The Energy Chamber of Trinidad & Tobago
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The Value of Renewables and Energy Efficient Power Plants to Trinidad

By:
Energy Efficiency and Alternative Energy Committee

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The Energy Efficiency and Alternative Energy Committee.

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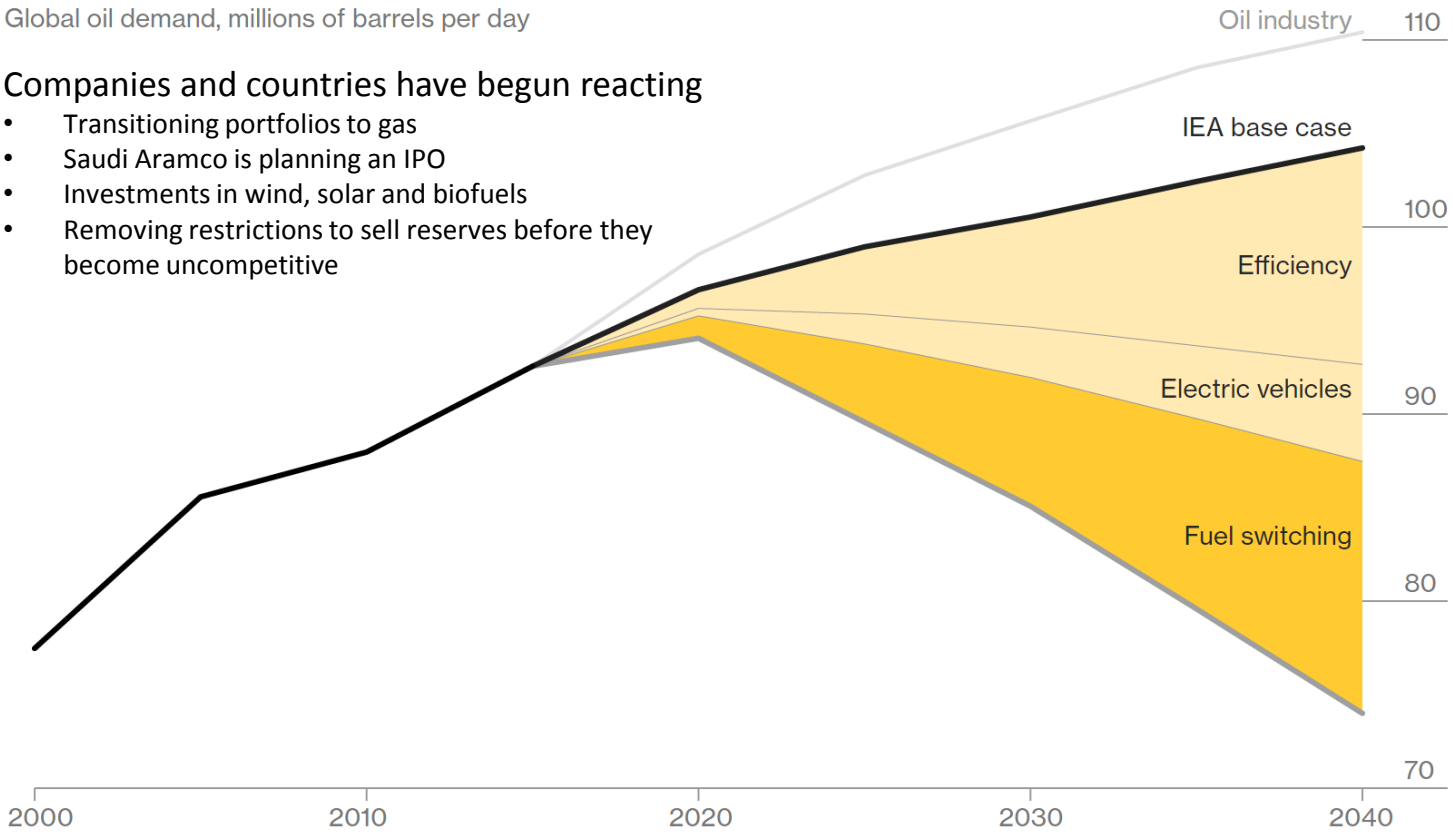
Made up of stakeholders comprising of Energy Chamber members from:

The Committee comprises of Energy Chamber members from the Upstream, Midstream, Downstream and Powergeneration sectors. As well as representatives from Government Ministries and Regulatory bodies, Renewable Energy and Energy Efficiency Business Developers, The University of Trinidad and Tobago and Civil Society

How can disruptive technologies change our outlook for hydrocarbon demand

A Radically Different Future

Global oil demand, millions of barrels per day



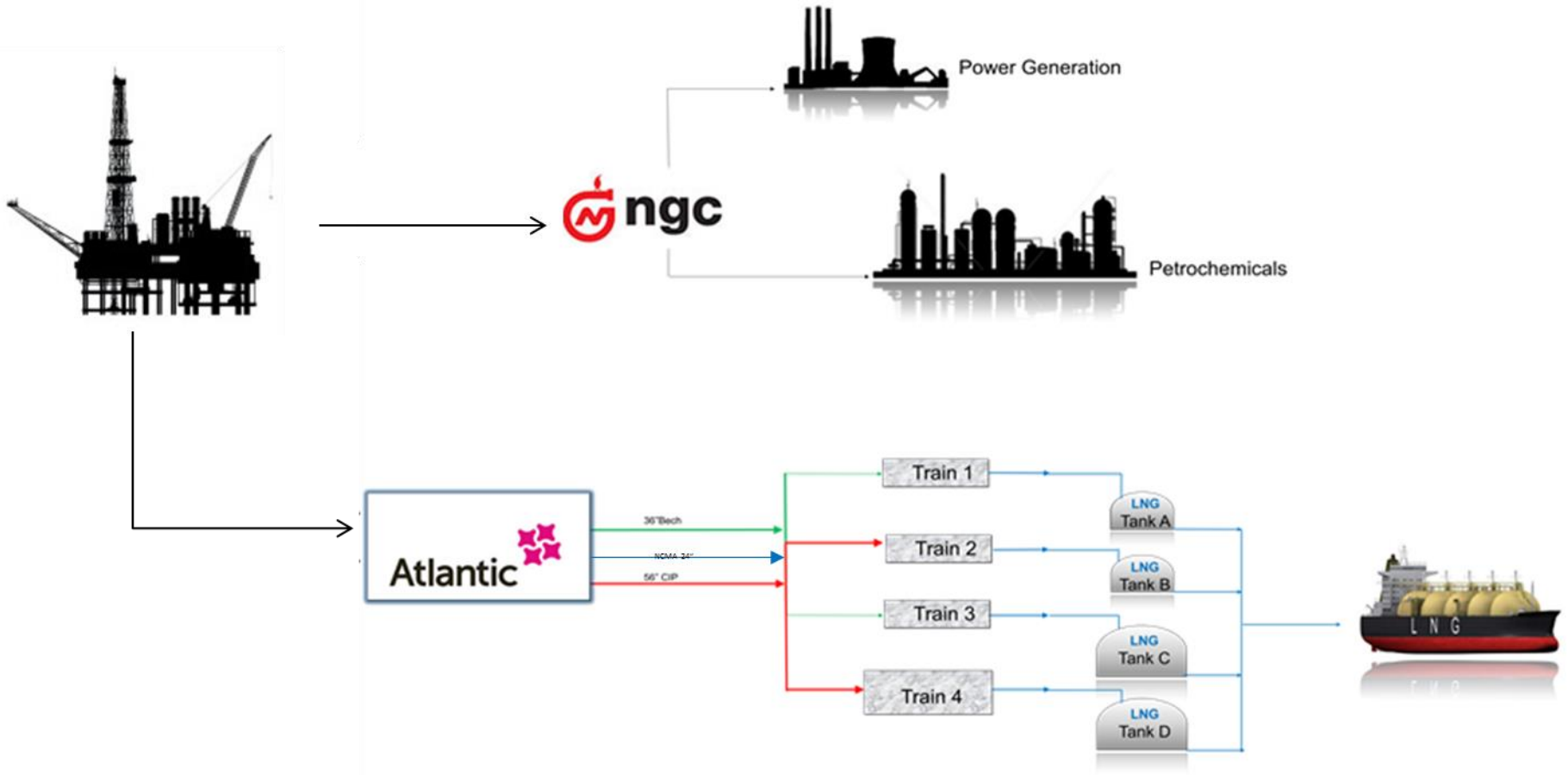
Source: IEA

Companies and countries have begun reacting

- Transitioning portfolios to gas
- Saudi Aramco is planning an IPO
- Investments in wind, solar and biofuels
- Removing restrictions to sell reserves before they become uncompetitive

Lack of demand may be what makes T&T uncompetitive in the future

How can RE & EE fit into the Trinidad context?



When renewables or energy efficiency reduces consumption in the power sector, gas can be diverted to higher value consumers generating increased government revenue and foreign exchange. To date few have viewed RE or EE benefits in the context of the "***value add***" from gas monetization downstream.

The Electricity Value Chain

Typical European and North American electricity value chain

POWERGEN

ngc

Sells Gas

Trinity Power Limited

Produces and Sells Electricity

TRINIDAD GENERATION UNLIMITED
Redefining Energy

Trinidad electricity value chain

Independent Power Producers

POWERGEN

Trinity Power Limited

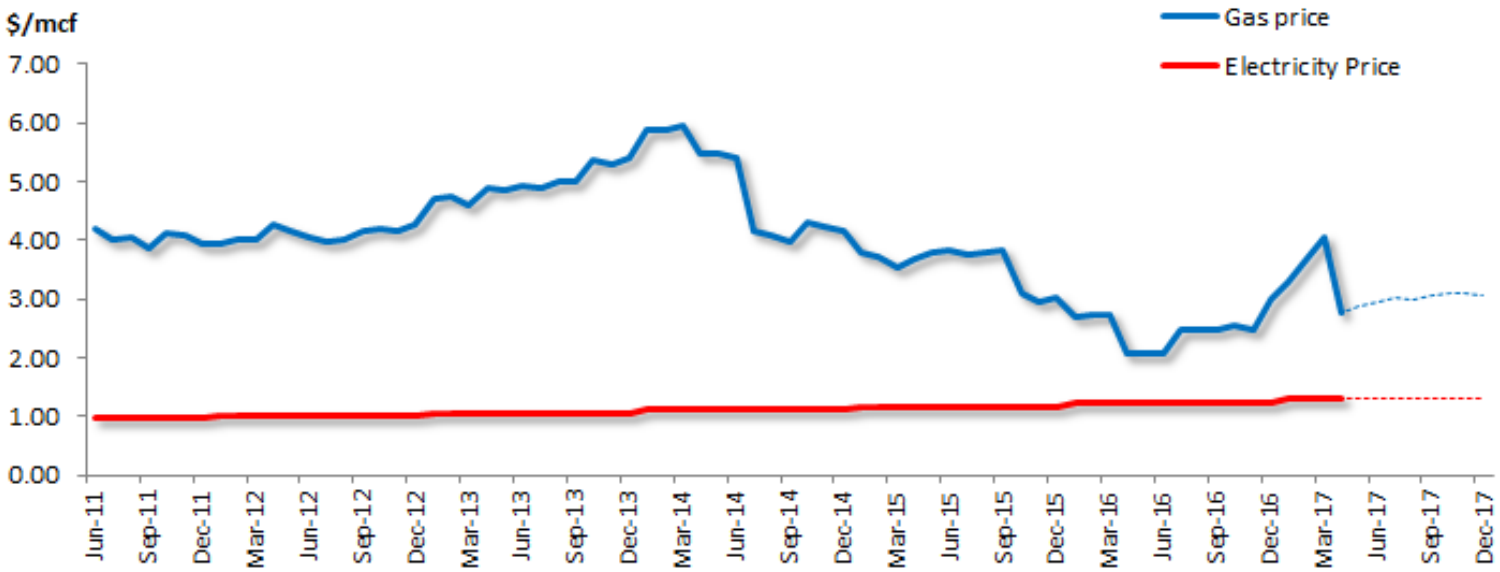
TRINIDAD GENERATION UNLIMITED
Redefining Energy

In T&T, Independent Power Producers (IPPs):

- Do not purchase gas
- Receive payment based on their ability to make power available when called upon (availability contract).
- Contractually cannot earn revenue from energy byproducts (heat, steam etc)
- Hence they are not incentivized to pursue energy efficiency upgrades.

The Electricity Subsidy

How does the electricity subsidy work?

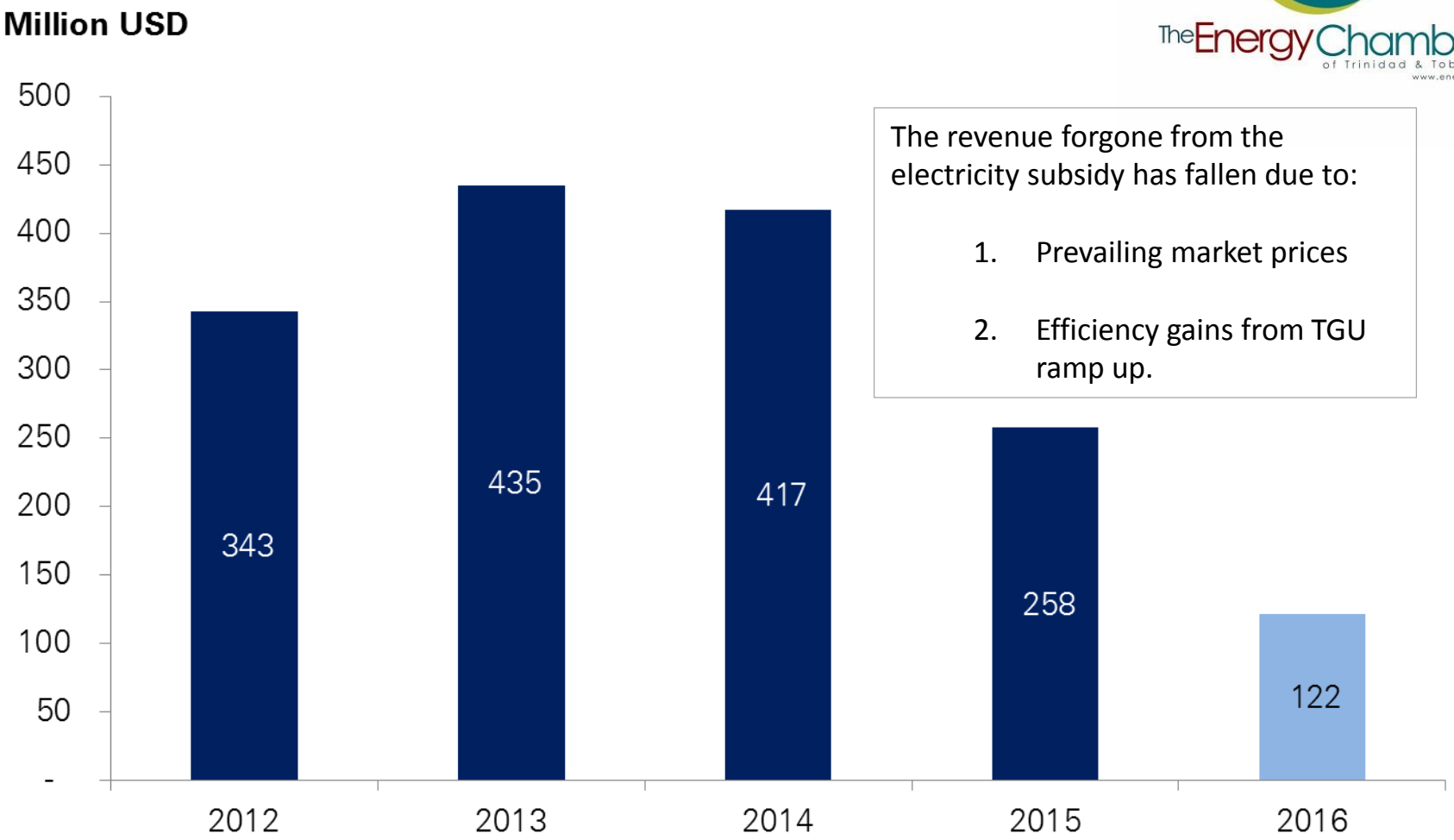


- Gas sold to petrochemical producers is tied to the prevailing market price of petrochemicals: ±3.8 USD/MMBTU @ USD400/MT methanol price

- T&Tec is guaranteed its supply of natural gas and it purchases gas from the NGC significantly **below the prevailing market price** for alternative uses of gas i.e. petrochemicals/LNG.

- The electricity subsidy is therefore at its core **an opportunity cost subsidy**.

Revenues foregone from gas sales to power



The revenue forgone from the electricity subsidy has fallen due to:

1. Prevailing market prices
2. Efficiency gains from TGU ramp up.

Note: Does not account for the value lost from lower Government taxes downstream or non payments by T&Tec

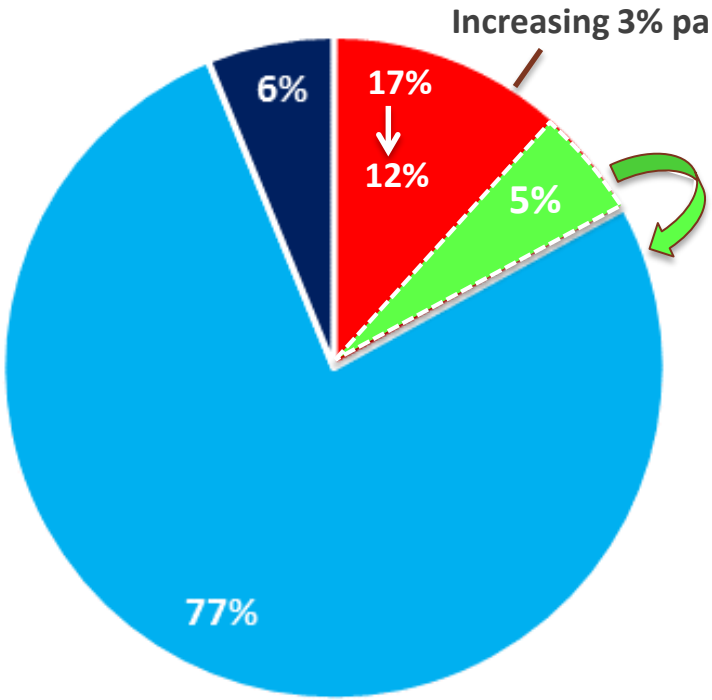
Sources:

- From Oil to Gas and Beyond, Natural Gas market structure, contracts and pricing in Trinidad & Tobago, Boopsingh & McGuire, 2014.
- IHS Chemical Market advisory service 2016, Methanol FOB W. Europe.
- MEEA Bulletins
- EE & AE Committee Calculations

Energy Efficiency in Power Generation

NGC gas sales by sector

Source: MEEA Bulletins



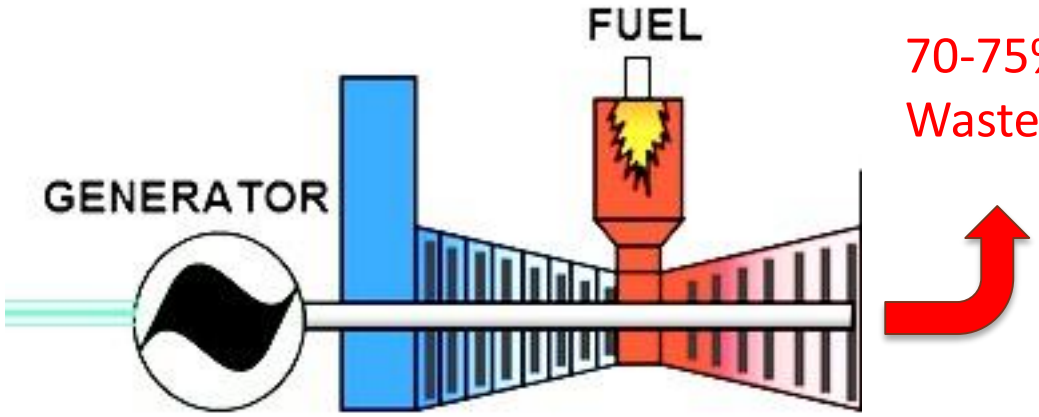
NGC Gas Sales Volumes

- EE + RE savings
- Power
- Petrochemicals
- Other

- 17% of NGC gas usage goes to power generation (~255mmscfd), increasing by 3%pa
- **Energy Efficient (EE)** power plant upgrades and **Renewable Energy (RE)** deployment would offset more than 1/3 of power sector gas demand by 2030.
- Offset gas would then be available for processing in the high value petrochemical sector , earning substantial additional profits for NGC, GoRTT, and Petrochemical operators.

Existing Power Plant Configuration

Single Cycle Gas Turbine



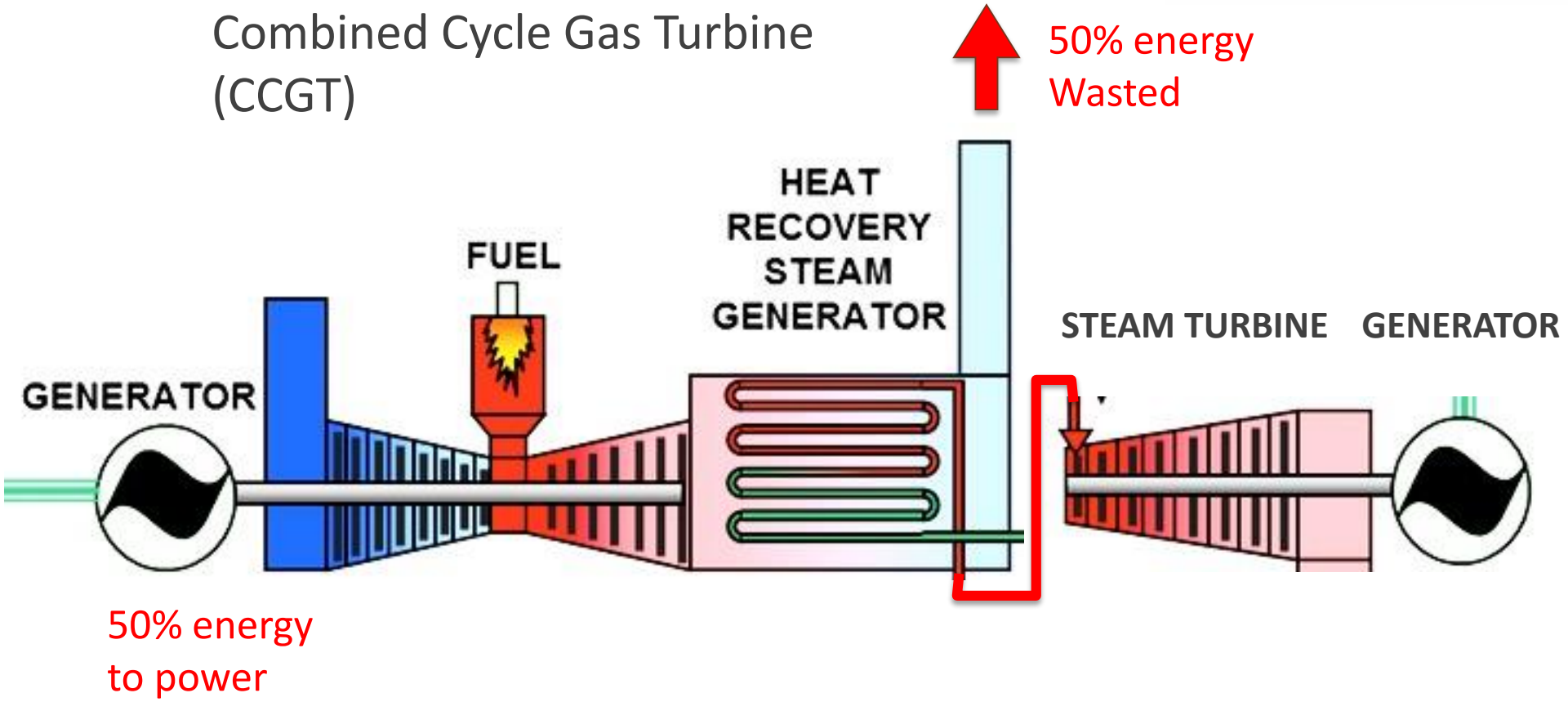
70-75% energy
Wasted

25-30% energy
to power

>50% of TnT's generating capacity is dated and inefficient single cycle technology

Upgraded EE Plant Configuration

Combined Cycle Gas Turbine (CCGT)



Total cost 520m USD, payback via stakeholder incremental revenues: 2.5 yrs

Why hasn't this been done?

IPPs incur high upfront costs to upgrade their facilities. Current estimates are:

- US $100m per combined cycle unit
- US $60m per cogen unit

Also IPPs:

- Do not purchase gas
- Receive payment based on their ability to make power available when called upon (availability contract).
- Contractually are not entitled to energy byproducts (heat, steam etc)
- Hence they are not incentivized to pursue energy efficiency upgrades.

Solution

- Tax incentives already exist to circumvent this issue
- In 2010 a 150% tax allowance was provided for Energy Service Companies that install energy savings equipment
- A tax allowance of this type can provide the commercial driver for uptake

Remaining Challenge

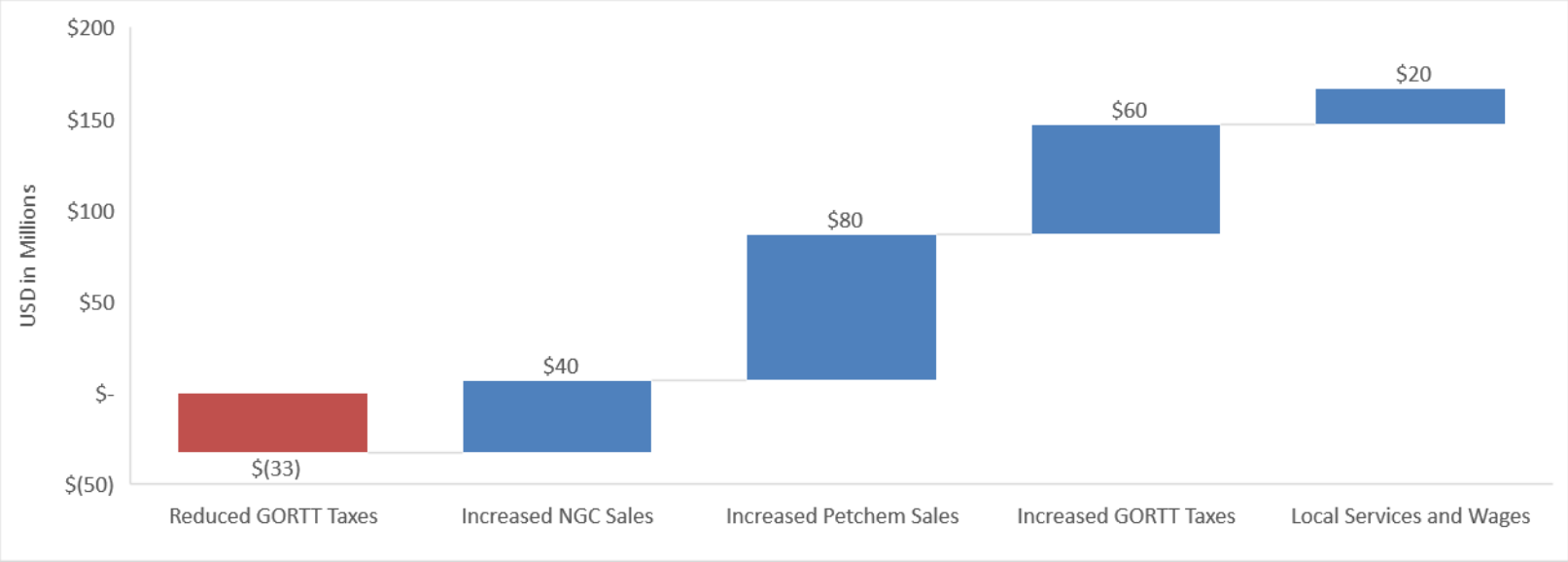
- There have been no claims because there is currently no process to certify ESCOs.

ESCO incentive = Greater Government Revenue

T&Tec paid the IPPs US $93.6m in 2010, of which GORTT tax take is estimated at US $32.8m* (does not include TGU)

*(Source IDB: A Unique Approach to Sustainable Energy in Trinidad & Tobago, 2015)

If the ESCO incentive is given to the remaining IPPs to improve them to TGU's level of efficiency



Additionally, the reduction in gas demand by T&Tec will alleviate gas shortfall on the Pt. Lisas Industrial Estate and reduce the NGC's penalty risk.

GAS SAVINGS VIA RENEWABLE ENERGY

Utility scale Solar and Wind energy PPA pricing trends

- Pricing trends steadily lower

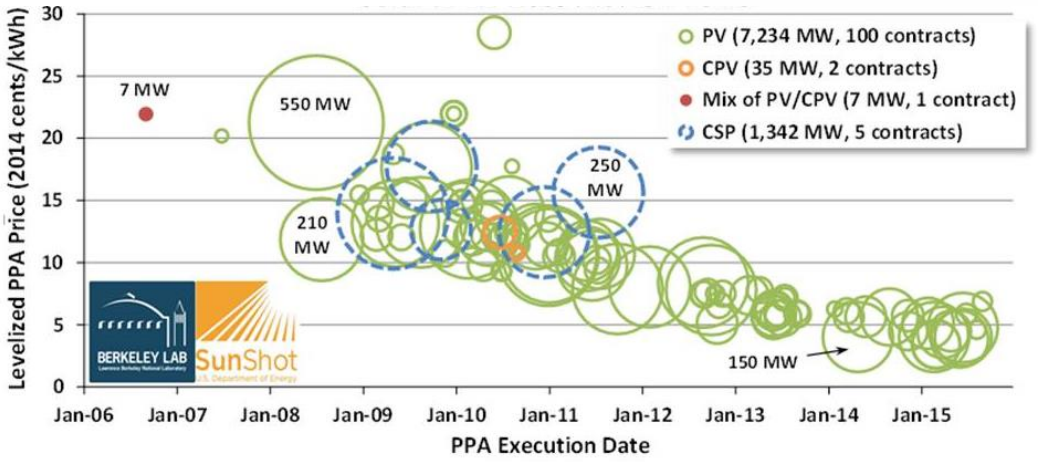
Driven by:

1. Technology costs
2. Installation excellence
3. Investor acceptance, lower cost of capital

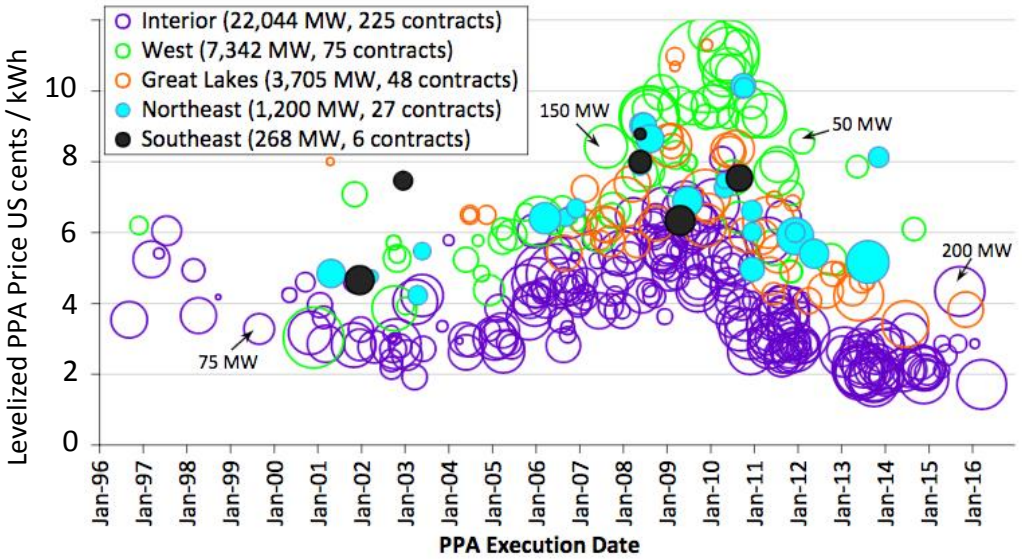
- higher returns than corporate bonds at lower risk

- Wind and solar now competing against gas and coal generation in some markets, without subsidies

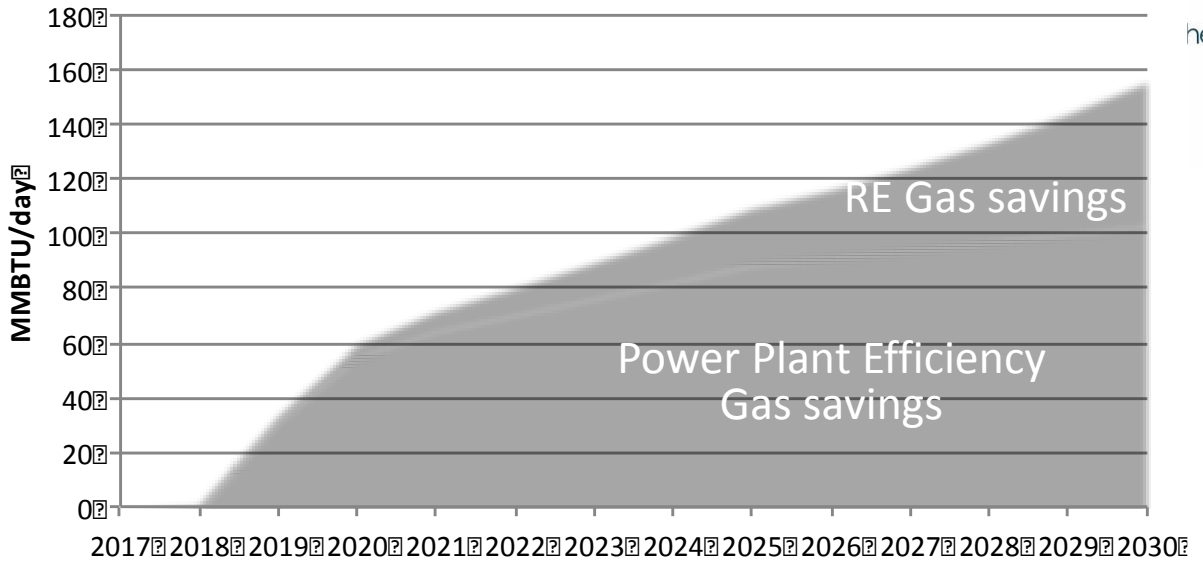
Solar Energy PPA pricing trends



Wind Energy PPA pricing trends



Impact of combined EE and RE implementation



Total EE and RE Impact	2021	2025	2030
MMSCFd savings	73	111	152
NGC earnings mUSD/yr	45	67	94
Petrochem earnings mUSD/y	89	134	184
GoRTT Tax earnings mUSD/yr	61	89	116
Foreign exchange mUSD/yr	149	233	353

- Combined impact equivalent to 2 petrochemical plants by 2025
- Substantial value add to all Trinidad and Tobago stakeholders, starting today

Key Recommendations

- Tax incentives should be given to IPPs who upgrade to combined cycle or cogeneration.
  - Currently IPPs have availability contracts and energy efficiency upgrades do not grow their bottom line.
  - They simply are additional costs that the IPPs cannot recoup.
  - IPP's should be able to benefit for 150% Tax allowance already legislated for and there will be no loss to the government

- A RE portfolio standard that any new power purchase agreement must have some renewable energy component. *i.e. industrial scale solar with natural gas fired back up for electricity generation during the night and/or low solar output during the day.*

- Duty and VAT exemptions should be granted for energy efficient Dryers, A/C units, water heaters, motors, pumps and compressors as these are biggest ***residential and commercial*** consumers of power.

- Conclude the process of amending the T&Tec and RIC acts to encourage renewable energy generation on a residential scale.

- A 4th pricing tier should be created for the more affluent in society. This Tier should be priced at the true cost of electricity (unsubsidized) as 40% of households in T&T consume **greater than** 1000kwh on a bi monthly basis.