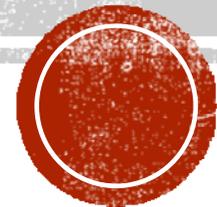


BELIZE COUNTRY REPORT

JICA Training – Energy Policy

June 21, 2015 to July 12, 2015

Presentation by: Derek Davis – Public Utilities Commission



BELIZE – GEOGRAPHY AND FACTS



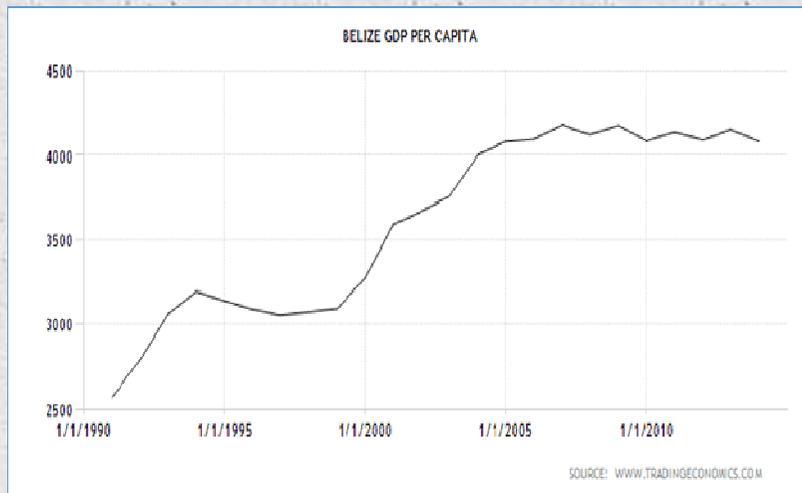
- Formerly British Honduras a Colony of UK
- Area – 8,866 Sq. Miles (22,963 Sq. KM)
- Length 280 KM – Width 109 KM
- Temperature - 10 to 35.6 deg. C
- Rainfall – 50 to 175 inches per Year
- Dry season – February to May
- Country Peak – 3,669 Feet
- Terrain – Mangrove and Tropical Forest

BELIZE – GENERAL FACTS



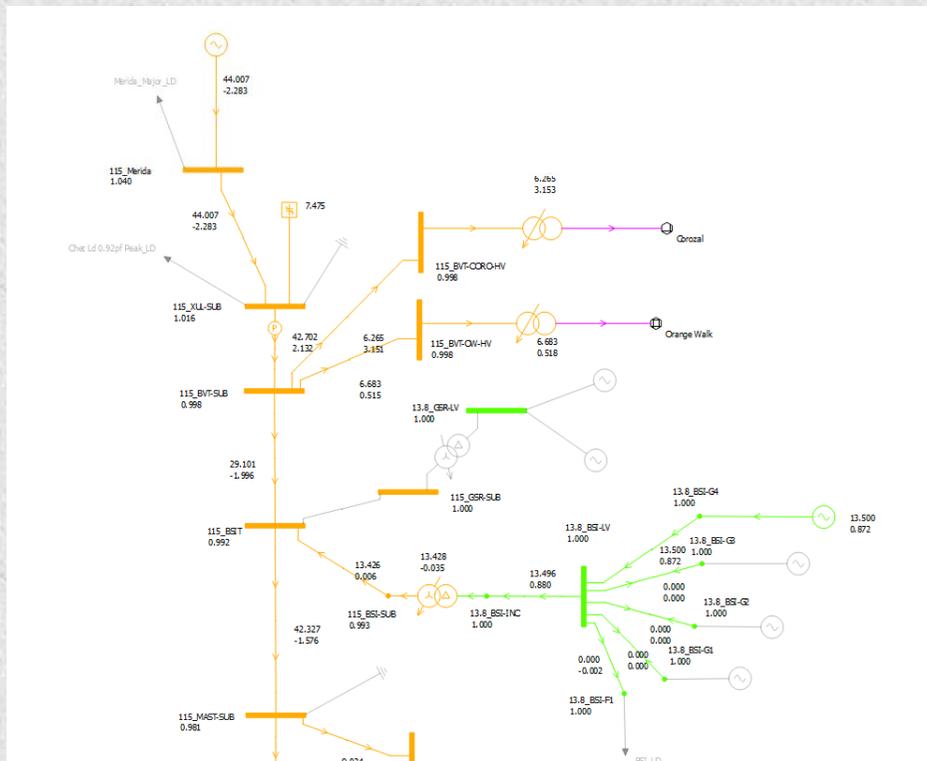
- Population – 340,000 (2014)
- People – Creoles, Latinos, Garifuna and Mayas
- Independence – September 1981
- Government – Parliamentary Democracy
- Government – Based on Westminster System
- Education – Literacy over 90%
- Universities – University of Belize and Galen
- Foreign Campuses – Two Medical Schools

BELIZE ECONOMY



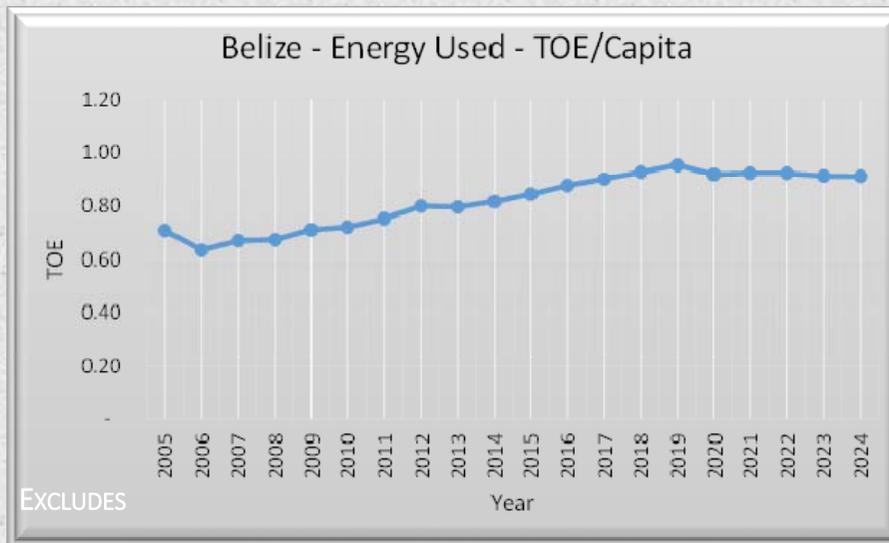
- GDP/Capita – USD 4,100 (2014)
- Major Industries
 - Tourism
 - Export of Sugar
 - Export of Citrus
 - Export of Bananas
 - Export of Marine Products
 - Crude Oil (As of 2006 – 2 Wells)
- Significant Economic Issues
 - Super Bond (1/2 of Debt) – Restructured
 - Petro-Carib debt (1%, 25 years) made available
 - Trade Deficit of concern
 - Oil Wells expected to dry up by 2020
 - Huge Disparity between Rich and Poor

BELIZE POWER SECTOR



- Power Sector regulated by PUC
- GOB majority owner of monopoly T&D Utility
- Peak Demand – 88 MW (2014)
- 82,000+ customers
- Power Sources
 - Hydro – 50 MW
 - Sugar Co-gen – Bagasse (13.5 MW)
 - HFO (22.5 MW)
 - Diesel (GT – 22.8 & Other 2.8 MW)
 - Mexico (Up to 50 MW – 50% Energy)
- 300+ miles of TX Lines (115 & 69 kV)
- Mean Elec Rate – USD 0.1925/kWh
 - USD 0.0650/kWh T&D / USD 0.0225/kWh Taxes / USD 0.1050/kWh Power and Energy Production & Purchase

ENERGY POLICY



-Bio-Mass Industrial Energy Usage
-Energy for Steam Production

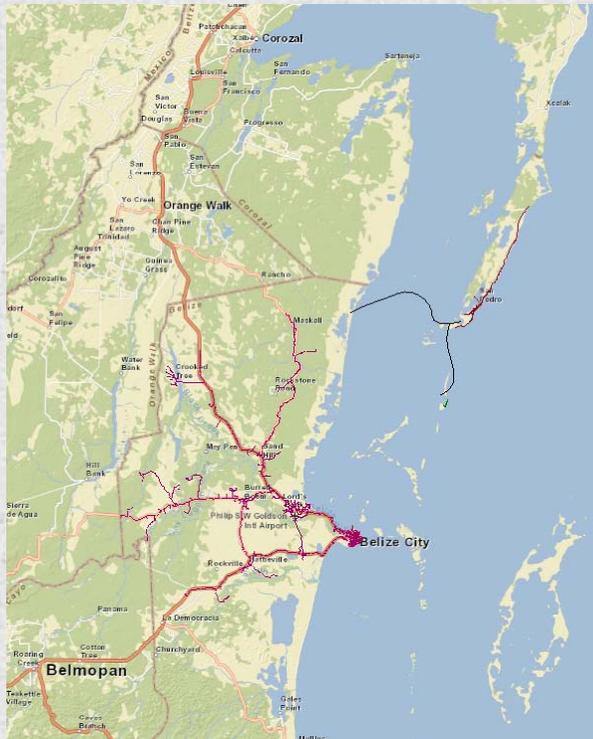
- Main Objectives for Energy Sector
 - Sustainability
 - Resilience
 - Efficiency
- Power Sector Specific Policies
 - Encourage Utility Scale RE generation
 - Promote Dev of Co-Generation
 - Allow Power Wheeling
 - Interconnect Grid to Neighbors
 - Encourage Distributed RE Generation
 - Promote EE (Grant Funding for studies)
 - Allow continued Rural

COMMITTED PLANS – POWER SECTOR

- Results of Request for Proposals 2013
 - Add 7.5 MW HFO Backup Unit (2015)
 - Add 12.8 MW Hydro Project (2019)
 - Add 9 MW Hydro Project (2019)
 - Add 18 MW Co-gen (Ethanol) (2018)
 - Add 16 MW Co-gen (Sugar) (2016)
 - Add 15 MW Solar PV (by 2017)
- Estimated 80% supply based on RE by 2019
- Revise Legislation to Allow
 - Distributed Generation with FiT
 - Interconnection and Wheeling
- Conduct Tariff Study – Address RE & EE
- Conduct Interconnection Analysis to investigate connection to SIEPAC
- Review Transmission System Upgrade Studies

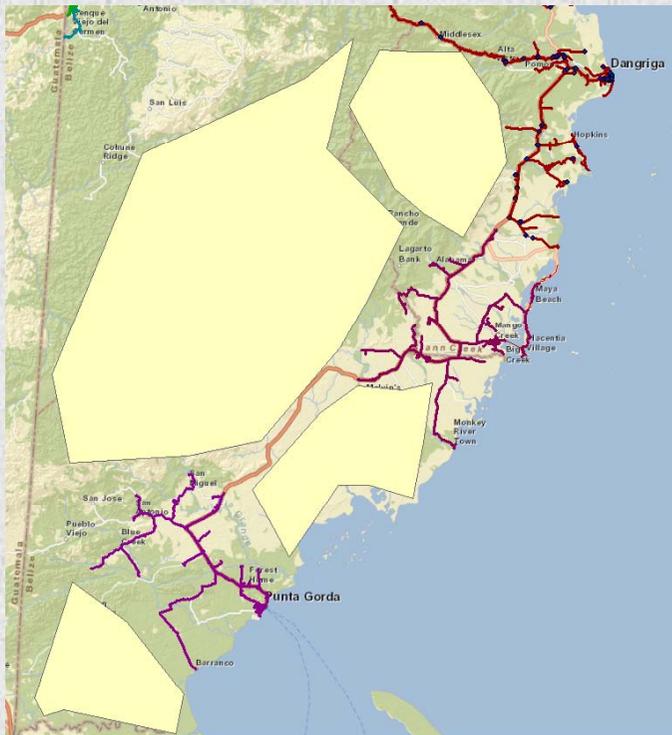
RE by 2019

POWER SECTOR EXPANSION PLANS



- Interconnect Caye Caulker to San Pedro at 34.5 kV
- Use of Submarine Cable
- Savings to reduce Diesel generation
- Improved reliability
- Enhance Tourist Industry – Larger Developments
- Caye Caulker Peak Demand – 1.8 MW (2014)
- San Pedro already connected with 14 MVA Cable
- San Pedro Load 8.5 MW
- Plan for 2nd San Pedro Submarine Cable by 2020

POWER SECTOR RURAL EXPANSION



- Rural Electrification for Southern Belize
- Distribution Lines presently along main highways
- Expansion being done inland
- 90% of Belize Citizens have access to Electricity
- After Rural Program (2017) Estimated as 95%
- Important for
 - Education
 - Commercialization
 - Agriculture
 - Improve Sanitation
 - Improve health

ENERGY POLICY – TRANSPORTATION SECTOR

- Transport Sector Uses more Energy than Power Sector
 - Difficult to control as linked to personal tastes and affordability
 - Road and Highway conditions needs to improve (Major Project Underway)
 - Most improvement can be made with public transportation
 - Needs experienced professionals in regulatory sector to implement meaningful policies
- Major Policies
 - Develop Efficiency Standards for vehicles
 - Develop legislature for vehicle importation to conform to efficiency and emission standards (TALL ORDER)
 - Develop traffic management and vehicle licensing legislature to improve safety and encourage efficiency (TALL ORDER)
 - Improve Regulation of Public Transportation for improvements in safety, efficiency and CO2 emissions (DO-ABLE)
 - Encourage the production and use of Bio-Fuels

OIL EXPLORATION IN BELIZE



- Government inexperienced in this area
- Oil find in 2006 being extracted
- Estimated to last until 2020
- Maximum 4,250 barrels/Day in 2011
- 2,800 barrels/Day in 2014 and decreasing
- New Exploration Licenses have been granted for inland exploration
- Considerable resistance to OFF-Shore Drilling by Nature Lobbyists

PROBLEMS FORMULATING AND IMPLEMENTING ENERGY POLICY

Power Sector

- Effective Policy Unit established
- The Power sector is well developed
 - Monopoly T&D GOB owned company
 - Generation IPPs
 - GOB supported CFE Mexico/BEL Belize Power Purchase Agreements
 - Regulation of the Sector by the PUC
- Mainly Legislation used to implement Policy

Transport and OIL Sector

- Policy Unit not clearly established
- Transport Policy Formulation - Low prioritization by GOB
- Lack of Financing to develop policy and regulate Sector
- Lack of detailed information
- Shortage of qualified professional expertise for Policy Unit and Regulation

WHERE ARE WE – WHERE ARE WE GOING

Power Sector

- Well established
- Realistic Plans for development formulated
- Results Expected by 2020
 - Near to 80% Renewable Generation
 - EE initiatives implemented
 - Distributed Generation introduced
 - Countrywide Grid Interconnection
 - Reduction of Power Losses
 - Interconnection to neighboring Countries
 - Improved Reliability (<6 hours SAIDI)
 - TOE/Capita reducing
 - Minimum Energy Performance Standards (MEPS) established for Power equipment

Transport and OIL Sector

- No real Energy Planning Strategy at present
- GOB needs to focus and identify realistic objectives for this Sector
- National Energy Plan (NEP) adopted by GOB includes some recommendations but not all are realistic in the short term
- Some improvement expected by 2020
 - Better Roads and Highways
 - Improved Regulation of Public Transport
 - Definition of Minimum acceptable Efficiency and Emission standards
 - Effective OIL Exploration Sector Regulation including fair distribution of profits to GOB

* Strategic NEP Recommendation -Establishment of Energy Planning Unit by GOB

Major Objectives

- * Restructuring of the power sector where necessary;
- * Optimize land utilization and natural resources for energy supply;
- * Maximize local content in indigenous energy projects;
- * Update/Conduct inventory studies for energy production potential in Belize;
- * Establish comprehensive regulatory framework for oil and gas exploration and extraction in Belize.
- * Promote the development of a bio-fuel industry in Belize;
- * Conduct studies and mitigate where possible the effects of global warming and climate change in Belize;

Other Objectives

- * Conduct energy audits for GOB buildings in Belize and enact regulation to enforce energy audits to be conducted for all public buildings in Belize.
- * Establish FIT where feasible for the various types of distributed energy generation in Belize.
- * Minimize/Mitigate impacts of energy projects on local communities;
- * Identify sources of financing for renewable energy projects and negotiate terms where possible.

Belize - Historical Energy Balance (2005 to 2014)

(All figures in TOE)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Power Sector										
Energy Used In TOE										
Source										
Diesel	25,044	2,254	11,078	5,287	5,781	2,888	2,122	4,188	2,582	2,480
HFO	.	.	.	.	11,851	1,085	.	853	228	871
Add'l HFO	.	.	.	.	3,188	3,188	3,188	3,188	3,188	.
Hydro	5,871	15,282	15,254	17,588	18,140	22,827	21,082	17,888	22,288	21,882
Bio-Mass	.	.	.	.	487	18,888	24,828	22,188	18,804	22,822
Add'l Bio-mass	7,185	7,185	7,185	7,185	7,185	7,185	18,082	5,822	8,082	12,820
Solar PV	.	.	.	.	.	.	.	28	58	58
Purchases from Mexico	31,888	42,854	48,110	50,888	44,388	82,782	84,828	48,887	47,820	47,782
Crude Oil (centrifuged)	.	.	.	.	.	2,888	8,127	3,887	3,887	3,887
Sub-Total	80,078	74,858	78,808	78,888	88,882	88,488	101,798	108,295	104,487	112,088
Industry CHP Steam										
Bio-Mass - Energy Used In TOE	88,848	88,848	88,848	88,848	88,848	88,848	43,785	37,782	28,030	37,288
Sub-Total	88,848	88,848	88,848	88,848	88,848	88,848	43,785	37,782	28,030	37,288
Cooking										
Energy Used In MWh										
Source										
LPG Cooking	595	605	624	644	664	674	694	694	694	694
Wood burning Cooking	59	60	62	64	66	67	69	69	69	69
Kerosene	.	.	.	.	.	.	.	.	.	.
Sub-Total	654	665	687	708	731	742	763	763	763	763
Transportation Sector										
Energy Consumed In TOE										
Source										
Diesel	88,800	71,187	80,880	81,888	88,474	82,180	88,882	101,787	107,885	118,028
Gasoline	41,182	38,874	38,882	44,488	48,704	48,048	51,142	58,810	58,888	58,878
Jet Fuel	4,118	3,857	3,888	4,447	4,870	4,808	5,114	5,882	5,884	5,888
Bio-diesel	.	.	.	.	.	.	.	.	.	.
LPG	.	.	.	.	.	.	.	.	.	.
Sub-Total	134,100	114,498	124,048	130,782	142,148	134,882	146,818	166,789	169,579	178,878
Crude Oil Export										
Energy Content Estimated In TOE	.	110,870	180,048	187,288	212,885	228,788	228,788	172,888	180,048	148,878
Total Energy Produced In-country plus Imports	273,824	258,487	273,282	278,888	284,708	302,888	300,878	305,487	303,824	328,788
Net (Produced In-country & Imports/Export) Energy (MWh)	273,824	197,887	118,288	81,788	81,848	76,132	74,148	132,814	148,774	178,407

Note: - In-country Energy Production includes energy used to produce products which are exported

Belize - Forecast Energy Balance (2015 to 2024)										
<i>(All figures in TOE)</i>										
	2015	2016	2017	2018	Forecast					
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Power Sector										
<i>Energy Used in TOE</i>										
Source										
Diesel	2,480	2,480	2,480	2,480	2,480	2,480	2,480	2,480	2,480	2,480
HFO	671	671	671	671	671	671	671	671	671	671
Additional HFO	-	-	-	-	-	-	-	-	-	-
Hydro	21,992	21,992	21,992	21,992	28,473	28,473	28,473	28,473	28,473	28,473
Bio-Mass	22,822	38,891	38,891	37,388	37,388	37,388	37,388	37,388	37,388	37,388
Additional Bio-mass	12,910	17,214	17,214	20,801	20,801	20,801	20,801	20,801	20,801	20,801
Solar PV	58	38	1,244	1,244	2,431	2,431	2,431	2,431	2,431	2,431
Purchases from Mexico	33,335	48,231	51,538	7,718	3,808	8,983	14,220	18,888	25,372	31,285
Crude Oil (centrifused)	3,387	-	-	-	-	-	-	-	-	-
Sub-Total	117,888	128,547	134,040	142,100	148,880	152,019	157,371	162,738	168,423	174,338
Industry CHP Steam										
<i>Bio-Mass - Energy Used in TOE</i>										
Sub-Total	37,288	63,683	63,683	143,856	143,856	143,856	143,856	143,856	143,856	143,856
Cooking										
<i>Energy Used in MWh</i>										
Source										
LPG Cooking	694	694	694	694	694	694	694	694	694	694
Wood burning Cooking	69	69	69	69	69	69	69	69	69	69
kerosene	-	-	-	-	-	-	-	-	-	-
Sub-Total	763	763	763	763	763	763	763	763	763	763
Transportation Sector										
<i>Energy Consumed in TOE</i>										
Source										
Diesel	118,198	123,838	132,418	138,388	147,134	138,713	142,148	142,888	141,818	142,234
Gasoline	62,834	66,247	68,840	73,801	77,584	73,673	74,853	73,404	74,677	73,012
Jet Fuel	6,283	6,625	6,984	7,360	7,738	7,387	7,483	7,340	7,488	7,501
bio-diesel	-	-	-	-	-	-	-	-	-	-
LPG	-	-	-	-	-	-	-	-	-	-
Sub-Total	187,313	196,710	208,240	220,549	232,457	220,793	224,984	223,632	223,784	224,747
Crude Oil Export										
<i>Energy Content Estimated in TOE</i>										
	124,483	98,388	74,880	48,783	48,783	-	-	-	-	-
Total Energy Produced in-country plus imports	344,080	382,520	407,728	507,268	524,058	517,388	526,484	533,288	538,806	543,722
Net (Produced in-country & Imports/Export) Energy (in/toe)	219,547	282,934	333,038	457,478	474,269	517,389	526,484	533,289	538,806	543,722

Notes: - in-country Energy Production includes energy used to produce products which are exported