Will New Commercial Models Help Floating LNG Cross the Chasm?

Floating LNG 2012
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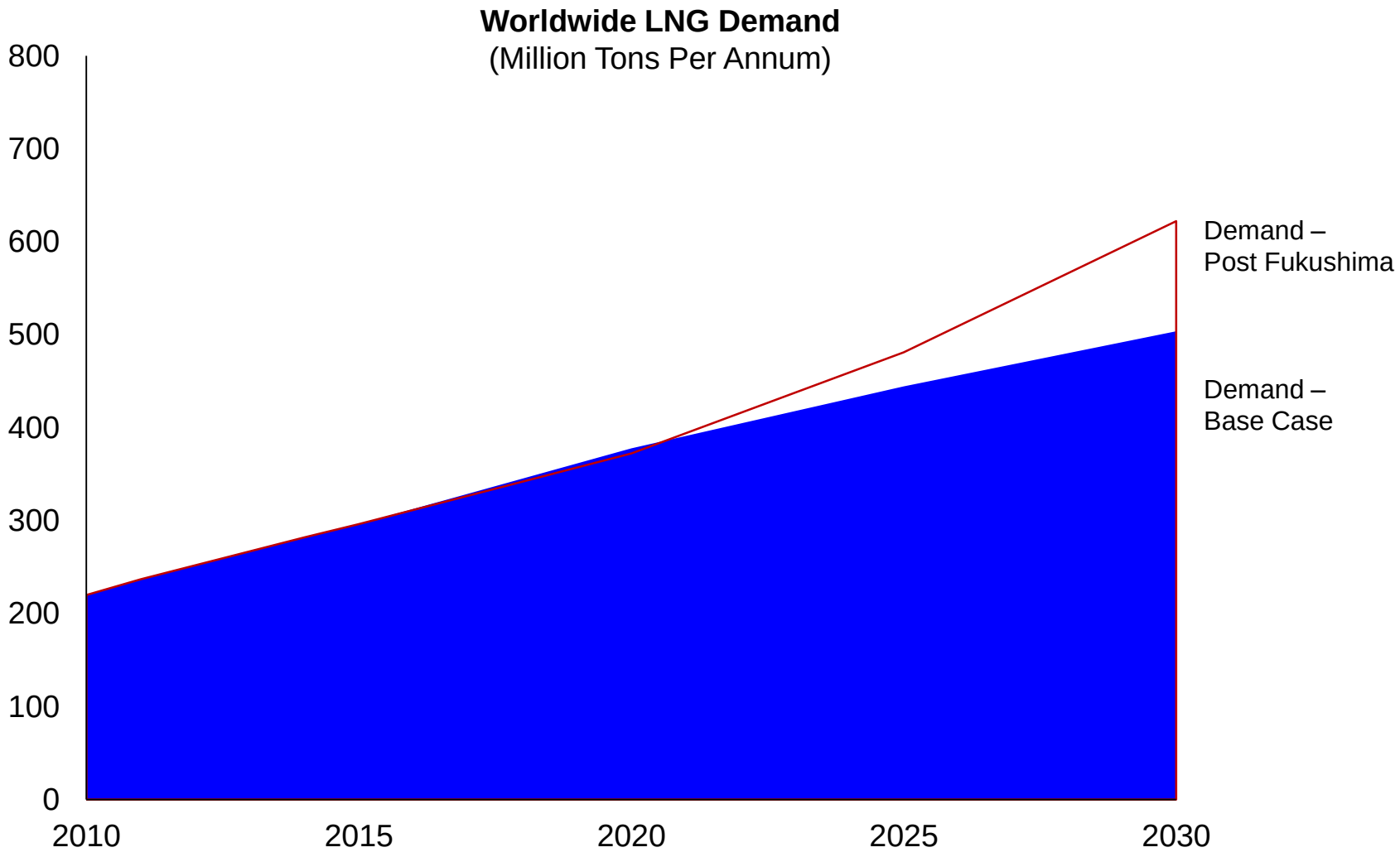
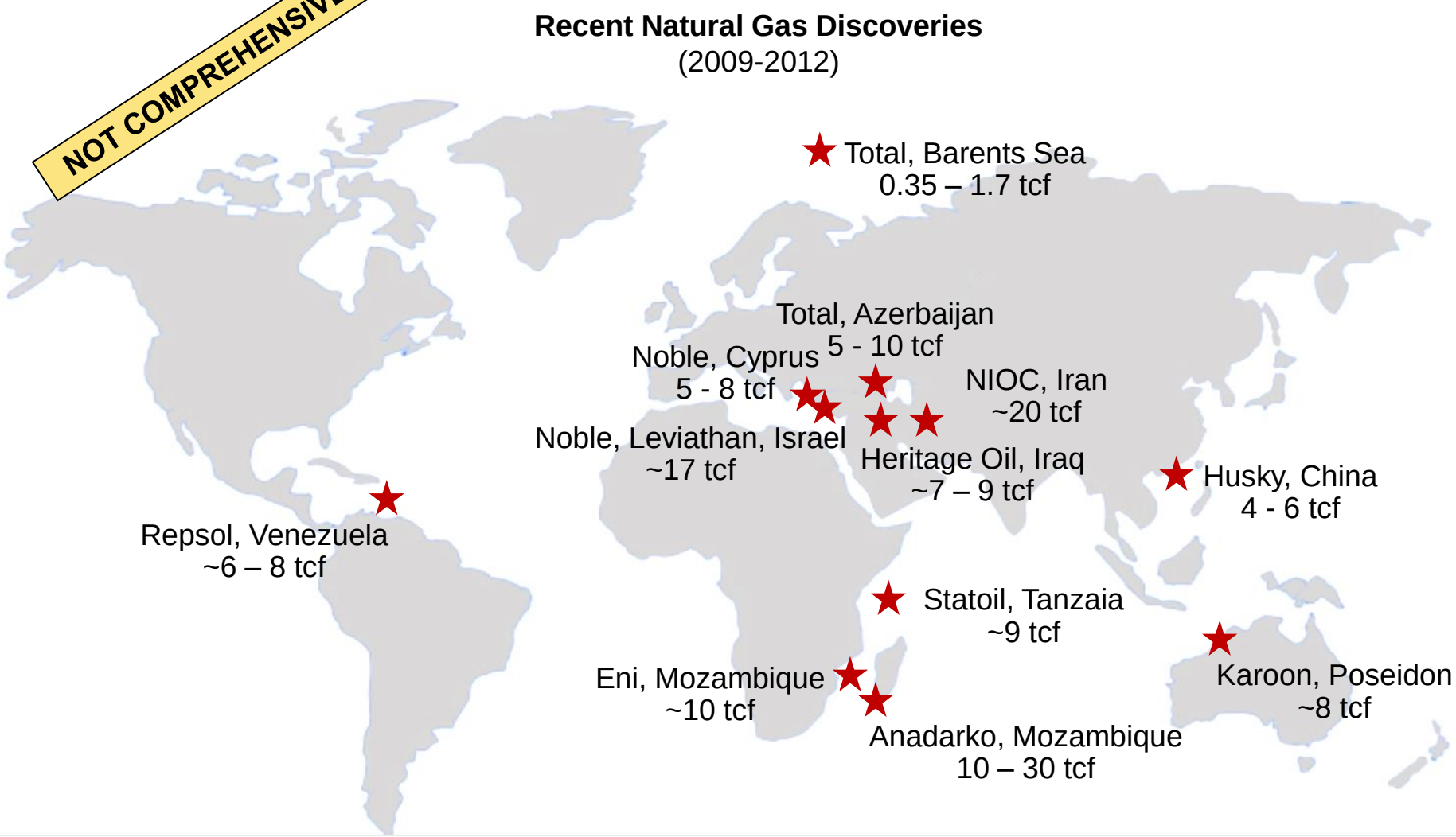
Global LNG demand is growing and could accelerate with shift away from nuclear power and an economic recovery



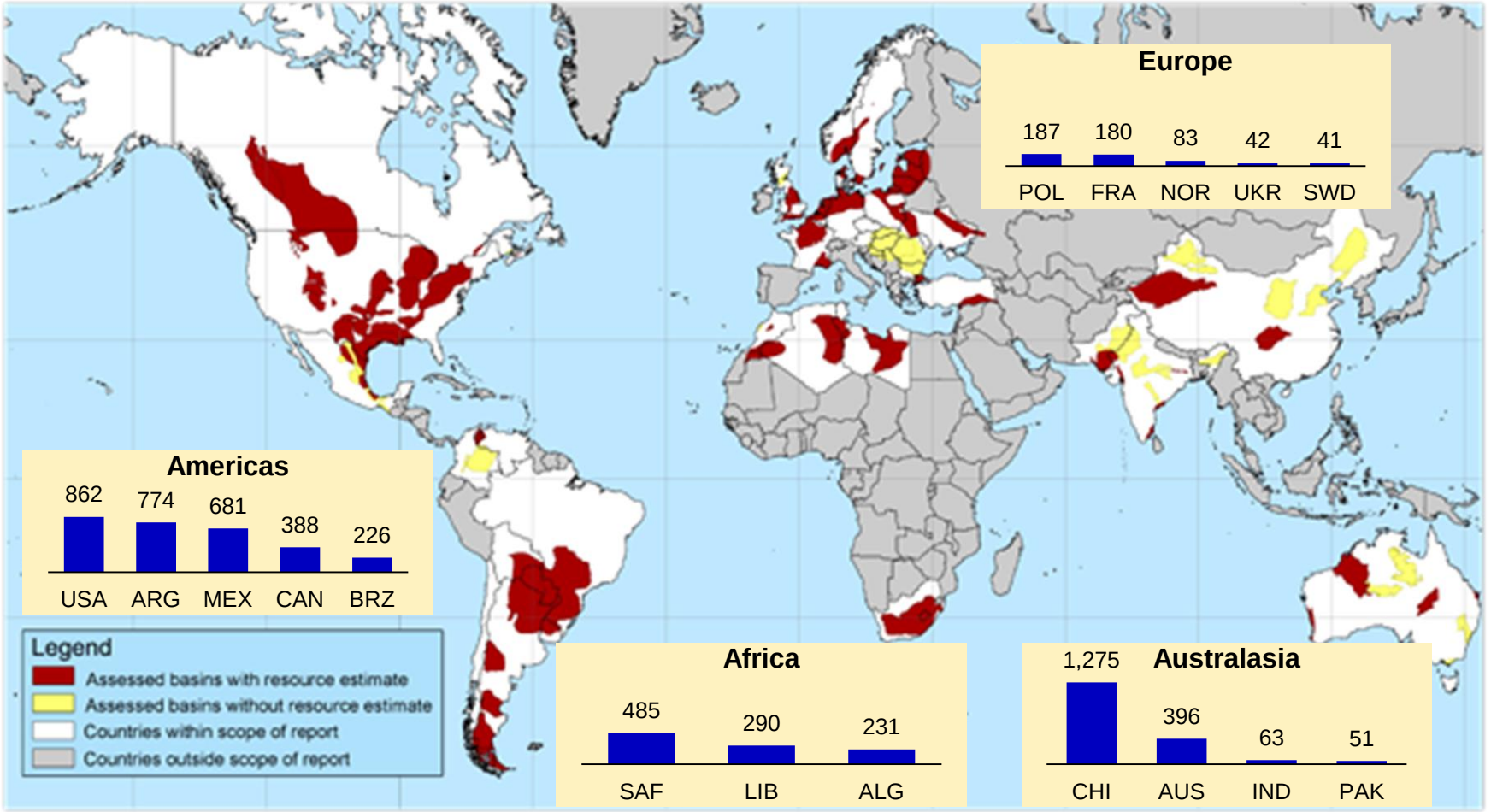
Fortunately, there has been a resurgence in the supply of natural gas with several new conventional discoveries and …

NOT COMPREHENSIVE



… Promising estimates of unconventional resources – both natural gas and oil – globally

Technical Recoverable Shale Gas Resources
(Trillion Cubic Feet)



Source: EIA

LNG is the preferred gas monetization strategy reflected by the many projects planned around North American shale gas

Location of Potential LNG Export Terminals

Source: U.S. Energy Information Administration based on data from various published studies. Canada and Mexico plays from ARI.
Updated: May 9, 2011

Source: EIA

U.S. East Coast

1. Cove Point, MD / Dominion

U.S. Gulf Coast

2. Lake Charles, LA / BG
3. Sabine Pass, LA / Cheniere
4. Cameron, LA / Sempra
5. Freeport, TX / Freeport LNG
6. Corpus Christi, TX / Cheniere
7. Brownsville, TX / Gulf Coast LNG

Oregon

8. Coos Bay, OR / Jordan Cove
9. Warrenton, LA / Oregon LNG

Canada, British Columbia

10. Kitimat, BC / Apache et al
11. Near Kitimat, BC / Shell et al
12. Near Kitimat, BC / BC LNG
13. Prince Rupert, BC / Petronas & Progress Energy

Alaska

14. Valdez / ExxonMobil, BP, COP

Floating LNG projects have four key drivers

1. Locate flexibly in remote / stranded / offshore gas fields
2. Mitigate political / security issues in potentially risky regions
3. Reduce or manage costs with offshored / modular construction
4. Lower footprint may reduce environmental and regulatory impacts

Given growing global interest in LNG, activity around floating LNG projects has also been picking up …

NOT COMPREHENSIVE

2009

- Petrobras awards FEED for Brazil project

2010

- FLNG preferred for Sunrise
- PNG approves Petromin's FLNG

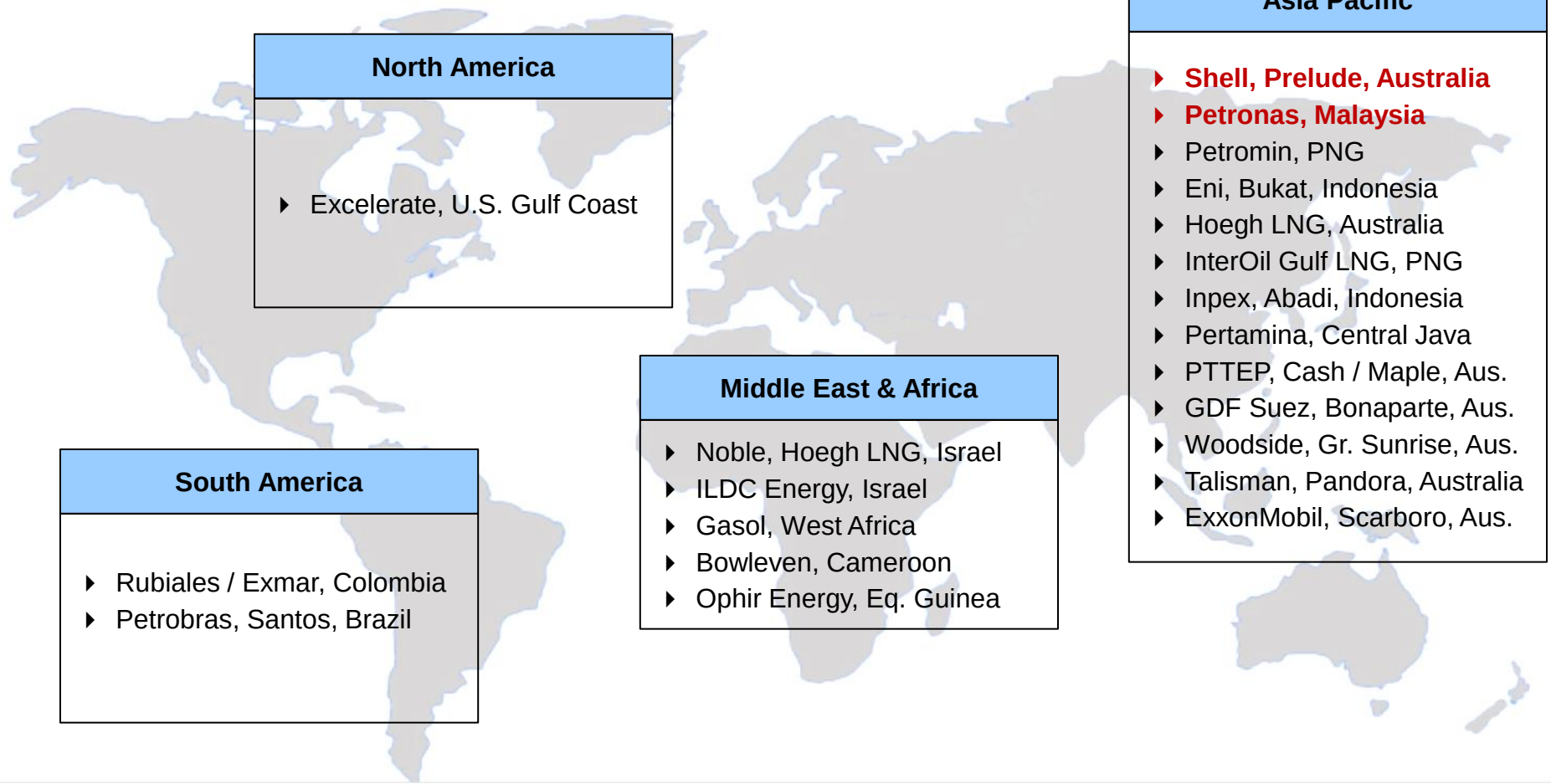
2011

- **Shell FID on Prelude project**
- FLNG for Abadi in Indonesia
- PTTEP for FLNG for Cash / Maple
- GDF awards pre-FEED for Bonaparte
- Flex LNG joins Gulf LNG project

2012

- **Petronas FID on Malaysian project**
- Excelerate announces Port Lavaca project …
- … Lets out initial contracts
- Nexus proposes FLNG for Browse
- Shell and Inpex join Abadi

… Leading to several proposals globally but FIDs have been made for only two projects, one each by Shell and Petronas



North America

- Excelerate, U.S. Gulf Coast

South America

- Rubiales / Exmar, Colombia
- Petrobras, Santos, Brazil

Middle East & Africa

- Noble, Hoegh LNG, Israel
- ILDC Energy, Israel
- Gasol, West Africa
- Bowleven, Cameroon
- Ophir Energy, Eq. Guinea

Asia Pacific

- **Shell, Prelude, Australia**
- **Petronas, Malaysia**
- Petromin, PNG
- Eni, Bukat, Indonesia
- Hoegh LNG, Australia
- InterOil Gulf LNG, PNG
- Inpex, Abadi, Indonesia
- Pertamina, Central Java
- PTTEP, Cash / Maple, Aus.
- GDF Suez, Bonaparte, Aus.
- Woodside, Gr. Sunrise, Aus.
- Talisman, Pandora, Australia
- ExxonMobil, Scarboro, Aus.

There are a number of key differences between traditional and floating LNG projects

	TRADITIONAL LNG	FLOATING LNG
TECHNOLOGY	▪ Mature and proven ▪ Numerous projects ▪ Virtually no technical risks	▪ Emerging technology ▪ No commercial reference ▪ Risk management to be proven
OPERATIONS	▪ Predictable lead times ▪ Permitting process known ▪ Known infrastructure needs ▪ Standard storage and loading	▪ Uncertain lead times ▪ Lengthy permitting process ▪ Uncertain infrastructure needs ▪ Storage and loading challenges
COSTS	▪ Well known costs and … ▪ … Economies of scale curves ▪ Onshore minimizes cost risks	▪ Low cost potential but uncertain ▪ Modular / shipyard construction may reduce need for scale ▪ Offshore may escalate costs
COMMERCIAL	▪ Proven commercial models ▪ Long-term sales agreements ▪ Easy to raise financing	▪ Each project has its own unique commercial model ▪ Several risks, e.g., financing

Commercial models will driven success in floating LNG with stranded gas monetization being the most straightforward

Risks

1

Stranded Gas Utilization

- Monetize stranded, remote, and offshore gas at low capital costs, in principle
- Representative projects
  - Petronas, Malaysia
  - Shell, Prelude, Australia
  - Petrobras, Santos, Brazil

Location

Even so, commercial models are evolving, e.g., floating LNG is becoming an option in sensitive regions

Risks

2

Political / Security Risk Mitigation

- Monetize gas in contested / difficult or environmentally sensitive regions
- Representative projects
  - Rubiales / Exmar, Colombia
  - Noble, Hoegh LNG, Israel
  - ILDC Energy, Israel

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Location

Finally, new commercial models are emerging due to shale gas and moving from offshore to onshore areas

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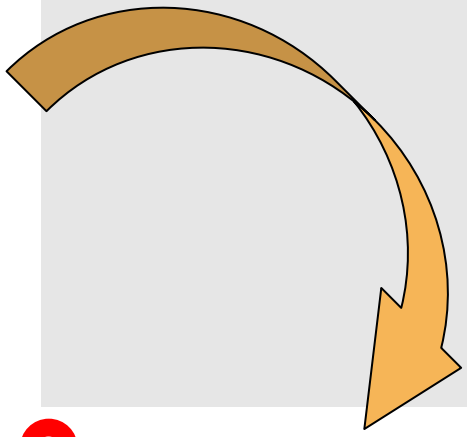

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3

Regional Gas Sourcing Flexibility

- Leverage shale gas availability in North America to advantage FLNG with flexibility in sourcing gas
- Representative projects
  - Excelerate Energy, USGC

Location

Even so, there are several questions that the industry – and today's panel session – needs to address

1 **Technology Issues**	▪ What strategies can be used to manage commercialization risks? ▪ How will infrastructure and operations hold up in harsh weather? ▪ What are the expectations around performance and utilization?
2 **Commercial Model**	▪ Will the rapid growth of gas supply impact commercial models? ▪ What impact will new entrants such as shipping companies have? ▪ Will customers find SP&As to be sufficient to address supply risks?
3 **Project Execution**	▪ How will permitting needs evolve and be met? ▪ How will projects raise financing and sign SP&As? ▪ What does the project lifecycle look like, e.g., facility redeployment?

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