Floating Liquefied Natural Gas From Concept to Reality

Jean-Marc Letournel – VP Offshore Unit, Technip
Paris, October 2011
Technip Today

- Worldwide leader in engineering, project management and technologies, serving the oil & gas industry for more than 50 years
- A workforce of 25,000 in 48 countries
- Industrial assets on all continents, a fleet of 18 vessels
- 2010 revenue: €6,082 million
- 2010 net income: €417 million
Technip – a major LNG contractor

- We built the first ever LNG Plant, 45 years ago...

- We have been active ever since

- Our projects equate to 57 Mtpa of additional LNG capacity brought on-stream in the last 5 years

- The six Qatar mega trains, Yemen LNG, Shell FLNG confirm our position in the first tier of EPC contractors in LNG
Technip – a major subsea contractor

- Vertical integration
- In-house technologies
- Worldwide leadership
- First class assets

- Products
  - Flexible pipe (in house manufacturing)
  - Rigid pipelines
  - Umbilicals (in-house manufacturing)

- Services
  - Deep water installation & construction
  - Flexible/rigid pipelaying
  - Inspection, Repair & Maintenance
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Technip – a major FPSO contractor

FPSO'sInstalled or Planned

Technip FPSO projects

Source INFIELD Feb 2008
FLNG is built on industrial experience.......
FLNG: New opportunities for oil and gas producers

- Floating LNG reaching maturity
- Open sea transfer of LNG solved (e.g. Technip ALLS)
- Industry experience with large FPSO’s
- Processing on moving platforms is understood
- Industrial momentum with many FLNG projects at FEED stage

Opportunity
Stand-alone gas reserves

- No immediate delivery infrastructure or local market
- Insufficient reserves to support onshore LNG
- Difficulty in landing gas onshore

Opportunity
Associated gas disposal

- Enable oil field developments
- Monetize gas rather than re-injection or flaring

2011
Realities
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FLNG – The challenges

- LNG tank sloshing over 25 years without dry docking
- Offloading LNG between two vessels in the open sea
- Importing large quantities of HP feed gas through a swivel
- Equipment and piping loads due to motion

- Marinisation of gas processing facilities
  - Compact designs
  - Designing for motion
- Feed gas - Sulphur free; high methane content preferred
- Safety – escalation, cryogenic spill management

- Local content
- Synergy with domestic gas schemes (except for LPG)
- Logistics/Accommodation
- Insurance – storms, piracy
- Expansion capacity
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FLNG Market Trend

• Opens up offshore gas resources once considered too remote to tap

• A significant number of small scale FLNG projects have been proposed:
  • IOC’s
  • NOC’s
  • Utilities companies
  • Shipping companies

• FLNG Projects need the support of large integrated players
  • project management and technology
  • portfolios of LNG supply
  • financial capability to keep projects on balance sheet

• Many projects in the Conceptual/FEED stage

• First FID declared by Shell 20th May, 2011
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FLNG Potential projects

[NW Shelf Australia, WA South Atlantic, Santos Basin, NW Shelf Australia, Offshore Malaysia, Timor Sea, Nile Delta, Trinidad]
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**Shell Floating Liquefied Natural Gas**

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### Technip Samsung Consortium Contracts

<table>
<thead>
<tr>
<th>Contract Type</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master Agreement</td>
<td>28/07/2009</td>
<td>The design, construction and installation of multiple FLNG facilities over 15 years</td>
</tr>
<tr>
<td>Generic FLNG – FEED</td>
<td>28/07/2009</td>
<td></td>
</tr>
<tr>
<td>Prelude FLNG – FEED</td>
<td>08/03/2010</td>
<td>Offshore Western Australia</td>
</tr>
<tr>
<td>Prelude FLNG – EPCI</td>
<td>08/03/2010</td>
<td>Contract under which the FLNG would be built when the project receives the final investment decision (FID announced 20th May 2011)</td>
</tr>
</tbody>
</table>

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Generic FEED – finalised
Prelude – start up 2016
Sunrise – to come

Picture courtesy of Shell
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Shell Prelude

- 488 m x 74 m
- 600 000 t displacement with tanks full
- 3.6 Mtpa LNG capacity
- 1.3 Mtpa condensate production
- 0.4 Mtpa LPG production
- Total liquid production 110 000 boe/day

Picture and graphic courtesy of Shell
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Shell Prelude - Execution

Paris

Goeje
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Prelude FLNG execution

- Shell Project Directorate
- TSC Project Directorate
  - IT/methods
  - Project controls
  - Procurement of tagged items and equipment
- Technip (POC)
  - Topsides engineering

- Technip (KLOC)
  - Topsides engineering

- SHI
  - Hull engineering
  - All construction & module integration up to mechanical completion
  - Procurement of steel and other selected bulk
- Technip
  - Construction management
  - Onshore commissioning

Paris La Défense

Goeje

Kuala Lumpur

Perth

Offshore

Tow

HUC

Local
Petrobras Pre-Salt FLNG FEED

- Petrobras in Joint Venture with
  - BG
  - Repsol
  - Galp Energia

- Technip leader of an association with JGC with Modec as TMS supplier and O&M partner
  - Paris, France
  - Rio de Janeiro, Brazil

- Associated gas imported from FPSO's
  - LNG: 2.7 MTPA
  - LPG: 0.7 MTPA

- Design competition
  - FEED completed on Dec. 2010
  - Proposal for EPCIC / O&M submitted
Petronas FLNG FEED

- Client: Petronas / Misc
- Technip leader of a consortium with DSME
- FEED to be completed in Q4 2011
- Gas fields located off Sabah (Malaysia)
- Capacity 1 Mtpa LNG
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TOTAL FLNG pre-FEED

- Client: TOTAL
- Technip leader of the topside design
- Pre-FEED completed in Q4 2011
- Capacity 2.5 Mtpa LNG
- Length: 410m+
- N2 cycle

http://www.total.com/fr/nos-energies/gaz-naturel
Thank you