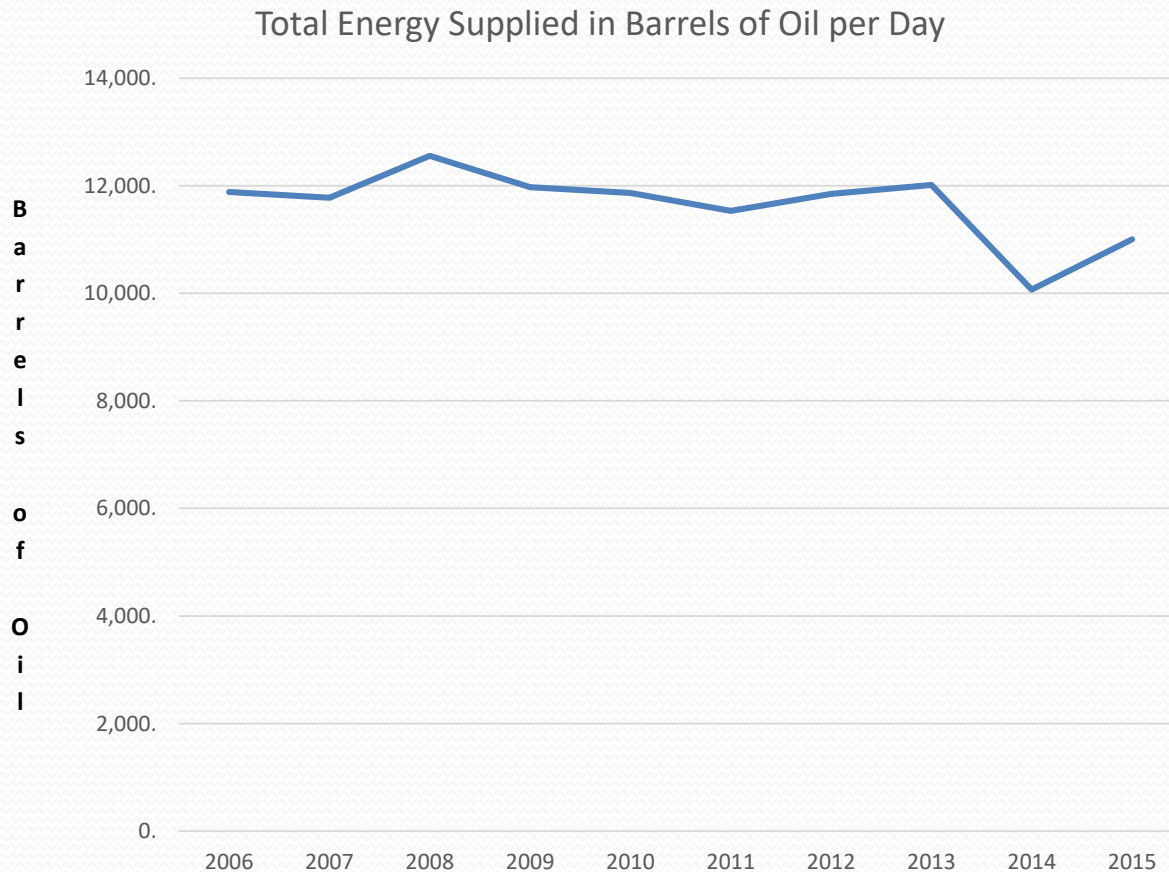


# Overview and Analysis of The Energy Market

BRYAN A. HAYNES

DIVISION OF ENERGY AND TELECOMMUNICATION

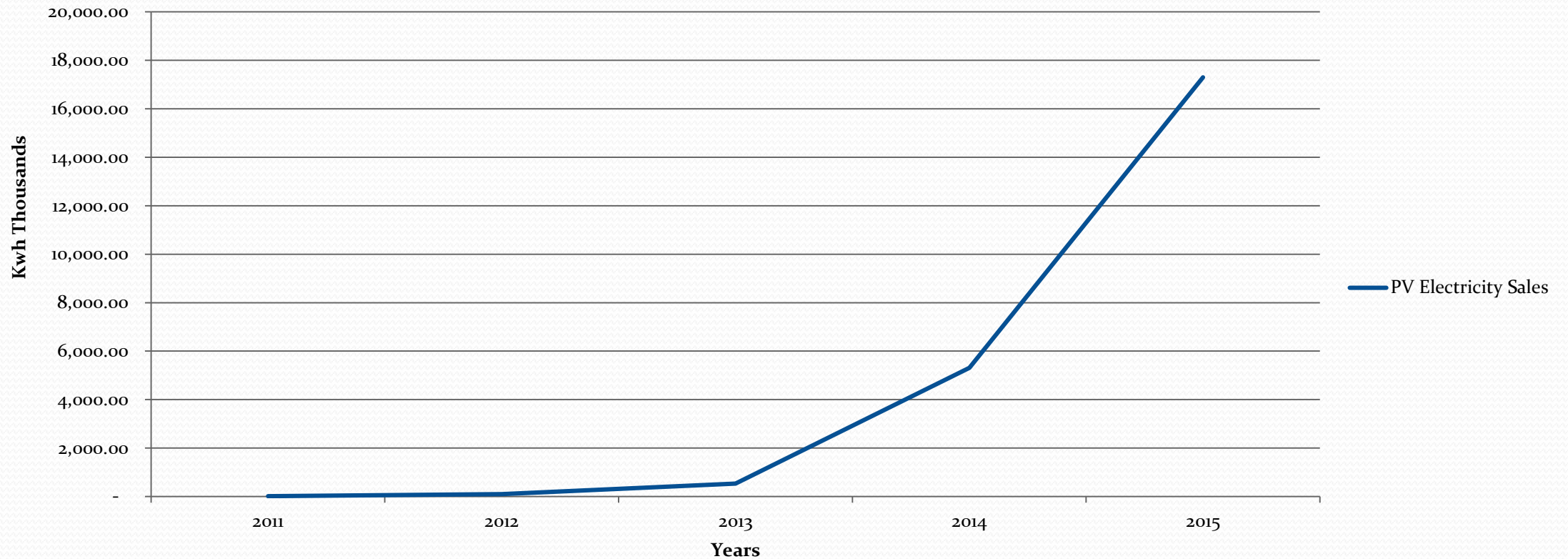
# Daily Energy Supply



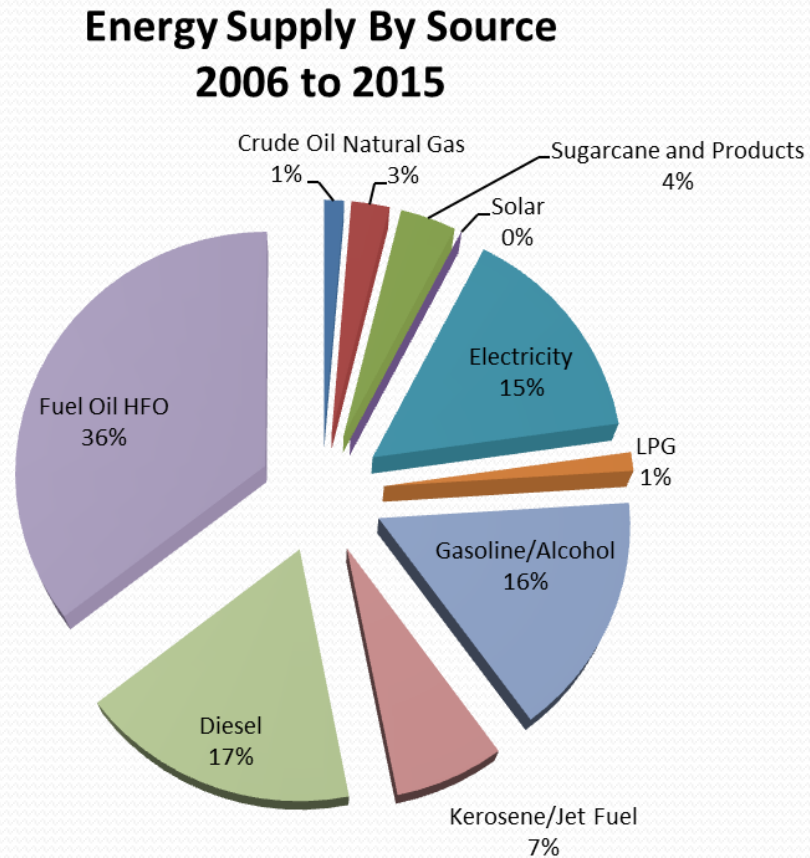
- Average daily supply of Energy during the period 2006 to 2015 is estimated to be 11 654 barrels.
- Daily Energy Supply is estimated to decline by 0.866% per year.
- Local supply represent 8% of total supply.
- During the period the local supply has declined by 4% as a result of a drop in bagasse .
- Solar Water heating has a domestic penetration of 33%.
- Solar PV increased by 175%.

# Sale of Electricity To Grid From Distributed PV Up to 2015

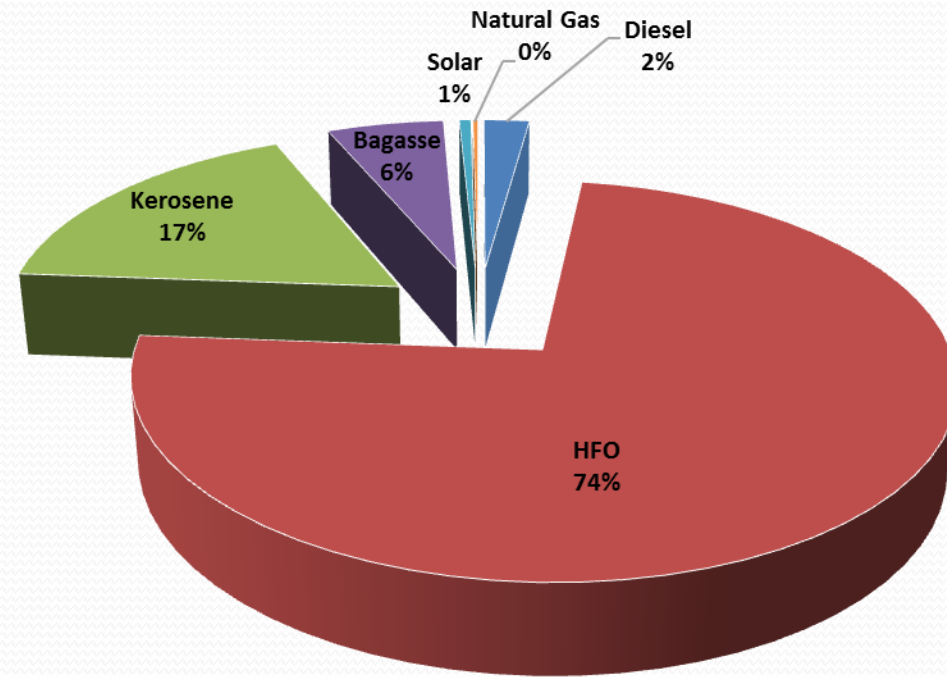
**Sale of Electricity to Grid for PV**



# Major Sources of the Barbados Energy Supply

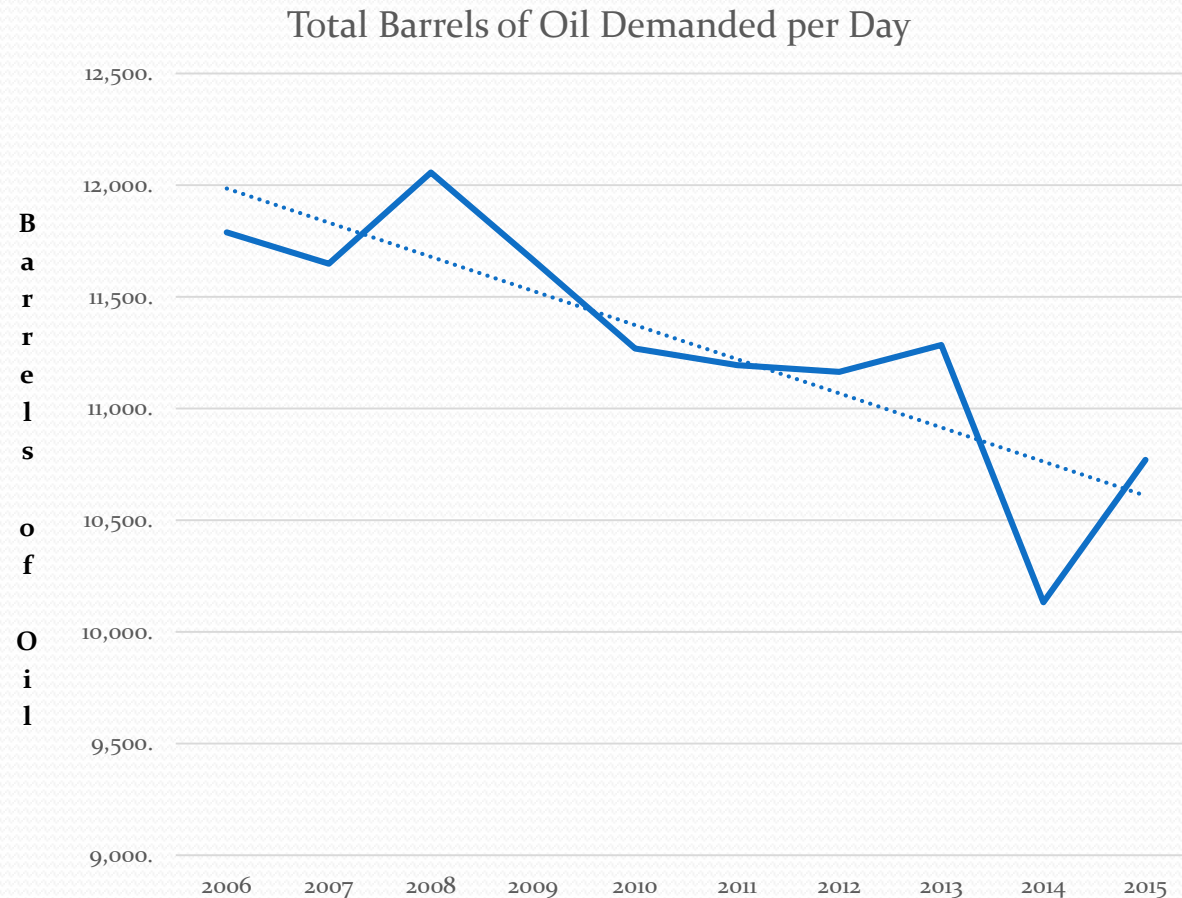


# Fuel Input By Source for Electricity Production 2015



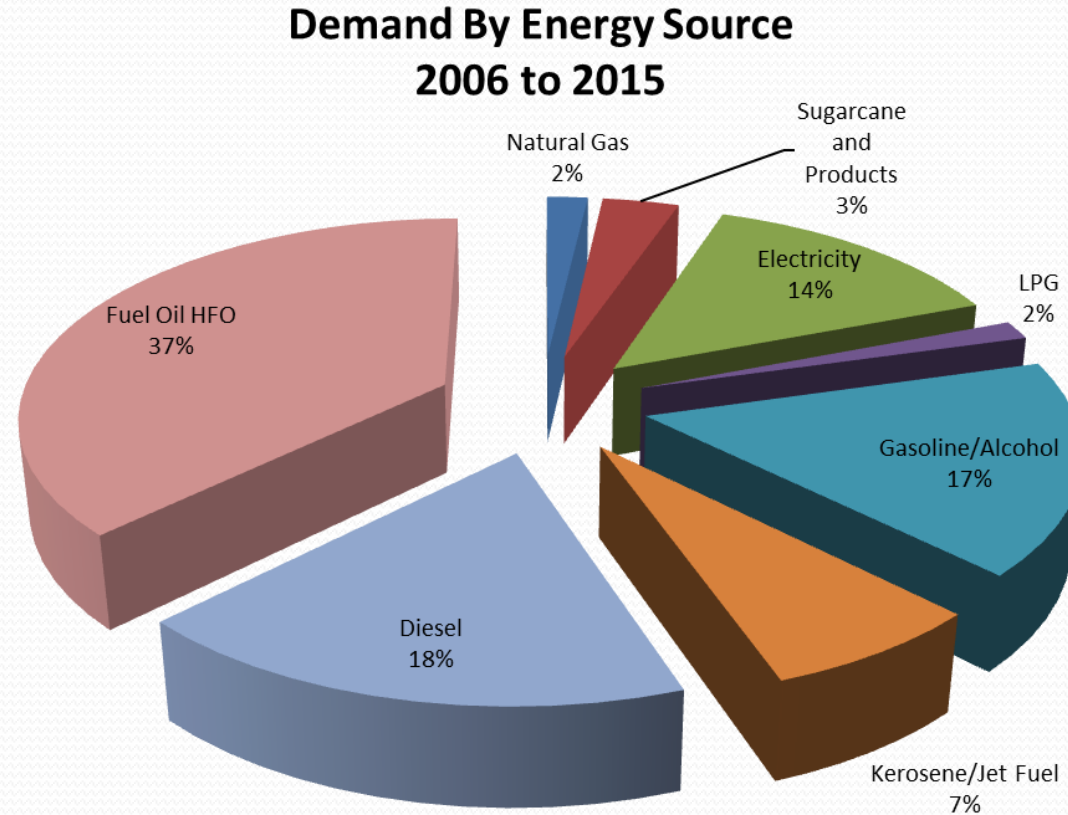
FUEL INPUTS FOR ELECTRICITY PRODUCTION 2015  
BARBADOS

# Demand for Energy



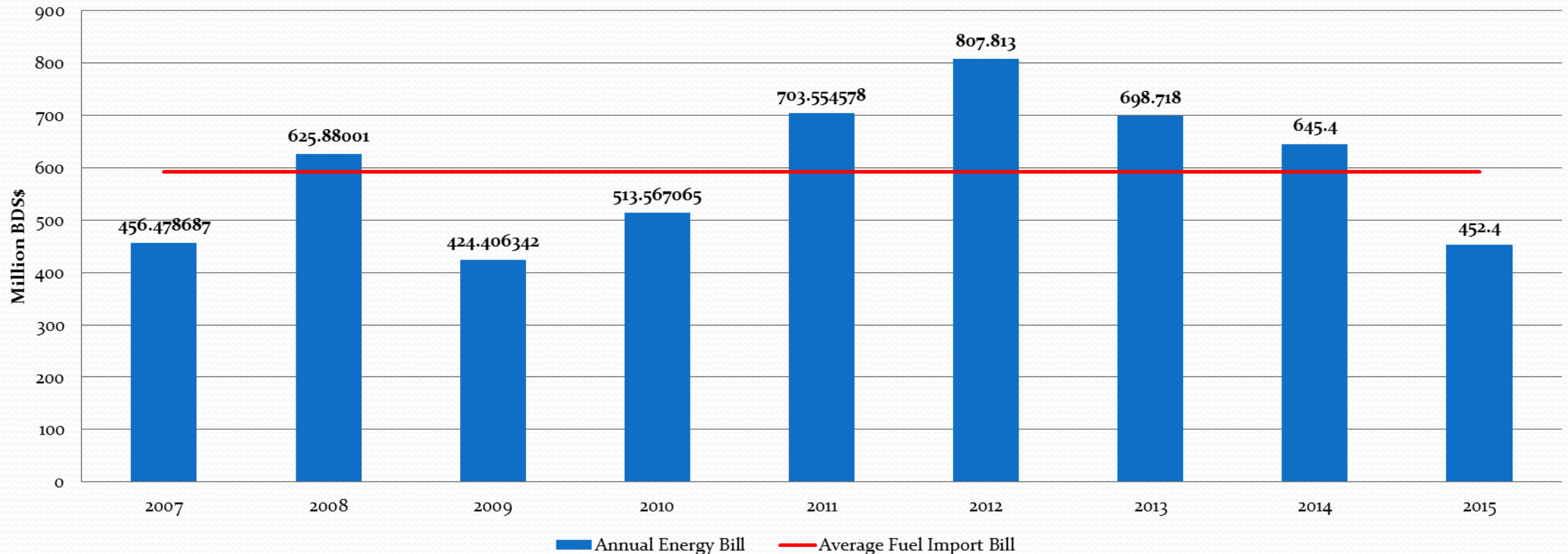
- The average daily demand is estimated to be 11 297 barrels of oil.
- Daily Demand has been declining at a rate of 1% annually.
- Energy Demand was at its highest in 2008 with a daily demand of 12 056 barrels.
- Lowest level of demand was in 2014 with 10 132 barrel per day.

# Major Sources of Energy Demand



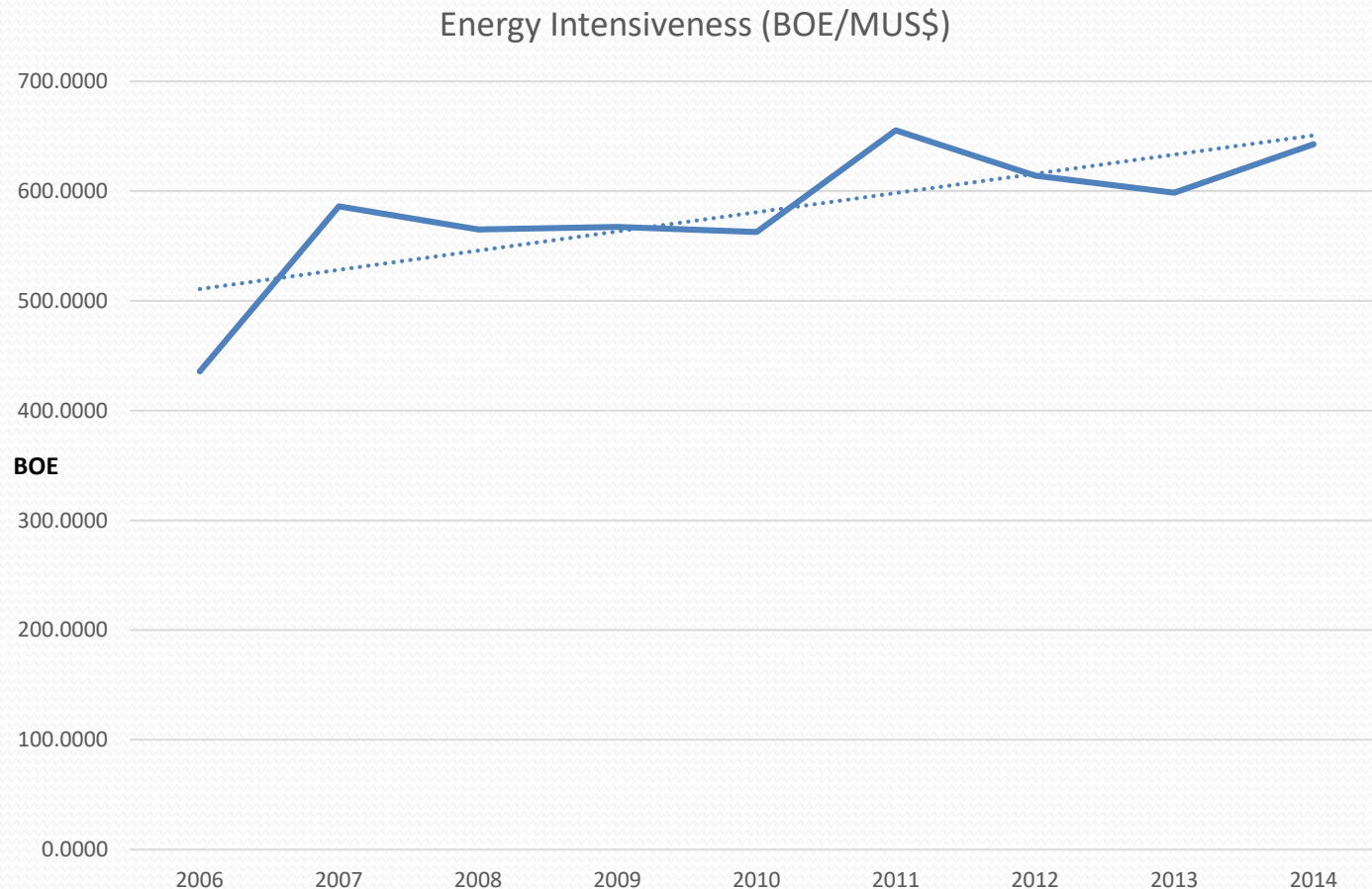
# Barbados' Fuel Import Bill

Barbados Energy Bill





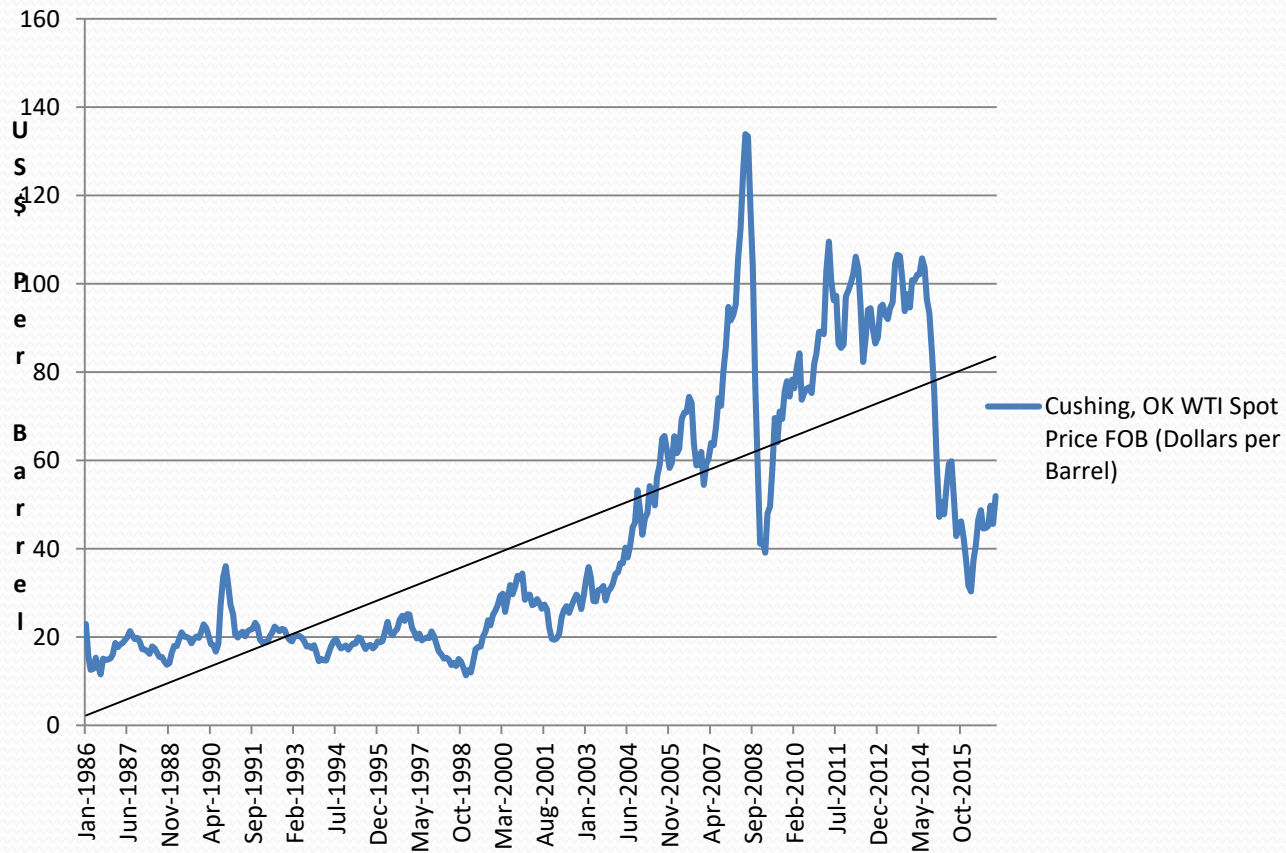
# The Amount of Energy Used to Produce US\$1 Million of Output.



- This is the amount energy we use to produce output.
- In Barbados we use on average 580.82 barrels to produce US\$1.0 Million
- Energy Intensity for Barbados between 2006 to 2014 increased at a rate of 4.85% per annum
- Highest point was in 2011 with 655.27 BOE per US\$1.0 Million

# International Oil Prices 1986 to 2016

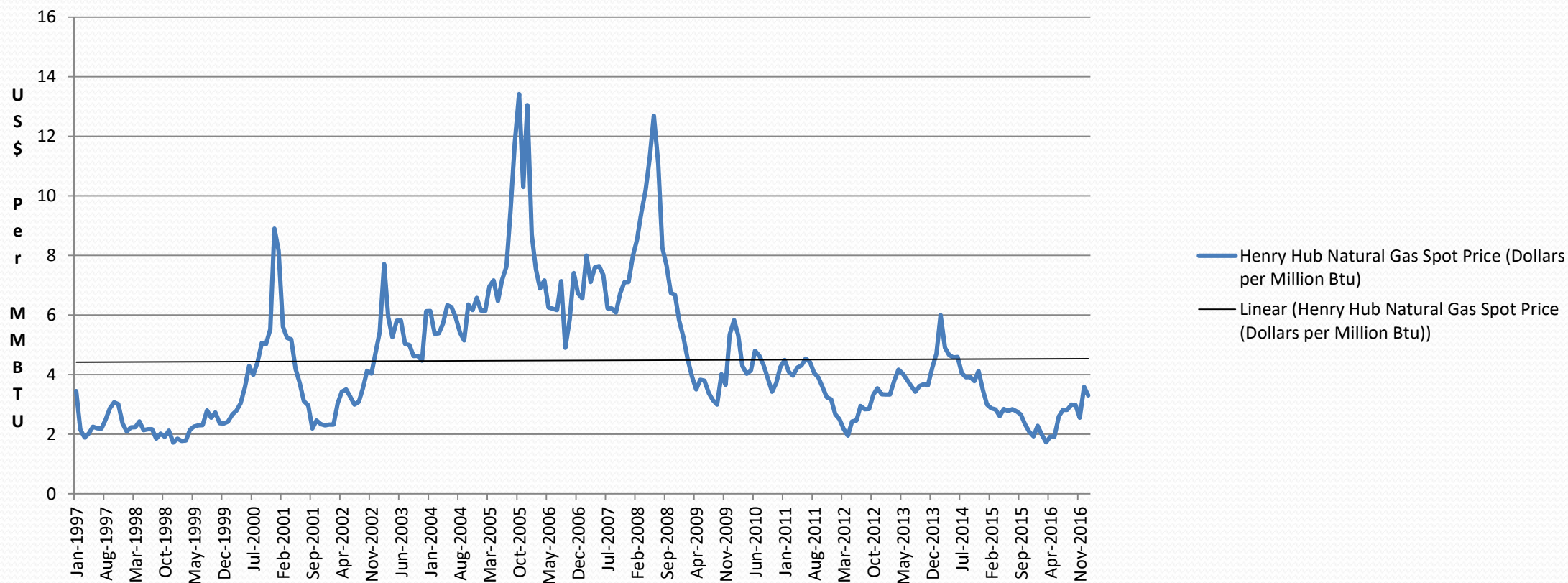
Cushing, OK WTI Spot Price FOB (Dollars per Barrel)



- During the last 30 years the long run average price of oil was – US\$50 per barrel.
- Price of oil Peaked in 2008 to \$133 (WTI) per barrel.
- The annualised price volatility stood at 30%.

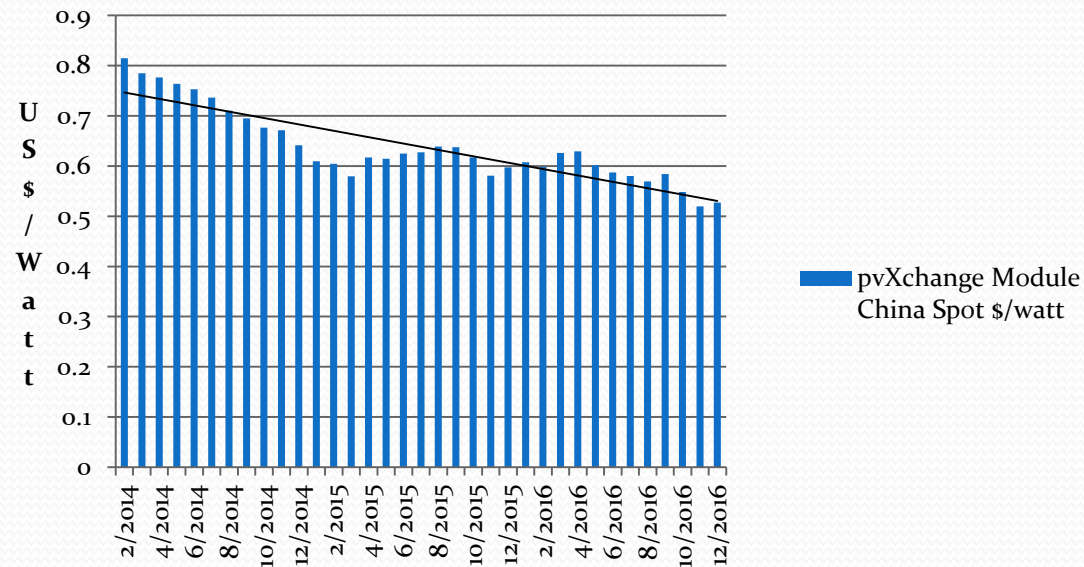
# International Price of Natural Gas 1997 to Jan 2017

Henry Hub Natural Gas Spot Price (Dollars per Million Btu)



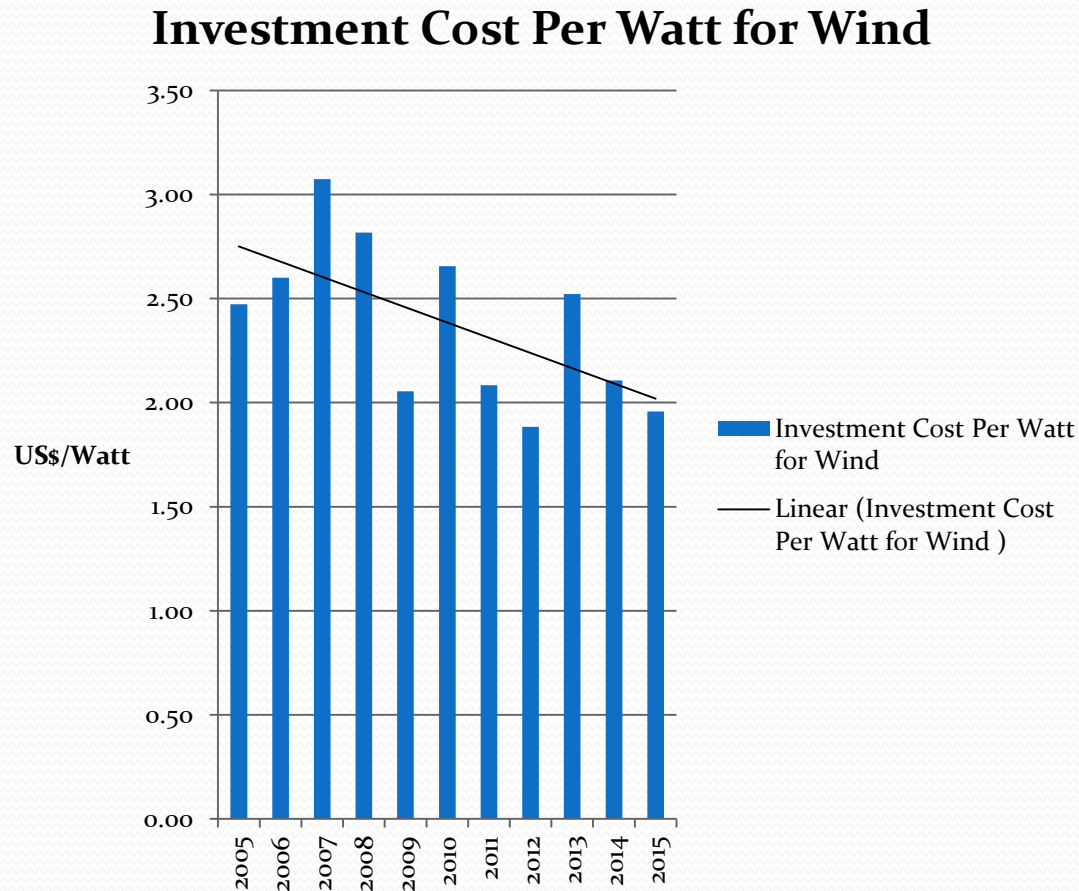
# International PV Prices 2014 to 2016

pvXchange Module China Spot \$/watt



- PV panel prices have declined by 44% between 2014 to end 2016.
- The input cost of manufacturing PV panels have been declining.

# International Investment Cost of Wind Per Watt 2005 to 2015



- The Investment cost of wind turbines have declined between 2005 to 2015 by 23%.
- It is anticipated the cost will continue to decline but at a slower rate.

# Economics of the Barbados Energy Market

			<u>Energy Economic Summary</u>		
	Fossil Fuels	Natural Gas	PV	Biodiesel	Electricity
Total Market cost	\$ 967,569,979	\$ 17,978,963	\$ 8,299,328	\$ 2,657,665	\$ 437,763,739
Cost of Traded Factors	\$ 885,195,211	\$ 6,272,161	\$ 1,809,092	\$ 259,060	\$ 237,239,101
Domestic Factor Cost	\$ 82,374,769	\$ 11,706,802	\$ 6,490,235	\$ 2,398,605	\$ 200,524,637
Private Cost per Dollar Earned	\$ 0.42	\$ 0.66	\$ 0.49	\$ 0.53	\$ 0.74
Domestic Resource Cost/\$	\$ (0.70)	\$ 0.40	\$ 0.13	\$ 0.41	\$ 0.05
The Private Benefit	\$ 112,005,787	\$ 6,042,742	\$ 6,737,408	\$ 2,092,049	\$ 69,983,623
Economic/social Benefit	\$ (138,133,575)	\$ 14,043,751	\$ 26,458,839	\$ 2,551,494	\$ 2,905,464,934

# Outlook International Output

- The International Energy Outlook 2016 of US DOE has projected that the world's GDP, adjusted for purchasing power, will increase at an annual rate of 3.3%.
- The Outlook projects that economic growth in the developing and emerging economies will expand on average by 4.2% per annum.

# Outlook International Energy Consumption

- The Outlook as presented by the EIA, projects that by 2040 global energy consumption will increase by 48%.
- The increased consumption of global energy will be derived from the developing and emerging economies which is expected to register an increase in energy consumption of 71% by 2040.
- The Outlook points to renewable energy sources being the fastest growing energy source for the period up to 2040, with consumption of this resource growing at an annual rate of 2.6%.
- Although consumption of non-fossil fuels is expected to grow at a faster rate than fossil fuel, the Outlook projects that fossil fuel will account for 78% of energy use by 2040.



# Outlook International Oil Prices

- The reference price forecast for Oil is US\$141.00 per barrel for the period up to 2040.
- The Outlook points to a minimum price of US\$76.00 per barrel.
- A forecast maximum oil price of US\$252.00 per barrel.

# The Offshore Petroleum Sector

- In 2007 Barbados Launched its Offshore Petroleum Sector. The sector is governed by:
  - Offshore Petroleum Act;
  - Offshore Petroleum Taxation Act;
  - Offshore Petroleum Regulations.
- Since that time Barbados signed licences for two of the blocks with BHP Billiton.
- Has commenced discussions to licensed another block with Repsol.
- The Offshore Petroleum Sector is governed by a Royalty/Tax Regime Comprising of:
  - Royalty of 3%;
  - Income Taxes of 25%
  - Additional Profit Tax of 30%.
  - State participation of up to a maximum of 25%
- The fiscal regime allows for a state take of between 55% to 65%.
- It is considered to be competitive and progressive Regime.

# Summary of Analysis to Reduce Fossil Fuel Consumption by 75% and replace with Clean and RE

- Given the initial estimated annual cost of \$1.2 billion to import distribute and produce energy.
- We need a course of action to reduce energy cost to \$720 million per year at market prices.
- This represents a 40% reduction.
- Provides a social/economic benefit to Barbados of an estimated \$2.2 billion annually.
- Reduce Barbados' CO<sub>2</sub> emissions by 70%.
- Significantly reduce Barbados' volatility risk.
- Ensure a course of action that allow for financial viability, economic viability, environmental viability, and utilise technologies that are proven (FEET).



THANK YOU FOR YOUR ATTENTION