ACHIEVING SUSTAINABILITY: ENERGY AT THE CENTRE

Sixth Gathering of the ParlAmericas Parliamentary Network on Climate
Thursday, 23 June 2022 on Climate

Dr. Devon Gardner
Caribbean Centre for Renewable Energy & Energy Efficiency (CCREEE)
Occurrence of hydro-met disasters in the Caribbean (1980 – 2017)

Source: EM-DAT 2017
STRENGTHENING THE NEXUS: CLIMATE & ENERGY

ANTHROPOGENIC CLIMATE CHANGE
- Temperature Rise
- Sea-level Rise
- Meteorological Shifts
- Precipitation Change

GLOBAL & LOCAL POLLUTION
- Greenhouse Gas Emissions
- Local Pollutants

IMPACTS ON HUMAN & NATURAL SYSTEMS
- Food & Water Resources
- Energy Resources
- Ecosystems & Biodiversity
- Built Environment

SOCIO-ECONOMIC DEVELOPMENT PATHWAYS
- Economic Growth
- Technology Deployment
- People
- Governance

Adaptation
Mitigation
# APPROPRIATE RE OPTIONS, CARICOM

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<tr>
<th>Countries</th>
<th>SOLAR PV</th>
<th>Wind</th>
<th>HYDRO Run-of-river</th>
<th>GEO Binary</th>
<th>BIOMASS Gasification</th>
<th>BIOMASS Anaerobic</th>
<th>BIOMASS Liquid biofuels</th>
<th>OTEC/SWAC</th>
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CARICOM ENERGY, AT A GLANCE

<table>
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<tr>
<th>CARICOM ENERGY TRENDS</th>
<th>REGIONAL TARGETS</th>
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<td>2012 6.2%</td>
<td>2022 28%</td>
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<td>2020 11.4%</td>
<td>2027 47%</td>
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<td>2012 ~14,500 BTU per USD (GDP)</td>
<td>2019 ~12,800 BTU per USD (GDP)</td>
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Map of Caribbean island countries showing various energy sources and capacities, including geothermal, solar photovoltaics, wind, and hydropower. Key points include:

- **Belize**: 70 MW, 42 MW
- **Jamaica**: 56.1 MW, 1876 MW, 1313 MW
- **Bahamas**: 60 MW, 229 MW
- **St. Kitts & Nevis**: 1280 MW, 16 MW, 23.4 MW
- **Anguilla**: 400 MW, 27 MW
- **St. John's**: 1390 MW, 45 MW, 30 MW, 17 MW
- **Antigua and Barbuda**: 1.5 MW
- **Montserrat**: 680 MW, 36 MW, 40 MW
- **Dominica**: 8 MW, 890 MW, 10 MW, 23 MW
- **St. Lucia**: 1100 MW, 50 MW, 50 MW
- **Trinidad and Tobago**: 39.7 MW, 40 MW
- **Costa Rica**: 308 MW, 50 MW

Legend:
- Geothermal Energy
- Solar Photovoltaics
- Wind Energy
- Hydropower
THE TRADITIONAL POWER SECTOR ARCHITECTURE

The “Utility-centric” SUPPLY APPROACH

GENERATION

Fuel → Generator

TRANSMISSION & DISTRIBUTION

Electricity network → Appliance & equipment

Energy service
A TYPICAL ELECTRIC GRID

- Generation facilities
- High-voltage switchyard
- Distribution line
- Transformer
- Substation
- Transmission lines
Daily variability
Daily variability

20MW PV Plant, August 18, 2016 (6:00am - 6:30pm)

MW

Content Solar
PV Power
18 August 2016
ENERGY STORAGE, JAMAICA

~25 MW Battery-Flywheel Hybrid [Jamaica]
US$ 26.5 million
Belize Hydroelectricity Production, 2018

Seasonal variability
Freeport, Grand Bahamas
October 2016

Grid vulnerability
End-use vulnerability
Climate-Resilient Energy Planning

CARICOM Energy Ministers [April 2018] established a Task Force to:

- Develop an “appropriate mechanism” for systematically addressing the weaknesses in the energy system designs within the Region, to include Integrated Resource and Resilience Planning (IRRP), such that climate and disaster risk are captured within existing sustainable energy policies, strategies and action plans, at national and regional levels.

- Address the identification of appropriate disaster resilience measures that can provide a judicious balance between: (a) Full recovery of the energy networks; and (b) Quick restoration of a minimum level of energy services, in the aftermath of disasters.
FRAMEWORK FOR ENHANCING ENERGY RESILIENCE TO CLIMATE RISKS

Enhance Resilience of Energy System to Adverse Weather & Climate Change Impacts

- Enhance System Resilience
  - Planning & Operations
  - System Strengthening
- Rapid Response & Recovery
  - Emergency Response
  - Damage Recovery
STRATEGIC PROGRAMMES

Climate Resilience

Sustainable Industry & Business

Energy Access

Sustainable Buildings

Sustainable Transport

Financing & Project Support

Knowledge Management & Knowledge Transfer

CARICOM ENERGY
1. Data
- Energy service demand
- Energy supply resources
- Electricity system infrastructure
- Hydro-Met trends (historical)
- Hydro-Met impacts (historical)

2. Metrics
- Stability
- Reliability
- Flexibility
- Affordability
- Security (in supply & pricing)
- GHG Abatement
- Resilience (to hydro-Met & epidemiological hazards)

3. Demand Forecasting
- Demand for energy services
- Impact of weather & climate variability [other sudden shocks] on energy service demand

4. Demand Response Scenarios
- Demand Response Options, to include treating “energy efficiency as a resource”
- Impact of weather & climate variability [and other sudden shocks] on demand response scenarios

5. Supply Scenarios
- Supply Resources & Options, to include indigenous & imported sources
- Projected impact of weather & climate variability [other sudden shocks] on supply resources & options

6. Least Regrets Pathway
- Systems scenarios, from demand & supply options
- Grid integration requirements for various system scenarios
- Hydro-Met & epidemiological risks for system scenarios
- “Least regrets” scenario, on the basis of constraints and metrics, including risk, ranking

7. Investment Plan
- Define & validate
- Implement

8. Monitoring, Evaluation & Review
- Monitor and evaluate
- Update
- Iterate

INTEGRATED RESOURCE & RESILIENCE PLANNING (IRRP)
THE OPPORTUNITY

The Multi-actor **DEMAND-DRIVEN APPROACH**

**RESOURCE**
- Energy resource (Capture)
- Primary energy
- Energy storage

**CONVERSION**
- Energy conversion (Generation)
- Energy carrier
- Transmission & distribution
- Energy storage

**END-USE**
- Energy conversion (Device)
- Energy service

To include electric mobility
MULTI-CRITERIA DECISION ANALYSIS FOR RENEWABLE PROJECT DEVELOPMENT

Identify a clear set of RE policy goals
Energy security
Rural development
Energy export
Climate change
Adaptation and or mitigation

Choosing RES for energy production
Is the RE potential sufficient and available technology suitable for the choice made?

Sustainable development analysis
Is the choice of RES expected to make a positive contribution to the National SDGs?

Environmental analysis
Is it possible to assure that environmental issues are mitigated?

Social Analysis
Is it possible to assure that positive social outcomes arise from RE production & use?

Economic Analysis
Is the selected RE option the most cost-effective means of achieving policy goals?

Produce with development of the project
Proceed with development of the project

Look at issues such as large-scale v. small-scale production; land rights and acquisition; and skills
Look at SDG indicators and issues with particular focus on whether the RES choice can cause a negative impact.

Can the RE option compete with alternative local energy supplies?

Does competitiveness and int’l market access support RE export?

Yes
Yes
Yes
Yes
Not Sure
Not Sure
Not Sure
Not Sure

Production for local and remote areas
Production for national consumption
Production for regional and global markets
THE ENERGY EFFICIENCY PATHWAY

Situation regarding energy use and energy efficiency within the Region is baselined.

Energy efficiency potentials in selected productive sectors and subsectors identified.

Regional and National EE targets, as well as disaggregated targets for key sectors, established.

Implementation support for the action plan is provided.

Action plan, which identifies a core set of policies, regulations, and market promotion mechanisms required to achieve targets, is developed.
ELECTRICITY DEMAND BY CUSTOMER CATEGORY [2019]
RQI for Sustainable Energy

Energy Efficiency Building Code, and MEPS for Non-residential Buildings

MEPS for select appliances, equipment, rooftop SWH and Solar PV systems

Energy labelling standards for household electrical appliances

Metrology, Accreditation and Conformity Assessments
1. Hinterland Areas and Riverine Islands in Belize, Guyana, and Suriname

2. Island Communities of The Bahamas, Belize and the Grenadines

3. Rural Communities in Dominica, Jamaica, and St. Vincent

4. Unserved and Underserved Areas Haiti
KEY PERSPECTIVES & MESSAGES

Size Matters
- Scale of Available Commercial Technology
- Scale of the Available Market

Site Matters
- Data & Information
- Adapt Technology to Market

Cost Matters
- Economics & Finance
- Public Service Obligations

Cost & Investment Risk
- Opportunities for Sector Coupling
- Affordability & Access
“Energy is no longer simply an economic issue but, for the Community, energy is part of a longer-term sustainable development and resiliency strategy”

CARICOM Member States are prioritizing projects that enhance the resilience of the energy sector to climate change and other external impacts, while simultaneously providing opportunities for climate abatement co-benefits.

The CARICOM Energy Revolution should endear the sector with systems that are able to “survive, adapt and grow” in response to the myriad of hydro-meteorological, epidemiological, economical and other disruptions that could occur.

Global public financing is required to help to pay for the differential cost of resilience within our energy systems, so as not to burden rate-payers, who are already paying some of the highest costs, globally, for electricity and fuels.

The differential cost of resilience should be treated as public service obligations within a global climate context.
“For the things we have to learn before we can do them, we learn by doing them”

-Aristotle

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