

# Opportunities in LNG

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Credit Suisse Investor Meeting

March 7, 2019



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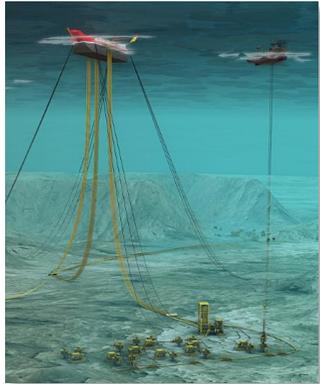
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# TechnipFMC across the gas value chain



Associated Gas  
Oil/Gas Field Facilities including Shale gas  
Non- Associated Gas



**Gas Processing**

Propane and heavier

**LPG**

**Condensate**

Ethane (C<sub>2</sub>)



**Steam cracker (Ethylene)**

Methane (C<sub>1</sub>)



**Offshore Liquefaction**

**GTL**  
Gas to Liquids



**Petrochemicals**  
- Ammonia/Urea  
- Hydrogen  
-----  
- Polyethylene  
- Polyvinyl chloride



*Indicates FTI scope*

LNG = Liquefied Natural Gas  
FLNG = Floating LNG

# LNG: one of the fastest growing oil & gas markets



Upstream



Pipelines



Treatment, liquefaction  
and export terminal



Shipping



Regasification terminal



Distribution

Liquefaction train capacity  
reached ~8 Mtpa

Emergence of offshore  
(FLNG)

Feasibility of large-scale  
modularization

## Large capital investments with low risk development strategies

- ▶ Long-term offtake agreements; established technologies
- ▶ High barriers to entry; established players with proven execution track record
- ▶ EPC / EPCM contracts; risk mitigation – conservative industry

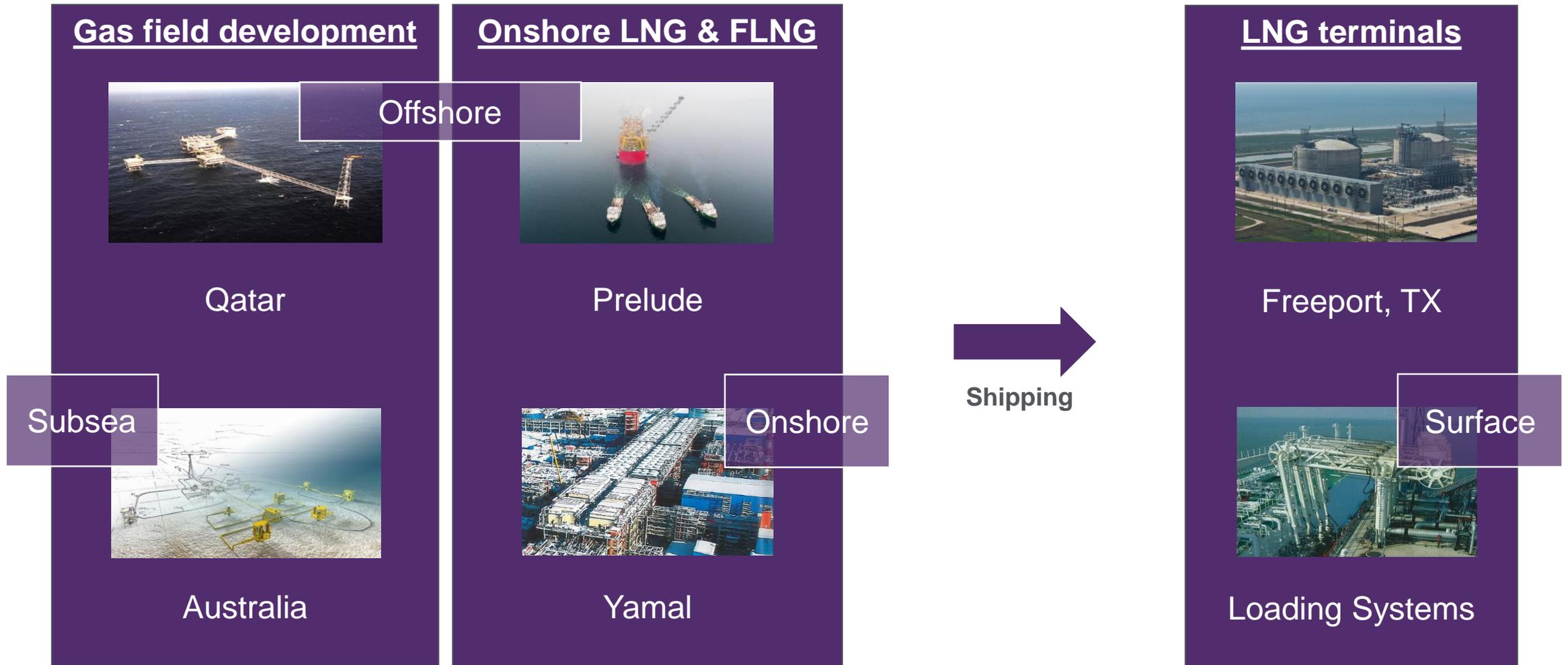
## The future growth path for LNG

- ▶ Lower cost solutions for onshore / offshore liquefaction; offshore competitiveness comparable to onshore
- ▶ The emergence of small to mid-scale LNG

➤ **Since 2000, LNG trade has almost tripled in size from 100 Mtpa to around 300 Mtpa; ~7% CAGR**

Mtpa = million tonnes per annum

# TechnipFMC portfolio encompasses three links of the LNG chain



# TechnipFMC growth potential driven by LNG market leadership

## Leadership

**90** Mtpa

Global production delivered

**>20%**

of operating LNG capacity<sup>(1)</sup>

**7.8** Mtpa

World's largest LNG trains delivered

### ▶ 50 year track record in LNG

- **World's first LNG** Algeria (1964)
- **World's largest LNG trains** Qatar
- **Largest Arctic project** Yamal

### ▶ Pioneer in floating LNG (FLNG)

- **World's first** FLNG delivered Petronas Satu in Malaysia
- **World's largest** floating vessel Shell Prelude in Australia
- **New frontier** Eni Coral in Mozambique



## Differentiation

- ▶ An **integrated offering** from wellhead to LNG loading
- ▶ **Diversity in scale and technology**
  - Solutions for remote locations; **modularization methodology**
  - Growing technology portfolio: loading arms, heat exchangers
- ▶ **Presence in all regions with large gas reserves**
  - Middle East
  - Russian Arctic
  - East/West Africa
  - North America
  - Asia Pacific
- ▶ **Next generation LNG/FLNG**
  - Economic solutions for large scale reserves

<sup>(1)</sup> Percentage is based on 71.5 / 340.2 Mtpa of TechnipFMC delivered and operating / industry operating capacity as of December 31, 2017.

# Market overview

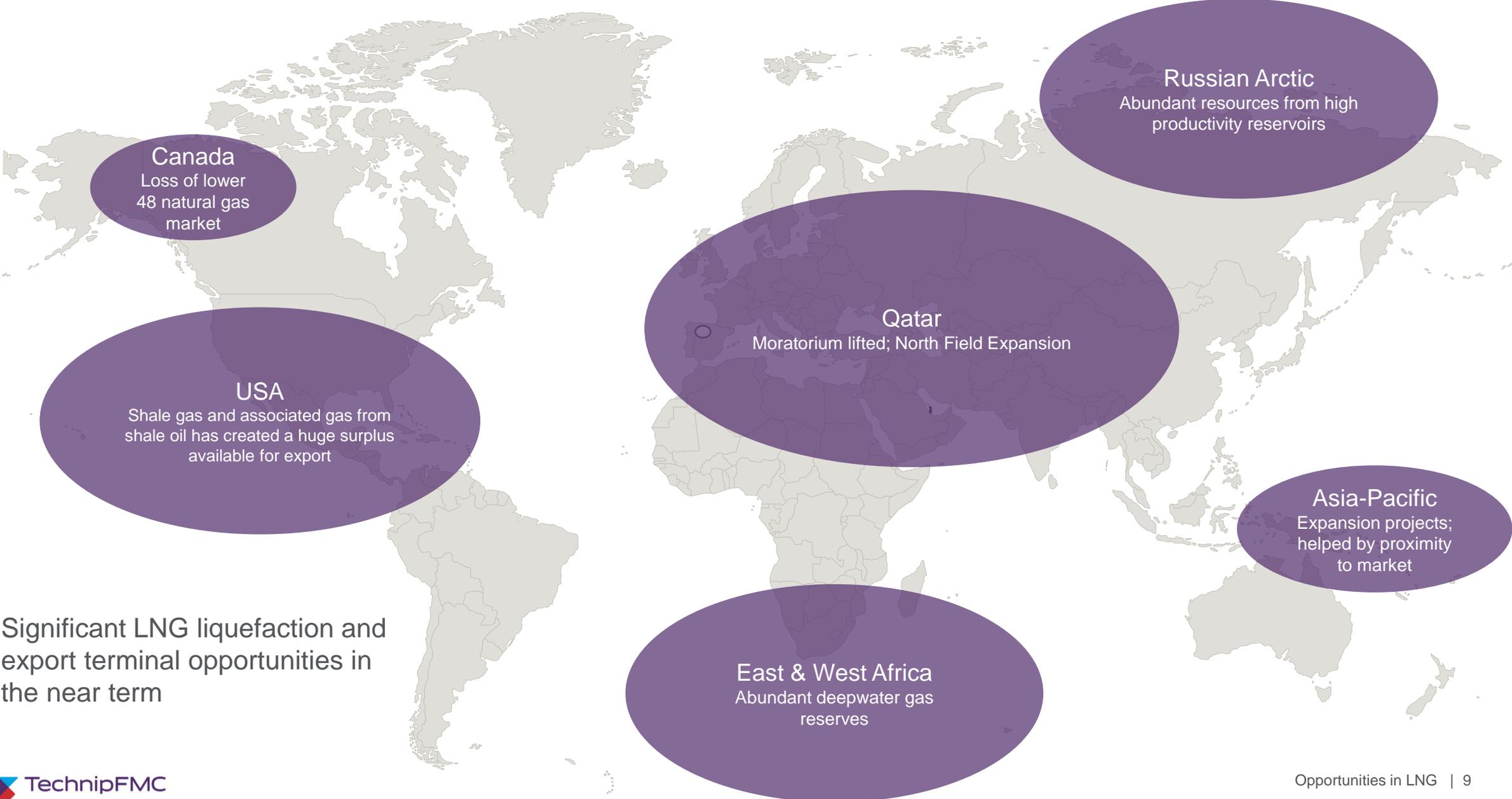
# Future onshore LNG and FLNG export projects

## Estimated world liquefaction capacity (Mtpa)



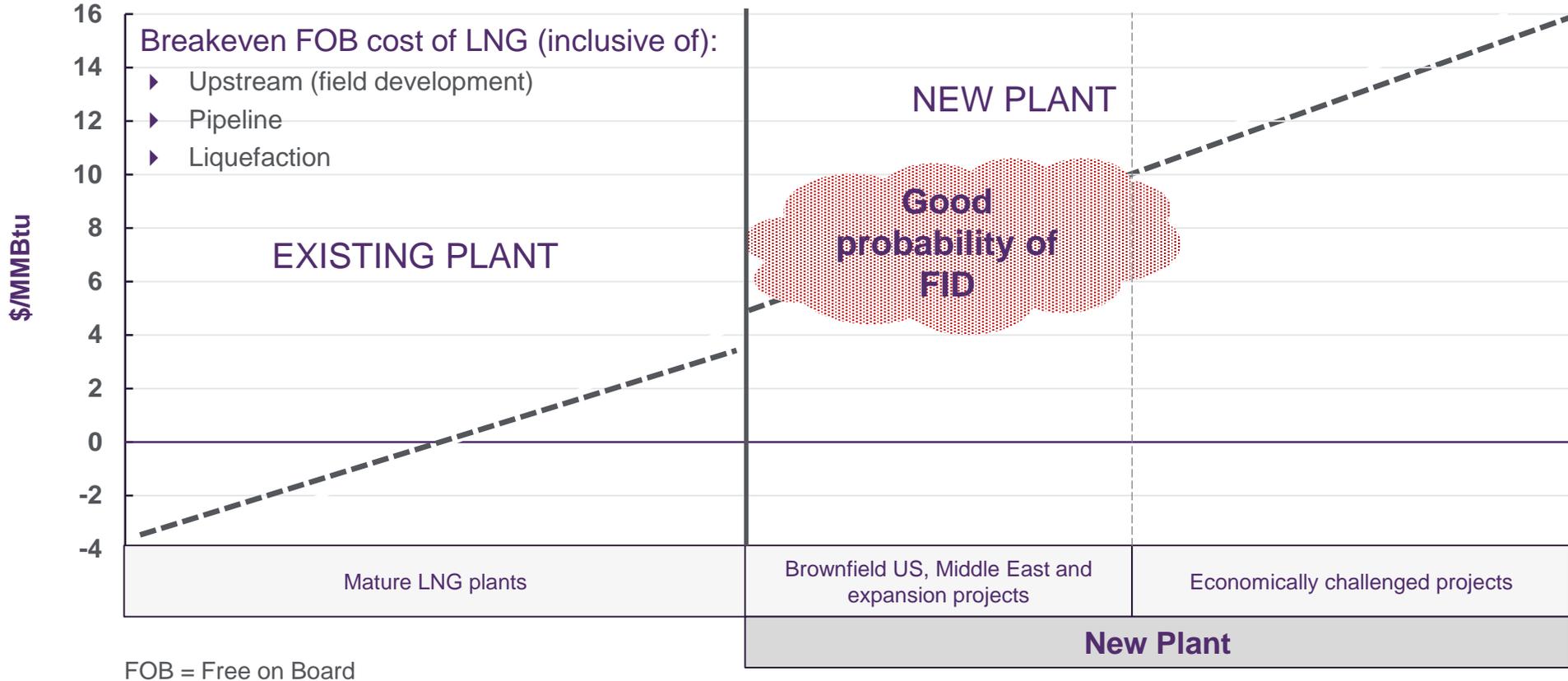
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# LNG business environment – market drivers



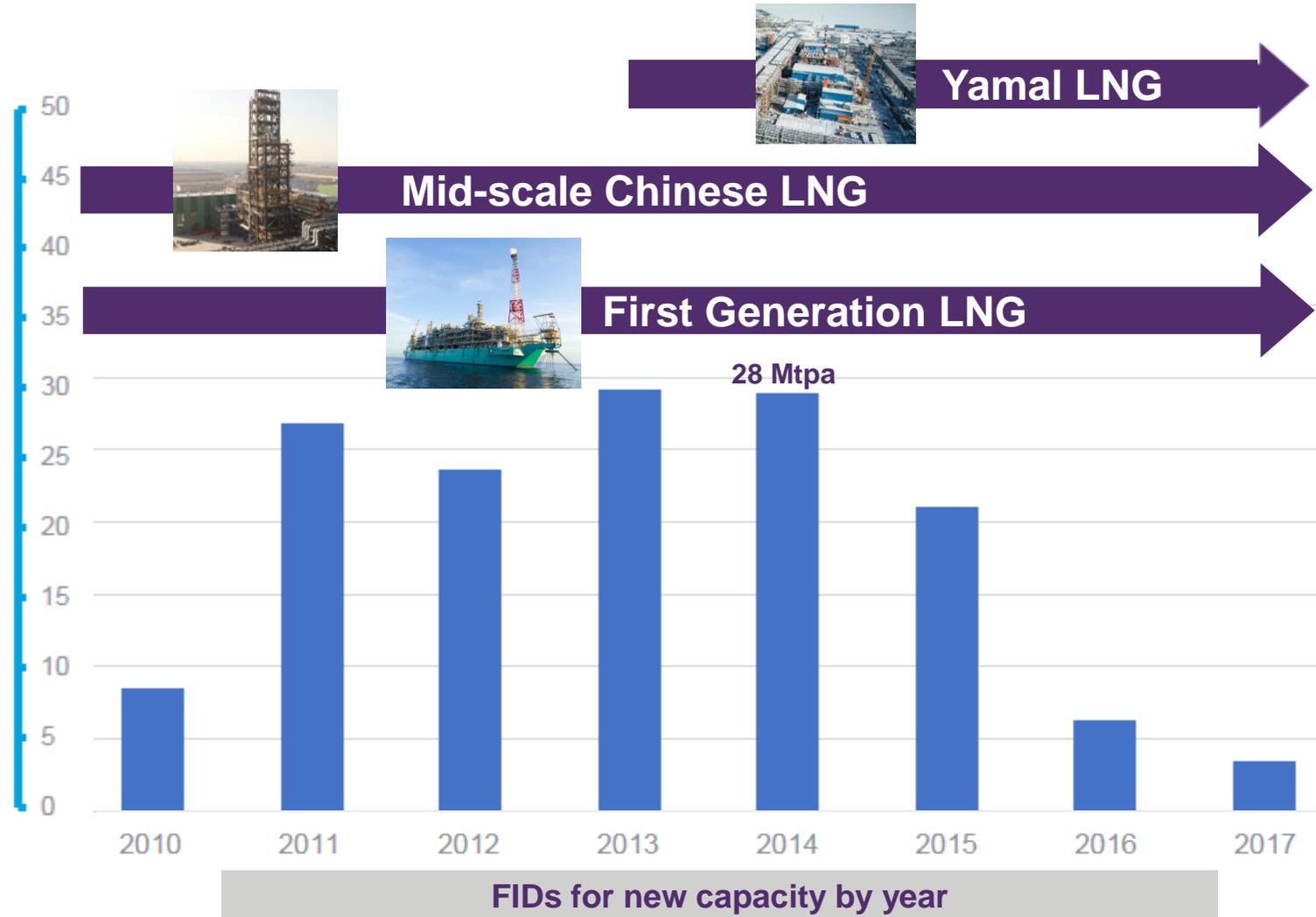
Significant LNG liquefaction and export terminal opportunities in the near term

# Projects with vastly different economics



➤ **Only the most profitable projects are likely to move forward**

# The end of the era of high oil prices stalled investment but many lessons from this period are useful in the new environment



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# Building on our experiences for the recovery



## First Generation FLNG

- ▶ FLNG feasibility demonstrated; increase revenue per m<sup>2</sup>
- ▶ Minimize on-deck module integration, including topside/hull interfaces
- ▶ Consider specialized yards for topsides



## Mid-scale Chinese LNG

- ▶ Extensive procurement in China
- ▶ Lower risk profile allows for efficient quality control and assurance
- ▶ Standardize and enable repeatability



## Yamal LNG

- ▶ Larger modules and FLNG-type design would have advantages
- ▶ Modularization on a large scale enables cost and schedule certainty in extreme locations
- ▶ Minimize cable pulling and other integration activities at site

# Big strides in LNG equipment

Initiatives born in the boom have reached maturity



## Rotating equipment

- ▶ 2-shaft heavy duty gas turbines
- ▶ Large aero-derivative gas turbines



## Cryogenic exchangers

- ▶ Large capacities in single shell



## Non-cryogenic exchangers

- ▶ Enhanced heat transfer surfaces

# New cost-effective delivery models

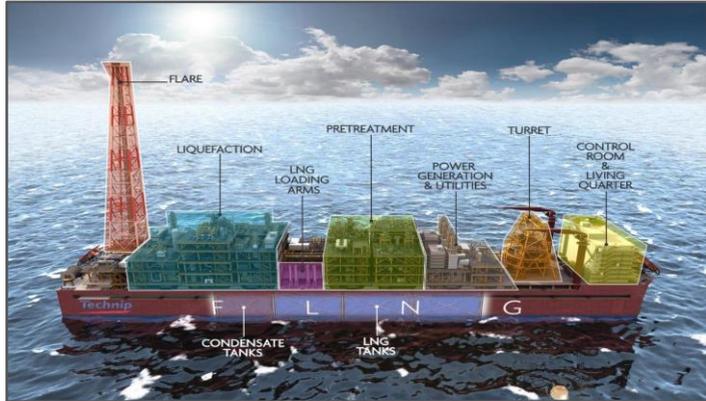
FLNG

Mid-scale

Onshore export terminals

# FLNG: preparing the new generation

- **Economic solution for large capacity**  
A cost breakthrough in the short-term



- **Mid-scale FLNG for liquid rich gas**  
Simple, robust and repeatable



- ▶ Split construction, minimum interfaces
- ▶ Intensification

- ▶ Quayside completion of functional modules
- ▶ Productivity

- **FLNG costs can be improved in many ways**  
Current estimates suggest substantial cost reduction

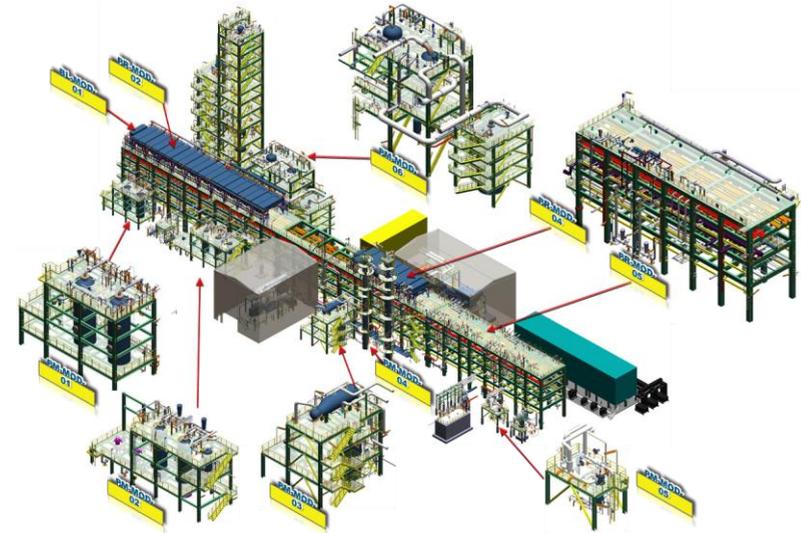
# Onshore mid-scale LNG

## Offering standardized and modularized units



*Shaanxi Yangling LNG (500 Ktpa, 2015)*

- ▶ 0.3 - 2.5 Mtpa
- ▶ Number of modules adjusted according to location; single module possible
- ▶ Electric motor or gas turbine driver
- ▶ Air or water cooled

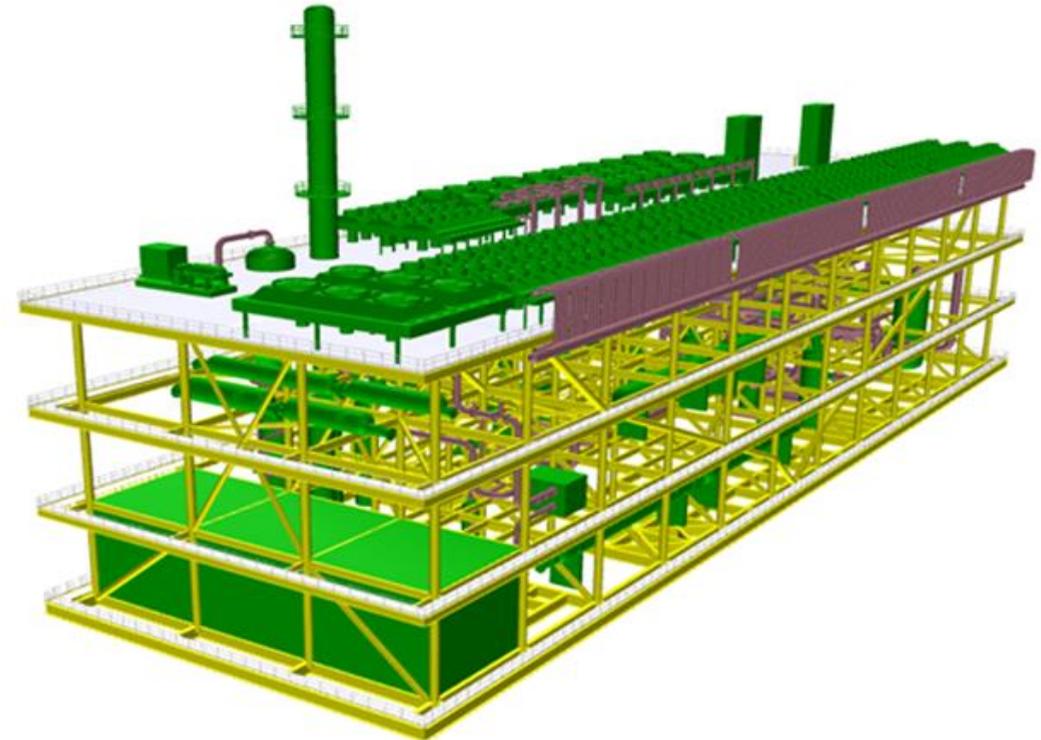


ktpa = kilo tonne per annum

# Onshore export terminals

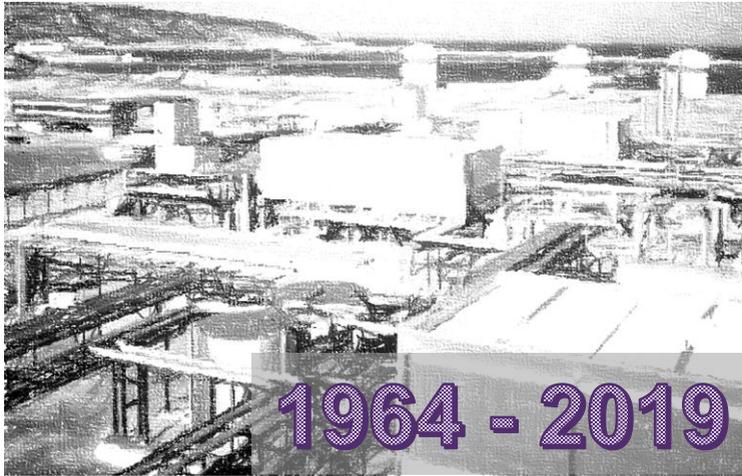
Offering high efficiency and reliable designs with potential modularization

- ▶ 5 Mtpa capacity in 3 modules
- ▶ Yamal-type execution with pre-commissioning in the yard reduces schedule and costs
- ▶ \$/tpa competitive in the US GoM



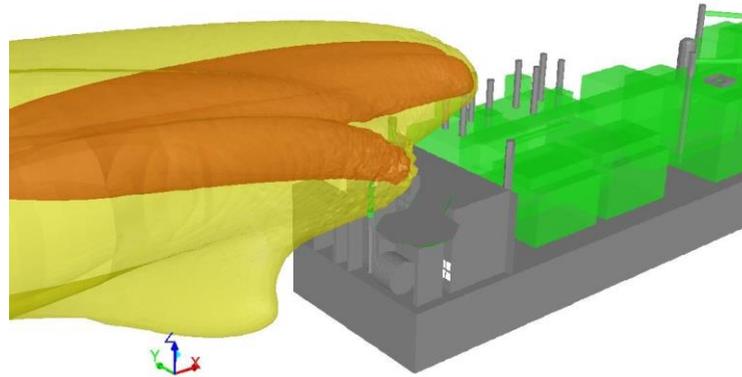
# Summary – bringing it all together

# TechnipFMC – multiple differentiators in LNG



## Delivery certainty

- ▶ LNG leader & pioneer in FLNG
- ▶ 50-year delivery track record
- ▶ EPC culture capability



## Technical ability

- ▶ Conceptual design / technology
- ▶ Engineering solutions
- ▶ Construction methodology



## Experience diversity

- ▶ Modularization, FLNG
- ▶ Harsh environments
- ▶ Mid-scale to mega projects



TechnipFMC