FLNG – A Nice Niche?

Martin Wilkes
What we’ll cover

- The space for FLNG in the development arena
- LNG Market dynamics and how changes may help the development of FLNG
- Similarities between FLNG and FPSO development
- Opportunities and challenges for Australian producers
- A possible future for FLNG
Traditional LNG Development has left a gap

- Land based developments have adopted economies of scale
- Increase in minimum economic field size

![Graph showing the relationship between resource base and LNG train capacity. The graph highlights the gap between stranded resources and land-based LNG capacity.](image)
Floating LNG offers options to fill the space

- Potential to reduce minimum economic field size
- Access stranded resources
**Different approaches being taken**

<table>
<thead>
<tr>
<th>Project</th>
<th>Proponent / Operator</th>
<th>Capacity MTPA</th>
<th>Technology / Design Features</th>
<th>Anticipated Start-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caribbean (F)LNG</td>
<td>Pacific Rubiales/Exmar</td>
<td>0.5</td>
<td>Black &amp; Veatch Prico™, SMR. Tethered barge with separate storage. Feed gas from onshore</td>
<td>2015/16</td>
</tr>
<tr>
<td>PFLNG1 (Kanowit)</td>
<td>Petronas</td>
<td>1.2</td>
<td>Air Products AP-N™ Nitrogen expansion. Permanent turret mooring.</td>
<td>2015/16</td>
</tr>
<tr>
<td>Prelude FLNG</td>
<td>Shell</td>
<td>3.6</td>
<td>Shell C3MR, Steam systems, Permanent turret mooring, LPG and condensate export</td>
<td>2016</td>
</tr>
<tr>
<td>PFLNG2 (Rotan)</td>
<td>Petronas</td>
<td>1.5</td>
<td>Air Products AP-N™ Nitrogen expansion, Permanent turret mooring.</td>
<td>2018</td>
</tr>
<tr>
<td>Cameroon FLNG*</td>
<td>Perenco / Golar</td>
<td>1</td>
<td>Black &amp; Veatch Prico™, SMR. Converted Moss Carrier “Hilli”</td>
<td>2017</td>
</tr>
<tr>
<td>Fortuna FLNG* EG Block R</td>
<td>Ophir / Golar</td>
<td>2</td>
<td>Black &amp; Veatch Prico™, SMR. Converted Moss Carrier “Gimi”</td>
<td>2019</td>
</tr>
</tbody>
</table>

*FLNG Vessel conversion has been sanctioned, project has not

Exmar sanctioned a 2nd barge in December 2014 – project unknown
Significant changes in LNG Market

- LNG development traditionally supported by long term contracts
  - Small resources unable to commit to long term contracts
- Strong growth in LNG market
  - Significant increase in short term trade
- Development of short term market means buyers less reliant on long term contracts
  - Security of Supply through diversification
- Increased diversity and more liquidity
- Increased confidence in sales

Sources: GIGNL, BP and BG Group
Historical Development of FPS facilities

Development of FPS facilities

Source: International Maritime Associates Inc./GIIGNL, BP and BG Group/LNG Journal and IGU
Development of FPS facilities / LNG short term market

Source: International Maritime Associates Inc./GIIGRI, BP and BG Group/LNG Journal and IGU
A lesson in History?

Development of FPS facilities / LNG short term market / FRSUs

Source: International Maritime Associates Inc./GIIGRI, BP and BG Group/LNG Journal and IGU
What does the future hold?

**FLNG becomes “mainstream”**

- Competition and cost reduction
- Smaller less expensive facilities
  - Development of smaller resource pools
  - RISC analysis indicates FLNG may be viable for ~0.5Tcf

**Australian Context**

- Australia already has 1 sanctioned FLNG project
- RISC is aware of at least 8 other projects that are or have considered FLNG
  - All of them >2Tcf
RISC analysis of “Yet to Find” gas in 3 Australian Basins*

- Most new finds will be smaller than those already discovered

<table>
<thead>
<tr>
<th>Size Range</th>
<th>0.5-2 Tcf</th>
<th>&gt;2Tcf</th>
</tr>
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<tbody>
<tr>
<td>Possible number of discoveries in next 15 years</td>
<td>4-15</td>
<td>0-5</td>
</tr>
</tbody>
</table>

- This will be repeated worldwide
  - Many more opportunities in smaller developments
  - Ability to develop small fields will be key

*For further information please see Nick Eustance’s presentation on Wednesday afternoon
Challenges

- Successful development of the technology
  - Not new in the E&P industry
  - Long history of innovation and adaption
  - Clear indication of progress in adaptation of existing knowledge

- Financing, particularly of early projects
  - Involvement of IOC/NOCs
  - World Bank and CEIB providing funding to Caribbean FLNG
  - Ultimately, lower development costs and smaller environmental footprint should make FLNG attractive
Summary

- FLNG poised to become the next generation of the floating industry
- Challenges are not dissimilar to those that the industry has previously overcome
- Continued strong growth in LNG, and even stronger growth in short term trades indicates the potential for development of smaller resources
- History supports a growth both in development and in technology choices
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