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





#### Belize – General Facts

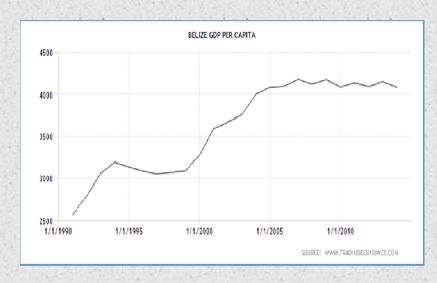


- o Population 340,000 (2014)
- People Creoles, Latinos, Garifuna and Mayas
- o Independence September 1981
- Government Parliamentary Democracy
- Government Based on Westminster
   System
- Education Literacy over 90%
- Universities University of Belize and Galen
- Foreign Campuses Two Medical Schools





### BELIZE ECONOMY

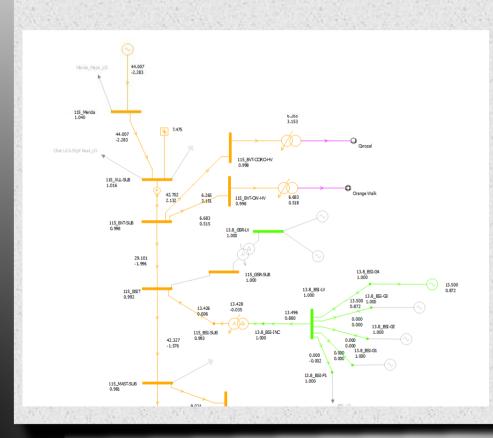


- o GDP/Capita USD 4,100 (2014)
- o Major Industries
  - o Tourism
  - Export of Sugar
  - Export of Citrus
  - o Export of Bananas
  - Export of Marine Products
  - o Crude Oil (As of 2006 2 Wells)
- Significant Economic Issues
  - Super Bond (1/2 of Debt) Restructured
  - Petro-Carib debt (1%, 25 years)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





# Belize Power Sector

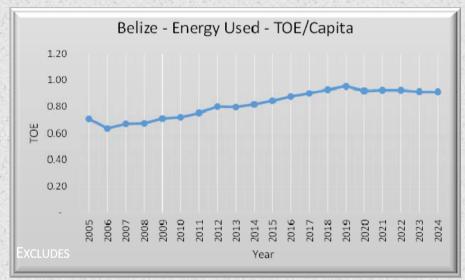


- o Power Sector regulated by PUC
- GOB majority owner of monopoly T&D Utility
- o Peak Demand 88 MW (2014)
- o 82,000+ customers
- o Power Sources
  - Hydro 50 MW
  - Sugar Co-gen Bagasse (13.5 MW)
  - o HFO (22.5 MW)
  - Diesel (GT 22.8 & Other 2.8 MW)
  - Mexico (Up to 50 MW 50% Energy)
- o 300+ miles of TX Lines (115 & 69 kV)
- o Mean Flec 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

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





# COMMITTED PLANS - POWER SECTOR

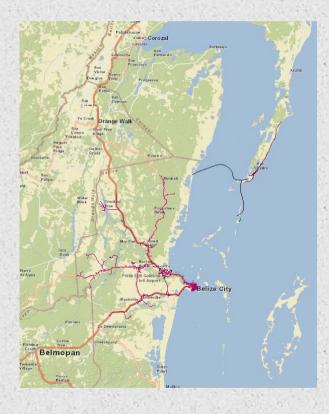
- Results of Request for Proposals
   2013
  - o Add 7.5 MW HFO Backup Unit (2015)
  - o Add 12.8 MW Hydro Project (2019)
  - o Add 9 MW Hydro Project (2019)
  - o Add 18 MW Co-gen (Ethanol) (2018)
  - o Add 16 MW Co-gen (Sugar) (2016)
  - o Add 15 MW Solar PV (by 2017)
- Estimated 80% supply based on

- 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





# POWER SECTOR EXPANSION PLANS



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





### POWER SECTOR RURAL EXPANSION



- o 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
  - o 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

- o 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



- o Government inexperienced in this area
- o Oil find in 2006 being extracted
- o Estimated to last until 2020
- o 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
- o 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)</li>
  - TOE/Capita reducing

Power equipment

o Minimum Energy Performance

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
  - o Effective OIL Exploration Sector Regulation including fair distribution of

# \* 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.





(All figures in TOE)					Actuals					
	2005	2006	2007	2008	2009	2010	2011	2012	2019	2014
Power Sector		7 27			7 27					
Energy Used in TOE										
Source					4.1		7 10 2 2 2 2			
D'e me	25,044	9,254	11,079	8,167	5,761	1,886	2,122	4,186	1,591	2.49
HPO	ETGET TENE		7 (12)	1100 1000	11.651	1.065		855	228	67
Add't'one HFO	11/2/2011	1.150	1400/	1000000	8,188	8,188	8,138	8,180	8,188	377
Hydro	5,671	15,262	15,254	17.503	16,140	22.627	21.082	17,986	22,286	21.99
B'o-Mass	1704 940	La contract		77-12 SVG	457	16,569	14,828	22.186	16,604	11.62
Add't'one B'o-mess	7,165	7,165	7,165	7,165	7,165	7,165	18,081	5,821	8,091	11,91
So er PV	No Marie	184 XIII		No Marie	200		0-56-075	19	50	ALC:
Purchage a from Me k'co	51,999	42,954	48,110	50.658	44,268	81.781	84,929	48,697	47,920	47.72
Crude O' (centr*fuged)	200 100	000000000000000000000000000000000000000			-	1,086	8,127	3,367	8,867	8,86
Sub-Tota	90,079	74,656	79,608	70.000	86,582	88,498	101,798	105,295	104,457	112.06
SHOW THE REAL PROPERTY.	15	288	Self A	124	1333	Selen		X	3834	
Industry CHP Steam		27.			1 27.				-	
Bio-Mass - Energy Used in TOE	68,648	58,548	68,648	68,648	68,648	68, 648	45,765	57,761	29,050	37,20
<u>Sub-Tota</u>	69, 548	59,549	68, 648	69,649	68, 648	59, 548	45,765	57,761	29,050	57,21
Cooking										
Energy Used in MWhs										
Source			ON HARM			3000				1000
LPG Cooking	595	605	624	644	664	674	694	694	694	69
Wood burn'ng Cook'ng	59	60	62	64	66	67	69	69	69	6
keros ne	DUMBER STATE	ALCOHOLISTS	130/00/2016	Author's transfer	we green b	825305080E	earchtair ile	SARSE GOOD	BONISH	0.000
Sub-Tota	654	665	697	709	791	741	769	769	768	76
THE RESERVE OF THE PROPERTY OF THE PARTY OF	100	224			324				110010	FILAY
Transportation Sector		0			100				100	
	4.0			4						
Energy Consumed In TOE		7 7 1000			727130					
Source										
D'e m	69,500	71,167	80,690	81,886	86,474	91,180	96,962	101,787	107, 595	118,02
Grac 'ne	41,181	89,874	59,691	44,469	45,704	48,048	51,141	58,610	56,585	59,67
Jet Pue	4,118	8,957	3,980	4,447	4,570	4, 805	5,114	5,861	5, 654	5,96
b'o-d'esse	100	-4.5	X 100 4	The Paris		40000		40.00		100
LPG		****								
<u>Sub-Tota</u>	114,544	114,499	124,940	190,751	195,748	144,991	152,618	160,708	169,579	178,67
Crude Oli Export		CONT.			100			1000	ON FIRE	
Energy Content Estimated in TOE	200	120,570	160,049	187,158	212,985	116,756	226,798	171,658	160,049	149,87
		The to	THE SERVICE			TAX COL		BAR U.S	Translate N	
Total Energy Produced in-country plus imports	275,924	258,467	275,282	279,995	294,708	902, 969	500,879	905,467	503, 824	928,76
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Net (Produced in-country & Imports/Export) Energy (MWhs	275,924	197,897	119,299	91,798	81,845	76,192	74,149	192,614	143,774	179,4

Note: - in-country Energy Production includes energy used to produced products which are exported





All floures in 70 E)  Power Sector  Chargy Used in 70 E  Review  Nasel  HPO  Additional HPO  Hydro  Ric-Mass  Additional Bio-mass  Solar PV  Purchases from Maxico  Crude Oil (centrifugad)  Sub-Total  Industry CHP Steam  Sic-Mass - Energy Used in 70 E  Sub-Total	2,480 671 - 21,992 22,822 12,910 58 53,335 1,387 117,666	2,480 671 21,952 38,891 17,214 58 48,231	2,480 671 21,992 38,891 17,214 1,244	2,490 871 - 21,992 87,385 20,601	2,490 671	2,490 571	2,490 571	2,490 671	2,490 671	2024 2,490
Energy Used in TOE  Review  Classe  4FO  Additional HFO  Additional Bio-mass  Slo-Mass  Additional Bio-mass  Solar PV  Purchases from Mexico  Crude Oil (centrifuged)  Sub-Total  Industry CHP Steam  Slo-Mass - Energy Used in TOE  Sub-Total	2,490 671 - 21,992 22,922 12,910 58 53,335 1,397	2,480 671 21,992 38,891 17,214	2,480 671 21,992 38,891 17,214	2,490 671 - 21,992 87,386	2,490 671 29,473	2,490 671	2,490 671	2,490 671	2,480	2,480
Energy Used in TOE  Review  Classe  4FO  Additional HFO  Additional Bio-mass  Slo-Mass  Additional Bio-mass  Solar PV  Purchases from Mexico  Crude Oil (centrifuged)  Sub-Total  Industry CHP Steam  Slo-Mass - Energy Used in TOE  Sub-Total	21,992 22,822 12,910 58 53,335 3,387	2,490 671 - 21,952 38,891 17,214	21,992 30,891 17,214	671 21,992 87,386	871 29,473	671	671	671	2,480	
Course  Drasel HFO Additional HFO HVdro  Sic-Mase Additional Sic-mase Solar PV  Purchases from Mexico  Crude Oil (centrifugad)  Sub-Total  Industry CHP Steam  Sic-Mase - Energy Used in TOE  Sub-Total	21,992 22,822 12,910 58 53,335 3,387	571 21,992 38,891 17,214 58	21,992 30,891 17,214	671 21,992 87,386	871 29,473	671	671	671		
Classi HPO Additional HPO Hydro No-Mass Additional Bio-mass Solar PV Purchass from Mexico Crude Oil (centrifuged) Sub-Total Inclustry CHP Steam Sio-Mass - Energy Used in TOE	21,992 22,822 12,910 58 53,335 3,387	571 21,992 38,891 17,214 58	21,992 30,891 17,214	671 21,992 87,386	871 29,473	671	671	671		
HFO  Additional HFO  HVdro  Stor-Mass  Additional Bio-mass  Solar PV  Purchases from Mexico  Crude Oil (centrifuged)  Sub-Total  Side-Total  Cooking	21,992 22,822 12,910 58 53,335 3,387	571 21,992 38,891 17,214 58	21,992 30,891 17,214	671 21,992 87,386	871 29,473	671	671	671		
Additional HFO Hydro Sito-Mass Additional Bio-mass Additional Bio-mass Solar PV Purchases from Mexico Crude Oil (centrifuged) Sub-Total Industry CHP Steam Sig-Mass - Energy Used in TOE Sub-Total	21,992 22,822 12,910 50 53,335 3,307	21,992 30,091 17,214 30	21,992 38,891 17,214	21,992 87,386	29,473		-		8/1	
riviro  Sic-Mass Sic-Mass Sic-Mass Solar PV  Purchases from Mexico  Crude Oil (centrifuged)  Sub-Total  Industry CHP Steam  Sic-Mass - Energy Used in TOE  Sub-Total	21,992 22,922 12,910 50 53,395 3,397	21,992 38,891 17,214 32	21,992 38,891 17,214	21,992 87,386	29,473					671
Ro-Mass Additional Bio-mass Solar PV Purchases from Mexico Crude Oil (centrifuged) Sub-Total Industry CHP Steam Bio-Mass - Energy Used in TOE Sub-Total	22,822 12,910 58 53,335 3,387	30,091 17,214 50	38,891 17,214	87,386			29,473	29.473	29,473	29,479
Additional Bio-mass  Solar PV  Purchases from Mexico  Crude Oil (centrifuged)  Sub-Total  Industry CHP Steam  Sic-Mass - Energy Used in TOE  Sub-Total	12,910 50 53,335 3,307	17,214 50	17,214			17,308	25,475 07,306	25,475 97,395	27,326	25,475
Solar PV Purchases from Mexico Crude Oil (centrifuged)  Sub-Total Industry CHP Steam  So-Mase - Energy Used in TOE  Sub-Total	50 53,335 3,307	50		20.501	97,398					
Purchases from Mexico Crude Oil (centrifuged)  Sub-Total  Industry CHP Steam No-Mase - Energy Used in TOE  Sub-Total	53,335 3,307		1,244		20,801	20,801	20,601	20,601	20,601	20,601
Crude Oil (centrifuged)  Sub-Total  Industry CHP Steam  So-Mass - Evergy Used in TOE  Sub-Total	3,307	40,251	24 222	1,244	2,431	2,431	2,481	2,481	2,431	2,431
Sub-Total Industry CHP Steam Blo-Mass - Energy Used in TOE Sub-Total Cooking			51,530	7,718	3,909	1,963	14,220	19,606	25,372	31,205
Industry CHP Steam  So-Mare - Energy Used in TOE  Sub-Total  Cooking	117,068	400.00		- 17 N 11 - 12 1						
Ro-Mare - Energy Used in TOE Sub-Total Cooking		122,547	134,040	142,100	146,960	152,015	157,271	182,732	168,423	174,338
Ro-Mare - Energy Used in TOE Sub-Total Cooking										
Sub-Total Cooking			65 E 0, 1	27		31110371			(A)	E 0,110
Cooking	37,299	63,693	63,693	143,956	143,956	143,956	143,956	143,956	143,956	143,956
	37,228	67,683	63,683	143,858	143,858	143,858	143,856	143,856	143,856	143,858
					10000					
Energy Used in MWhe										
loures										1000
P3 Cooking	694	694	694	694	694	694	694	694	694	694
Wood burning Cooking	69	69	69	69	69	69	69	69	69	69
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Suis-Total	763	763	763	763	763	763	763	763	763	763
THE REPORT OF THE PARTY OF THE PARTY.	10000		3.500	144	3 1 2 2		F	323333		10/2012
Transportation Sector				1,4410		1.000				
Energy Consumed in TOE										
louron	10			25		21210374			(21110B)	
Diesel	119,196	125,656	132,416	139,509	147,134	139,713	142,145	142,990	141,619	142,254
Sepoline	62,134	55,247	69,840	73,501	77,304	73,675	74,953	73,404	74,577	75,012
et Fuel	6,283	6,625	6,984	7,360	7,758	7,367	7,485	7,540	7,458	7,501
sio-diesei		4,013		1,500	7,7-00		1,700	-		1,502
PG	5574	No.	230	- 3754	100					
Sub-Total	188,313	198,527	209,240	220,550	232,477	220,755	224,594	225,942	223,764	224,767
DISTRICT CONTRACTOR OF STREET			20192-10					C 10701		
Crude Oli Export		1 CT.			250			110000	(C)	
Energy Content Estimated in TOE	124,483	99,506	74,890	49,793	49,793	1 23 0	500		437 .3	
	1 2 2 3 1	47-1/20-5	44.74	541	55					
Total Energy Produced in-country plus Imports	344,030	392,520	407,728	507,269	524,058	517,389	526,484	533,299	538,806	543,722
Not (Produced in-country & Imports/Export) Energy (IVIWhs)	218,547	292,934	333,036		1					

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