GLOBAL FORUM

London, October 24 & 25, 2012
Modular GTL
global solutions and projects
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3 proven and operational GTL processes today

World scale GTL Gas monetization 300MMscf/d ++

Modular GTL Oilfield access <= 50MMscf/d
Entire GTL process

Modular SMR Reactor

61,000 hours SMR reactor & SMR catalyst in operation

Modular FT Reactor

52,000 hours FT reactor & FT catalyst in operation
Project delivery – exclusive partners

**Project Timeline**

- **FEED stage**
- **EPC stage**

**Compact GTL**

**FLUOR**

**SBM Offshore**

**Qualifited EPC Contractor**

**Onshore project**

**Offshore project**

**Johnson Matthey Catalysts**

**GPP**

**Kawasaki**
Commercial demonstration plant

World’s first modular fully integrated GTL facility!

- Gas pre-treatment
- Pre-reforming
- Reforming
- Waste heat recovery
- Process steam generation
- Syngas compression
- Fischer Tropsch synthesis
- FT cooling water system
- Tail gas recycling

Plant commissioned in Dec 2010. CompactGTL technology now approved by Petrobras for deployment.
## Project examples

<table>
<thead>
<tr>
<th>Client</th>
<th>Region</th>
<th>Feed gas rate</th>
<th>Project driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>IOC</td>
<td>MENA</td>
<td>50 MMscfd</td>
<td>Liberate crude production</td>
</tr>
<tr>
<td>NOC</td>
<td>Americas</td>
<td>25 MMscfd</td>
<td>EWT</td>
</tr>
<tr>
<td>NOC</td>
<td>Russia-CIS</td>
<td>10 MMscfd</td>
<td>Remote location</td>
</tr>
<tr>
<td>NOC</td>
<td>MENA</td>
<td>20 MMscfd</td>
<td>Liberate crude production</td>
</tr>
<tr>
<td>NOC</td>
<td>Russia-CIS</td>
<td>100 MMscfd</td>
<td>Remote location</td>
</tr>
<tr>
<td>IOC</td>
<td>Asia-Pacific</td>
<td>30 MMscfd</td>
<td>Eliminate flaring</td>
</tr>
</tbody>
</table>
Case Studies of opportunities

- The Analysis was carried out by Fugro Robertson, using data from the Wood Mackenzie global database. Three generic situations were identified

- Case 1: gas flaring limit imposed on a field leading to shut-in production

- Case 2: onshore field awaiting or under development with no nearby gas infrastructure – this means gas disposal must be by reinjection

- Case 3: as Case 2, but with an offshore field
Case 1 – gas flaring limit

- Where an oilfield is subject to a flaring limit there will be shut-in production due to the amount of associated gas
- A CompactGTL process would allow the bringing forward of this production
- Likely examples of this will occur in Nigeria

- Assuming that:
  - Oil production is brought forward by 5 years
  - CompactGTL process with 12 MMscf/d leading to 1 Mstb/d of additional liquids output
  - Royalty rate of 15% and a Tax rate of 85%

- Results for 10 years of operation of the CompactGTL plant are very positive
  - Sensitivities of results also presented
# Case 1 – Results with CompactGTL

<table>
<thead>
<tr>
<th>Economic Metrics</th>
<th>Undiscounted Profit $MM</th>
<th>NPV 10 $MM</th>
<th>Reserves MMboe</th>
<th>NPV10/Boe $/Boe</th>
<th>Payback Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7.3</td>
<td>62.8</td>
<td>3.7</td>
<td>17.20</td>
<td>2015</td>
</tr>
<tr>
<td><strong>Sensitivity:</strong></td>
<td>Leasing half of GTL capex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.8</td>
<td>81.4</td>
<td>3.7</td>
<td>22.31</td>
<td>2015</td>
</tr>
<tr>
<td><strong>Sensitivity:</strong></td>
<td>Bringing forward production 7 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9.6</td>
<td>92.7</td>
<td>3.7</td>
<td>25.39</td>
<td>2015</td>
</tr>
</tbody>
</table>
Case 2 – CompactGTL vs gas injection, onshore

- For an oilfield under development where there is no nearby gas infrastructure or market the only viable option for ANG is gas reinjection
- CompactGTL represents a viable option to reinjection
- There are numerous examples to be found in Russia
- Other examples occur in:
  - Central Asia
  - Middle East
  - West Africa
  - South America
  - North Africa
- The economic test is to compare the two options by taking one as the base case and then comparing it incrementally to the other case
Case 2 – CompactGTL vs gas injection, onshore

• The key assumptions are the costs of gas injection
  – The capex for this is not insubstantial consisting of injection well(s) and associated equipment

• The CompactGTL process is for a 12 MMscf/day gas throughput to produce 1 Mstb/day of synthetic oil

• The fiscal terms are taken to be those of Russia with 24% tax rate, $30 per barrel export duty and mineral extraction tax (MET) of $2 per barrel and $0.6 per MCF for gas; this last cost is paid even for gas injection operations

• Results are positive with 11.7% ROR
## Economic Metrics

<table>
<thead>
<tr>
<th>Undiscounted Profit $MM</th>
<th>NPV 10 $MM</th>
<th>IRR</th>
<th>Reserves MMboe</th>
<th>NPV10/Boe $/Boe</th>
<th>DPIR $/$</th>
<th>Payback Year</th>
<th>Maximum Exposure $MM</th>
</tr>
</thead>
<tbody>
<tr>
<td>96.40</td>
<td>8.35</td>
<td>11.7%</td>
<td>3.0</td>
<td>2.77</td>
<td>0.09</td>
<td>2019</td>
<td>101.3</td>
</tr>
</tbody>
</table>

**Incremental Gross Cash Flow**

- **Incremental Annual Gross Cash Flow**
- **Incremental Cumulative Gross Cash Flow**
Case 3 – CompactGTL vs gas injection, offshore

- For an oilfield under development where there is no nearby gas infrastructure or market the only viable option for ANG is gas reinjection
- CompactGTL represents a credible option to reinjection

- There are examples of target fields in abundance:
  - Australia
  - Far East
  - West Africa
  - Southwest Africa
  - South America

- The economic test is to compare the two options by taking one as the base case and then comparing it incrementally to the other case
Case 3 – CompactGTL vs gas injection, offshore

- The key assumptions are the costs of gas injection
  - For the most likely case of a deepwater field with an FPSO, these costs are high:
    - Injection well(s)
    - SURF cost
    - Gas compression

- A selection of fiscal terms were modelled:
  - PSC terms typical of West Africa
  - Tax/royalty terms typical of Australia, Ghana, Namibia

- Results are positive with 15.2% ROR and the PSC terms and even more positive with tax/royalty at 16.7% ROR
Case 3 – results with PSC terms

<table>
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<tr>
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<th>Reserves MMboe</th>
<th>NPV10/Boe $/Boe</th>
<th>DPIR $/$</th>
<th>Payback Year</th>
<th>Maximum Exposure $MM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>61.20</td>
<td>14.04</td>
<td>15.2%</td>
<td>2.7</td>
<td>5.13</td>
<td>0.31</td>
<td>2017</td>
<td>66.7</td>
</tr>
</tbody>
</table>

**Incremental Gross Cash Flow**

- **Incremental Annual Gross Cash Flow**
- **Incremental Cumulative Gross Cash Flow**

**Year**

- **2012**
- **2013**
- **2014**
- **2015**
- **2016**
- **2017**
- **2018**
- **2019**
- **2020**
- **2021**
- **2022**
- **2023**
- **2024**
- **2025**
- **2026**
- **2027**
- **2028**
- **2029**
- **2030**
- **2031**
- **2032**
- **2033**
- **2034**
- **2035**
- **2036**

**$ Million (Nominal)**

- **-80**
- **-60**
- **-40**
- **-20**
- **0**
- **20**
- **40**
- **60**
- **80**
Case 3 – results with tax/royalty terms

<table>
<thead>
<tr>
<th>Economic Metrics</th>
<th>Undisc Profit $MM</th>
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<th>NPV10/Boe $/Boe</th>
<th>DPIR $$</th>
<th>Payback Year</th>
<th>Maximum Exposure $MM</th>
</tr>
</thead>
<tbody>
<tr>
<td>71.27</td>
<td>18.77</td>
<td>16.7%</td>
<td>2.7</td>
<td>6.86</td>
<td>1.58</td>
<td>2017</td>
<td>66.7</td>
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</tr>
</tbody>
</table>

Incremental Gross Cash Flow

- **Incremental Annual Gross Cash Flow**
- **Incremental Cumulative Gross Cash Flow**
A ‘Win-Win’ for IOCs, NOCs and Governments

**IOCs**
- Enhance production
- Unlock new discoveries
- Increase recoverable reserves
- Add gas reserves to balance sheet

**NOCs**
- Increase in PSC profit oil
- Greater tax revenues
- Environmental “Kudos”

**Governments**
- Preserve and utilise National natural resources
- Gain access to World Bank finance