Arctic Platforms and Floaters
Agenda

1. About TechnipFMC
2. Designing for Arctic conditions
3. Arctic floaters
4. Arctic GBS
## TechnipFMC in figures

<table>
<thead>
<tr>
<th>2</th>
<th>$17B</th>
<th>21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock Exchange listings – NYSE and Euronext Paris</td>
<td>Total company market capitalization(^{(1)})</td>
<td>Vessels(^{(2)})</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>48</th>
<th>$16B</th>
<th>44,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Countries in which we operate</td>
<td>Total company Backlog(^{(3)})</td>
<td>Employees</td>
</tr>
</tbody>
</table>

### Footnotes:

\(^{(1)}\) Source: Public market quote from Bloomberg, LLP; Combination of market capitalization of FMC Technologies and Technip as of Jan 6, 2016; EUR/USD exchange rate of 1.05361 as of Jan 6, 2017.

\(^{(2)}\) With four vessels under construction.

\(^{(3)}\) Backlog as of Sep 30, 2016 (FMC Technologies: $3.02 billion; Technip: €12.28 billion), EUR/USD exchange rate of 1.09072 as of Oct 28, 2016; Source: individual company data as found in the European Prospectus filed on Jan 13, 2017.
Broadest portfolio of solutions for the production and transformation of oil and gas

Subsea

Onshore/Offshore

Surface
TechnipFMC worldwide Arctic

Pan Arctic

White Rose

Aasta Hansteen

Terra Nova

Sakhalin

Snohvit

Goliat

North Amethyst
TechnipFMC Russian Arctic project - YAMAL LNG

Client: Yamal spg (Novatek 80% / Total 20%)

Location: Nenets Region, Russia

Production: 3 x 5.5 MTA of LNG

Execution: TechnipFMC and JGC

Start-up: 1st LNG production targeted in 2016 for train 1. Train 2 & 3 in 2018 & 2019

Challenges:

- LNG in Arctic conditions
- Maximised modularization (400 000T)
- Single site – integrated utilities and infrastructure
- LNG tanks 4 x160 mcm
- Jetty with two berths
Defining Arctic
TechnipFMC – Arctic platform solutions

Ice

Severe

Pechora Sea, Kara Sea
Laptev Sea, Sea of Okhotsk
Caspian Sea

Moderate

Barents Sea
Sea of Okhotsk
Caspian Sea

Light

Barents Sea
Caspian Sea

Water depth, m
Arctic floaters
TechnipFMC has experience in all type floaters
Different solutions for different applications
Shtokman: 1st Application of Ice Resistant Hull

Scope
- Field Layout
- Topside System & Layout
- Spar Hull
- Ice Loads & Design Basis
- Global Motion & Mooring design
- Hull Fabrication
- Riser Design
- Marine Operations
- Schedule
- Weight & Cost Summary
Arctic Spar evolution after Shtokman

Aasta Hansteen Spar, Norway

Concrete disconnectable Spar, Canadian East Coast
Concrete Semo
Can typically be built locally

Excellent motion characteristics - verified by model tests
Inshore traditional deck mating
Traditional shape – easy construction
Concrete has good ice impact resistance
Concrete is an efficient insulator (oil storage)
Conceptual design including model tests for; 40,000 t topsides and 1,2 mill bls oil storage
Shtokman FPU
Study in 2011 (TechnipFMC, Wtokmah, DSME, SBM)

- Disconnectable turret (in 3 minutes)
- Underwater body shape to avoid ice
- Winterized topsides:
  - Complete roof to prevent snow
  - Perforated panels & blast relief wall panels
  - Protected working environment
  - Provides natural ventilation
  - Increases safety
CAT I Arctic drillship, Statoil for operation in managed ice

- Concept
- Class, national (US, CA, RUS)
- Ice breaking – ice sheet/ ice ridges. Ice conditions: 1.2m
- Temp. -40°C, wind, ice, darkness
- VDL 20,000t
Arctic GBS
TechnipFMC conical steel structure - designed for Arctic shallow water facilities

- Break sheet ice and ice ridges in an upward direction
- Provide protection to drill pipe, risers, etc.
- Early installation allows drilling activities whilst topsides construction
- Provides liquid storage
- Self floating for easy transport to site
- Minimum offshore hook-up & commissioning
- Designed for maximum local content
Concrete GBS
typical construction sequence

GBS in dry dock

Dry dock flooded

Construction afloat

GBS complete

Deck mating

Platform tow

Hook-up & Comm.
Thank you