From exploration to action:
Positioning Namibia as the next energy frontier

Maximising the Value of Natural Gas in the Orange Basin

INCREASING NATIONAL VALUE FROM NATURAL GAS IN A DEVELOPING COUNTRY LESSONS FROM TRINIDAD AND TOBAGO

Anthony (Tony) Paul, Future Energy Partners

Oil &Gas Value Addition and Retention Measures

1. **Fiscal & Monetary Policies**

2. **Non Fiscal Measures**
   - Local Equity Participation
   - Local Content (Backward linkages)
   - Local Value Addition (Forward Linkages)
   - Supporting other sectors (Lateral Linkages)
   - Capacity Development

3. **Operations**
   - Extracting more and cheaper
   - Getting a higher price
   - Increasing in-country activities and investments by foreigners (bigger tax base)
   - Locals Participating in **out of country** activities
   - Exporting local oil & gas goods & services

4. **Risk Reduction (Good Governance)**

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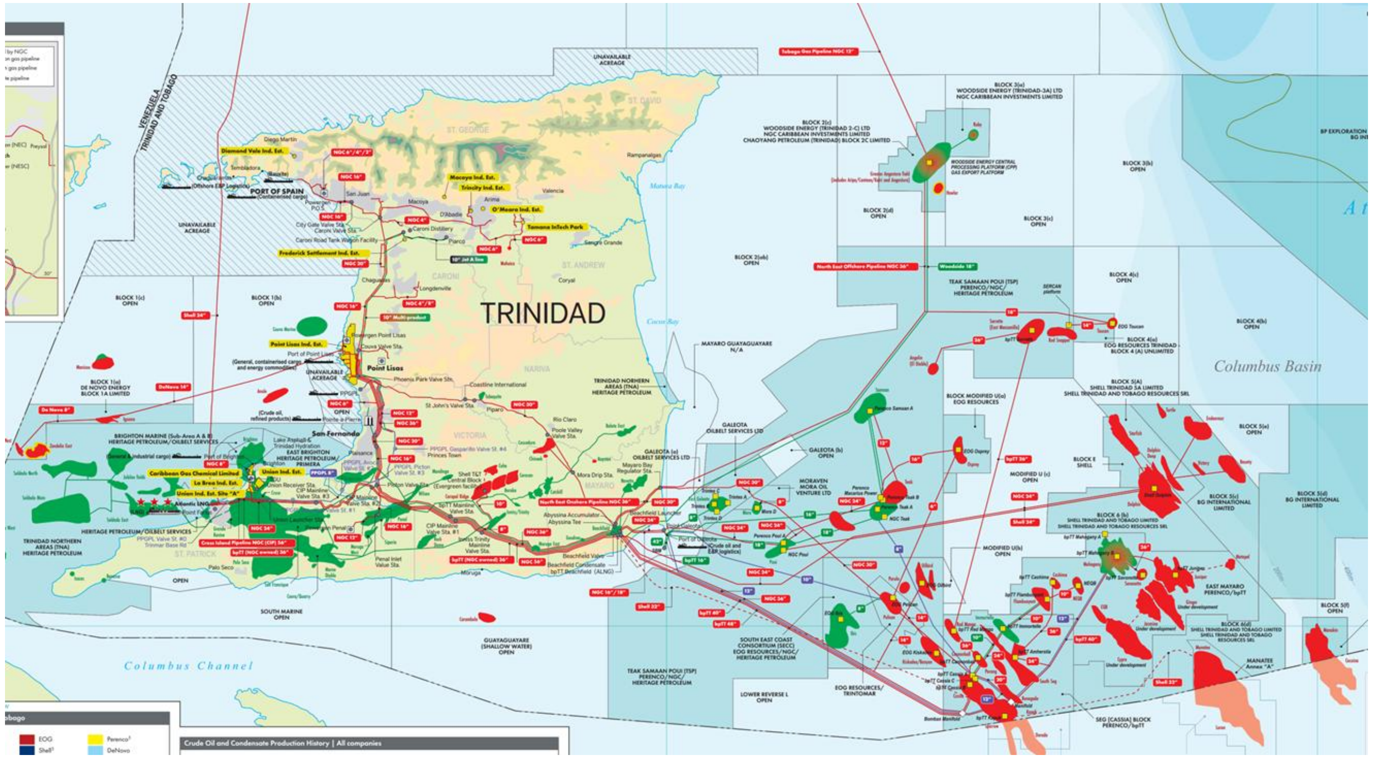

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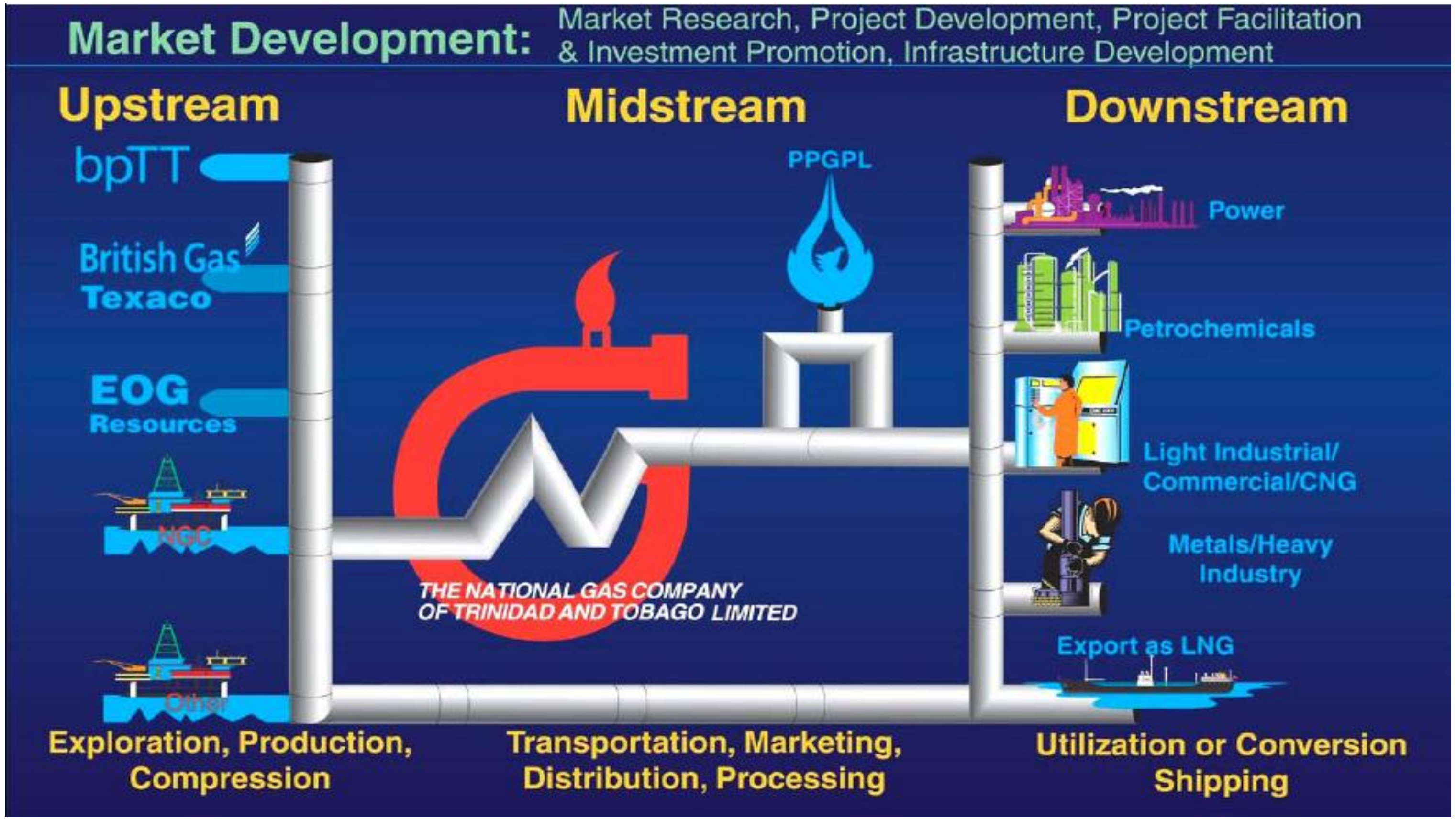

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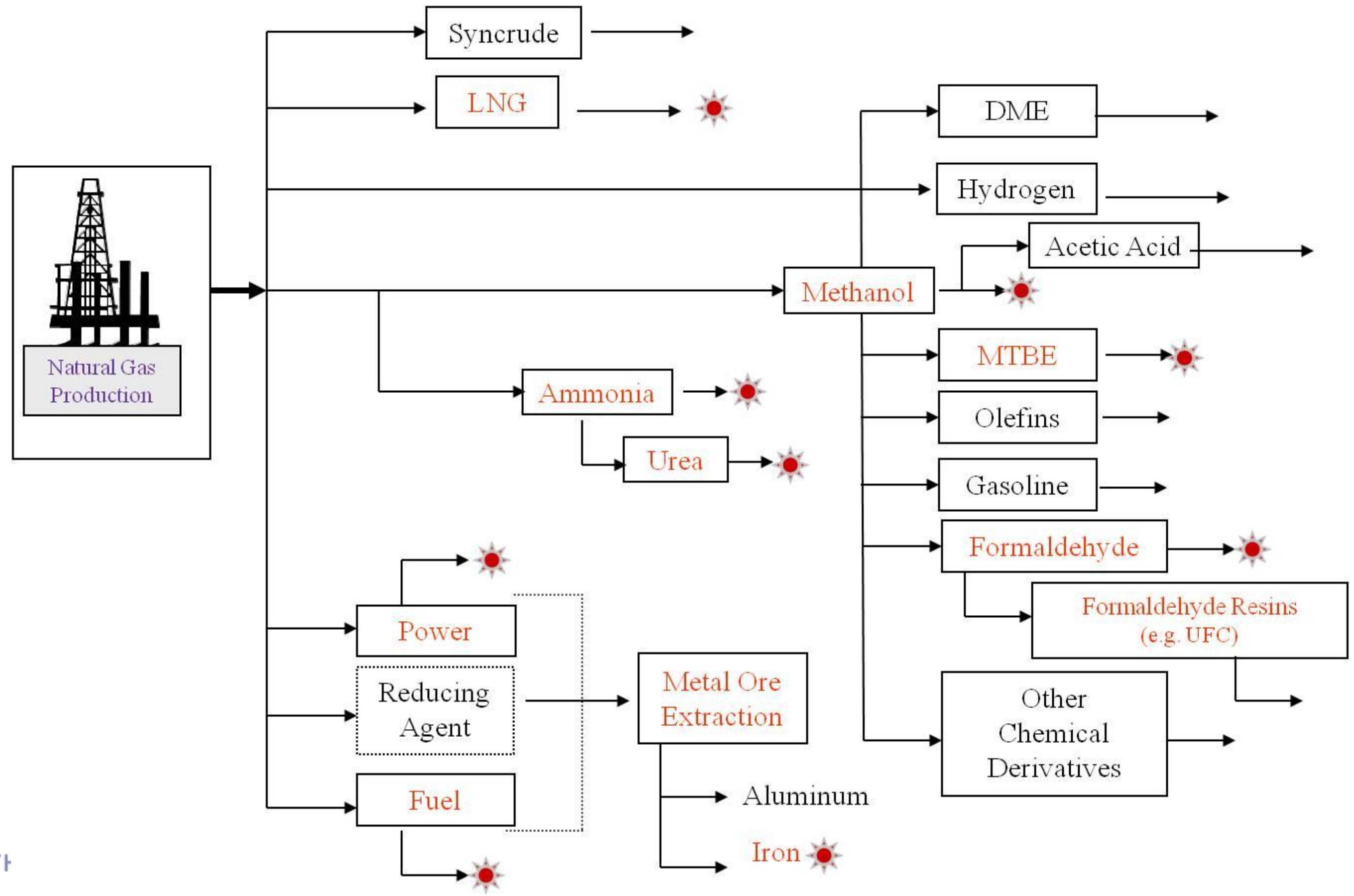
Natural Gas Usage (T&T uses in red)



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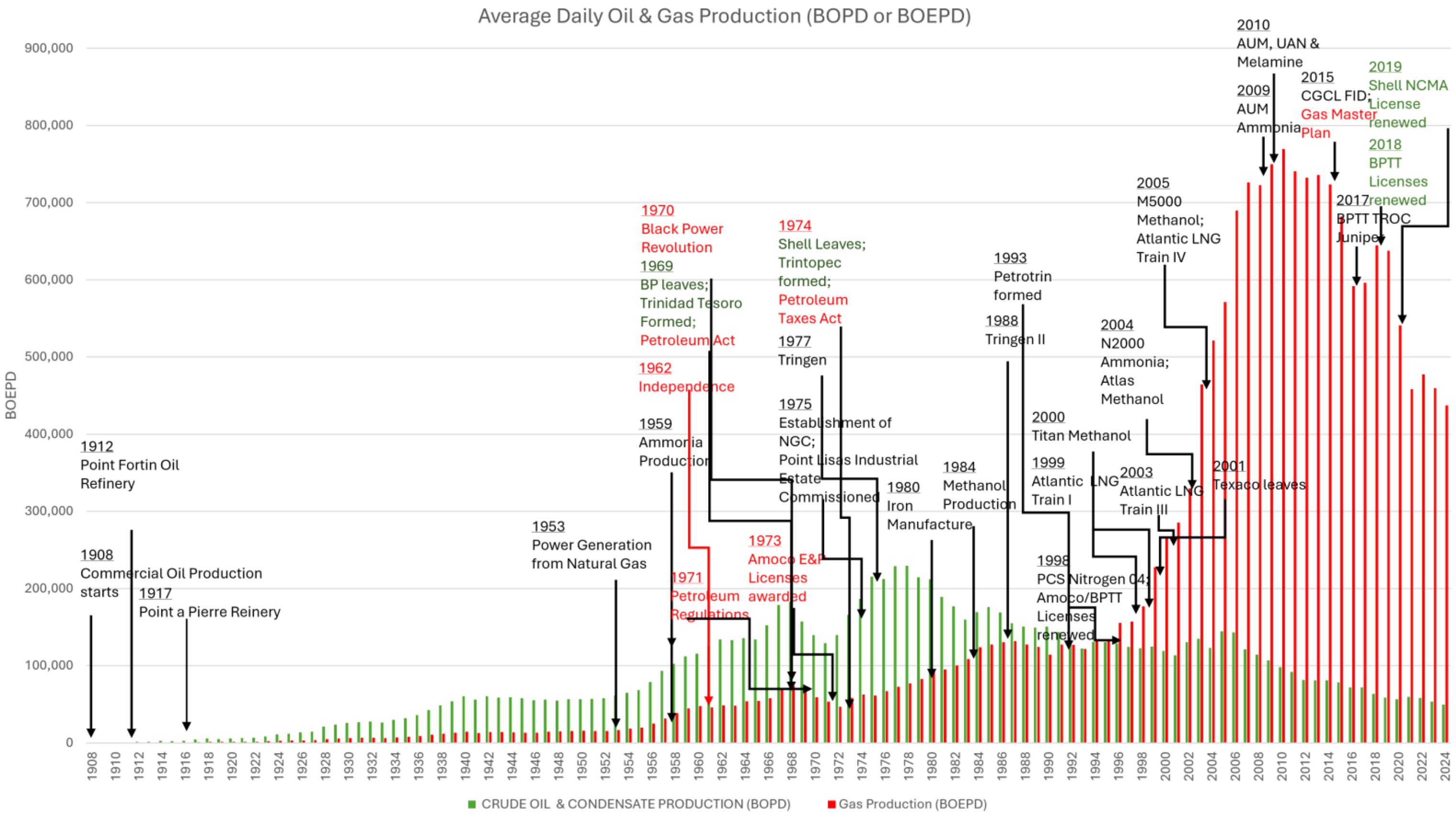
T&T's Oil & Natural Gas Production 1908-2024



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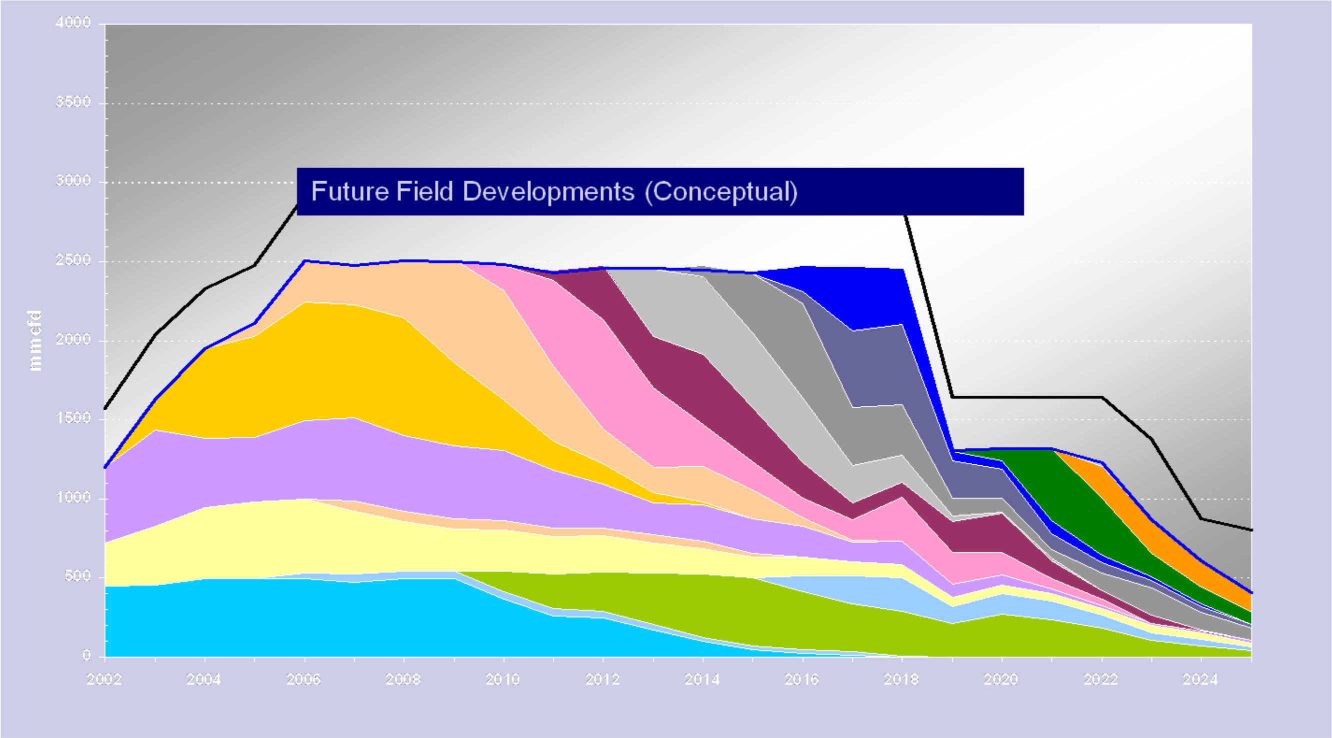
Early 2000's - Sustained, continuous Upstream Growth - allows for access to exploration & development spend.

Maintaining a sustainable level of production was to have assured a sustainable level of activities and employment



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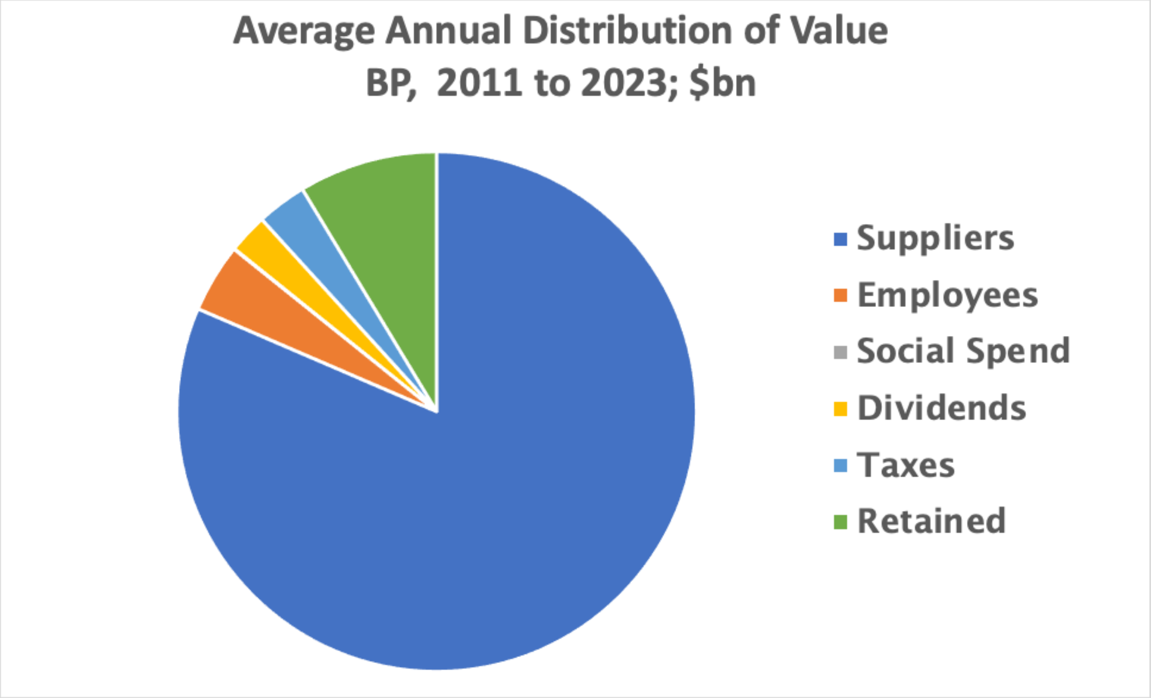
BP (Global) - Where Oil & Gas Revenue Goes

BP's Average Annual Revenue 2011-2023:

- ✓ $277.2 Billion
- ✓ Upstream ~25%
- ✓ **Downstream >70%**
  - ✓ *much outside producing countries*



80.95%
4.50%
0.04%
3.07%
3.02%
8.43%

(Source: BP's sustainability reports 2011-2023)

- This split represents the whole value chain, globally
- Upstream sector may return a higher share in taxes, varying from State to State
- Upstream 3rd party supplier share is similar.

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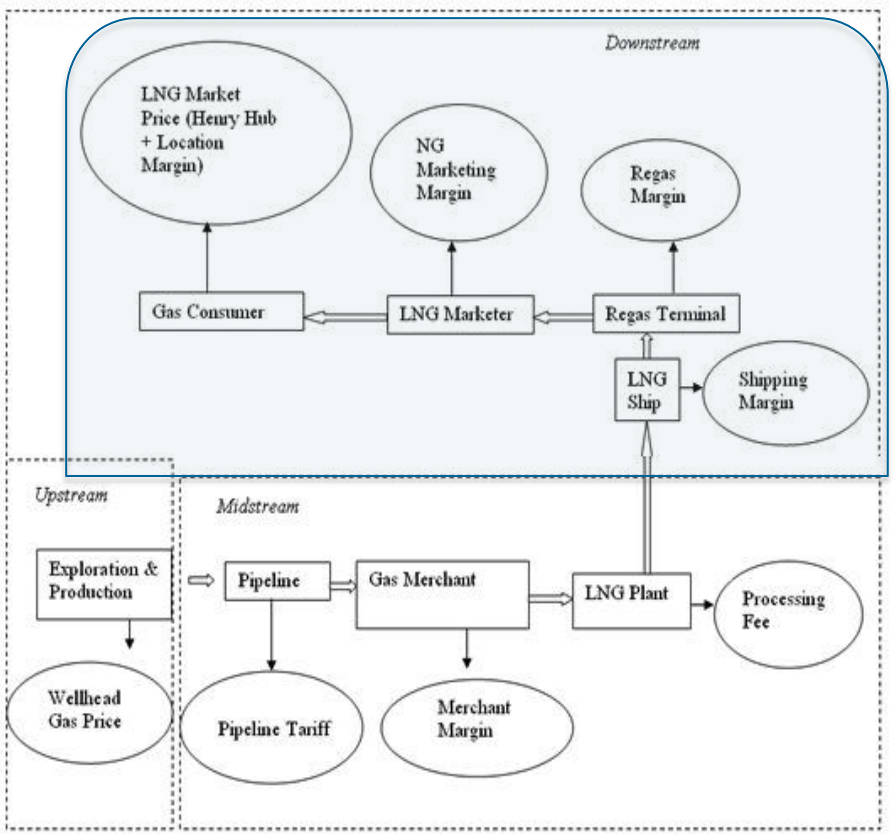
T&T LNG Value Chain
- value downstream of processing/manufacturing

incl. Trading, Marketing, Shipping, Insurance



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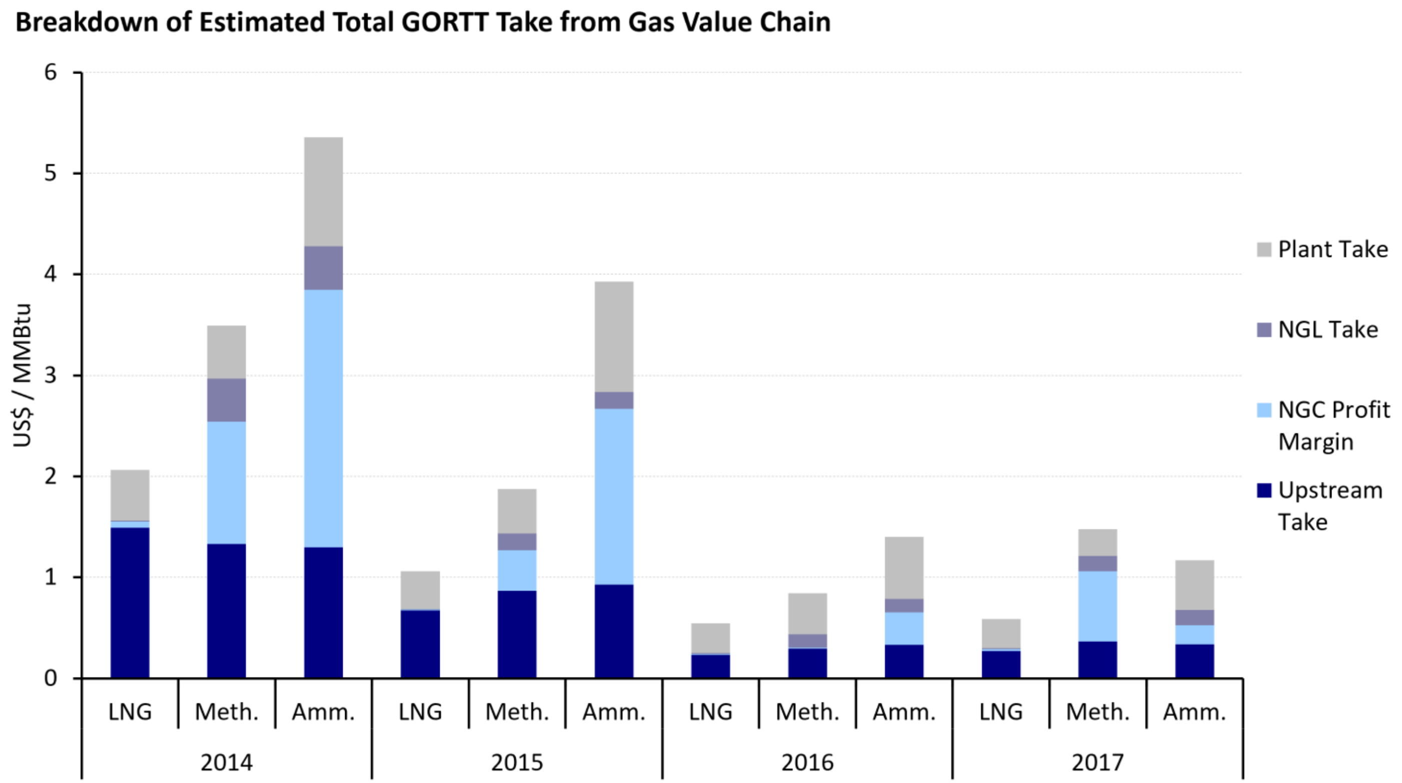
More Value Captured from Manufacturing than from Export of Raw Material (LNG)



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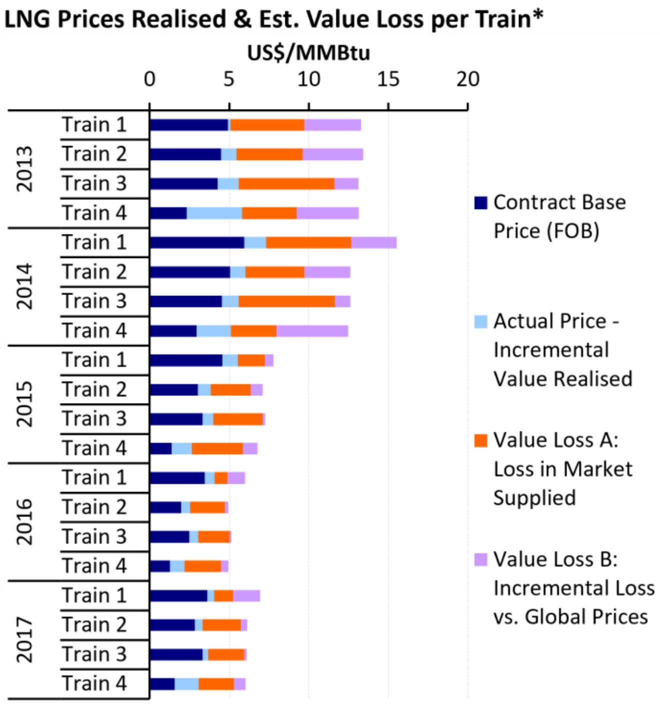
Transfer Pricing - Significant value in the LNG chain has not been realised in T&T



* Value Loss A: Difference between the price realized from the market actually supplied and Poten's estimate of the prevailing price in that market
Value Loss B: Poten's estimate of the incremental price that could have potentially been realized by selling FOB at an oil-linked price (11.5 – 12%)

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Hub Opportunities for Natural Gas Value Addition

1. Gas Supply & Processing Infrastructure - Shared assets:

- **Gas reception terminal** (pipeline tie-in, custody transfer metering)
- **Gas treatment & processing facilities** (acid gas removal, dehydration, NGL recovery)
- **Gas compression stations**
- **Pipeline distribution network** within the estate
- **Storage** (Product storage, LNG tanks, CNG storage)

2. Energy & Utility Systems

- **Power generation plant** (gas turbines/combined cycle), with:
  - Centralized **electricity distribution** network
  - Backup/standby power systems
- **Steam and hot water generation** for process heating
- **Cooling water systems** (centralized cooling towers, chilled water plant)
- **Instrument air and plant air systems**
- **Nitrogen production & distribution**
- **Industrial gases** (oxygen, argon, hydrogen if produced as by-products)
- **Water supply** (treated industrial water, potable water)
- **Wastewater collection & treatment** (process effluent, sanitary wastewater)
- **Firewater network** (hydrants, pumps, storage tanks)

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3. Storage & Logistics Facilities

Common materials-handling and transport infrastructure:

- **Bulk storage tanks** (for LPG, LNG, condensate, liquid feedstocks, intermediates)
- **Solid product warehouses** (fertilizer, plastics, packaged goods)
- **Truck and rail loading/unloading stations**
- **Port/marine terminal** for export/import (if coastal)
- **Pipeline corridors** for liquid and gaseous products
- **Internal road network** for heavy and light vehicles

4. Shared Services & Support Facilities

Services that reduce overhead and improve coordination:

- **Central control room / SCADA monitoring**
- **Laboratories** for product testing and quality control
- **Maintenance workshops** (mechanical, electrical, instrumentation)
- **Emergency response center** (fire, medical, security)
- **Waste handling facilities** (hazardous waste storage, recycling, incineration)
- **IT and telecommunications backbone**
- **Training and conference facilities**
- **Administration buildings** and common office space

5. Environmental & Safety Systems

- Shared systems to meet regulatory and safety requirements:
- **Flare systems** (main process flare, cold vent stacks)
- **Environmental monitoring stations** (air, water, noise)
- **Gas detection & alarm systems**
- **Stormwater management systems**
- **Green buffer zones** for noise and emissions control

6. Potential Shared Product Streams

Where processes produce overlapping or complementary outputs, sharing can be economical:

- **Steam** from a co-gen plant to multiple process units
- **Industrial gases** from large-scale production units
- **Recovered by-products** (e.g., CO_2 for beverages or EOR; sulfur for sulfuric acid)
- **NGLs and LPG** separated from the natural gas stream

Maximising the Value of Natural Gas in the Orange Basin

Synergies with Hydrogen

If a hydrogen production facility is located close to a **natural gas–based industrial estate** and both are linked to **export markets by sea**, the overlap creates a lot of scope for **shared infrastructure, integrated processing, and downstream diversification**.

1. Shared Energy & Utility Infrastructure

Hydrogen production and natural gas–based industries often require similar core utilities:

- **Power generation**
- **Cooling systems**
- **Water supply and treatment**
- **Industrial gases**
- **CO_2 handling**

  If hydrogen is "blue" (from NG with CCS), CO_2 capture, compression, storage or utilization facilities can also serve NG-based plants (e.g., for urea, beverages, or synthetic fuels)

2. Shared Logistics & Export Infrastructure

- **Marine terminal**
- **Pipeline corridors**
- **Bulk storage tanks** (cryogenic for LH_2, ammonia, methanol; pressurized for LPG/NGL)
- **Common loading/unloading bays**

3. Multiuse Process Plants & Equipment

- **Ammonia plants -** Can run on hydrogen from NG reforming, hydrogen from electrolysis, or blends. Acts as a "carrier" for hydrogen exports and a feedstock for fertilizers
- **Methanol plants -** Can take syngas from NG or green hydrogen + captured CO_2
  - Supports synthetic fuels (e-methanol) production
- **Synthetic fuel plants** (Fischer-Tropsch, e-kerosene, e-diesel) - Can integrate hydrogen from both NG and renewables, plus CO_2 from other processes
- **Industrial heat networks** using high-temperature heat from hydrogen production or NG-fired cogeneration

Maximising the Value of Natural Gas in the Orange Basin

4. Downstream Manufacturing Opportunities

Combining hydrogen and NG feedstocks enables a **more diversified product base**:

- **Fertilizers**
  - Ammonia → urea, ammonium nitrate, ammonium phosphate
- **Plastics & polymers**
  - Methanol → olefins → polyethylene, polypropylene
  - Hydrogen in hydrogenation steps for specialty chemicals
- **Metals processing**
  - Direct Reduced Iron (DRI) using hydrogen or NG syngas
  - Steelmaking with lower CO_2 emissions
- **Synthetic fuels**
  - Green/blue hydrogen + CO_2 → e-kerosene, e-diesel, marine fuels
- **Glass, ceramics, and float glass**
  - Can use hydrogen or NG for process heat
- **Electronics & semiconductor gases**
  - Hydrogen and nitrogen supply for chip manufacturing or solar PV production

5. Shared Support & Safety Systems

- **Centralized control rooms** monitoring hydrogen and NG facilities
- **Fire and emergency response systems** designed for both cryogenic and flammable gas hazards
- **Hazardous waste handling & neutralization**
- **Training & certification centers** for handling LNG, LH_2, ammonia

6. Strategic Benefits

- **Economies of scale** in utilities, port handling, and pipeline infrastructure
- **Flexibility in feedstock sourcing** (e.g., switch ammonia plant from NG-derived H_2 to electrolytic H_2 over time)
- **Resilience** through diversification — both sectors can serve energy, chemical, and material markets
- **Lower carbon footprint** by integrating blue and green hydrogen into existing NG value chains

Maximising the Value of Natural Gas in the Orange Basin

How T&T could have done better:

- a better understanding of the values and modus operandi of companies:
    - how they view and manage the value-chain
    - how they negotiate (that is often very different to how governments see it);
- managing the consequent contracts that we negotiate
- understanding how to offset short term benefits for the longer- term
- understanding the full life cycle of major projects, from front-end design to operations, and the implications for local value-addition
- understanding the markets and value-chains
- better regulating and overseeing the contracts and operations
- reviewing and keeping up to date policies, legislation and operating procedures of the government
- improving efficiency in revenue collection
- learning from others.

Maximising the Value of Natural Gas in the Orange Basin

Recommendations for Namibia

1. Have clear Policies
   - Revisit and review regularly
2. Have effective Governance Systems (Legal and Administrative)
3. Have Namibian Gas Master Plan, that:
   a. Contributes to and aligns with Regional Gas Master Plans
   b. Contributes to and aligns with Industrialisation Plan
   c. Contributes to National Development Plan
   d. Integrates Upstream – continuous exploration & appraisal to keep project flow
   e. Manages pace of development, production and new project development
4. Hold Regulators Accountable
5. Ask for Help
   a. Learn how to ask questions
   b. Learn from Mistakes
   c. Choose supporters wisely

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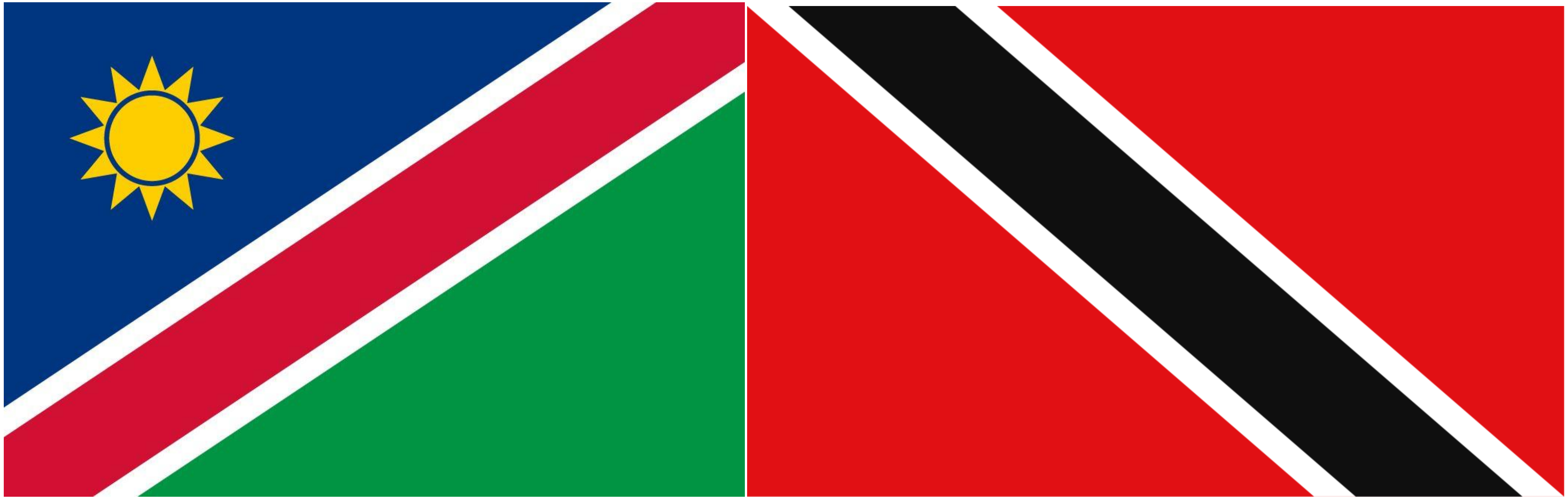
Thank you for the opportunity to share and for your kind attention



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