A HIGH CAPACITY FLOATING LNG DESIGN

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LNG17, HOUSTON, APRIL 19, 2013
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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 2P and 2C definitions.

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ENERGY FUTURE BY 2050

**RISING ENERGY DEMAND, SUPPLY PRESSURE, CLIMATE CHANGE**

- 9 billion people; up to 75% living in cities
- 2 billion vehicles; 800 million at the moment
- 3-4 times as rich as today as population in developing countries shifts from poverty to middle class
- More than double the energy: Supplying 55% more energy than today. At the same time having to reduce emissions from CO₂ and GHG
- Half the energy intensity: Using half the energy as now to produce each dollar of wealth
- 5-10 times as much: Energy from renewable sources will be 5-10 times as much as it is today
LEADERSHIP ACROSS LNG VALUE CHAIN

50 YEARS OF EXPERIENCE IN LNG

EXPLORATION & PRODUCTION
One of the world’s largest gas producers

LIQUEFACTION
Largest IOC supplier of LNG

LNG SHIPPING
Largest ship operator

REGAS, PIPELINES, STORAGE
Strategic positions, active portfolio management

MARKETING & TRADING
Global positions and capabilities

TECHNOLOGY
Leader in LNG and gas conversion technologies

Building world-class partnerships
FLNG:
HOW DOES IT WORK?

Subsea gas gathering from wellheads

FLNG FACILITY
moored near gas field

Off-loading onto standard LNG carriers
SHELL’S FLNG JOURNEY

MID 1990s-2008
EARLY THINKING AND DESIGN EVOLUTION

2009-2010
TSC CONSORTIUM PRELUDE FEED

2011-NOW
FID AND EXECUTION
SHELL FLNG:
PROVEN TECHNOLOGIES IN INNOVATIVE COMBINATIONS
INTEGRATED CONCEPT, REPLICABLE

Over 15 years identifying, understanding and addressing offshore challenges:
- Extensive physical modeling of technical challenges
- Development of numerical modeling techniques
- Completely integrated from reservoir to product off take
- Safety has driven the layout, and is on par with modern offshore facilities
- Roll and pitch less than for a typical FPSO
- Reliable supply – availability is on par with onshore plants
ECONOMIC DRIVERS
FOR FLNG PROJECTS

source: Shell Analysis
MATURE DESIGN
WITH A CAPACITY STEP UP

- Solution for lean gas fields
- Higher capacity
- Lower Unit Technical Cost
DESCRIPTION OF SHELL’S FLNG LEAN CONCEPT

Feed Gas from Turret → FEED GAS RECEIVING → GAS TREATING & CONDITIONING → CS+ REMOVAL → FUEL GAS

- Vent/CCS
- Water Make-up

- Fuel Gas → LIQUEFACTION (STRING 1) → LIQUEFACTION (STRING 2) → REFRIGERANT STORAGE → LNG STORAGE

- Ethane & Propane Import → LNG LOADING → LNG Export

- Lean MEG
- Produced Water
- Condensate Product

- Condensate STABILISATION
- CONDENSATE STORING
- CONDENSATE REGENERATION
- CONDENSATE LOADING

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■ Builds upon knowledge and experience of Prelude
■ Swivel stack permits fluid transfer from subsea system to topsides
■ Resists loads under the most extreme weather conditions
OLAF
SIDE BY SIDE OFF-LOADING SYSTEMS

- Co-development Shell – FMC
- OLAF - Offshore Loading Arm Footless
- ATOL - Articulated Tandem Offshore Loader - for more severe conditions

Outboard arm counterweight

In/Out - counterweight board arm assembly

Swivels

Slew bearing
CRITICAL SUCCESS FACTORS

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

LNG OFF-TAKE
- Availability
- Buyer confidence
- Project investor

SUSTAINABLE PERFORMANCE

Execution and Operating capability
BRINGING NEW ENERGY SOURCES TO MARKET

- Successfully executing the Prelude project
- Developing further partnerships and plays for future projects
- Continuing to develop our FLNG programme:
  - A global integrated FLNG programme team
  - Design development work to cater for larger and leaner gas fields
- FLNG Lean designed on the same platform as Prelude