

# FLNG market update

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The Standard





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# Offshore Overview and FLNG

5th November 2013 – Clarkson Research Services Limited



Presentation to Standard Club Offshore Forum,  
Steve Gordon, Managing Director, Clarkson Research



## About us



### Broking

Clarksons' shipbroking services are unrivalled: for the number and calibre of our brokers; breadth of market coverage; geographical spread and depth of market intelligence; analysis and support. We aspire to be best-in-class and market leaders in all key sectors.



### Support

Clarkson Port Services provides the highest level of support to vessel owners, operators and charterers at strategically located ports in the UK and Egypt. Offering ship's agency services, we are also engaged in stevedoring and warehousing at UK ports and support to the Offshore industry.



### Financial

From derivative products that have been pioneered at Clarksons to full investment banking services and tailored debt solutions, we help our clients manage risk and fund and conclude deals that would often be impossible via more traditional routes.



### Research

Up-to-the-minute intelligence is the cornerstone of any shipping organisation and Clarksons Research Services is recognised worldwide as the market-leading provider of comprehensive and reliable maritime information.



## Research



### Offshore and energy

The leading provider of data to the offshore industry for more than 30 years. Providing clients with the key information they need to operate their business more effectively. Market intelligence is available on more than 25,000 structures, vessels and companies and 6,000 oil and gas fields.



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Market leaders in providing timely and authoritative information on all aspects of shipping. Data is available on over 100,000 vessels either in service or on order, 10,000 companies and 600 shipyards as well as extensive trade and commercial data, and over 100,000 time series.



### Valuations

The world's leading provider of valuations to the shipping industry and financial community. More than 20,000 valuations are handled annually, covering the full range of vessel types.





# Update - FLNG

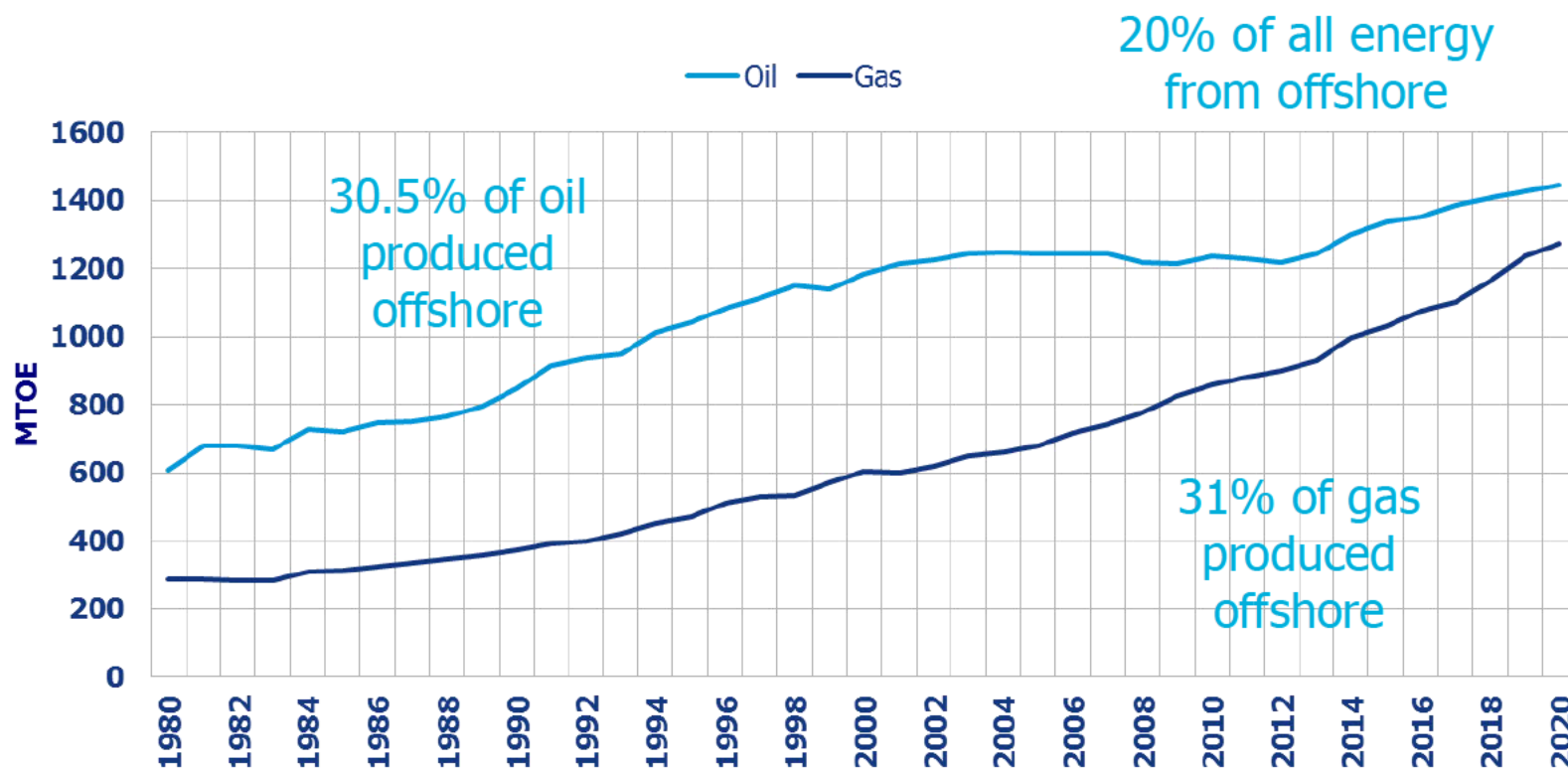
## Agenda:

1. Offshore Overview
2. FLNG in the LNG logistics chain
3. FLNG Project Review
4. Summary





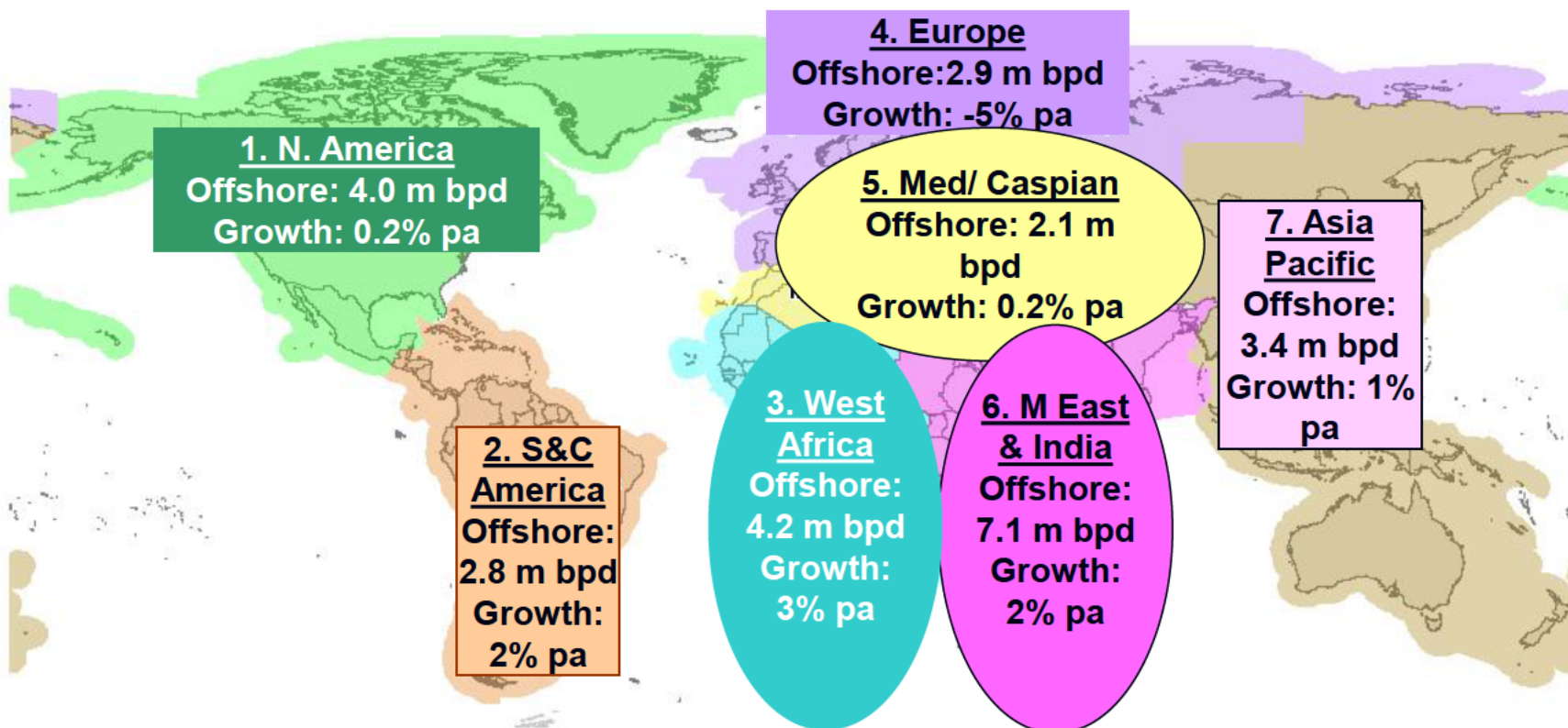
# Offshore Energy Within the Global Context





# World Offshore Producing Regions - Oil

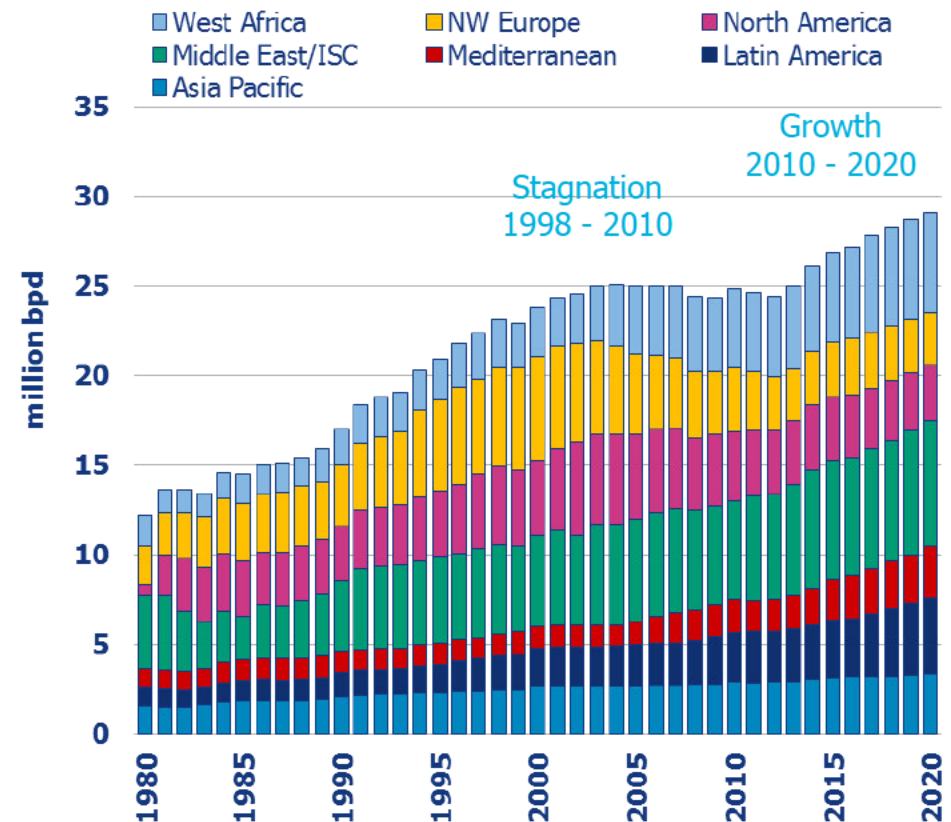
## Offshore Oil Production – 2013 Forecasts





# Offshore Oil Production & Forecast

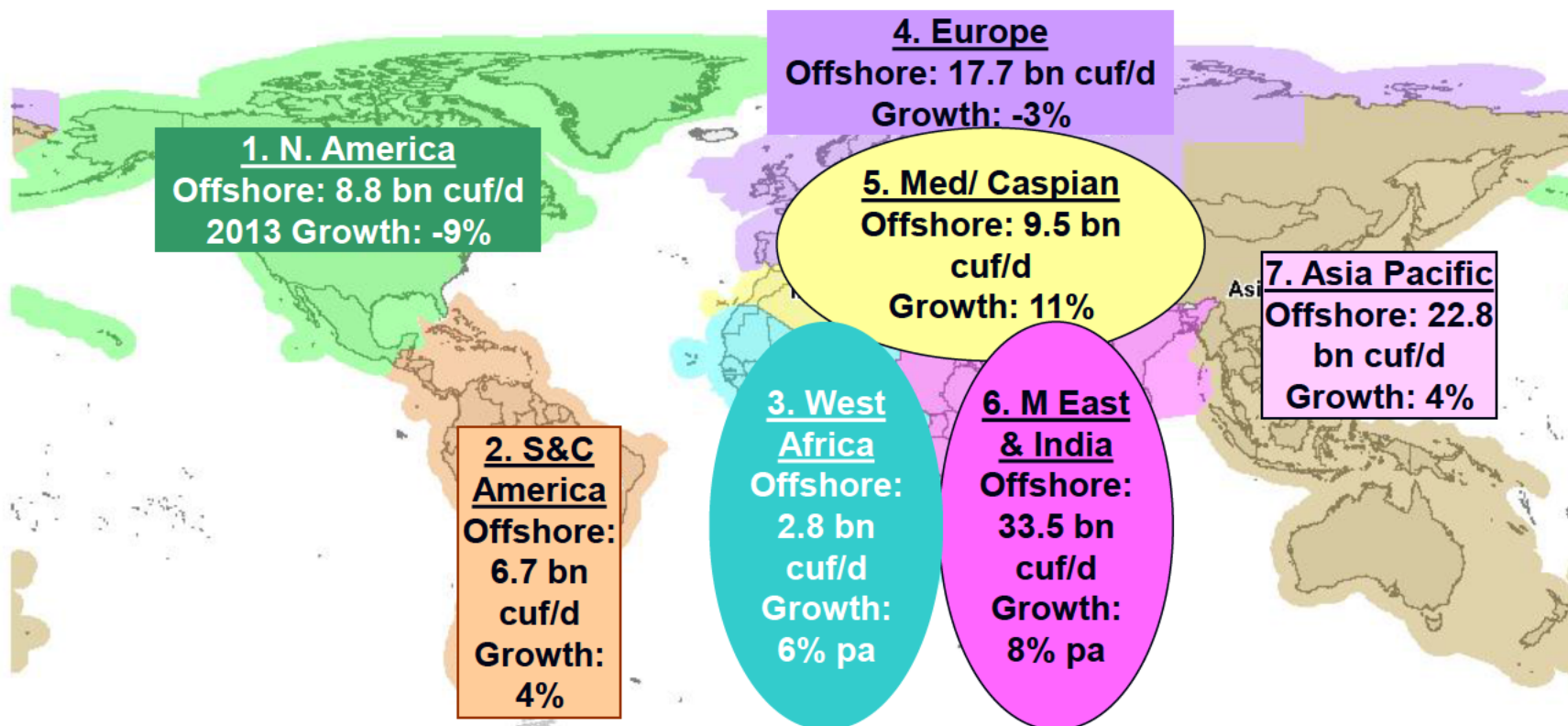
- Production fell between 2005 and 2010, but we expected growth to the 30m bpd level in the next five years.
- South America, Middle East and West Africa contribute the most absolute growth.
- North Sea & US Gulf steady or declining but still important.





# World Offshore Producing Regions - Gas

## Offshore Gas Production – 2013 Forecasts

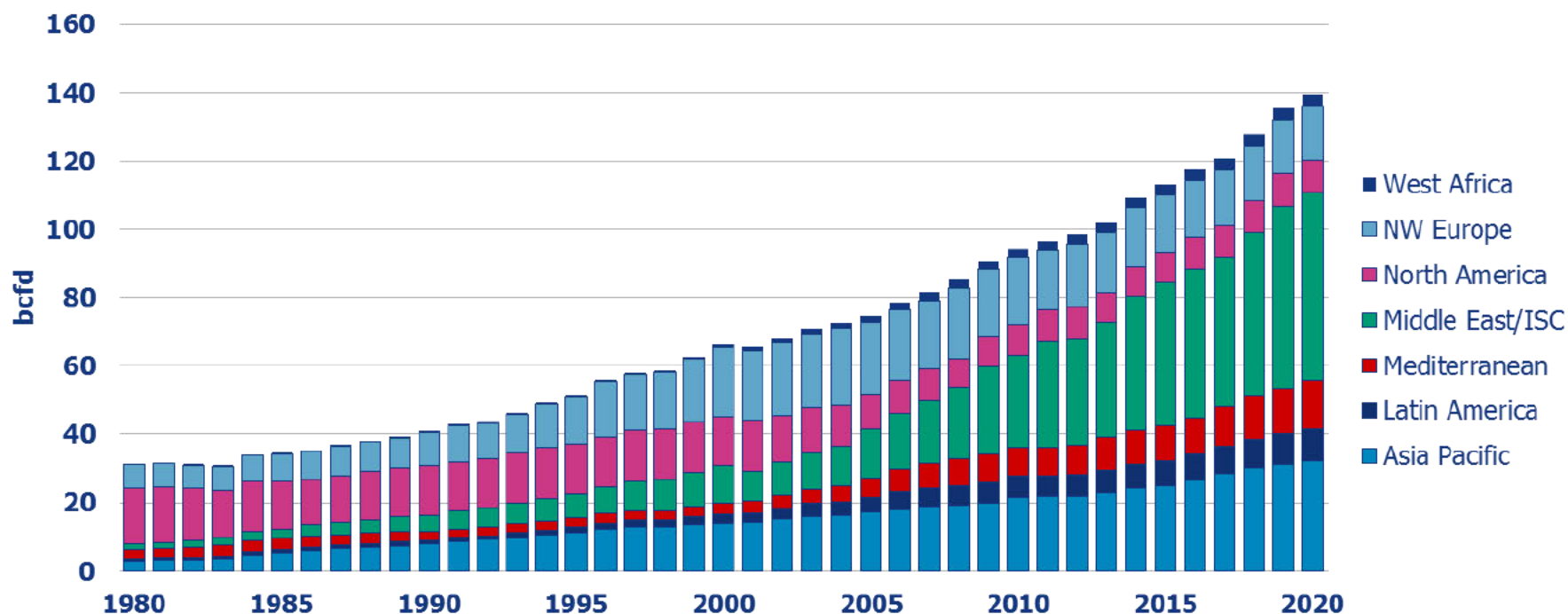




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# Offshore Gas Production Forecast



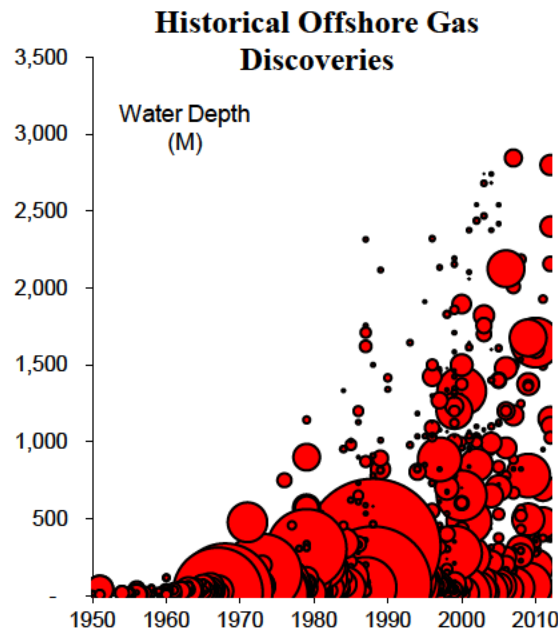
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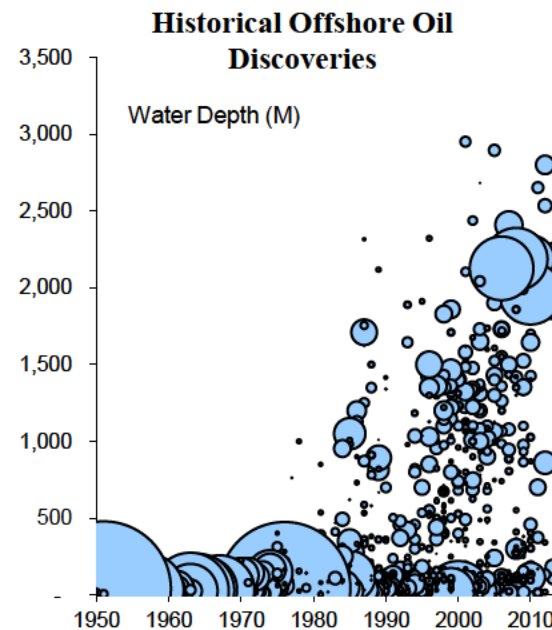


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# Offshore Gas Discoveries by Depth



Source: Clarkson Research Services



Source: Clarkson Research Services

- Both Gas and Oil discoveries have become more frequent in deeper water.
- Medium-sized deep gas discoveries are more common than for oil – bar a few Brazilian fields, most fields are relatively smaller.
- Several earlier gas discoveries in harsher environments are now more viable (technology developments, changing price conditions).

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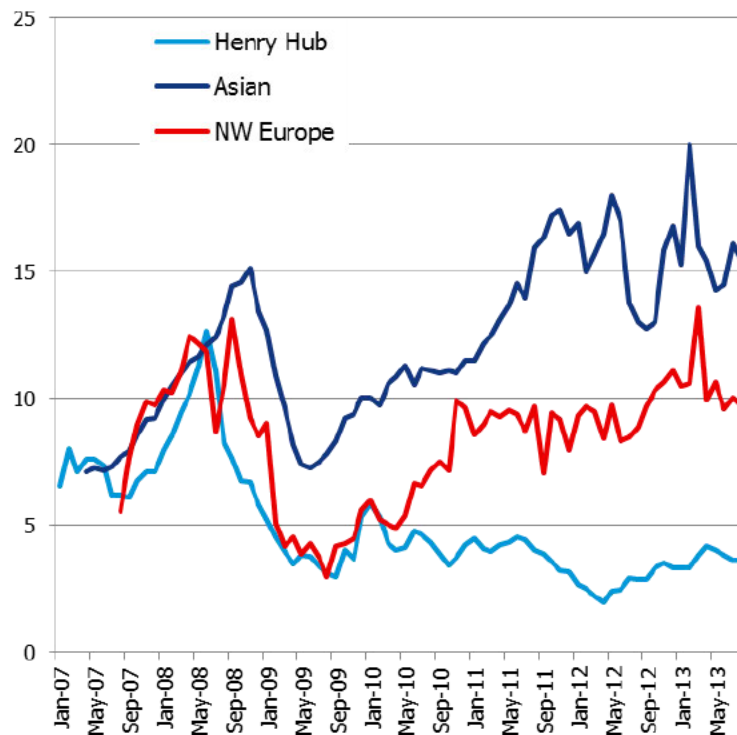




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# Gas Prices

## Global Natural Gas Prices (\$/mm BTU)



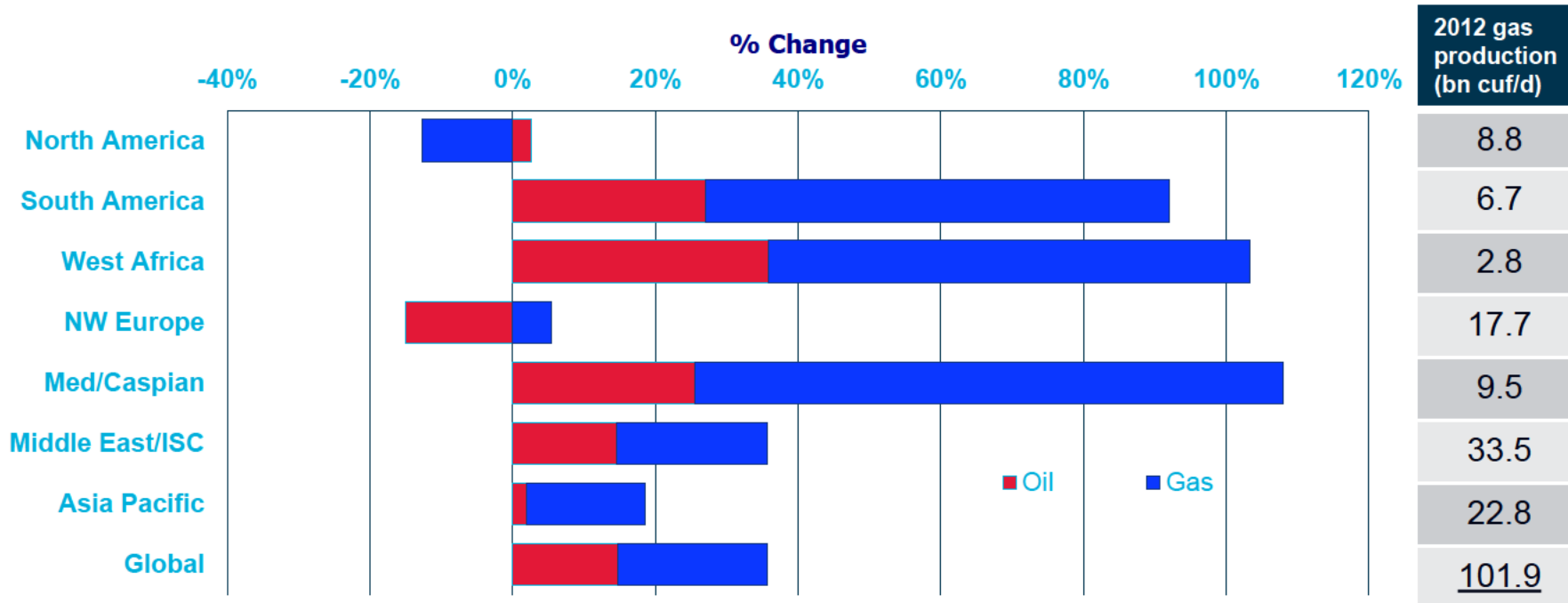
- Unlike oil, gas has yet to develop a global commodity market.
- Long-term LNG contract prices used to be benchmarked to oil (this is still common in Asia, dark blue line on chart)
- Shale gas has made US gas much cheaper though. European supplies have also become cheaper as more LNG competes with Russian pipeline gas.
- If the latter case, then offshore developments, including FLNG, could become less attractive.





# 2020/12 Change in Offshore Production

## % Change in Offshore Production



### Major Gas Growth Areas:

**Asia-Pacific:** Driven by large remote NW Australian field start-ups (Browse, Canarvon, Bonaparte basins)

**East Africa:** Recent deep discoveries off Mozambique and Tanzania

**Mediterranean:** Recent deep discoveries off Israel & Cyprus

**Middle East:** Further stages of project development in the South Pars/North Dome complex (**risk:** dependent on Iran)

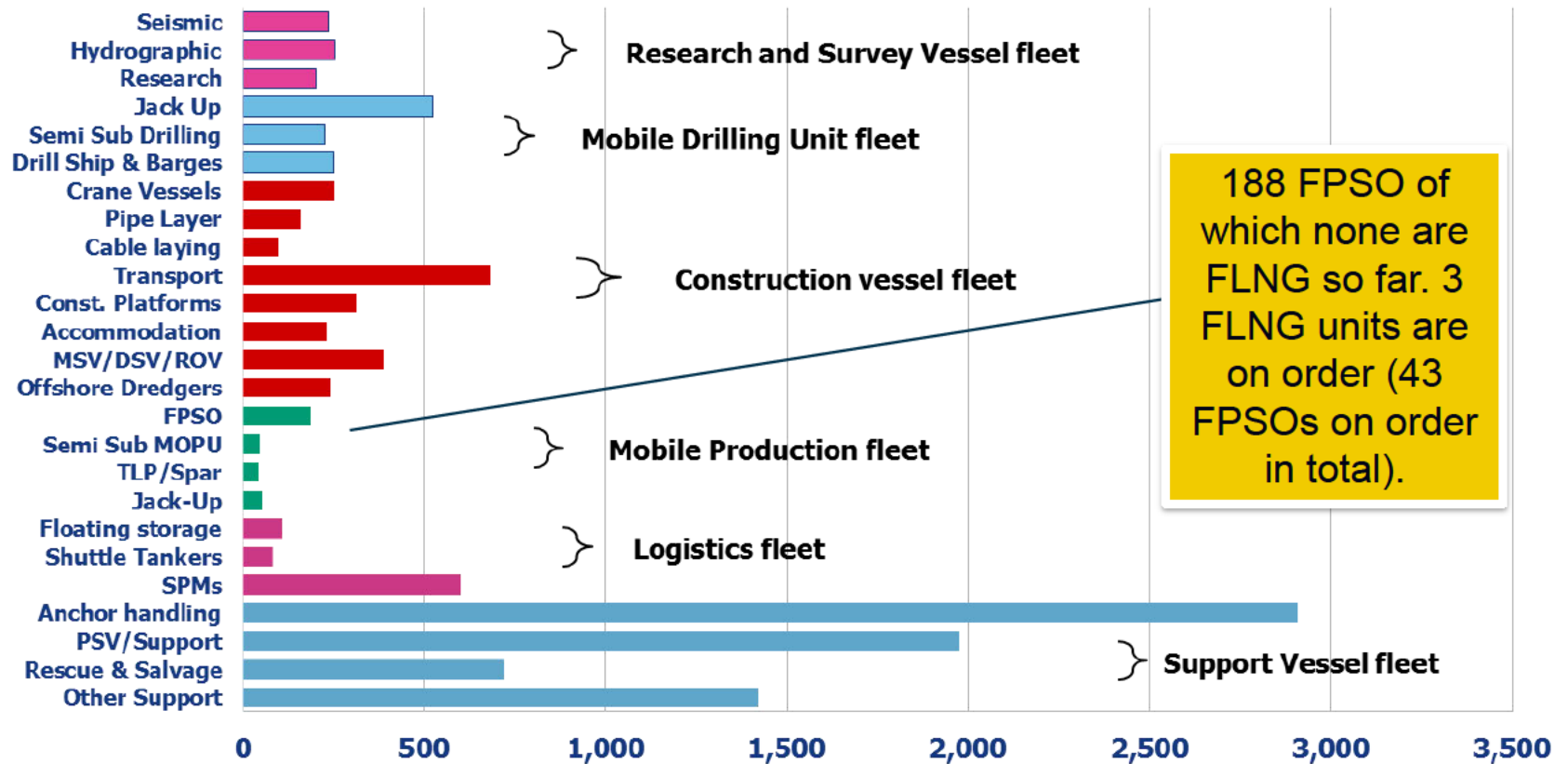


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# World Offshore Fleet

World Offshore Fleet as at September 1, 2013 (No of Units)



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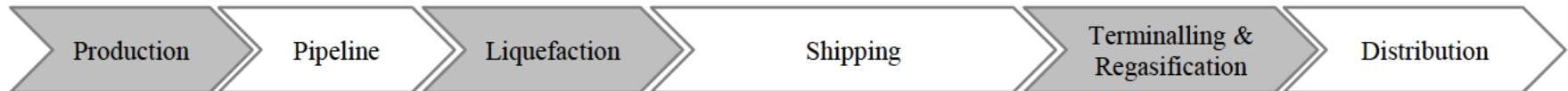
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# The LNG Logistics Chain

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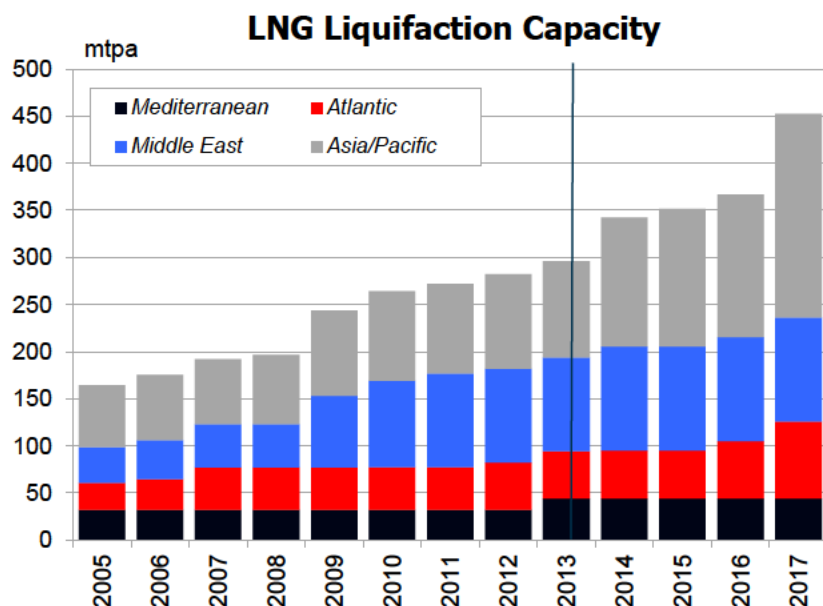


Floating LNG adds a different option at this point in the logistics chain.

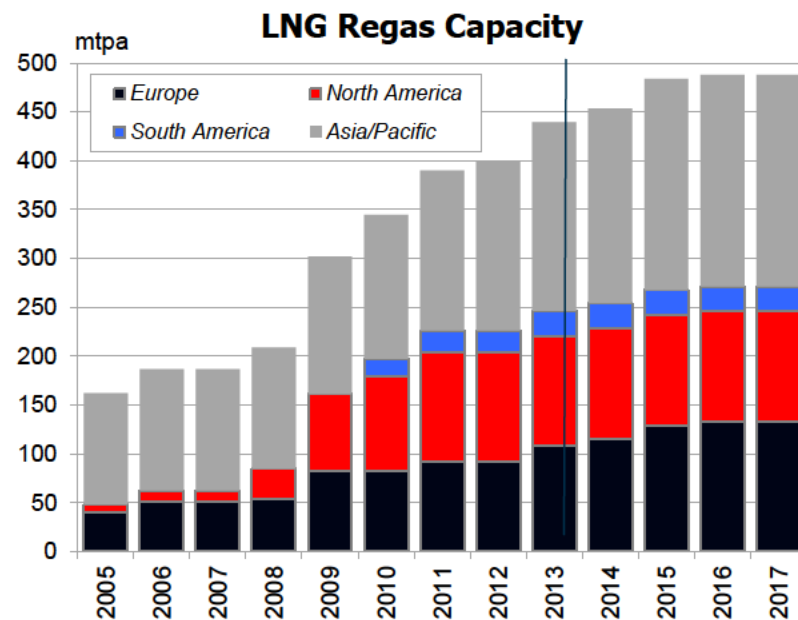
A small number of Floating Regasification vessels (FSRUs) also exist.



## LNG Capacity by Regions



Source: Clarkson Research Services



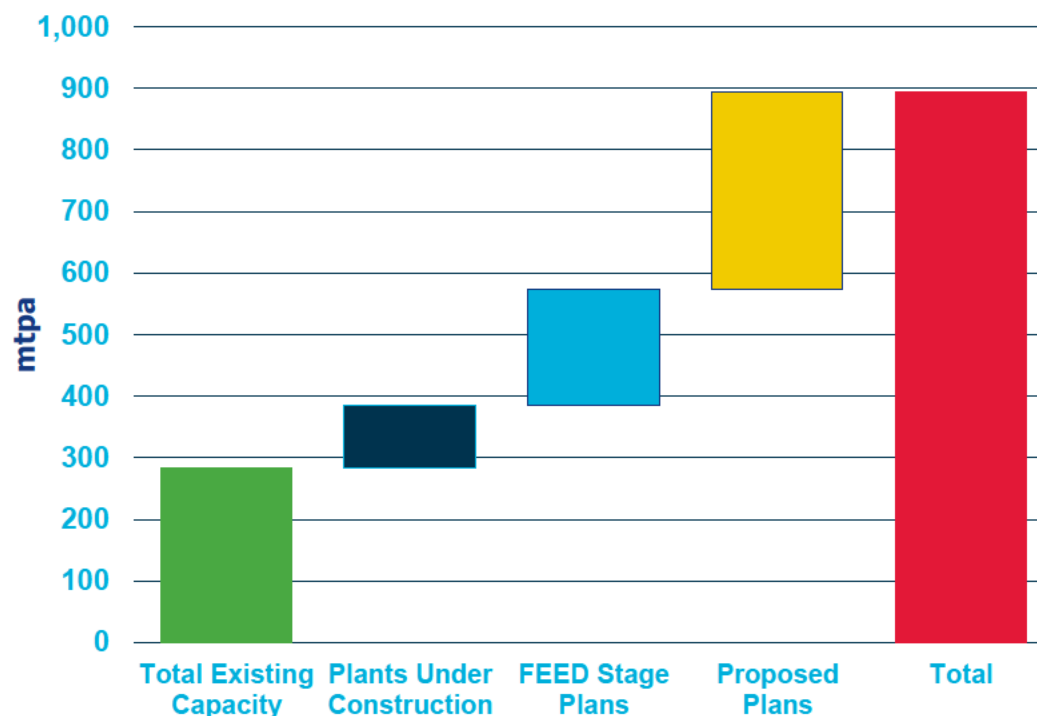
Source: Clarkson Research Services

- Capacity of both floating and onshore terminals.
- Future capacity expectation is based on terminals currently under construction or with final investment decision taken, so upside is possible.



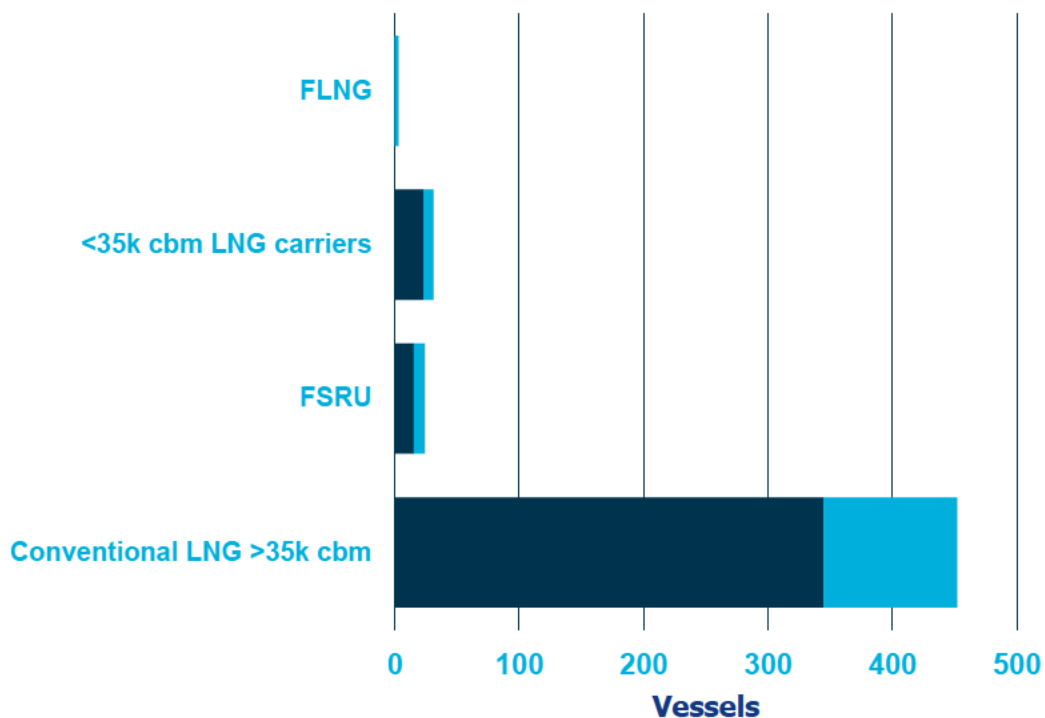
# Potential Development of LNG Export Capacity

## Development of Liquifaction Capacity: 2013-2021





# FLNG in the context of the wider LNG fleet



Fleet	Orderbook
0	3
23	8
15	9
345	107



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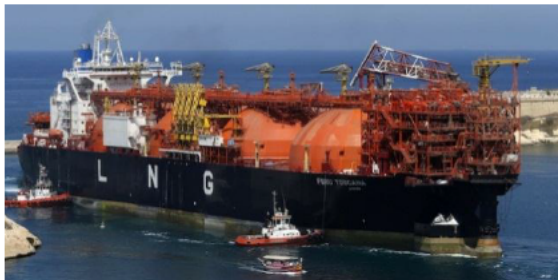
## Vessel Types



**Floating LNG:** Essentially a gas FPSO. The majority of the units in the planning process so far are intended as a means to enable the production and export of gas from offshore fields which would otherwise be non-viable : eg “stranded” gas fields some distance from shore or established pipeline infrastructure. Capital investment is large.

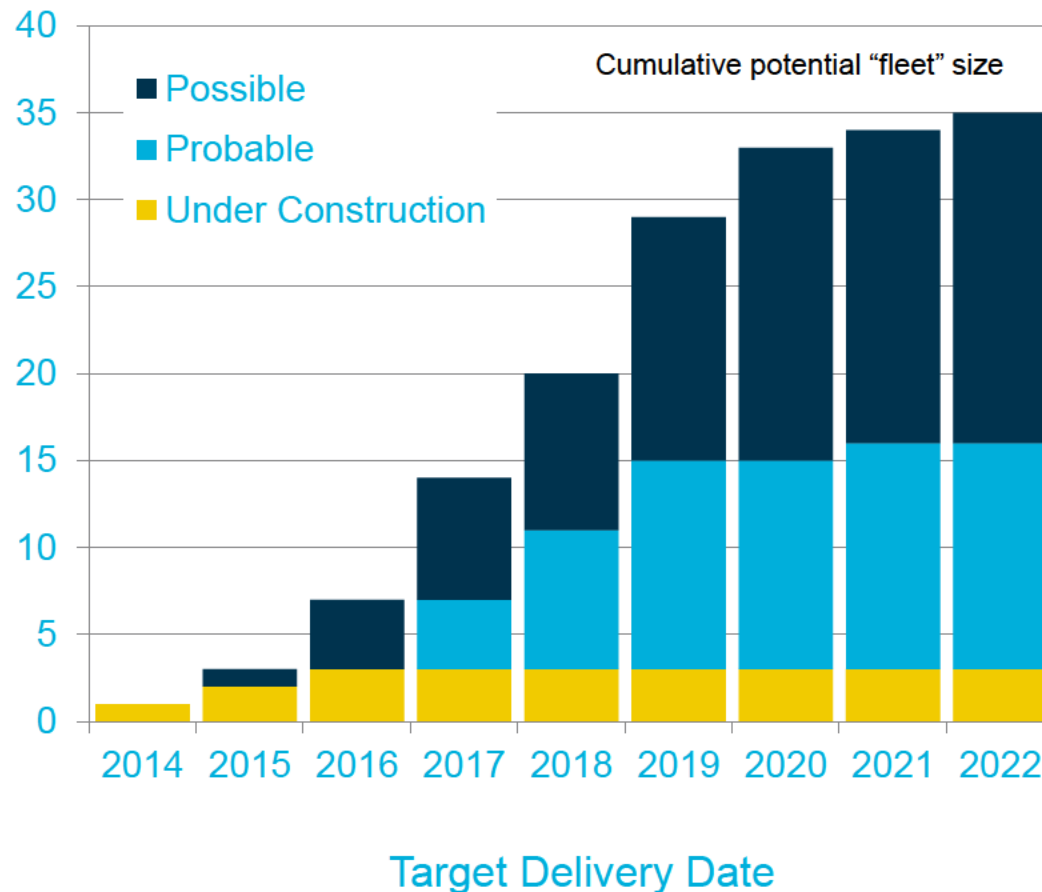


**Floating Regasification Units:** These are offloading units, analogous to the trans-shipment vessels which exist in bulk trades. Some units are designed to retain more ability to move location, thus serving countries like Kuwait where gas import demand is seasonal. Others are more permanently moored as a solution to reduce the cost or space issues of LNG Regas.





## Future Floating LNG Vessels



- CRS's projects database now has records for 35 mooted FLNG projects.
- Only 3 are under construction so far.
- Not all of the potential MPU projects shown on the left will come to fruition.
- However, FLNG looks like becoming increasingly important.
- There are currently only 91 land-based liquification terminals: so floating LNG is becoming a relatively large number.

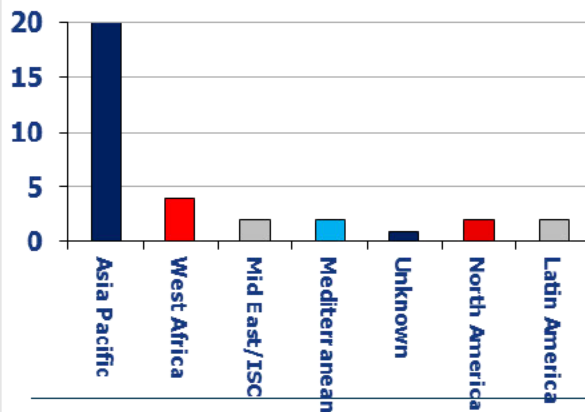




# Future FLNG Deployment

**1**  
**Unknown Region**

**Location of Possible  
FLNGs**



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## Why FLNG?

- Demand for natural gas is growing rapidly, particularly in Asia. Majority of prospective FLNG projects are in the Asia/Pacific region.
- LNG transport has an established track record in providing a logistical solution to moving volumes over long distances.
- Offshore gas fields are increasingly being discovered far from land, in deeper environments and harsher and more difficult conditions.
- In some situations FLNG can offer a cost effective solution to the question of extracting and delivering such gas to market, rather than using an onshore solution.



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## FLNG Projects - Under Construction

MPU Name	Field	Country	Build Date	Distance from Shore (km)	Operator
Kanowit FLNG-1	Kanowit	Malaysia	2015	162	Petronas Carigali
Exmar Pacific Rubiales FLNG Barge	La Crescente	Colombia	2014	Shoreside	Exmar Offshore
Shell Prelude FLNG	Prelude	Australia	2016	197	Shell

The majority of under construction and proposed FLNG projects are means of rendering exportable 'stranded' gas fields far from existing infrastructure - hence most are a large distance from shore.

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## **FLNG Projects Under Construction**



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## Prelude FLNG

World's first FLNG Project.

Lead company Shell.

Total estimated CAPEX= \$11.4bn.

Current status= EPC.

FID taken May 2011.

Production planned late 2016-early 2017.

FPSO-LNG facility with capacity of 5.3mtpa.



- FPSO-LNG production system awarded to Technip Samsung Consortium in July 2012. Keel laid in May 2013.
- Noble began drilling 7 wells in September 2013 using semi-sub drilling unit. Est. completion early-2015.
- FMC Technologies awarded contract for 7 EVDT Trees in July 2012. Est. completion start-2014.
- SBM Offshore awarded contract for 1 Turret (11,500t), world's largest.



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## Kanowit FLNG

Malaysia's first FLNG project.

Current status= EPC

FID taken April 2012.

Production planned end-2015.

FPSO-LNG facility with capacity of 1.2mtpa.



**PETRONAS**

FPSO-LNG production system awarded to Technip Daewoo Consortium in July 2012. Contract valued at \$2bn.

GE awarded contract for gas-turbine generator systems, 2 compressor units and 2 centrifugal compressor modules. Units delivered August 2013.

Aker Solutions awarded contract for 2 Completion, 1 Manifold and 1 Pipeline End Manifold structures in August 2010. Total cost \$45m. Delivered to Daewoo in 2011.



## Pacific Rubiales (Exmar)

- This Project is a shore-side Floating Liquifaction Project.
- Unlike the majority of other projects, it is not intended to 'rescue' a remote offshore gas field.
- Gas will be piped from the Colombian onshore *La Creciente* field to a barge moored on the Caribbean coast.
- 500,000 tpa export capacity.
- Targeting short-haul exports of LNG to Caribbean islands; i.e. Dominican Republic, Puerto Rico.
- Start up could be 2014, possibly making it a 'first step' in proving the technology.
- However, the majority of FLNG applications are likely to be offshore.





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## **Notable FLNG Projects Proposals**





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## FLNG Projects-Probable

MPU Name	Field	Country	Build Date	Distance from Shore (km)	Operator
Abadi FLNG	Abadi	Indonesia	2019	102	INPEX Masela
Bonaparte FLNG	Petrel	Australia	2018	100	GDF Suez Bonaparte
Browse FLNG 1 (Brecknock)	Brecknock	Australia	2017	259	Woodside Energy
Browse FLNG 2 (Calliance)	Calliance	Australia	2018	247	Woodside Energy
Browse FLNG 3 (Torosa)	Torosa	Australia	2019	285	Woodside Energy
Cash Maple/Oliver FLNG	Cash-Maple	Australia	2019	265	PTTEP Australia
Chaza/Jodari/Mzia FLNG	Mzia	Tanzania	2018	39	BG Group
Golar FLNG	Unknown	Angola	2018		Golar LNG
Malaysia Rotan Petronas FLNG	Rotan	Malaysia	2017	101	Petronas Carigali
PNG Petromin FLNG	Unknown	Papua N. Guinea	2017		Petromin PNG
Sankofa/Gye Nyame FLNG	Sankofa	Ghana	2019	53	ENI Ghana
Scarborough FLNG	Scarborough	Australia	2021	236	Esso Australia
Tamar Israel FLNG	Tamar	Israel	2017	94	Noble Energy

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## FLNG Projects-Possible

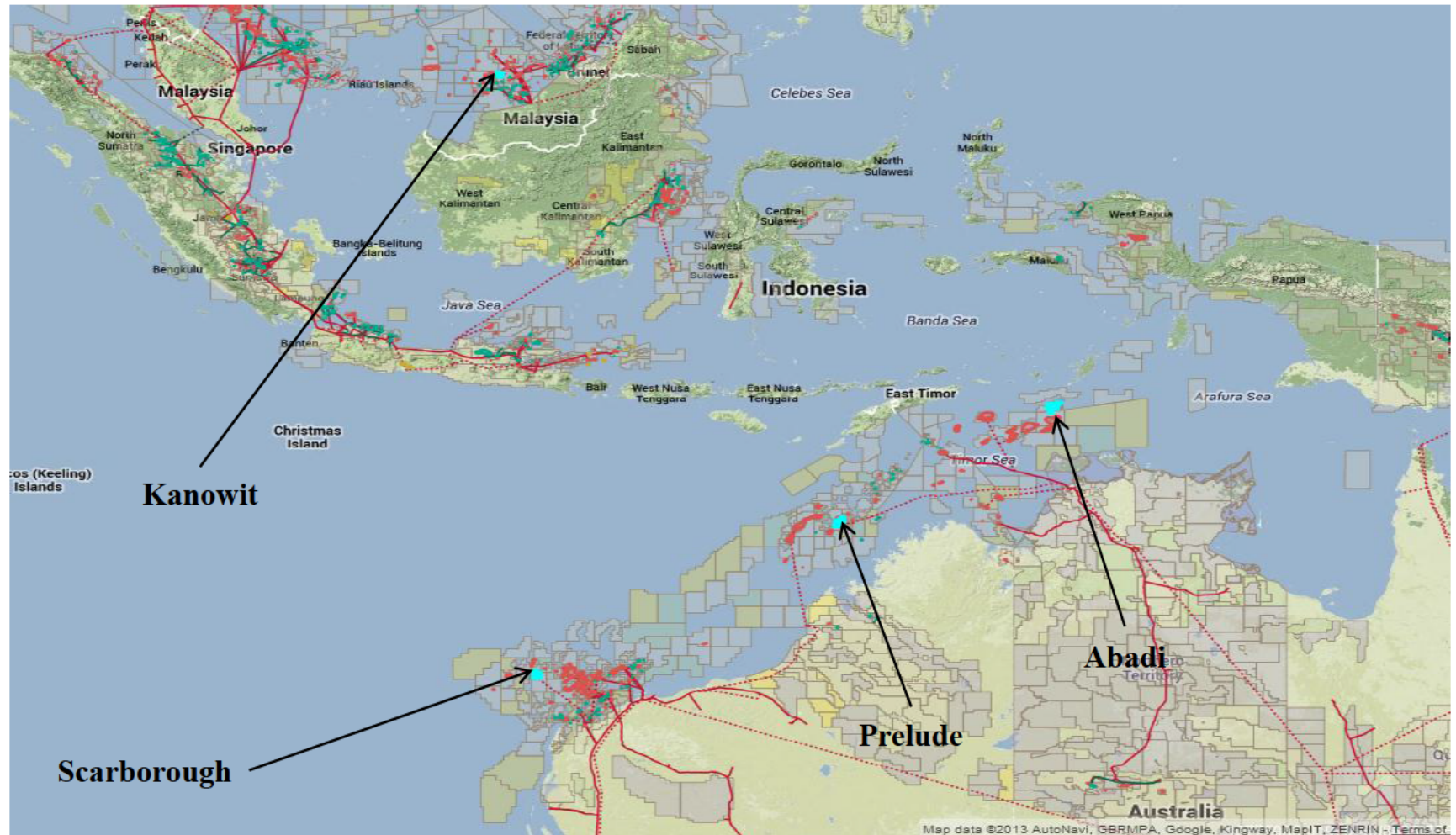
MPU Name	Field	Country	Build Date	Distance from Shore (km)	Operator
Acme FLNG	Acme	Australia	2017	83	Chevron Australia
Arnhem/Pinhoe FLNG	Arnhem	Australia	2019	290	Chevron WA-364-P
Bilabri/Orobiri FLNG	Bilabri	Nigeria	2019	48	Peak Petroleum
Block 22/NCMA 4 (Trinidad) FLNG	Unknown	Trinidad	2017		Centrica
Caldita/Barossa FLNG	Barossa	Australia	2017	157	Conoco Australia
Cambridge Energy FLNG	Unknown	United States	2016		Cambridge Energy
Echuca Shoals FLNG	Echuca Shoals	Australia	2019	174	Nexus WA377P
Elk/Antelope FLNG	Elk/Antelope	Papua N. Guinea	2016	0	InterOil Corp
Greater Chuditch FLNG	Chuditch	Aust-East Timor JDZ	2019	246	Minza
Greater Sunrise FLNG 1	Greater Sunrise	Australia	2020	306	Woodside Energy
Greater Sunrise FLNG 2	Greater Sunrise	Australia	2022	306	Woodside Energy
Hyundai/Linde FLNG	Unknown	Unknown	2016		Unknown
Lavani/Zafarani/Tangawizi (Block 2) FLNG	Lavani	Tanzania	2019	78	Statoil
Myra/Sarah FLNG	Unknown	Israel	2015		ILDC
Octopus8 FLNG	Unknown	Unknown	2020		Bluesky FLNG
Pechora FLNG	Unknown	Russia	2018		Pechora LNG
Pelican/Faucon FLNG	Faucon	Mauritania	2020	210	Dana Petroleum
Petrobras FLNG	Lula	Brazil	2018		Petrobras
Shtokman FLNG	Shtokman	Russia	2020	283	Shtokman Development

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## Scarborough/Thebe FLNG

Located 280km offshore Australia.

Lead company Exxon Mobil.

Total estimated CAPEX=\$20bn

Current status=pre-FEED.

FID delayed to 2014-2015 due to engineering studies.

# ExxonMobil

Project scheduled to utilise an FPSO-LNG vessel with a 6-7m tpa capacity.

Major challenges include the size of the turret and the cryogenic hoses for LNG offtake.

Despite difficulties, FID still likely.

12 wells are expected to be drilled in 2 phases.



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## Abadi FLNG

Located in the Arafura Sea.

Lead company Inpex.

Current status=FEED.

Total estimated CAPEX=\$20bn.

FLNG production scheduled to start in 2019.



Dual FEED for FPSO-LNG awarded to JGC Indonesia and Saipem Indonesia in January 2013.

Initial capacity estimate of 4.5mtpa, revised down to 2.5mtpa.

Contract for EPC on FPSO-LNG to be awarded by early-2014.

18 production wells from 5 semi-submersible drilling centres are planned.



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## Tamar FLNG- off Israel

Lead company Noble Energy



Current status=FEED.

Total estimated CAPEX=\$10bn.

Daewoo Shipbuilding likely to be awarded contract to build FPSO-LNG vessel, with a capacity of 3.4mtpa.

FLNG production scheduled to start in 2018.

Pre-FEED stage completed in November 2012. Vessel to be owned and operated by Hoegh LNG.

20 year sales agreement with Gazprom.

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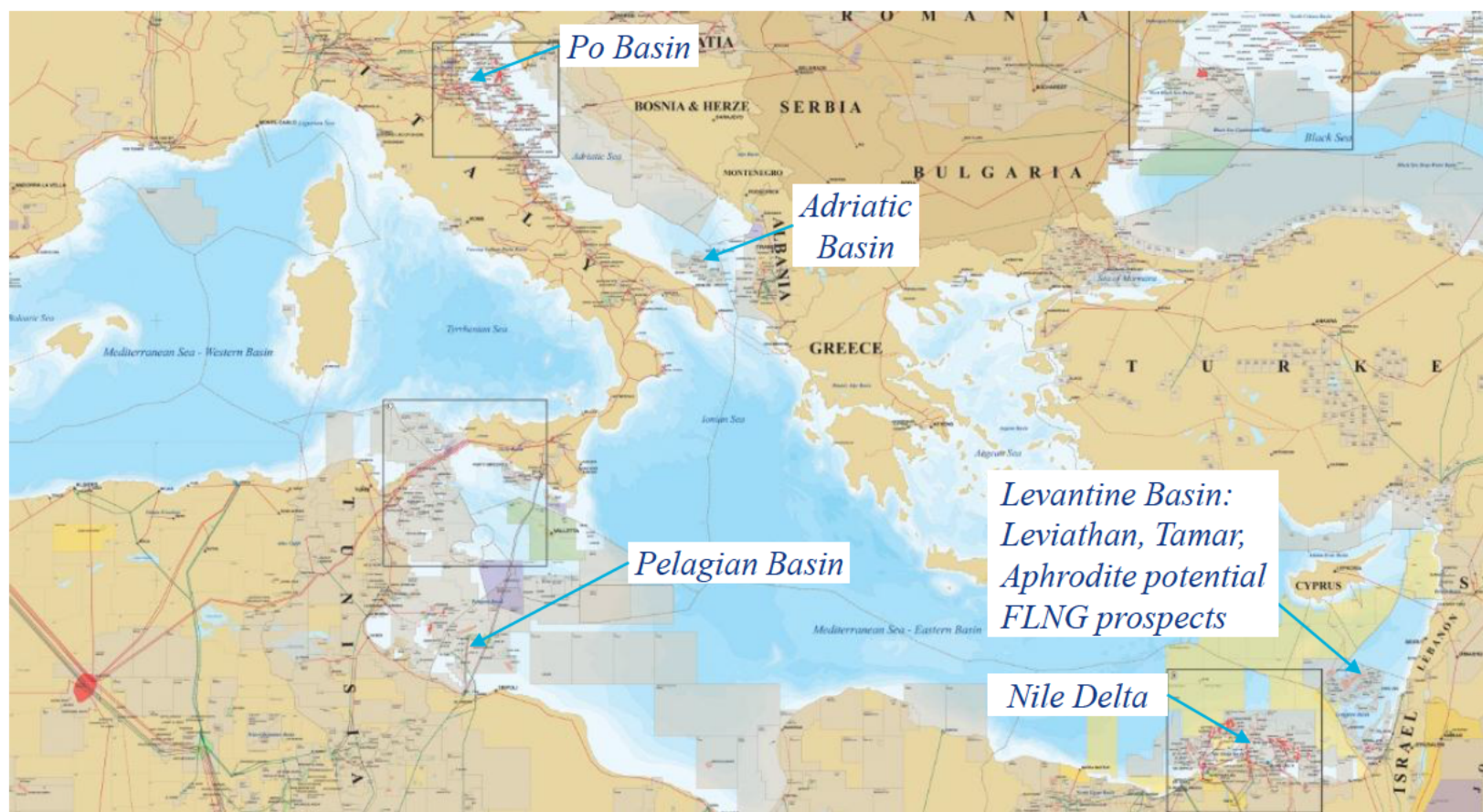




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# Mediterranean Offshore

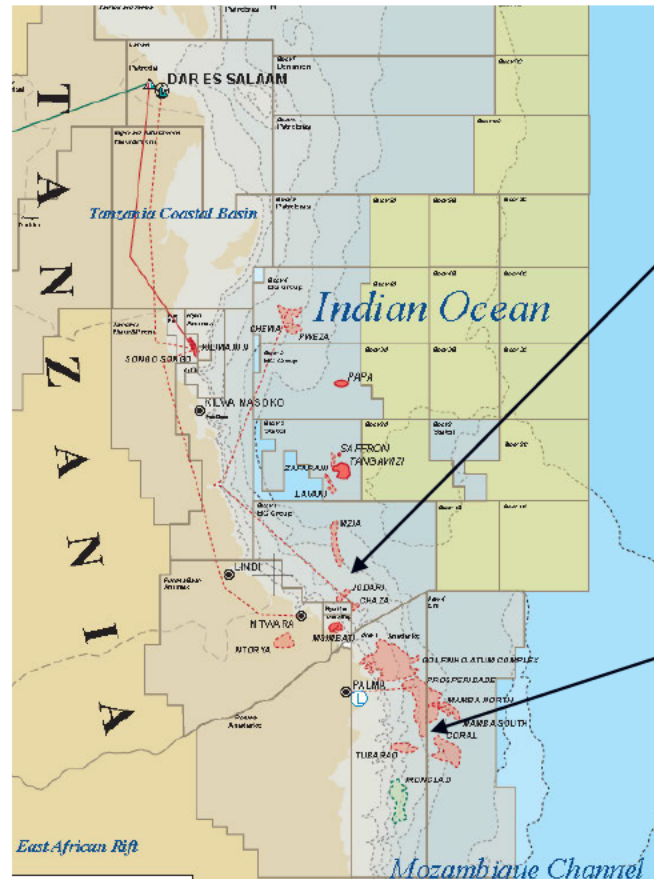




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# East Africa Offshore



**Potential Tanzania FLNG:** two potential sites for an FLNG terminal have been mooted (Mzia, Lavani fields). Tanzanian Government decisions may impact, and onshore LNG may be initial export solution.

**Potential Mozambique FLNG:** Again, onshore likely to be an initial solution to exports, but FLNG proposals have also been discussed (likely to be mid-2020s at earliest).





## FLNG Summary

- Offshore production is expected to grow significantly during the next decade.
- Offshore Gas production is likely to be the major element of this, growing at c. 4% p.a. over the next decade (offshore oil is expected to grow at c. 2% p.a).
- FLNG represents a highly complex engineering commitment in remote and sometimes hostile conditions.
- In an atmosphere of strong demand growth, FLNG provides a potentially cost-effective solution to deep-sea gas extraction.
- There are 3 FLNG under construction, 13 which we rate as probable and a further 19 possible projects.
- Risks (1): FLNG is an unproven technology – any issues with the start-up of the first units in service could impact how widespread the technology becomes.
- Risks (2): Commodity prices. If US regulators allow large-scale exports of shale gas, then if this were to produce downward pressure on prices, FLNG could become less attractive.
- Risks (3): Delays, postponement or cancellation of projects are a feature of the industry, given the resource constraints, technical challenges and high CAPEX involved.



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