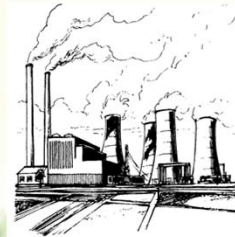


## TRINIDAD & TOBAGO ELECTRICITY COMMISSION



### Presentation to The Energy Caribbean Conference 2016.

2016-10-11



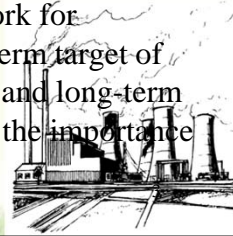
### Comments on Draft RE Policy

- Drivers: concerns over energy security, pollution and greenhouse gas (GHG) emissions.
- As signatories to the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol, many countries are obligated to reduce their GHG emissions, and the adoption of RE technologies is considered a key strategy in achieving emission reduction targets.
- Regionally, efforts to increase RE deployment have been stepped up. The Caribbean Community (CARICOM) has developed the CARICOM Energy Policy (CEP), which was approved since March, 2013.



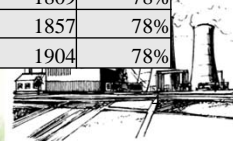
## Policy Framework Cont'd

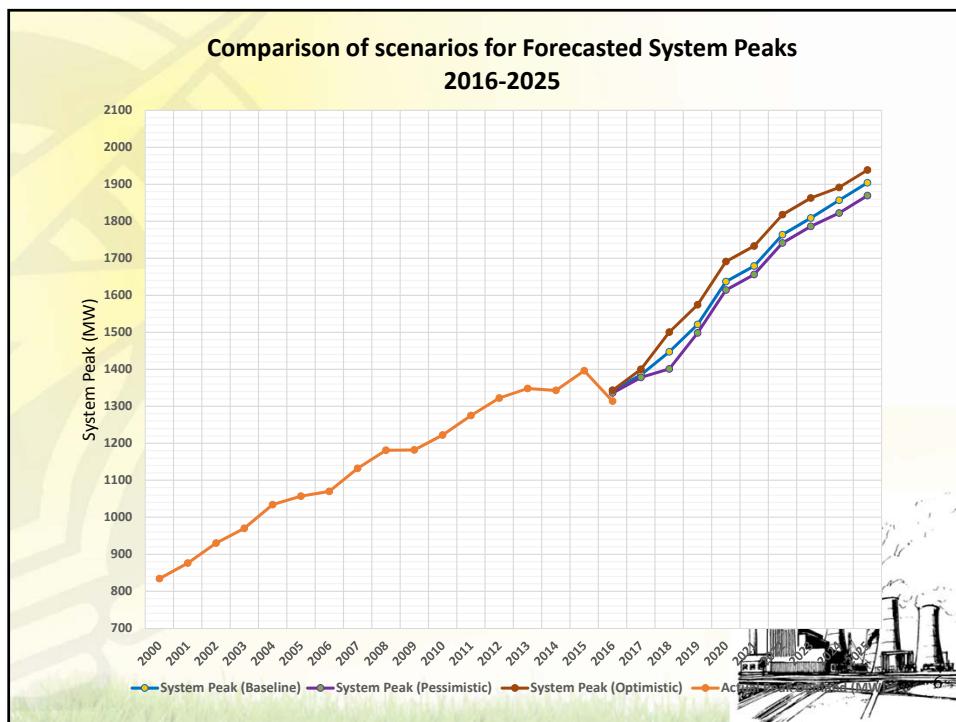
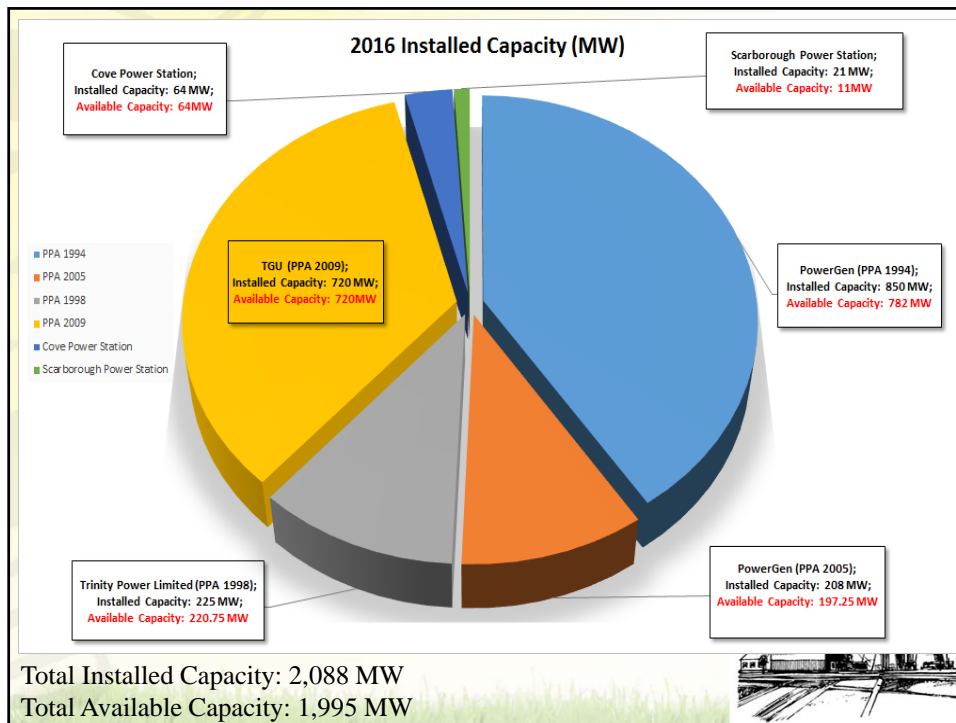
- The Caribbean region has significant potential for the development of RE resources, including hydro, wind, geothermal, solar and biomass.
- One aspect of the policy encourages Member States to draft and implement regulatory and legislative reforms to cater for harmonized interconnection policies that allow for self-generation and feed-in of excess electricity for small renewable power producers. Grant funding and technical is readily available.
- The Caribbean Sustainable Energy Roadmap and Strategy (C-SERMS) has developed an implementation framework for sustainable energy in CARICOM as follows: short-term target of 20% by 2017, medium-term target of 28% by 2022, and long-term target of 47% by 2027. The GoRTT also recognizes the importance of RE development and has targeted 10% by 2021



## T&TEC's forecast and Load profile

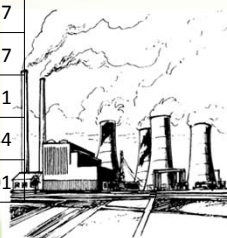
Total National Forecast							
Total Sales, Energy Losses, Units Sent Out, Peak Demand, Load Factor							
Year	Energy Sales (GWh)	System Losses			Units Sent Out (GWh)	System Peak Demand (MW)	Load Factor (%)
		GWh	% USO	% Sales			
2016	8639	654	7%	8%	9293	1343	79%
2017	8892	674	7%	8%	9566	1385	79%
2018	9287	693	7%	7%	9979	1447	79%
2019	9756	716	7%	7%	10472	1521	79%
2020	10480	739	7%	7%	11219	1637	78%
2021	10751	765	7%	7%	11516	1679	78%
2022	11283	791	7%	7%	12074	1764	78%
2023	11575	819	7%	7%	12394	1809	78%
2024	11881	848	7%	7%	12728	1857	78%
2025	12185	879	7%	7%	13064	1904	78%





# Natural Gas Demand Forecast

Year	Annual Gas Consumption (MMBTU)	Daily Gas Consumption (MScf/d)
2016	100,884,451	266,835
2017	102,428,007	271,660
2018	103,755,750	275,181
2019	110,292,942	292,519
2020	120,206,163	317,940
2021	124,144,672	329,257
2022	124,069,191	329,057
2023	125,409,143	332,611
2024	129,848,433	343,444
2025	134,303,971	356,201



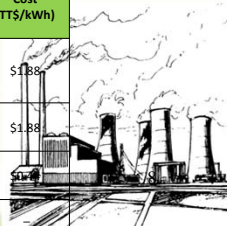
## National RE Target - 2020

Proposed RE targets up to 2025

	Dispatchable Renewable Resources				Non-dispatchable Renewable Resources			
	Capacity	Land Space (Acres)	Possible locations	Estimated FIT Conversion Cost (TT\$/kWh)	Capacity	Land Space (Acres)	Possible locations	Estimated FIT Conversion Cost (TT\$/kWh)
Micro Installations	2 MW (Bio-gas) pyrolysis	minimal	Close to existing land fills	\$3.80	1 MW (Solar)	-	rooftops	\$1.80
Macro Installations	3 MW (waste to energy) Incineration	1	Close to existing land fills	\$1.45	4 MW (Wind)	2	Windward side of Tobago	\$0.85
					4 MW (Solar)	8 to 10	Piarco, Wallerfield Caroni	\$1.30
Mega Installations	0 MW	-	-	-	1 MW (Ocean Tidal)	-	Speyside Tobago	\$2.10
Total	5 MW	-	-	-	10 MW	-	-	-

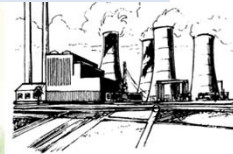
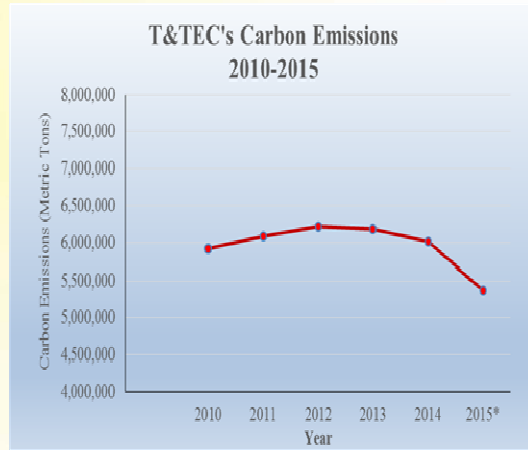
## National RE Target for the Time Period 2021 – 2025

	Dispatchable Renewable Resources				Non-dispatchable Renewable Resources			
	Capacity	Land Space (Acres)	Possible locations	FIT Conversion Cost (TT\$/kWh)	Capacity	Land Space (Acres)	Possible locations	FIT Conversion Cost (TT\$/kWh)
Micro Installations	2 MW (Bio-gas)	minimal	Farms and Food Processing Plants	\$3.80	4 MW (Solar)	20	rooftops	\$1.88
Macro Installations	5 MW (waste to energy)	minimum	Municipal type distributed generation	\$0.81	10 MW (Solar)	25	Caroni, Brechin Castle	\$1.88
Mega Installations	50 MW (waste to energy)	10	Close to existing land fills	\$0.81	30 MW (Wind)	10	East Coast of Trinidad	-
Total	57 MW	-	-	-	44 MW	-	-	-



Below chart shows the strides we have made in our effects to reduce our carbon emissions:

Year	Carbon Emissions (Metric Tonne)
2010	5,926,000
2011	6,091,000
2012	6,220,000
2013	6,190,000
2014	6,018,000
2015	5,842,000



## **RENEWABLE ENERGY PROJECTS**

### **Solar Power Projects**



University of Trinidad and  
Tobago  
O'Meara Campus (2 kW)



Trinidad and Tobago Electricity  
Commission  
Mt. Hope Compound (2 kW)



## T&TEC RE Initiatives

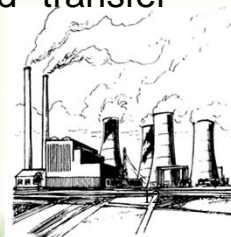
T&TEC has expanded its research into wind energy. Tobago's moderate to strong winds on its windward side, made the island an ideal location for the research.

- **Two anemometers** installed in January 2015
- Two locations – **Minister's Bay and Flag Staff Hill**
- Preliminary average wind speed readings – **5.5m/s**



## Grid Tie Inverter

- A grid-tie inverter (GTI) is a special type of inverter that converts direct current electricity into alternating current electricity and feeds it into an existing utility grid.
- GTIs are used for real time direct integration of renewable energy sources to the electrical grid. Where as standard inverters are used in conjunction with battery storage and transfer switching devices for standby power.



## Other Energy-Saving Initiatives

- T&TEC is actively pursuing the acquisition of infrastructure which makes use of ICT for the remote control of Public Playgrounds across T&T.
- Specifications are at an advance stage of development for the introduction on a phased basis of more energy efficient LED street lights with proposed annual energy savings of 526 kWh per installation (80%)

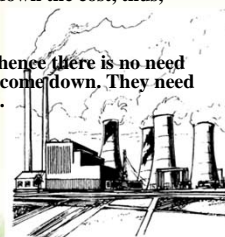


## Introduction of Electric Vehicles

- One car and one bus known of in T&T, 200 already in Barbados!

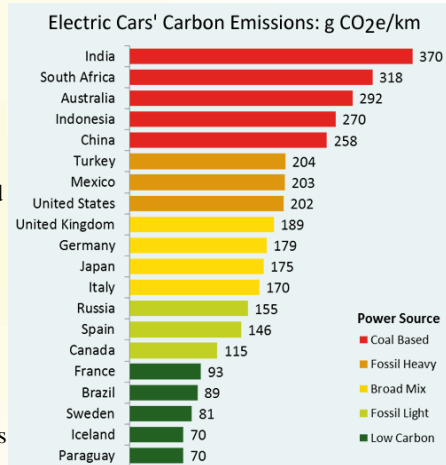
### ATTRactions:

- No Gas Required and Electricity is less expensive
- Lower Country emissions as gas/ diesel engines produce higher levels of CO<sub>2</sub> compared to natural gas used for Power Generation (.6kG/kWh)
- Vehicle-to-Grid describes a system in which plug-in electric vehicles communicate with the power grid to sell demand response services by either returning electricity to the grid or by throttling their charging rate.
- Cost Effective: both cost and maintenance of these vehicles have gone down. The mass production of batteries and available tax incentives have further brought down the cost, thus, making it much more cost effective.
- Low Maintenance: Electric cars runs on electrically powered engines and hence there is no need to lubricate the engines. Therefore, the maintenance cost of these cars has come down. They need not be sent for service as often as you do a normal gasoline powered car.



## Electric Cars' Carbon Emissions

- Electric cars have the potential to reduce carbon emissions, but important to realize this potential is dependent on the type of electricity that charges the battery
- Electric cars' carbon emissions can be four times greater in places with coal dominated generation than in those with low carbon power (as in T&T).
- In India, Australia and China coal's dominance in the fuel mix means that grid powered electric cars produce emissions ranging from 370-258 g CO<sub>2</sub>e/km, many multiples of those using low carbon sources
- The availability of charging stations and environmental issues related to battery disposal (3 to 10) years may be slight challenges.



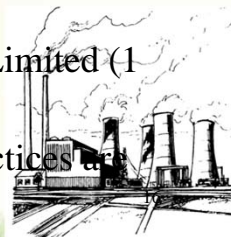
Note: Results include emissions for vehicle manufacturing, direct grid emissions, indirect grid emissions and losses. Based on national averages for 2009.  
Sources: DEFRA, GHG protocol, IEA, EPA, GREET, LCA literature



## So is T&T Ready for RE

In one word – Almost

1. Some legislative work is still to be done (<1yr)
2. An pass through mechanism approved by the RIC must be in place (<1yr)
3. A National Policy, FIT Policy and PPA templates are well advanced (<1yr)
4. T&TEC wiring regulations – Ready
5. Feasibility and investigative studies – Limited (1 to 2 years)
6. Public awareness and conservation practices are lagging (1 to 2 years)





**BY 2021 I believe a degree  
of penetration will be  
achieved**

**THANK YOU**

