Small Scale GTL - Upstream Sector Leads the Way

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Iain Baxter – Chief Operating Officer
An ISO 9001 Company- founded in 2006

Tony Hayward, Chairman of CompactGTL
• CEO Genel Energy plc, Chairman of Glencore Plc, and the former Group Chief Executive of BP plc

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Upstream oil & gas
• Decades of experience in successful construction project delivery, business development & operations with BP, Texaco, SOCAR, Sasol and British Gas

GTL plant design and operation
• Extensive experience of designing, building, commissioning and operating GTL plants with Sasol and BP in South Africa, Qatar and Alaska

Emerging markets operation
• Experience of senior management in commercial operations and project delivery in Russia, Kazakhstan and around the world with major and independent oil companies

Deal negotiation and financing
• Extensive experience of executing complex cross border transactions, negotiating projects and investment partnerships and raising capital for energy and emerging markets

Heavily equity incentivised
• Management buy-in has resulted in high equity ownership for management and strong alignment with external shareholders
World class supply chain

- Kawasaki
- Catalyst suppliers
- Reactor modularisation
- Johnson Matthey
- Reactor suppliers
- Engineering & project delivery partner
- Consultants
- FPSO Project delivery & expertise
- Sumitomo Corporation
- FLUOR
- Bayer Offshore
Conventional GTL vs CompactGTL

**Conventional GTL (Sasol / Shell )**
- Shell Pearl Project: 140,000 bpd
- Capex: >$20bn
- Construction: 7 years
- Sasol FT reactor: 60m x 10m
  - ≈ 17,000 bpd capacity
- 30,000 – 140,000 bpd diesel + speciality synthetic products

**Modular, CompactGTL**
- CompactGTL Kazakhstan: 2,500 bpd
  - Capex: $275m
  - Construction: 2 years
- CompactGTL FT reactors (Containerised modules)
  - ≈ 200 bpd capacity each
- 1,000 – 15,000 bpd syncrude or diesel
Pilot plant & training centre
Wilton, UK 2008

- Operator training centre
- Full GTL process from gas to syncrude
- Continuous improvement
CompactGTL provides a complete Turn-Key capability

- Economic Appraisal
- Design Concept Selection
- FEED
- Local Permitting
- EPC Contractor Qualification
- Supported by Fluor

- EPC Contractor Tendering
- High Local Content
- Detailed Engineering
- Procurement
- Construction
- Commissioning
- Fluor Supervisory Support

- CGTL Turnkey Plant Operations
- Or: Operator Training – UK & Local
- CGTL Reactor Maintenance - Local Facilities
- Local Employment & Investment
Project fundamentals

1. Gas Access
2. Product Offtake
3. Technology
4. Structure & Economics
1. Gas Access

Gas volume, distance to market and infrastructure constraints are the key factors dictating gas solution selection.

- **Reinjection & Flaring**
  - Smaller volumes at remote locations, generating no value

- **Gas Pipeline**
  - Moderate to large volumes at moderate distance to a gas market

- **Gas to Wire**
  - Smaller volumes with nearby market for electricity

- **CNG (Compressed Natural Gas)**
  - Moderate volumes at moderate distance to gas market

- **LNG (Liquefied Natural Gas)**
  - Large volumes at remote locations
Monetisation options don’t compete with small scale GTL

- **Gas to Wire**
  - Field size TCF: 1
  - Distance to market for converted product (km): 75

- **Small Scale GTL**
  - Field size TCF: 2
  - Distance to market for converted product (km): 150

- **Reinjection & Flaring**
  - Field size TCF: 5+
  - Distance to market for converted product (km): 500

- **CNG**
  - Field size TCF: 2
  - Distance to market for converted product (km): 150

- **Pipeline**
  - Field size TCF: 5+
  - Distance to market for converted product (km): 500

- **LNG**
  - Field size TCF: 5+
  - Distance to market for converted product (km): 500
Flared & reinjected associated gas

800 oilfields with problematic associated gas @ <500MCM/annum

Reserves of 73 bn barrels of oil

Analysis carried out by Wood Mackenzie and Fugro Robertson
Gas access issues

- Realisable gas cost
- Flow rate continuity
- Gas ownership & trading restrictions
- Dry gas following NGL recovery
Product offtake considerations

- Realisable net back value
- Certification for fuels
- Export infrastructure
- Fiscal regime / taxes

2. Product Offtake
Key technical aspects

3. Technology

- Demonstrable, integrated process
- Modular reactors
- Catalyst life & replacement
- Plant availability
**CompactGTL plant configuration**

### Feed Gas Flexibility
- Wide range of gas compositions
- Up to 50% CO2 accommodated
- Contaminants (H2S, Cl, Hg ..) removed by gas treatment package

### Gas Treatment Package & Pre-reforming

### CGTL SMR Modules or Conventional SMR or ATR

### Synthesis Gas

#### Synchrude Product
- Waxes, Middle Distillates, Naptha
- Blend & Export with Natural Crude
- Sell & Market @ Premium

#### Synthetic Diesel Product
- Premium, ultra-clean
- High Cetane, zero Sulphur
- Winter & Summer Grades

### Hydro-processing

### Diesel
A working solution is not just an “FT Island”

Operational impacts must be fully understood for whole plant:

- FT tail gas recycle
- Multiple system interactions
- Utility variability & failure
- Feed gas variability

10,000 bpd Plant
Modular reactors

- CompactGTL technology is inherently modular
- CompactGTL reactors are simple steel plate/fin heat exchangers
- Modular technology is flexible, mass producable & deployable in remote sites
Proprietary mini-channel FT reactor construction

Reactor formed from bonded stainless steel layers of mini-channels containing FT catalyst which alternate with layers of mini-channels through which coolant flows.

CompactGTL’s Fischer Tropsch reactor design maximises heat exchange to manage catalytic reactions effectively. Reactors have been designed for ease of manufacture and handling at the oil/gas field location.
Long FT catalyst life is essential

**Single Stage Fixed**
Conventional & Modular

- Short catalyst life, frequent regeneration
- Low availability, high opex
- Unsuitable for remote site deployment
- Duty + standby reactors just adds cost

**Slurry Bubble Column**

**Two Stage Fixed**

- Catalyst continuously “replaced”
- High availability
- Large, tall reactors
- Unsuitable for remote site deployment

- 3-5 year catalyst life, no regeneration
- High availability, low opex
- Modular reactors
- Perfect for remote site deployment
Proprietary 2-stage FT process

- Increased catalyst life
- Increased plant availability
- Suitable for remote locations
- Low OPEX

H₂O partial pressure is reduced in each stage, improving catalyst life

FT reactor Stage 1

FT reactor Stage 2

Syngas feed

Syncrude

H₂O removal

Tail gas

Syncrude

H₂O removal
FT Catalyst replacement without plant shutdown

- CompactGTL reactor modules exchanged in pairs for spares
- Plant continues to operate
- No catalyst handling and safety issues on the operational site
- High availability = low opex
IRR 20% + economics essential to:

- Justify financing costs
- Win competition for capital
Project structure

Project JV / Operating Company

Dedicated Supply Chain

Investors

Gas Resource Holder

Liquids Offtake

EPC Contractor

Qualified & competitively tendered
2014 – Developments to date for CompactGTL

- US$ 40 million reactor factory completion by Sumitomo
- MOC with Kazakh government
- US$ 300 million plant announced in Kazakhstan
- US$ 50 million new investment in company
A major milestone....

7th March 2014: MOC between Kazakhstan Oil Ministry & CompactGTL
CompactGTL plant design for Kazakhstan project

Fully integrated plant – remote location

Turnkey project by CompactGTL

Engineering support partner – Fluor

Operational by the end of 2017
Summary

$300m project underway in Kazakhstan @3,000 bpd

Opex and plant availability made viable by patented 2-stage FT process

Established World-class supply chain

20% + IRR achievable economics

Projects create “Win Win” for all the oilfield development parties

...On all fronts: Political, environmental, economic

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Thank you