FLNG – Still a Nice Niche?

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What we’ll cover

- A brief recap of what was said 2 years ago
  - The space for FLNG in the development arena
- LNG Market dynamics, what’s changed and how changes have and will impact the development of FLNG
- Opportunities and challenges for Australian producers
- A possible future for FLNG
Floating LNG offers options to fill a space created by land based projects’ focus on economies of scale

- 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 2017</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 2018</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 2020?</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>2017/18</td>
</tr>
<tr>
<td>Fortuna FLNG* EG Block R</td>
<td>Ophir / Golar</td>
<td>2.2</td>
<td>Black &amp; Veatch Prico™, SMR. Converted Moss Carrier “Gimi”.</td>
<td>2019 2020</td>
</tr>
</tbody>
</table>

*FLNG Vessel conversion has been sanctioned, project has not Exmar sanctioned a 2nd barge in December 2014 – project unknown
Floating LNG project changes

- Prelude
- PFLNG1
- Cameroon
- Fortuna

Graph showing
- Resource Base, Tcf
- LNG Train Capacity, MTPA

Legend:
- Land Based LNG
Floating LNG project changes

![Floating LNG project changes diagram](image-url)
LNG project changes – the rise of mid-scale developments

[Graph showing LNGTrain Capacity, MTPA on the x-axis and Resource Base, Tcf on the y-axis. Points labeled as Prelude, Land Based LNG, Woodfibre LNG, Magnolia LNG, Fortuna, Senoro LNG, Cameroon, andFLLNG.]

Resource Base, Tcf

LNG Train Capacity, MTPA

0 1 2 3 4 5 6 7 8

Prelude Land Based LNG

Woodfibre LNG

Magnolia LNG

Fortuna

Senoro LNG

Cameroon

FLLNG
2 years ago: indications of significant changes in the 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

![Graph showing LNG market consumption and trends](chart.png)

Sources: GII/GNL, BP and Shell
Historical Development of FPS facilities

Development of FPS facilities

Cumulative number deployed

Source: International Maritime Associates Inc./GIIGNL, BP and BG Group/LNG Journal and IGU
The LNG short/spot market has followed a similar development trend.
FSRU’s also appear to be following the same development path.

Source: International Maritime Associates Inc./GIIGNL, BP and BG Group/LNG Journal and IGU
FSRU’s also appear to be following the same development path.
Changes in export and import countries....
Changes in export and import countries....

2005

- FLNG Exporter
- FLNG Importer
Changes in export and import countries....

2010

- FLNG Exporter
- FLNG Importer
- FLNG Importer & Exporter

[Map of the world showing countries as FLNG Exporters, FLNG Importers, and FLNG Importer & Exporters in 2010.]
Changes in export and import countries....
Changes in export and import countries...
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
  - FLNG becomes development of choice

**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
- Most new finds will be smaller than those already discovered
  - Ability to develop small fields will be key
  - New players emerging and adopting similar techniques to the FPSO industry
  - Lower development costs and smaller environmental footprint will 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
  - Financing, particularly of early projects
    - Involvement of IOC/NOCs
    - World Bank and CEIB providing funding to Caribbean FLNG
    - HongKong Shipping Company financing for GoFLNG conversion
    - Chinese Banks providing funding for the Ophir Fortuna project
  - Long history of innovation and adaptation
  - Clear indication of progress & adaptation of existing knowledge

- 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
Will FLNG follow a similar development path

![Graph showing development of FPS facilities, LNG short term market, and FSRUs over years since first deployment.](image-url)