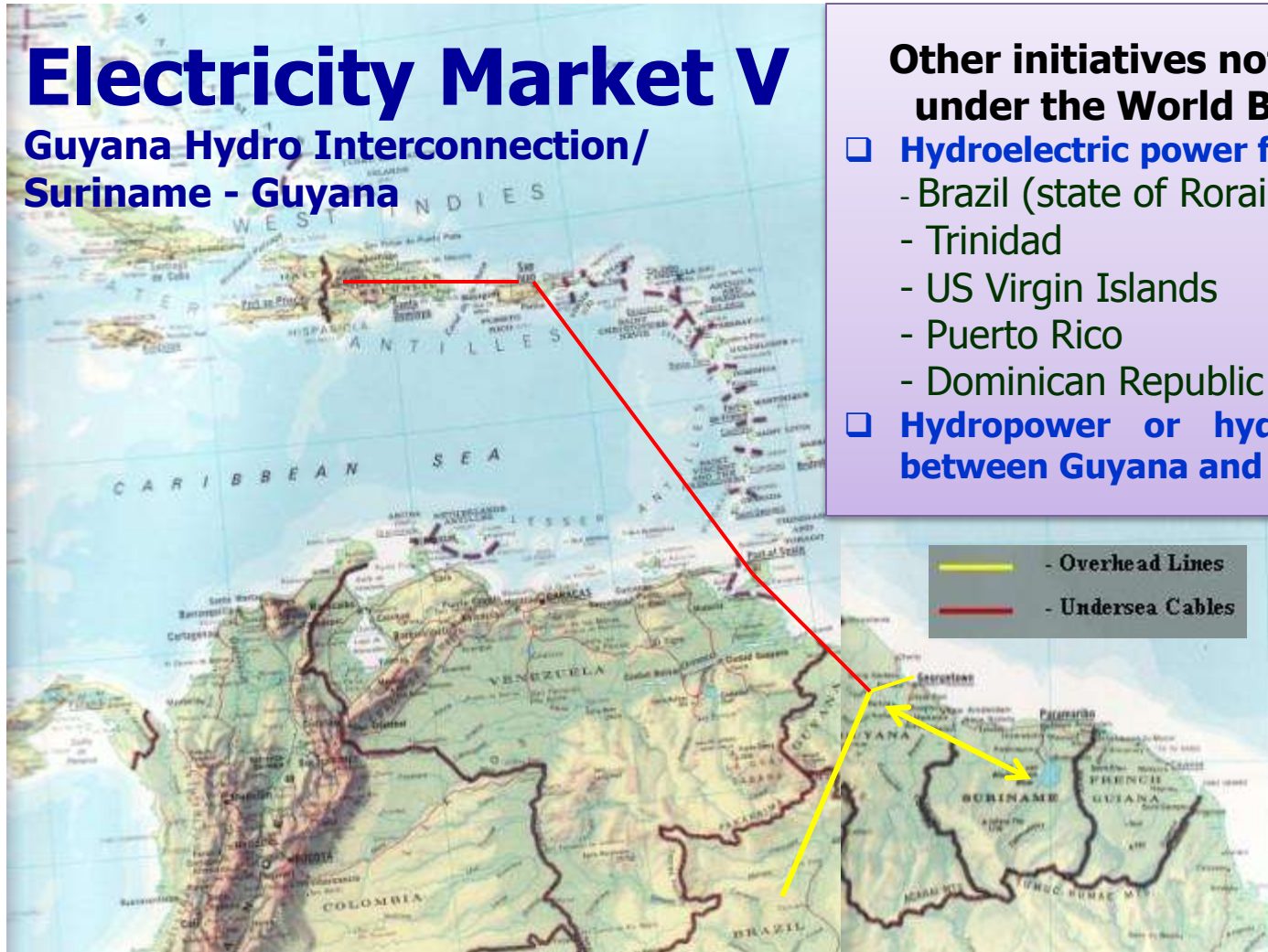
Interconnection linking Florida-Cuba-Haiti-Dominican Republic-Puerto Rico-Nevis



Regional Initiatives cont'd

Electricity Market V

Guyana Hydro Interconnection/
Suriname - Guyana



Other initiatives not considered under the World Bank Study:

- ❑ **Hydroelectric power from Guyana to:**
 - Brazil (state of Roraima)
 - Trinidad
 - US Virgin Islands
 - Puerto Rico
 - Dominican Republic
- ❑ **Hydropower or hydrocarbon trade between Guyana and Suriname.**

Source: ENMAN Services – Trinidad & Tobago



Regional Initiatives cont'd



BELIZE ELECTRICITY MARKET REPRESENTS A CLASSIC CASE OF ELECTRICITY INTEGRATION AND MARKET COMPETITION IN ELECTRICITY GENERATION. EXISTING INTERCONNECTION OF SYSTEMS BETWEEN BELIZE AND MEXICO.

- Peak Load – 74 MW
- Customers – 74,000
- Power Supply:
 - **Hydro IPP's – 36 MW**
 - **Mexico - 50 MW**
 - Company owned Diesel Fired 32 MW

Source: Lynn Young – Belize Electricity Limited



SUMMARY / CONCLUSIONS

- Electricity generation by fossil fuel is dominant.
- Threat to environmental and economic security of the region.
- Many of the RE projects require large 'take-up' to make them economically feasible.
- Fragmented transmission system for electricity.
- Inefficiencies exist.



SUMMARY / CONCLUSIONS

- Integrated electricity system is fundamental to the sustainability of the region's energy sector.
- Physical and institutional systems
- Resources assessment and mapping.
- Innovative financing mechanisms.
- Need for robust regulatory systems.
- Political will.
- Broad based commitment.



SUMMARY / CONCLUSIONS

- Strategies, policies and regulatory framework are required at regional level to support energy integration in CARICOM and give effect to the Revised Treaty.
- There are opportunities for greater collaboration within the Americas on the issue of energy integration:
 - Lessons to be learnt from success stories and experiences in electricity interconnections;
 - Technical experts to support detailed studies on various integration models;
 - Support in designing legal and regulatory framework for energy interconnection and negotiating commercial agreements.



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