Floating LNG - What Have We Learned and What is Next?

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Definitions & Cautionary Note

Reserves: Our use of the term "reserves" in this presentation means SEC proved oil and gas reserves.

Resources: Our use of the term "resources" in this presentation includes quantities of oil and gas not yet classified as SEC proved oil and gas reserves. Resources are consistent with the Society of Petroleum Engineers (SPE) 2P + 2C definitions.

Discovered and prospective resources: Our use of the term "discovered and prospective resources" are consistent with SPE 2P + 2C + 2U definitions.

Organic: Our use of the term Organic includes SEC proved oil and gas reserves excluding changes resulting from acquisitions, divestments and year-average pricing impact.

Shales: Our use of the term ‘shales’ refers to tight, shale and coal bed methane oil and gas acreage. Underlying operating expenses are defined as operating expenses less identified items. A reconciliation can be found in the quarterly results announcement.

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Shell’s FLNG Journey

MID 1990s-2008
EARLY THINKING AND DESIGN EVOLUTION

2009-2010
TSC CONSORTIUM PRELUDE FEED

2011-NOW
FID AND EXECUTION
Mature Design
With a capacity Step Up

- Solution for lean gas fields
- Higher capacity
- Lower Unit Technical Cost

Standard FLNG Design

FLNG Lean
Critical Success Factors

Integrated FLNG Development

- Seamless integration of upstream project with FLNG facility
- Continuous focus on cost/value
- Low environmental footprint

LNG Off-take

- Availability
- Buyer confidence
- Project investor

- Sound technical offering
- Strong balance sheet
- Insurability
- Ability to finance
- Attractive host country benefits

Sustainable Performance

Execution and Operating capability
FLNG session
LNG19
Rob Nibbelke
General Manager FEE and LNG Development
Living Quarters
Utilities modules
AGRU (stripping), End Flash and Offloading arms
Liquefaction, AGRU (absorption) and gas dehydration
Inlet Facilities and Fractionation
Flare and Turret

Secondary evacuation (TEMPSC)
Living Quarters
Utilities modules
AGRU (stripping), End Flash and Offloading arms
Liquefaction, AGRU (absorption) and gas dehydration
Inlet Facilities and Fractionation
Flare and Turret

Tertiary evacuation (liferafts, etc)

Entire living quarters area is designated a Temporary Refuge (60 min endurance time) and is separated from process by utilities and safety gap.

Primary evacuation (helidecks)

Secondary evacuation (helidecks)

Secondary refuge in forecastle

Decreasing risk potential moving along the barge length towards the living quarters/temporary refuge

Secondary evacuation (helidecks)

Secondary evacuation (helidecks)

Secondary refuge in forecastle

Decreasing risk potential moving along the barge length towards the living quarters/temporary refuge

Safety by design

Primary evacuation (helidecks)

Secondary evacuation (helidecks)

Secondary refuge in forecastle

Decreasing risk potential moving along the barge length towards the living quarters/temporary refuge

Safety by design
FLNG Technical challenges

- Complex processing offshore
- LNG plant lay out on a limited plot size
- Mooring and offloading of LNG/LPG carriers adjacent to a (moving) production plant
- Possibility of extreme weather conditions

Results of our engineering

- Safety on par with modern offshore facilities
- Availability on par with onshore LNG facilities
Cargo Containment system

Design factors limit the impact of sloshing

- Strengthened version of Mark III containment
- 2 rows of tanks
- Tank shape