

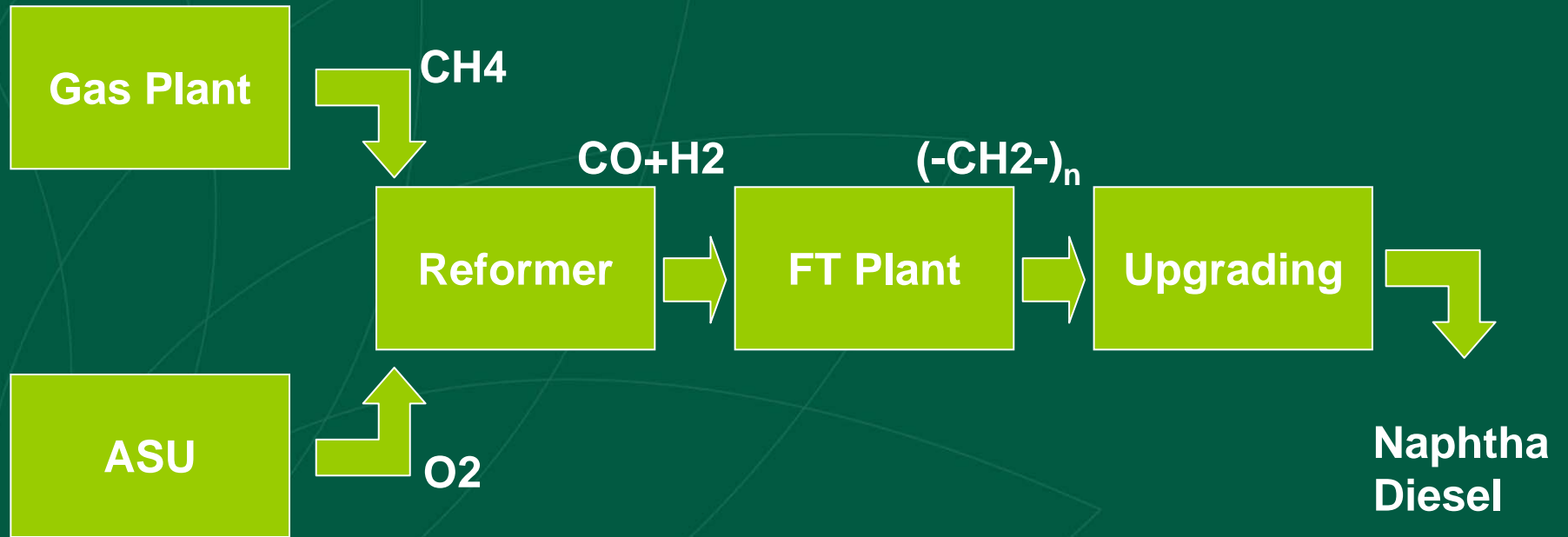
## Summary: Products and markets

- **XTP offers a broad product portfolio**
  - Improved conventional fuels (diesel, gasoline, jet fuel, etc)
  - New “designer” fuels and fuel additives (methanol, DME, hydrogen, ethanol, etc)
  - New large volume chemicals (olefins)
- **Fuel properties**
  - Greatly improved performance and emissions
  - Preferred (early) applications: blends
- **XTP is a must have tool in the tool box**

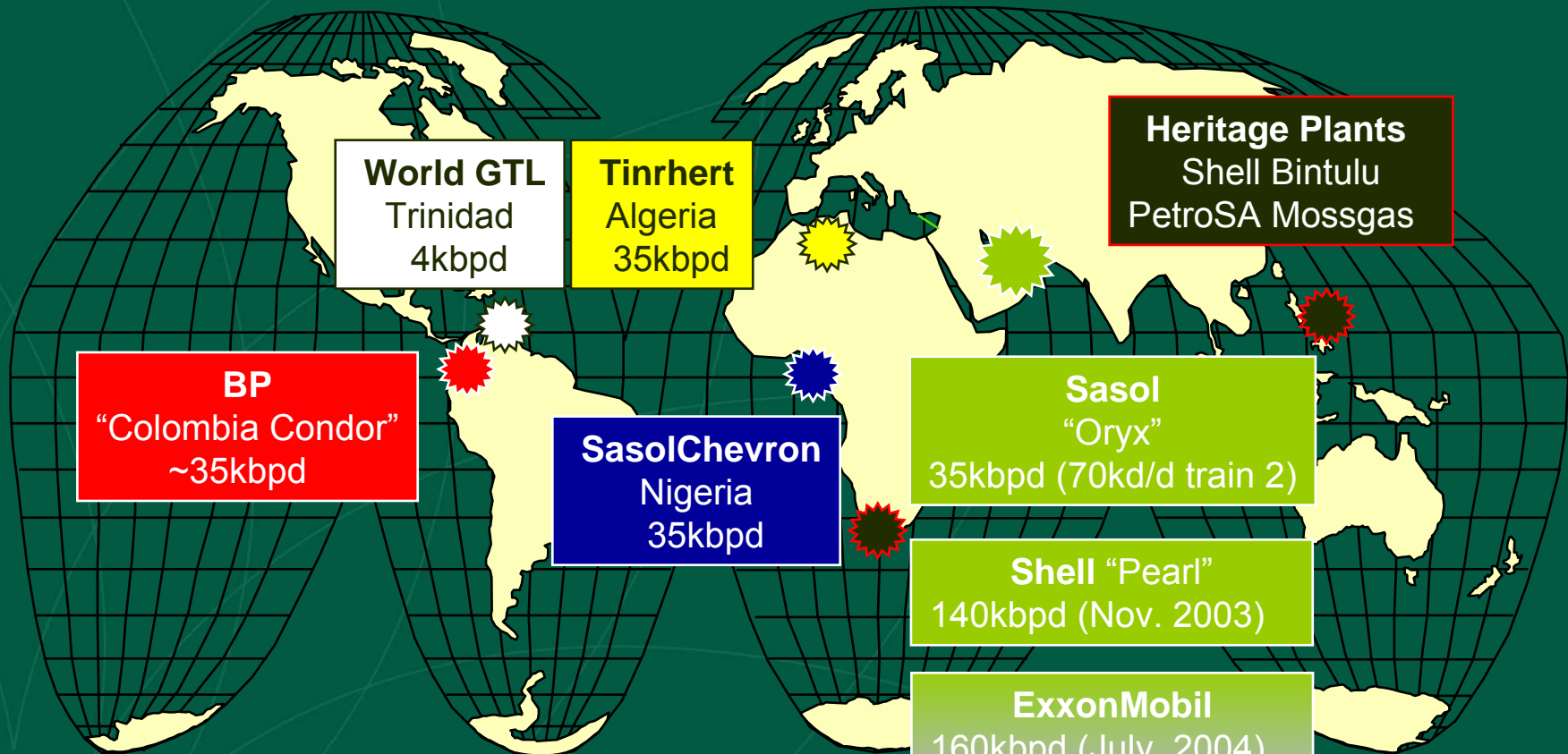
# Outline

- Problem with gas: stranded or associated
- Gas monetization options
- The case for Gas To Products (GTP)
  - What is GTP and GTL?
  - Products and markets
  - **Technologies**
  - **Global projects**
  - **Economic viability**
- **The future of GTP**

# GTL technology challenges



# GTL projects: the birth of an industry



**World GTL**  
Trinidad  
4kbpd

**Tinrhert**  
Algeria  
35kbpd

**Heritage Plants**  
Shell Bintulu  
PetroSA Mossgas

**BP**  
"Colombia Condor"  
~35kbpd

**SasolChevron**  
Nigeria  
35kbpd

**Sasol**  
"Oryx"  
35kbpd (70kd/d train 2)

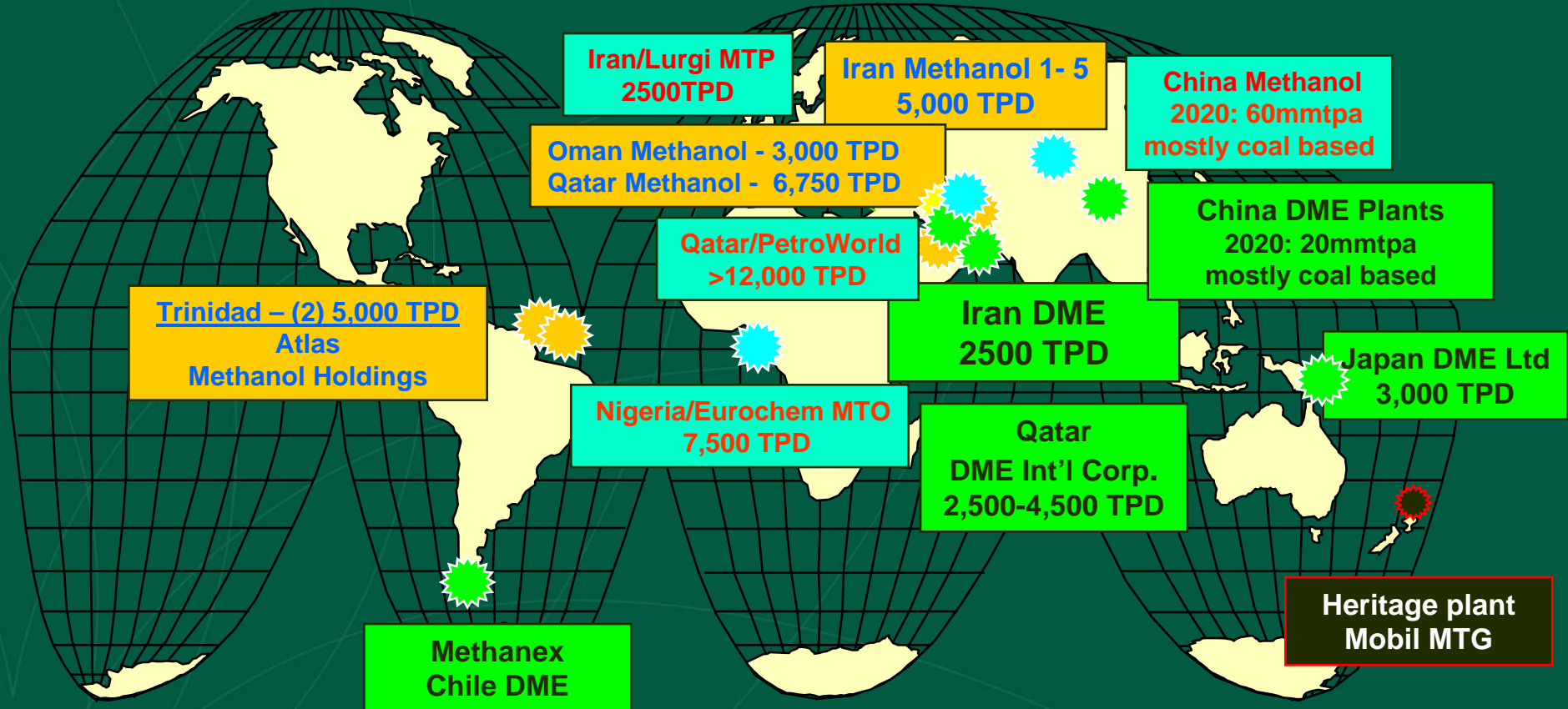
**Shell "Pearl"**  
140kbpd (Nov. 2003)

**ExxonMobil**  
160kbpd (July, 2004)  
PP: Feb. 2007

Many other proposed projects

**ConocoPhillips**  
**SasolChevron**  
**Marathon/Syntroleum**  
**POSTPONED**

# Methanol/DME projects: transition from chemicals to fuels



- Methanol
- Methanol for Fuel, Power/Olefins
- DME

Memo: Not including <5,000 MTPD methanol plants

# Oryx Plant: Pioneer GTL plant

Inaugurated June 6<sup>th</sup> 2006

“As we stand here today to celebrate the inauguration of Oryx GTL, we are **changing the world’s energy paradigm with gas-to-liquids (GTL) technology.**”  
- His Excellency Abdullah Bin Hamad Al-Attiyah, Second Deputy Premier, Minister of Energy and Industry, Qatar, and Qatar Petroleum chairman.



## Plant Statistics

34,000 bpd capacity

- 24,000 bpd Diesel
- 9,000 bpd Naphtha
- 1,000 bpd LPG

Construction Start – Dec 2003

Project Completion – March 2007

Believed to have cost \$1.2 Billion

## Atlas Plant (Trinidad): Pioneer methanol plant



- 5000tpd (160MMscfd); equivalent to 15,000bpd GTL
- Operated by Methanex, BP is 40% equity partner
- World's largest single train reformer



## GTP Economics: summary

- 2000: GTL reached parity with LNG in economic returns
  - Robust economics at \$20 crude and Capex of \$25k/bbl (2000)
  - But EPC cost increases: >\$50k/bbl (2006)
- 2006: Relative economic viability
  - GTL (~\$35/bbl), CTL (~\$50 - 60/bbl), BTL (~\$85/bbl)
  - Higher crude prices favor GTP over LNG
- Methanol and DME can be delivered at \$5-7/MMBTU and become viable as fuels above \$30 crude
  - Fuel methanol and DME are commercial realities in China
  - Olefin projects underway (new low cost technology)



# Important factors for economics

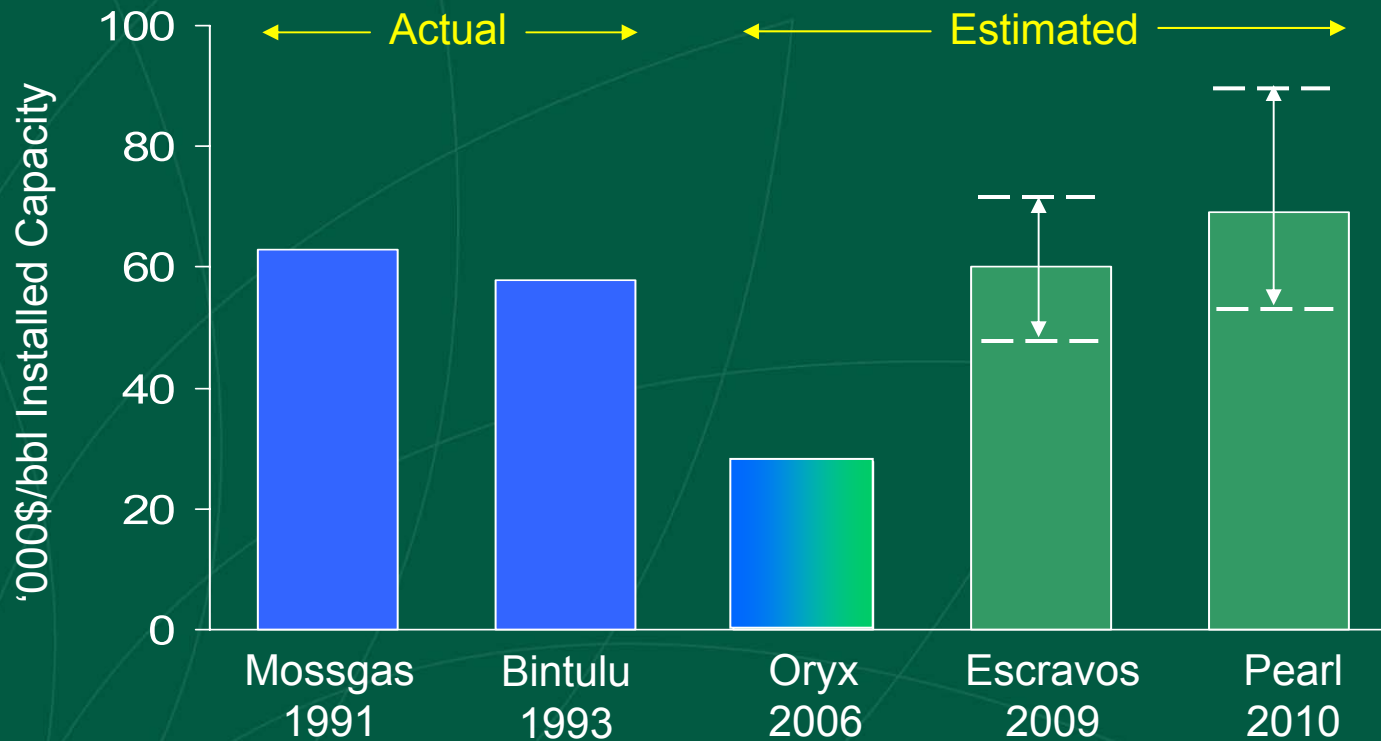
## 1. Feedstock cost

## 2. Capital cost

- Location factor
- Boundary conditions
- Inflation

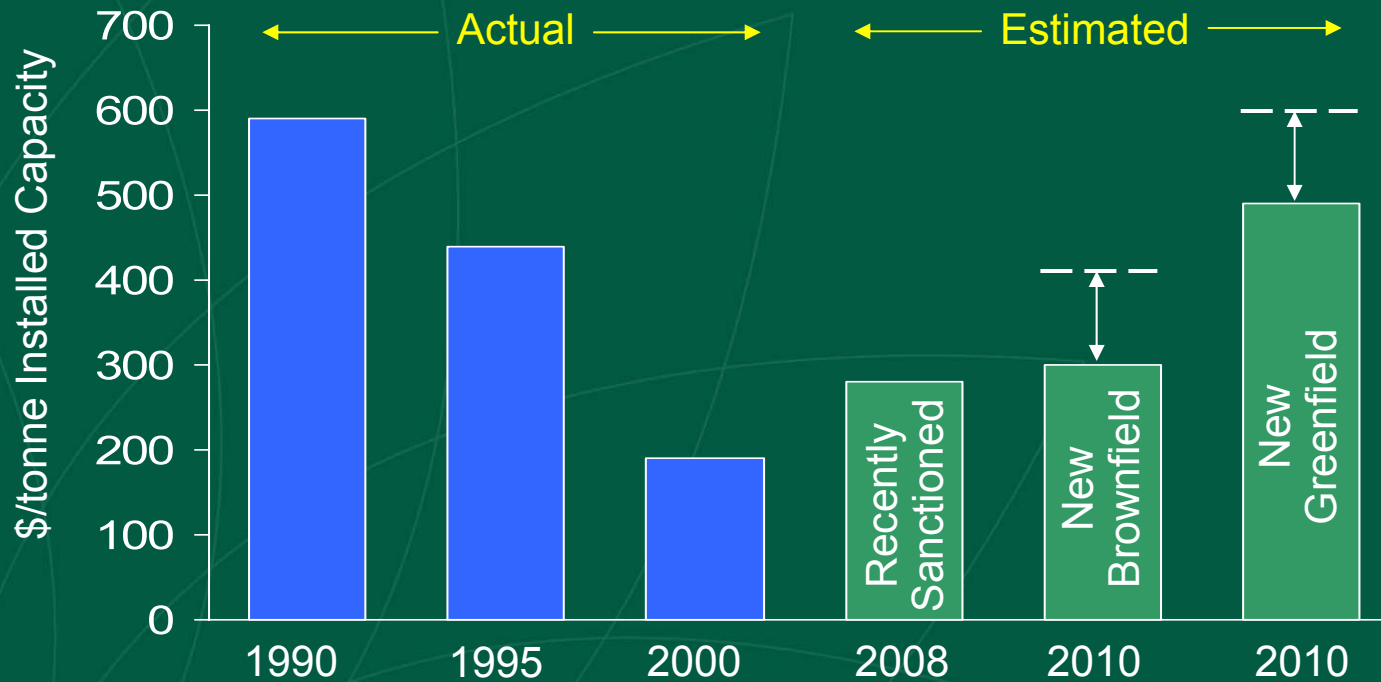
## 3. Product prices

# GTL Cost Trends



- Relatively few commercial-scale projects to date
- Significant scope, scale and location-specific differences
- Estimates based on published data

# LNG Liquefaction Cost Trends



## Drivers :

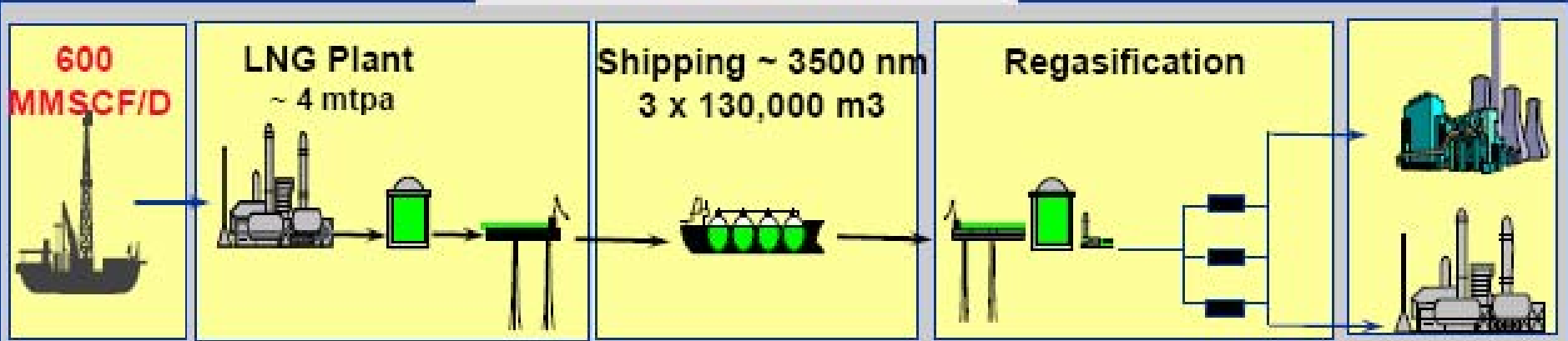
- Economies of scale (e.g. liquefaction, storage & shipping)
- Increased competition (e.g. licensors, contractors, suppliers)
- New technology (e.g. cryogenic pipelines; flexible hoses)

## Drivers :

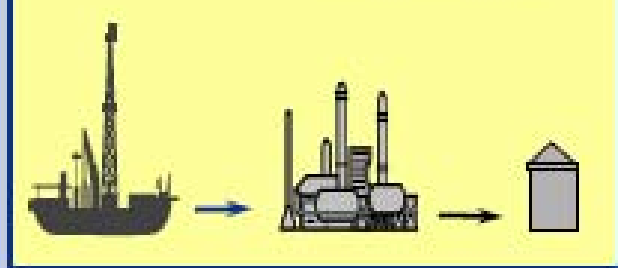
- EPC demand and supply imbalance
- Materials and labour costs
- Vendors and manufacturing (e.g. exchangers, turbines, compressors)
- LNG shipping and yard availabilities
- Increase in schedules

# LNG and GTL comparison: boundary conditions

## Fixed Chain



**600 MMSCF/D** **GTL Plant**  
75,000 bbl/day



## Unconstrained Market

Product carriers-  
spot/term

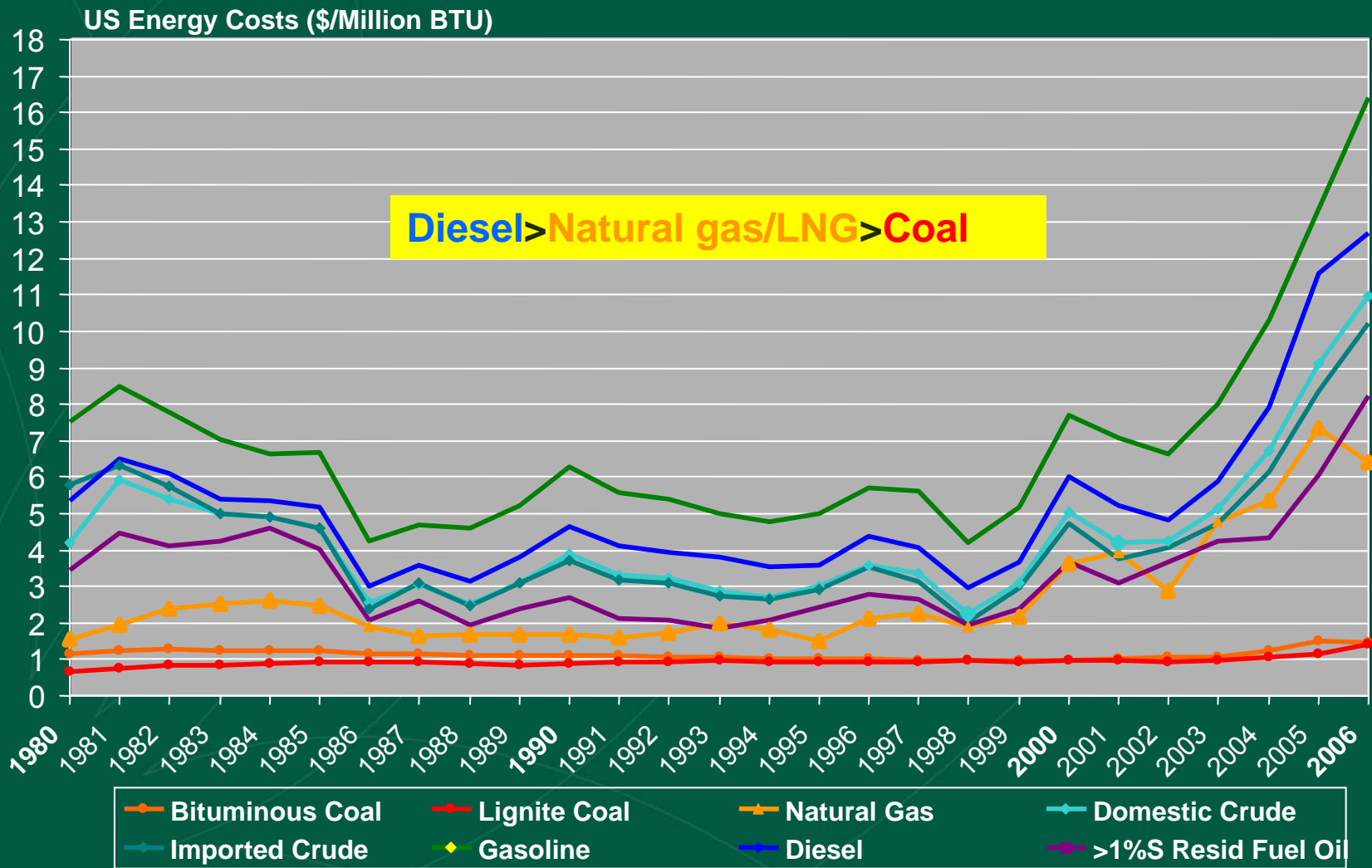


Distribution/  
Blending

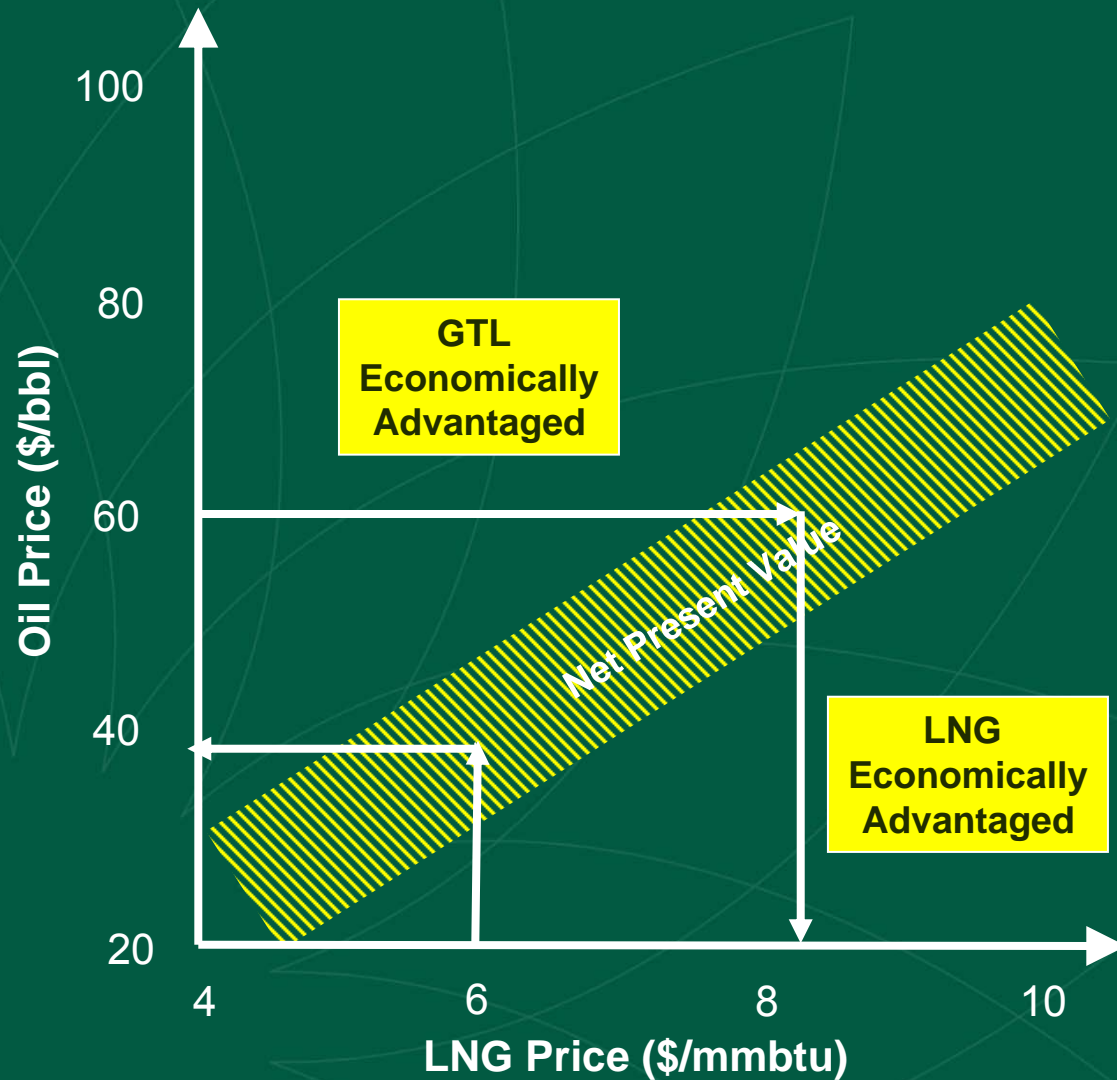


Shell

# Impact of product prices (USA)



# Economics of GTL vs. LNG



## Key Issues :

- Oil:gas price relationship; gas capped by coal
- LNG capex: plant only or value chain capex?
- Strategic value :
  - Revenue diversification
  - Value added in-country
  - LNG and GTP

## Summary: Pros and cons of GTP

### PROS

- Large new markets
- Host country appeal
- Premium “designer” products
- Robust economics
- Proven technologies
- Scaleability

### CONS

- Capital intensive
- Scale-up risks
- Aversion to new products
- Poor efficiencies



## Process carbon efficiencies

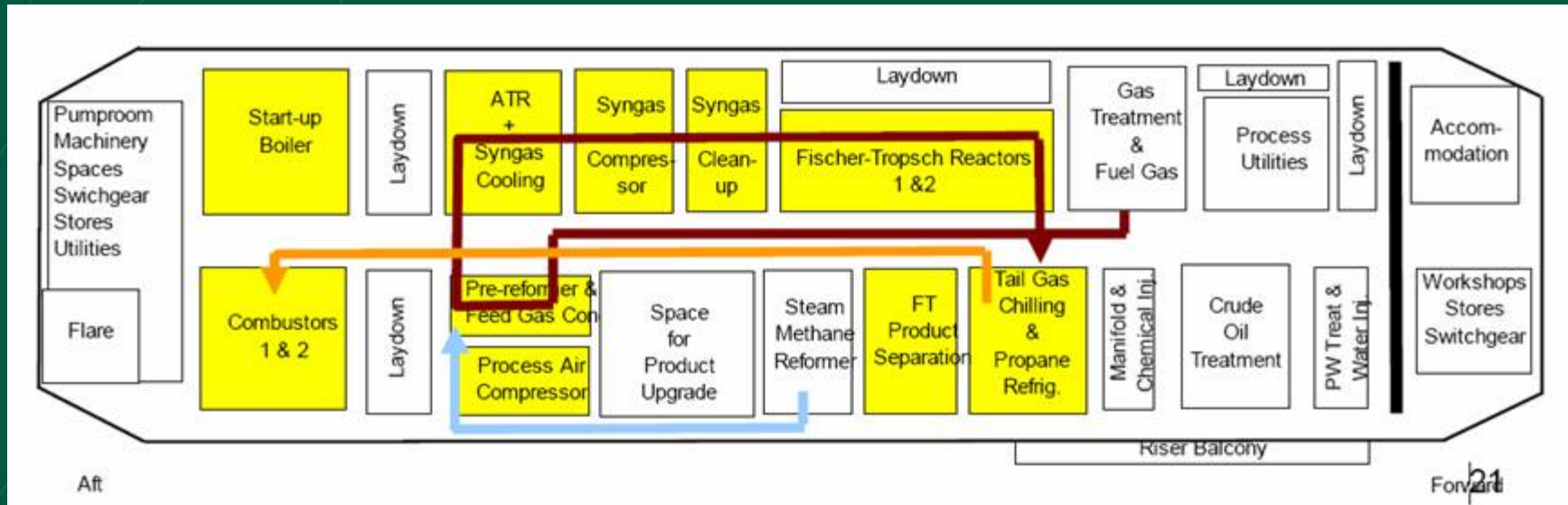
	Carbon efficiency (%)
Benchmark: LNG and refineries	85 - 90
GTL today	75 – 80
Goal	~>85
Methanol/DME today	80 – 83
Goal	85 - 90

## The future in GTP

- On-going R&D and value engineering
  - lower cost plants
  - Higher efficiencies
- Floating applications
  - Marinization of GTL FT
  - Micro-channel technologies (Velocys, CompactGTL)
- New products from syngas
- Gas refinery
  - Integration of different plants
  - Further conversion of primary products into consumer products (plastics)

# Technology Benchmark: Syntroleum FPSO

65 M



310 M

16,300 bpd GTL  
 150 mm-scf/d Gas  
 \$1.2b EPC  
 20,150 M<sup>2</sup>

## BP GTP Profile

- World class R&D group (~60 people)
- Relationship with Berkeley, Caltech, DICP (~60)
- Broad GTP product portfolio (CR, FT, alcohols,...)
- Atlas methanol plant (with Methanex)
- Portfolio of project options
- Decarbonized fuel projects
- Jan 2007: Transition to XTP



# Summary

- GTP and XTP are here to stay: new options for resource holders
- Oryx and Atlas: pioneer plants for new GTL and methanol/DME business
- Target feedstocks: stranded gas, flares, domestic coal
- Products: high performing, low emitting fuels
- No more stranded gas



Thank you!

