



Executive Summary

Anchorage, AK
August 5-9, 2013

North Slope Gas & LNG Symposium

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Introduction to global gas concepts

Global gas markets and macro fundamentals

Impact of shale gas

Detailed examination of potential markets for Alaskan LNG

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LNG and pipeline commercial structures and practices

LNG shipping

Executive Summary

- Gas is a fast growing segment of the global energy system—and LNG is the fastest growing segment within gas.
- Much of the growth in energy, gas and LNG is coming from Asia—meaning that Alaska is well positioned geographically to capture this market.
- But the opportunity set for the gas producers and for LNG buyers are widening; the question is why Alaska? Why should a company invest in Alaska? Why should a buyer come to Alaska to secure LNG?

Where Does Alaska Fit?

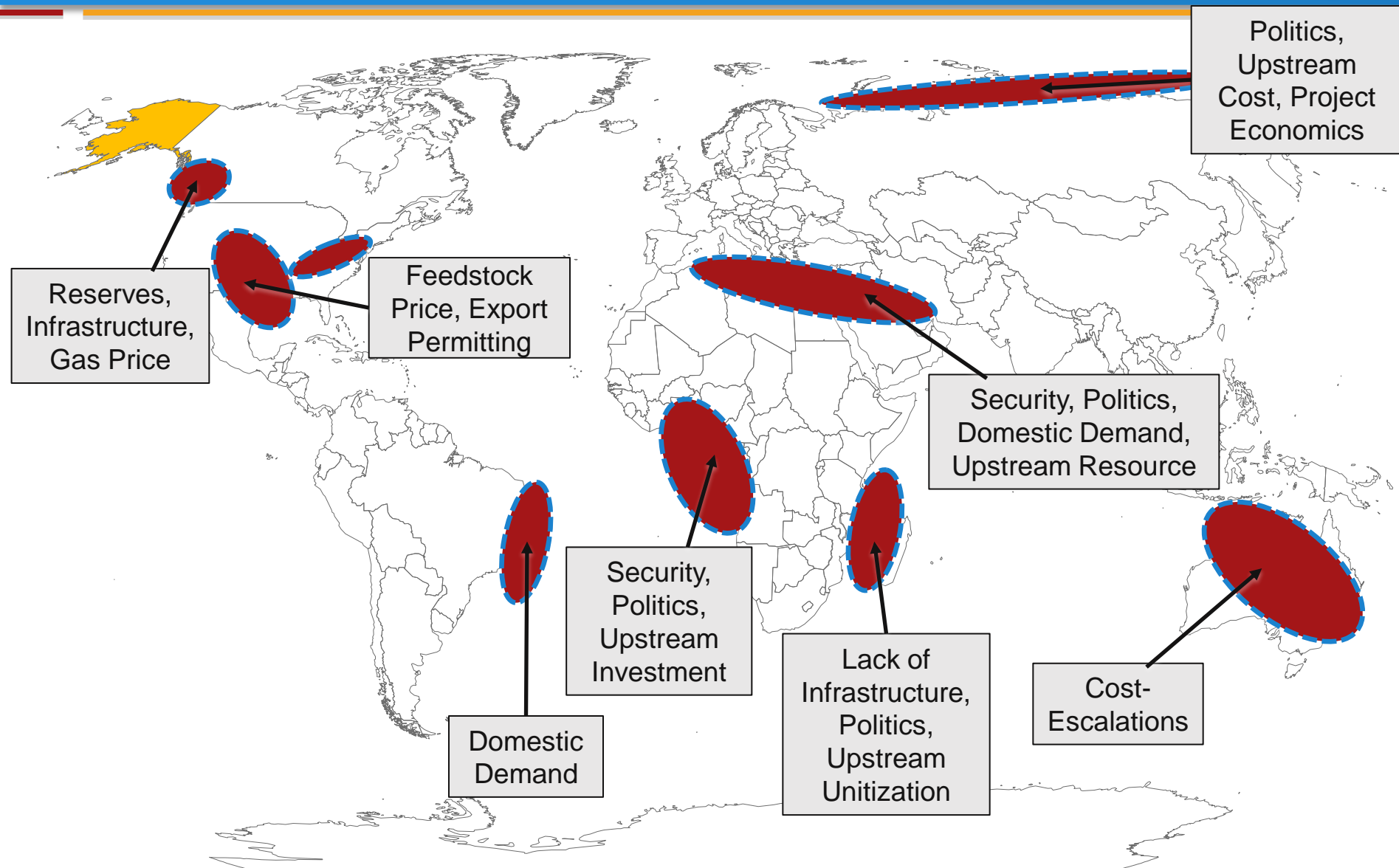


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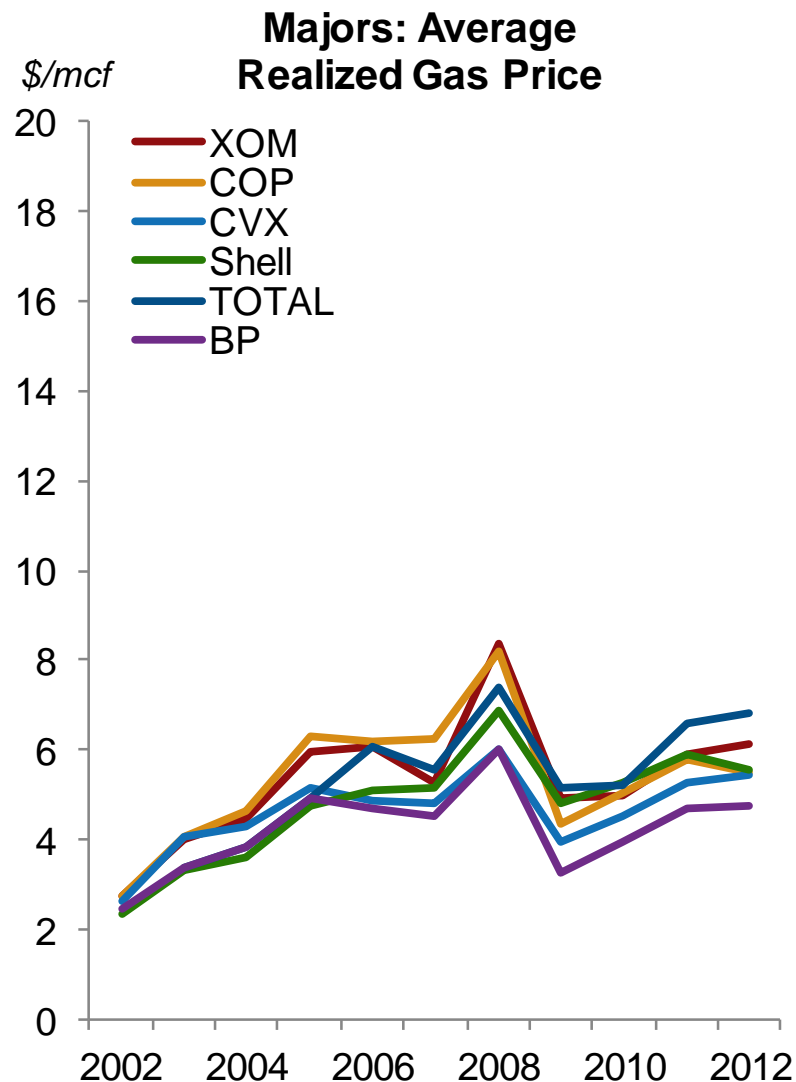
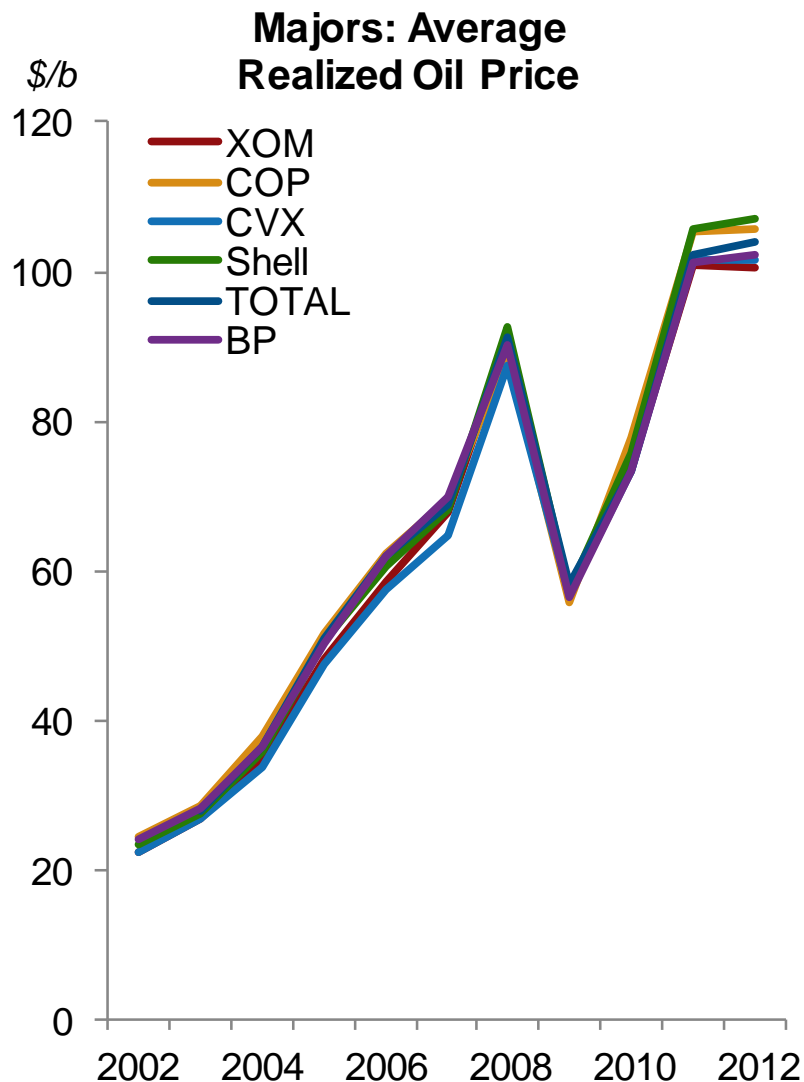
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Think Micro, Not Macro; Gas is Not a Global Market

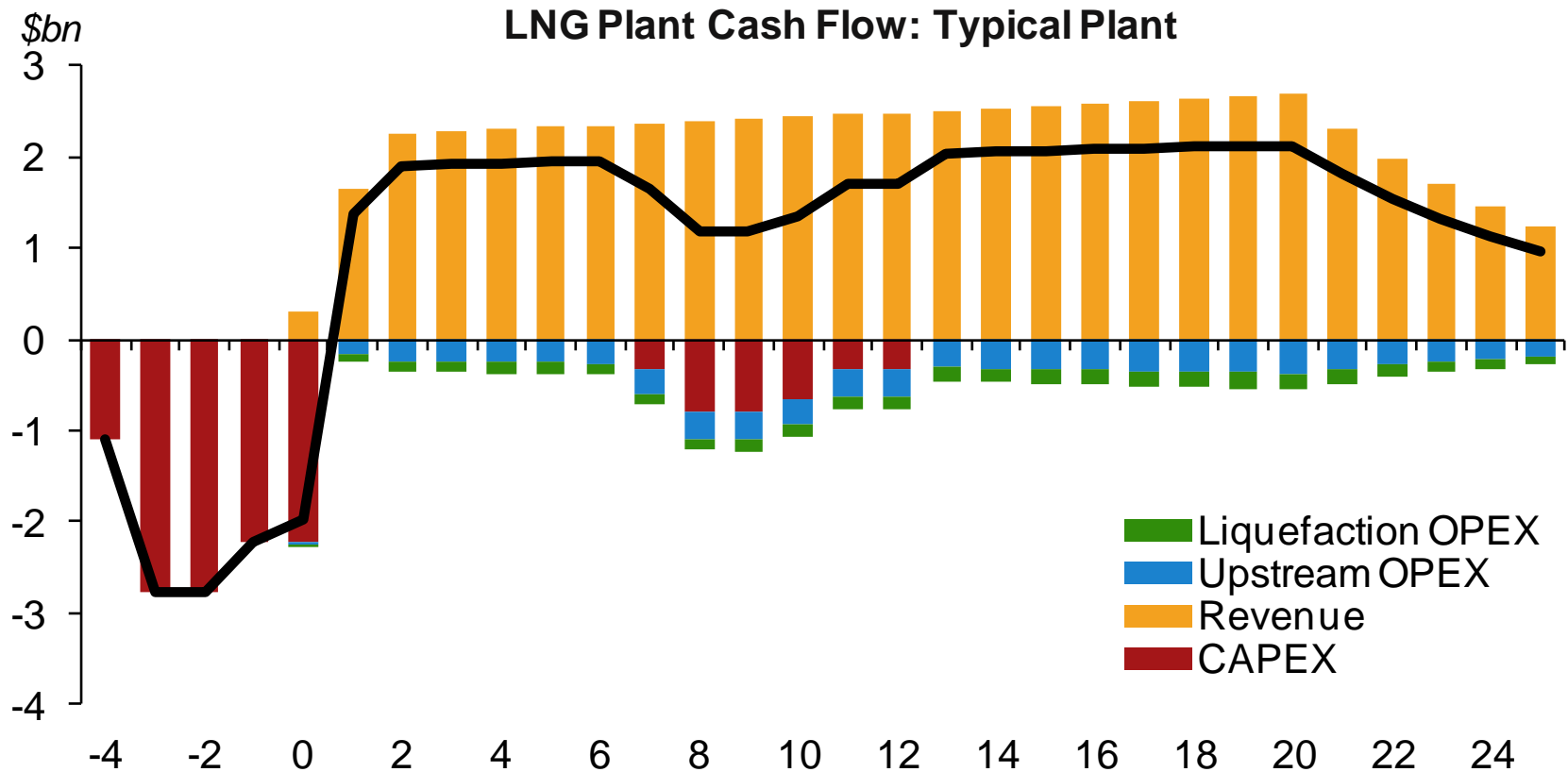


Gas is Very Different Than Oil

	Oil		Gas	
Production	86.1 mmb/d (2012)		54 mmboe/d (2012)	
	Middle East	32.5%	Europe/Eurasia	30.7%
	Europe/Eurasia	20.3%	North America	26.8%
	North America	17.5%	Middle East	16.3%
Reserves	1,669 bn boe (2012)		1,102 bn boe (2012) (ex. shale)	
	Middle East	48.4%	Middle East	43.0%
	C. And S. America	19.7%	Europe/Eurasia	31.2%
	North America	13.2%	Asia Pacific	8.2%
Prices	Brent: \$111/b WTI: \$94.1/b		Henry Hub: \$2.86/MMBtu (\$17.2/b) NBP (UK): \$9.47/MMBtu (\$56.8/b) Germany: \$10.86/MMBtu (\$65.1/b) Japan (LNG): \$16/MMBtu (\$96/b)	
End-users	Transportation	53%	Power	40%
	Non-energy	15%	Industry	17%
	Industry	8%	Distribution	15%
Trade	64% crosses border to be consumed		31% crosses border to be consumed	
Marketing	Global market; produce and then decide where / to whom to sell		Needs a market before it is produced	

Sources: BP Statistical Review of World Energy, International Energy Agency, national sources, PFC Energy

What Does an LNG Plant Look Like?



- Long **lead time** (4 years to build, several years to prepare to build)
- Large, **upfront** investment needed to develop the project (usually, tens of billions)
- Minimal **operating** expenses (only a small fraction of initial investment)
- **Long-term cash** flow (expected revenues for 20+ years)

LNG is Big, Complex, Risky and Multi-Stakeholder

Most of the money is spent after taking a Final Investment Decision (FID); before FID, the project developers:

- Certify **reserves** to ensure that the gas is there
- Sign sales and purchase agreements (**SPAs**) with buyers, which reassure the project developers that they will be able to sell their product. These are usually long-term and obligate the buyer to take the gas.
- Secure **financing**, often external and often non-resource (whereby the debt is guaranteed by the cash flow of the SPA). External financing is supported by loans and equity from the sponsors.
- Award an engineering, procurement and construction (EPC) contract to a company/consortium to **build** the plant
- Finalize all **approvals** (country/federal, state, local)

The LNG Value Chain

Upstream



Liquefaction



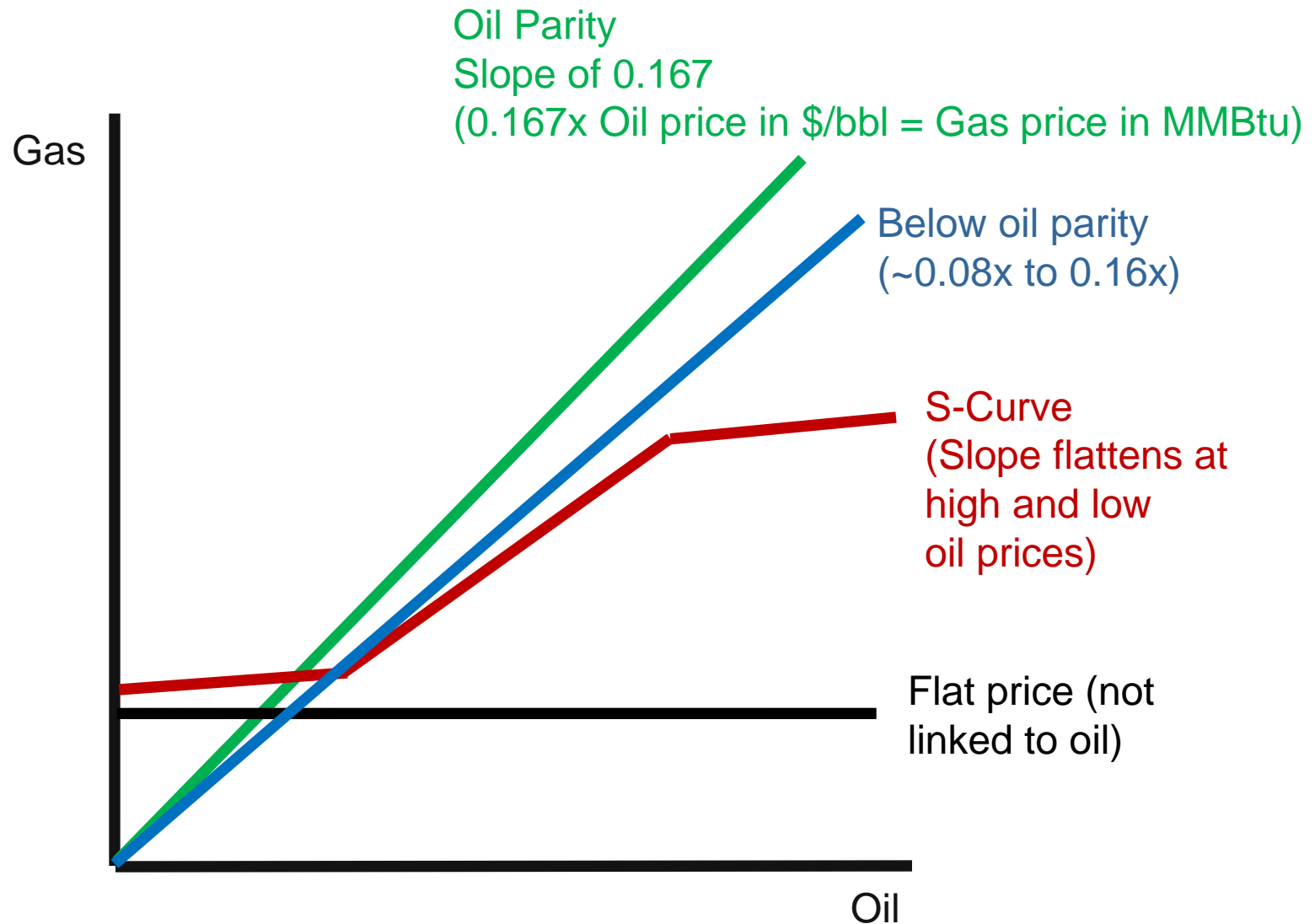
Shipping



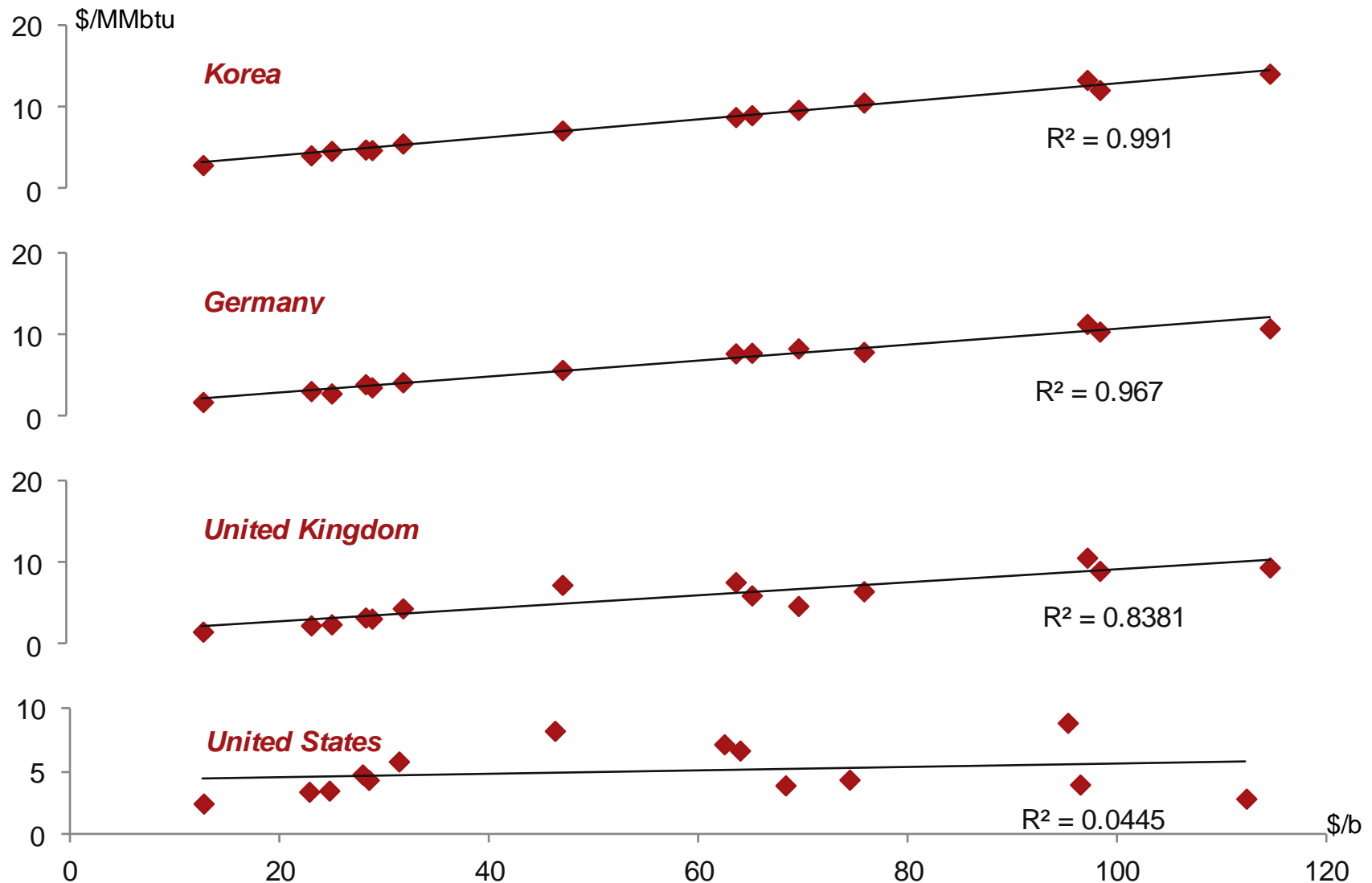
Buyer

- The companies that will **develop the gas fields** and supply the gas to be liquefied and exported. Usually projects have a primary supply source, but projects will often source gas from multiple fields and/or areas.
- The companies that will **own and operate the liquefaction facility**. These companies will assign one or more EPC (engineering, procurement and construction) contractors to build the plant.
- Either the **buyer or the seller handles the shipping**. If the buyer arranges for shipping, the sale is considered FOB (Free on Board). If the sellers arranges for shipping, it is consider CIF (Cost, Insurance, Freight) or DES (Delivered Ex Ship).
- The buyer can purchase LNG through a short, medium or long-term **contract** or they can purchase an **individual** cargo (called a spot transaction). The buyer can deliver the gas to an end-user (e.g. power plant) or can re-sell the gas.

Oil Indexation Systems



Varying Degrees of Oil Linkage Around the World



New Gas Pricing Expectations

- Companies are increasingly demanding or expecting a change in gas pricing systems. Change is driven by several dynamics, some temporary, others permanent; and some change leads to lower prices, some to higher:
 - An unprecedented boom in LNG capacity which rose 36% from 2008 to 2011 from projects in Qatar, Russia, Indonesia, Peru, Yemen and Malaysia.
 - More shale gas in the United States, which reduced that country's demand for imports. It also raised expectations that other countries with shale would soon replicate its success, and that the United States could start exporting.
 - Low gas demand in Europe—courtesy of a weak economy, the growth of renewables and the drop in carbon prices, which led to a mini-renaissance of coal at the expense of gas.
 - Cost escalation made new LNG projects more expensive, making it necessary to sign new long-term contracts at high (and oil-linked) prices.
 - The Great East Japan Earthquake of March 2011 altered both short and long-term demand dynamics in Japan, the world's largest LNG buyer.
- Besides altering expectations, these trends produced wide and sustained disparities in prices. In North America, shale gas has pushed Henry Hub to a decade-long low; in Asia, Japan is paying more for LNG than even before; and in Europe, a hybrid system that combined oil-linked and hub-based prices meant that gas was available at (at least) two pricing systems that, at one point or another, were either equal or diverged by a factor greater than two.

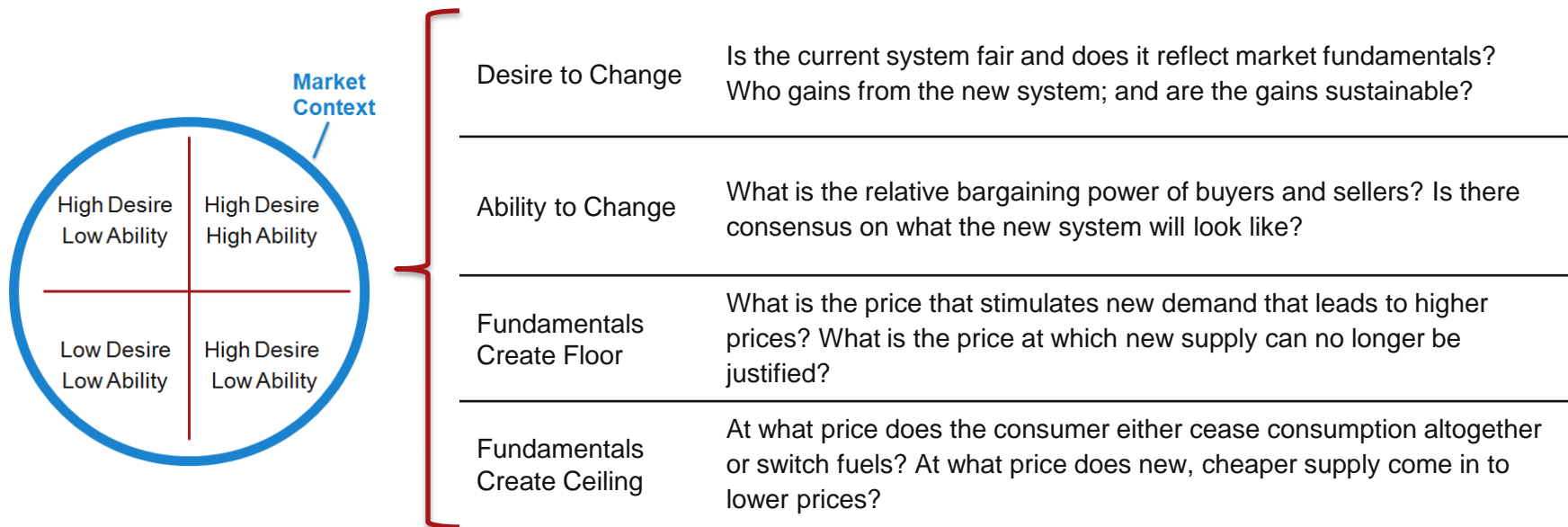
Regional Perceptions of Gas Pricing / Abundance

	North America	Europe	Asia
Producers / Sellers	Belief in scarcity until 2008; consensus on abundance since then	Belief in scarcity until 2008; divergent views on long-term balance from scarce (Gazprom) to less scarce (Statoil)	Belief in scarcity given ability to secure contracts and take FIDs; less sure about scarcity in 2012
Importers / Buyers	Belief in scarcity until 2008; consensus on abundance since then	Belief in scarcity until 2007-2009; near consensus on relative abundance through 2020 with low interest in securing long-term supply	Belief in scarcity until 2008; brief respite in 2009; rapid FIDs to secure LNG in 2010-2011; belief / hope of abundance in 2012

How Oil Prices Will Affect Gas?

	Gas Scarce	Gas Abundant
Oil Scarce	<ul style="list-style-type: none">▪ Opportunistic oil-to-gas switching▪ Equal investment focus to oil and gas▪ Oil indexation works (more or less)▪ Focus on alternatives to oil and gas	<ul style="list-style-type: none">▪ High levels of oil-to-gas switching▪ Companies shift investment focus to oil▪ Buyers reject oil indexation; sellers cling to oil indexation; buyers (eventually) triumph▪ Focus on alternatives to oil▪ Low impetus to find alternatives to gas
Oil Abundant	<ul style="list-style-type: none">▪ Limited oil-to-gas switching▪ Companies shift investment focus to gas▪ Sellers reject oil indexation; buyers cling to oil indexation; sellers (eventually) triumph▪ Focus on alternatives to gas	<ul style="list-style-type: none">▪ Limited oil-to-gas switching▪ Oil more favored investment than gas▪ Oil indexation works (more or less)▪ Low impetus to develop alternatives to oil and gas

A New Gas Pricing System: What Can Alaska Expect?



- Asian buyers are demanding lower priced gas—and they are also keen to avoid oil indexation. There is a clear downward pressure on LNG prices.
- Don't mix cost (what you need to break-even) with price (what you can sell gas for).
- A tight market pushes price towards the level of demand destruction; a loose market pushes the price towards the level of production.

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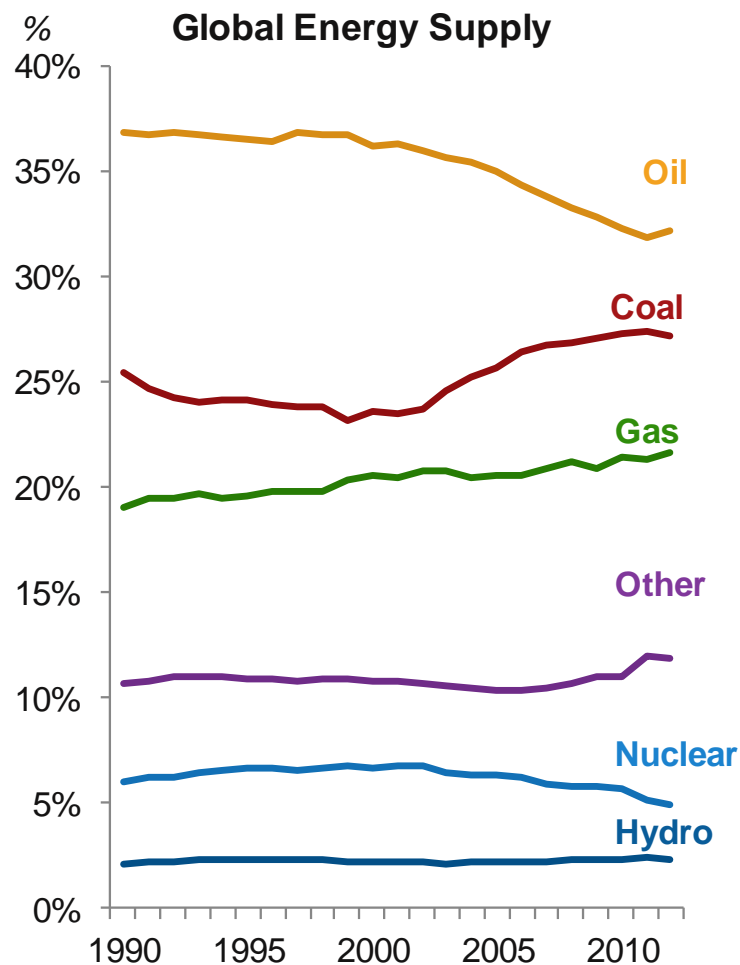
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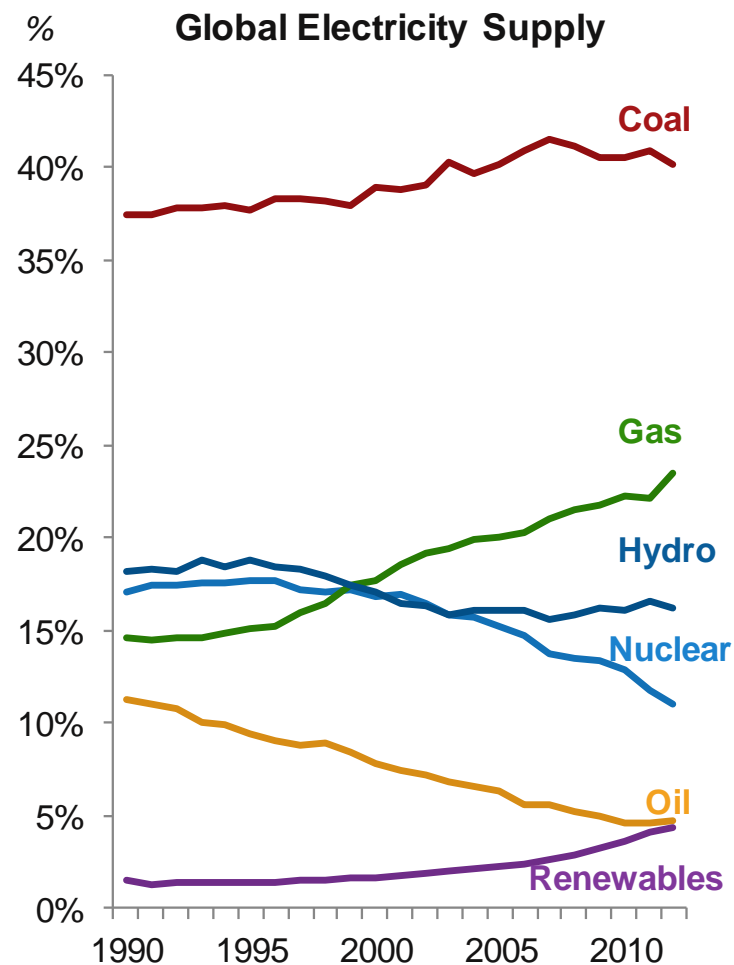
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The World is Turning More and More To Gas

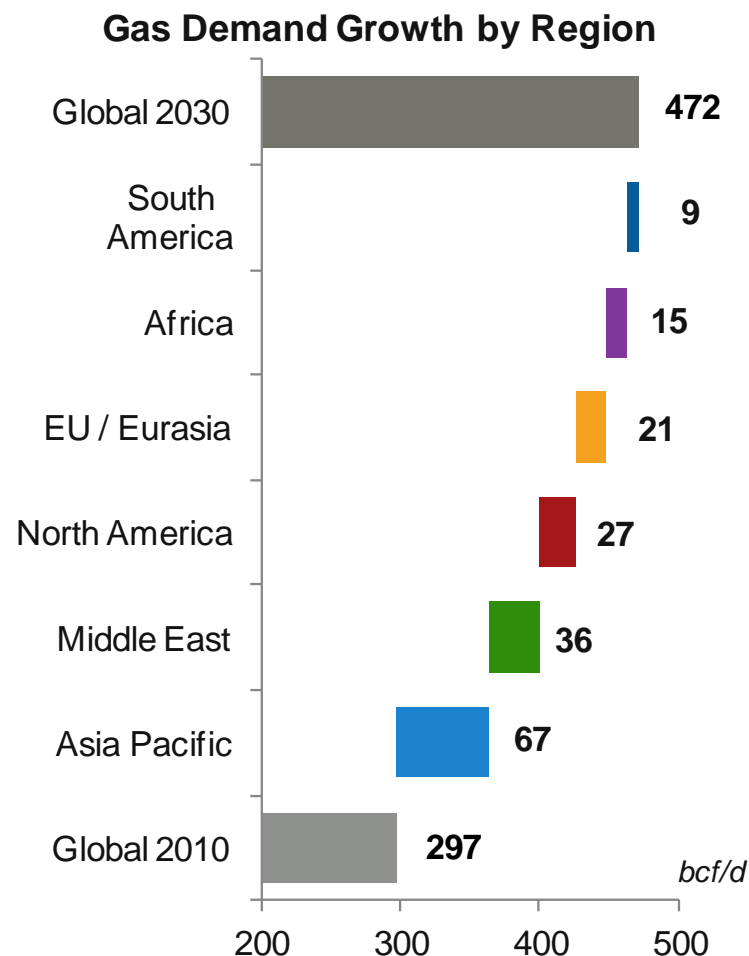
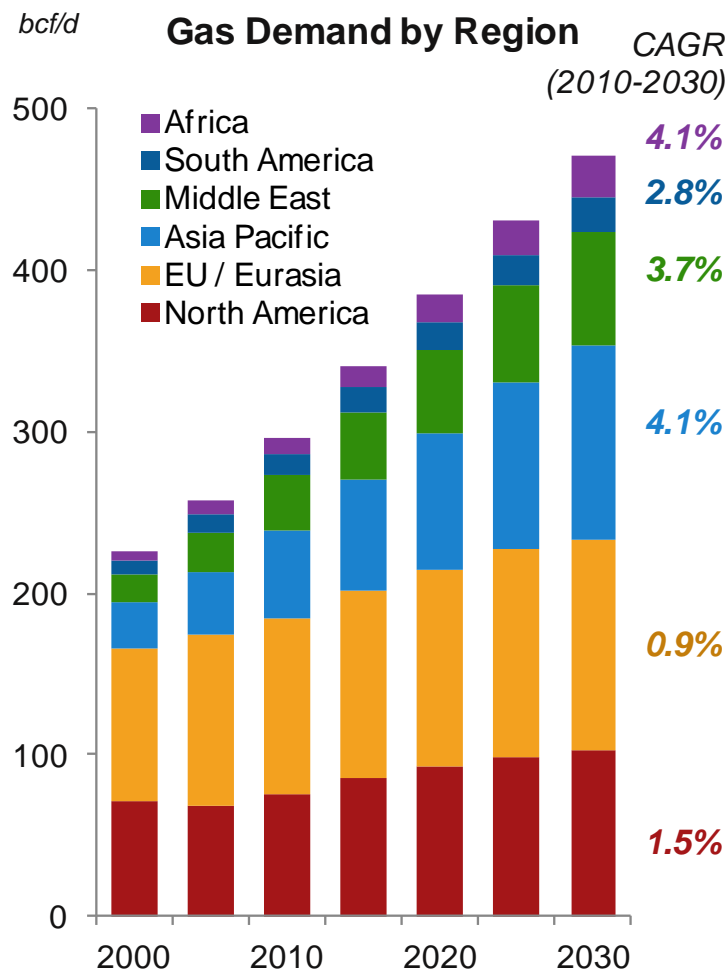


Gas share has risen from 19 to 22%



Gas share has risen from 15 to 24%

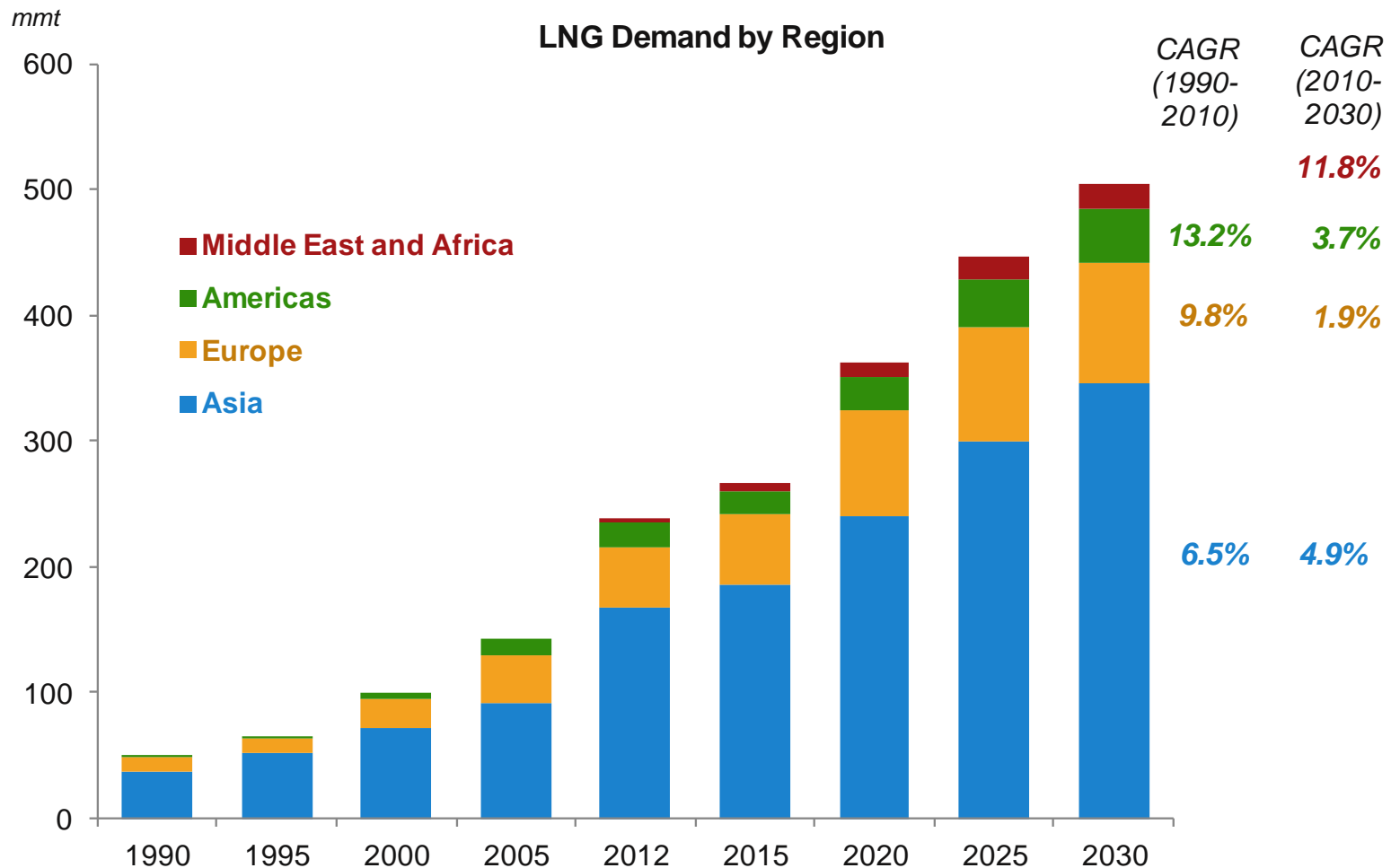
Growth at 2.3% per Year Driven by Asia



Global demand growth of 2.3% p.a.

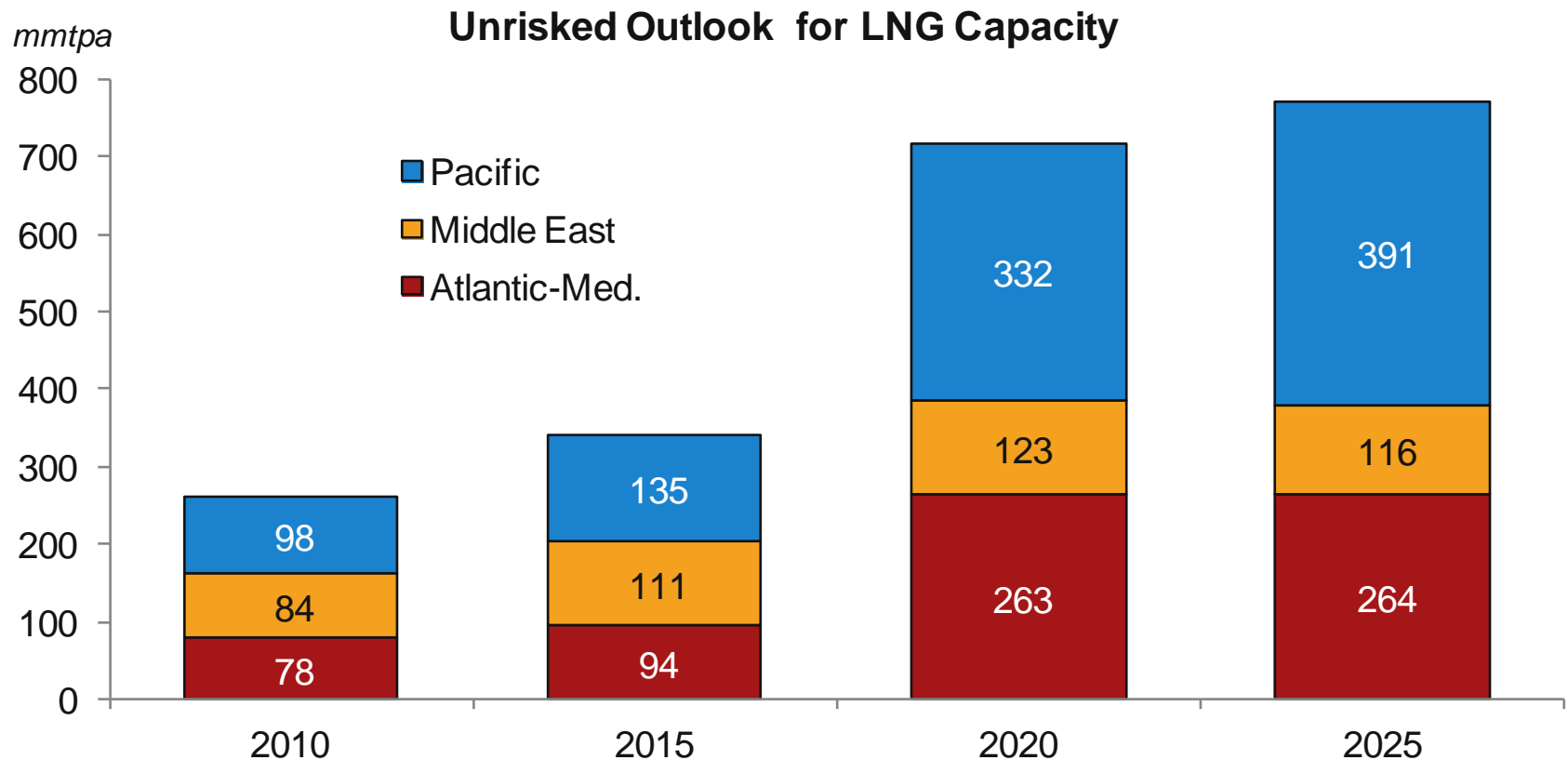
+175 bcf/d = ~3X US 2010 demand

Asia Drives LNG Demand As Well



Asia accounted for 2/3 of growth since 1990 and will make up 2/3 of new demand

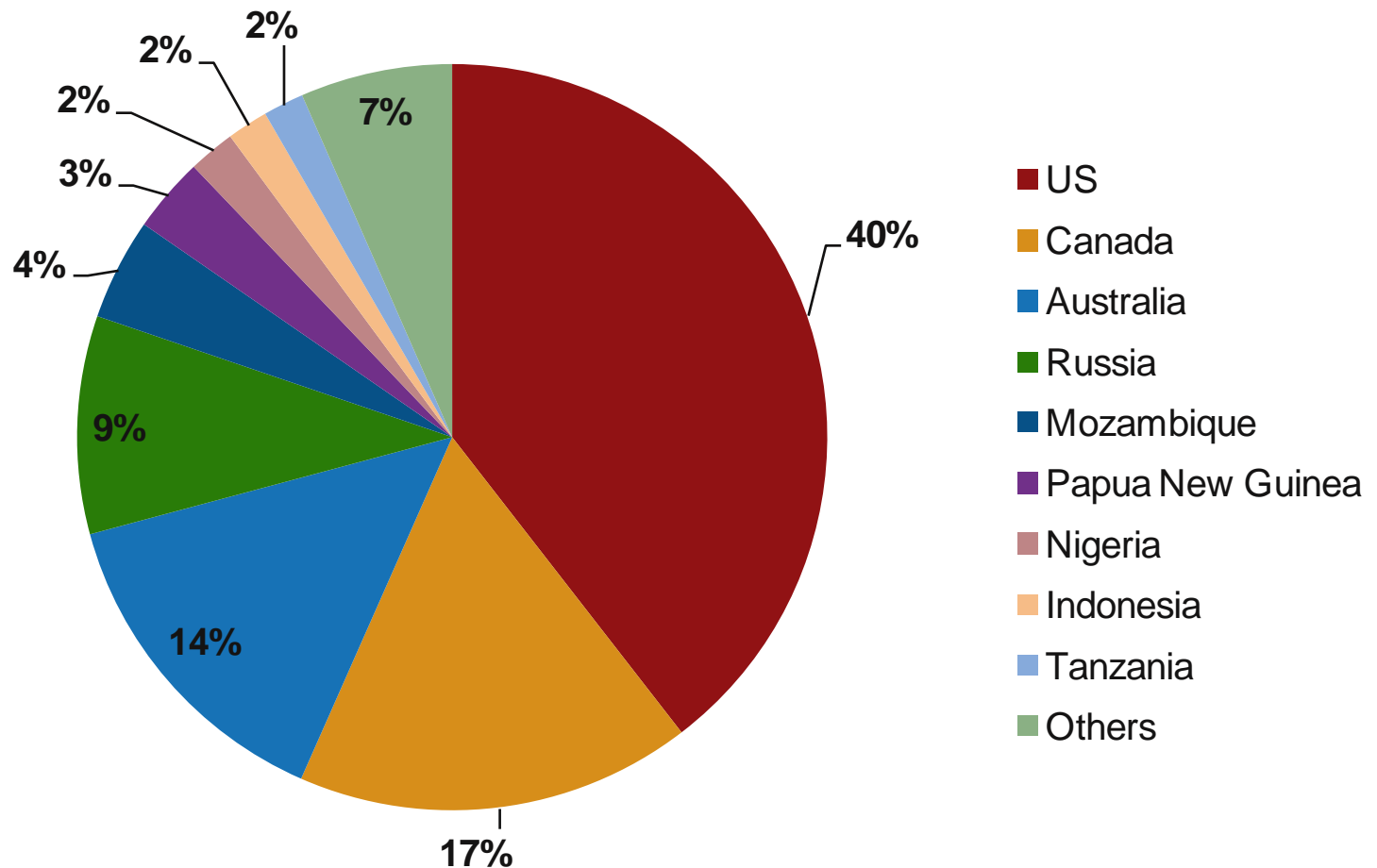
Industry Has Responded with Many and Big Proposals



- If **all LNG projects** were to move ahead according to plan, LNG capacity would grow from 281 mmtpa (2012) to 771 mmtpa in 2030. Clearly, such a build-out is unrealistic.

North America is Largest Prospective Supplier

Proposed Liquefaction Plants by Location



But Lots of Supply Competition

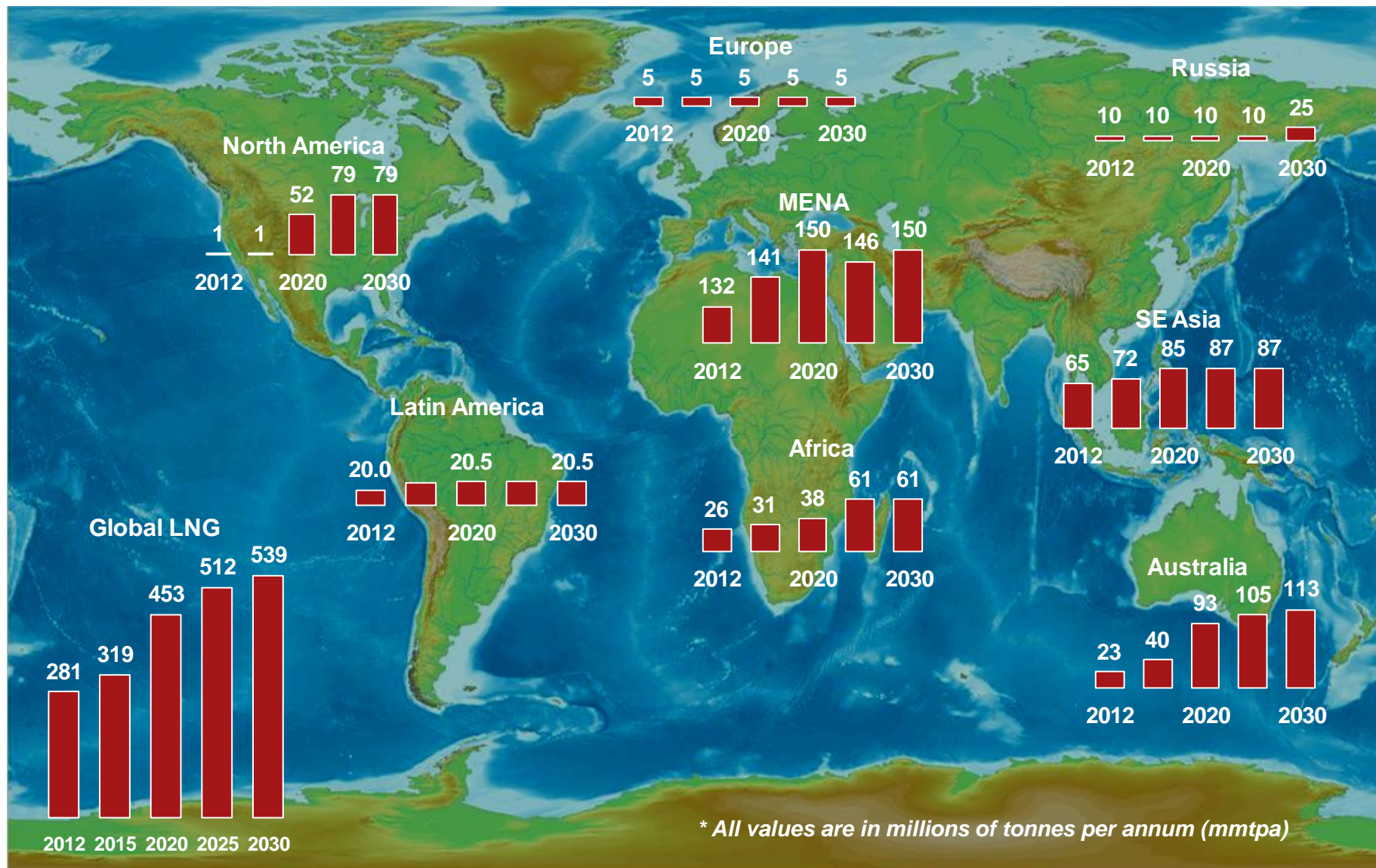


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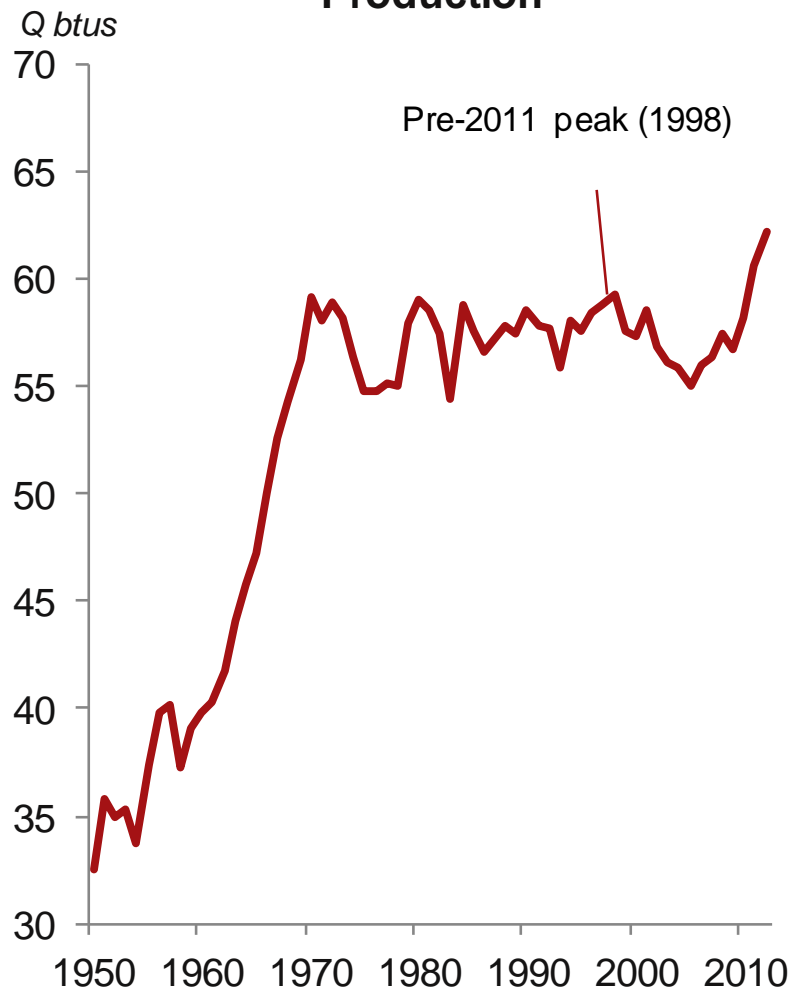
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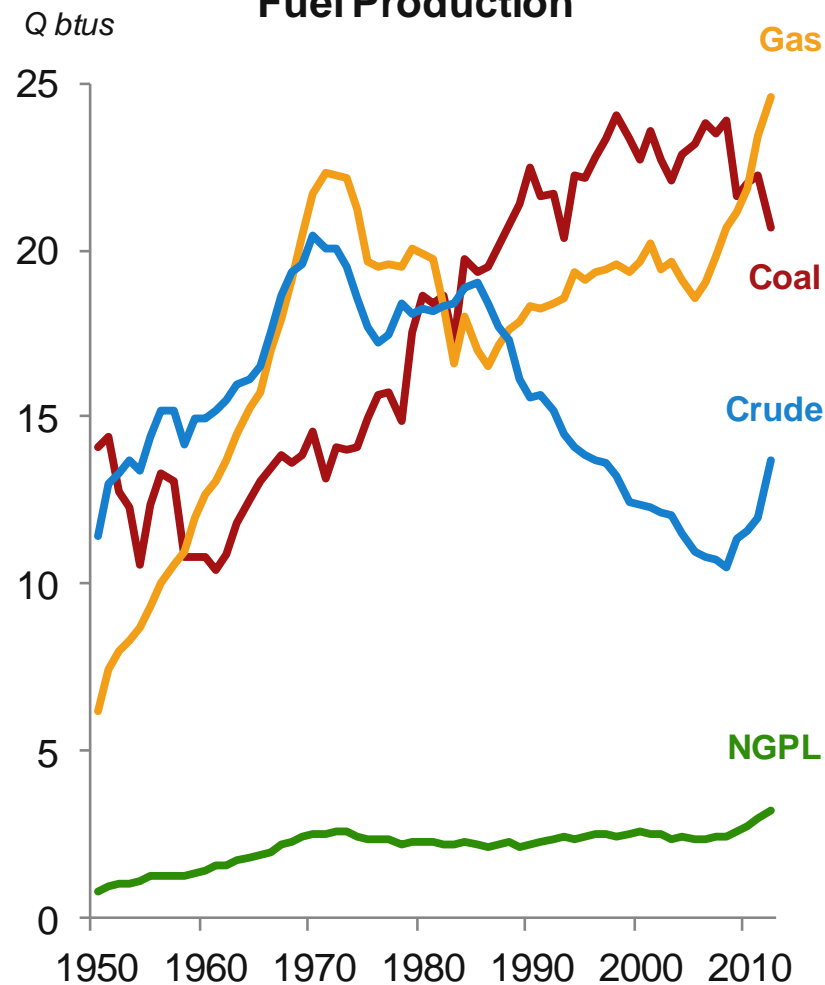
LNG shipping

Fossil Fuel Boom, Driven by Unconventionals

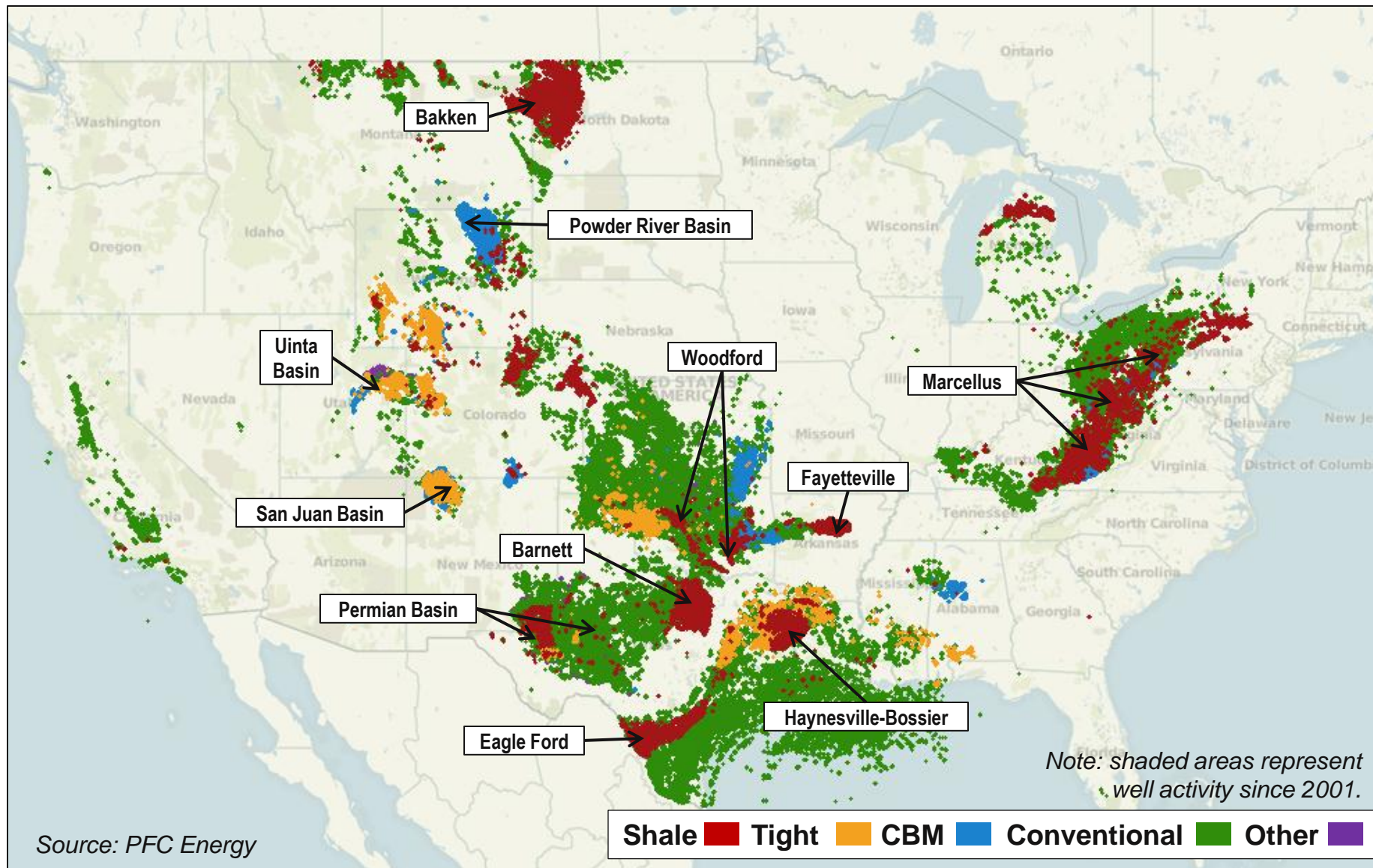
United States: Fossil Fuel Production



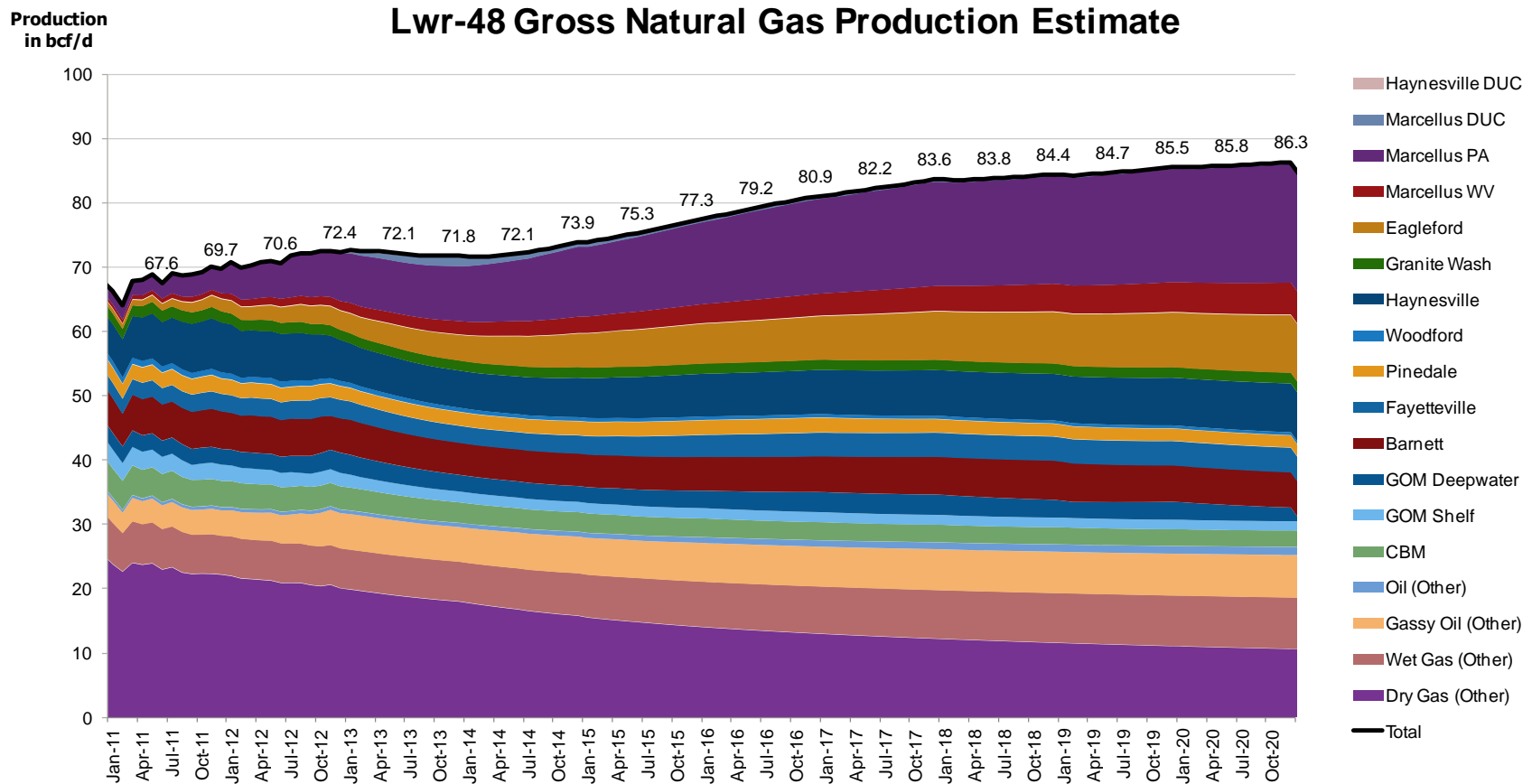
United States: Fossil Fuel Production



United States: Major Lower-48 Gas Basins



US Gas Production Can Keep Growing—Driven by Shale



Will Other Countries Follow? The Shale Gas Cocktail

- Rock characteristics/ resource base quality
- Resource base quantity
- Responsiveness to fracking
- Well control
- Land Tenure/Parcel Size
- Local advocates and beneficiaries
- Lease structure forcing establishment of production
- High number of operators/dispersion
- Company ability /willingness to spend significant capital quickly
- High company risk appetite for trial and error
- Service sector availability
- Rapid transmission of learning via leaky service sector and external company orientation
- Pipes, Gathering to allow processing/delivery
- Water and other essential fracking materials
- Skilled oil and gas labor pool
- Favorable natural gas prices and available markets
- Cooperative governments and incentives

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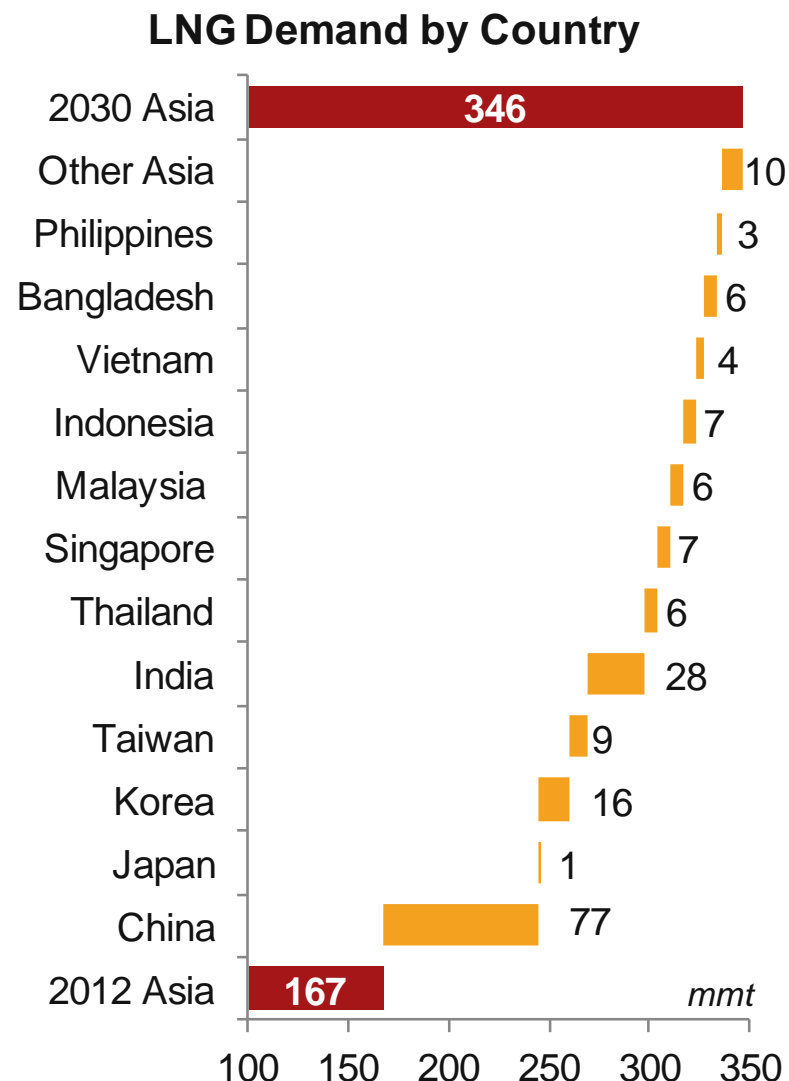
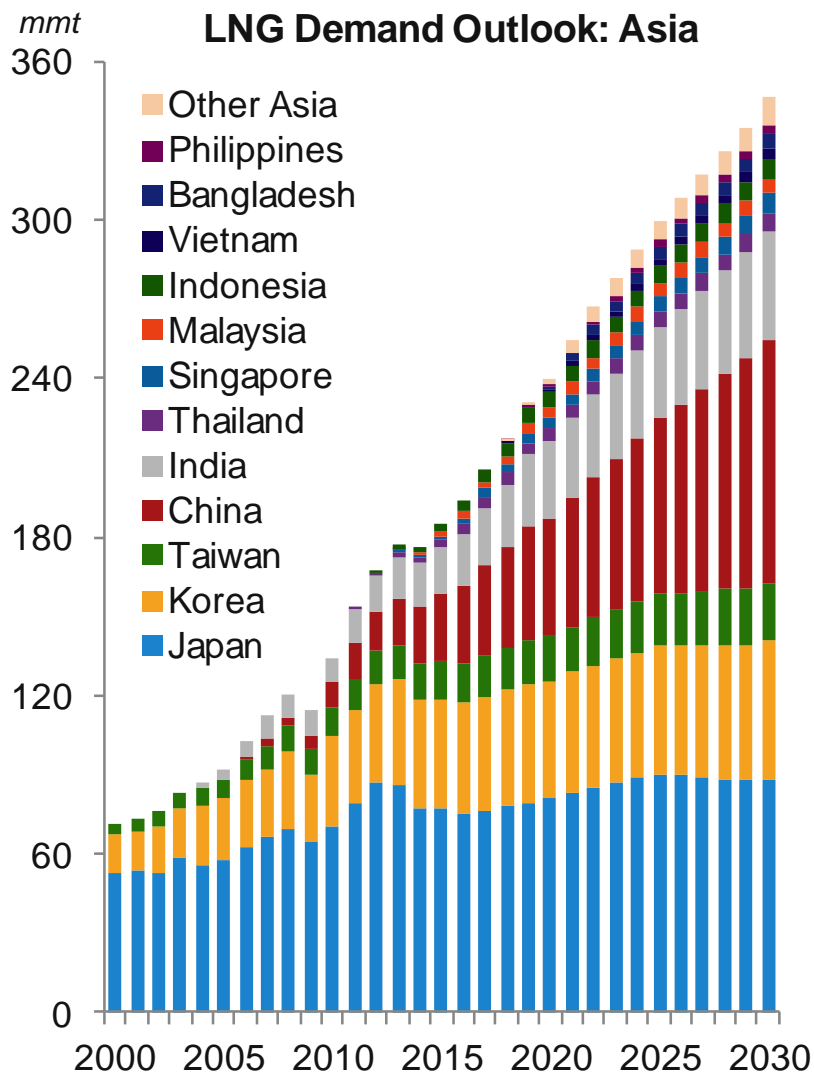
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Widespread Growth in Asian LNG Demand



S-D Imbalance Grows Post 2020

- Preliminary Contracts
 - MOU: Memorandum of Understanding
 - HOA: Heads of Agreement
- Finalized Contracts (15-20 years)
 - SPA: Sales and Purchase Agreement
 - Equity Offtake (small portion of total)
- Markets have different preferences for the share of demand not tied to long-term supply contracts
 - Short-term contracts
 - Spot volumes

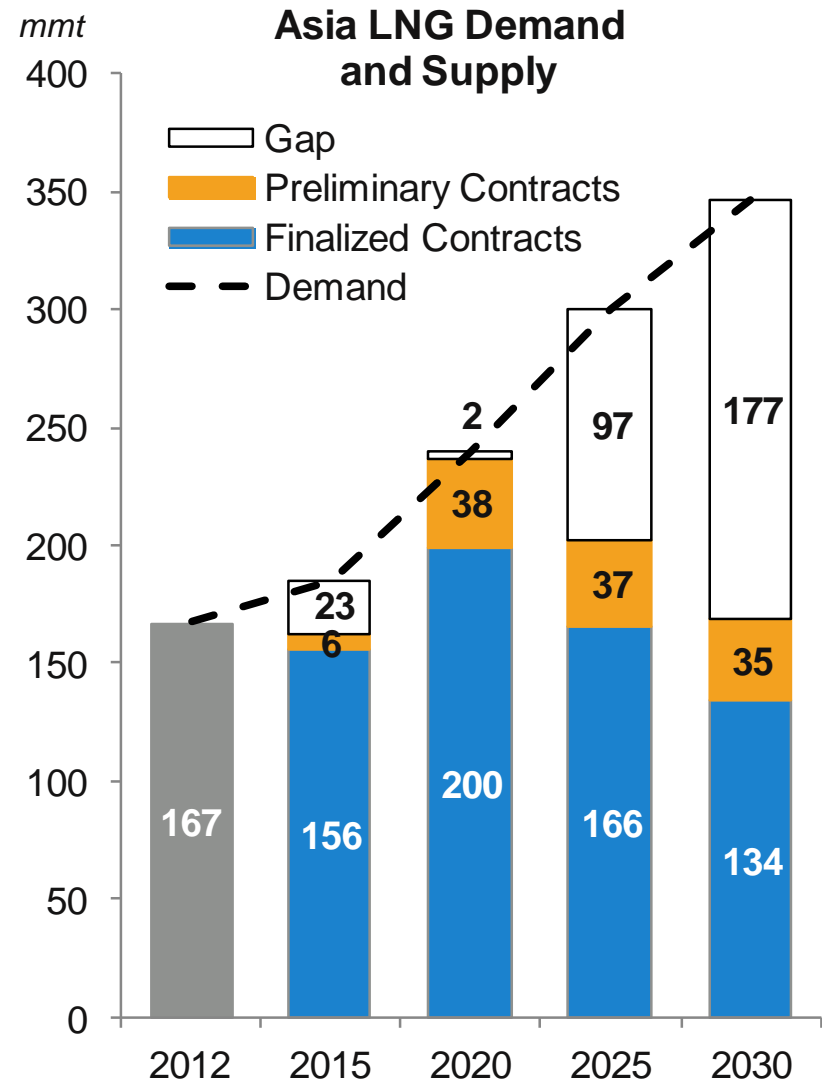


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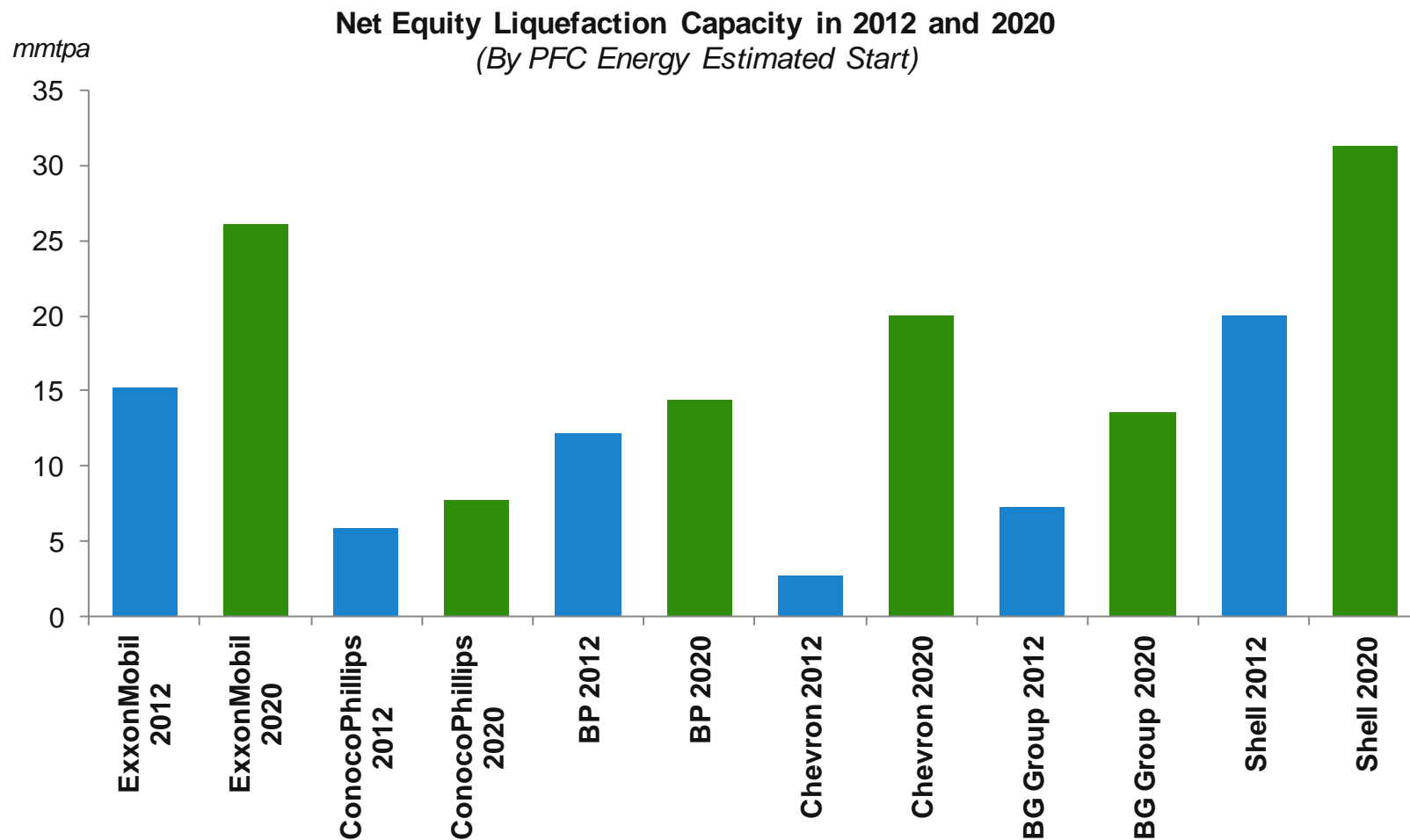
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BP, COP and XOM are Major LNG Players



The Companies Can Execute, but Will they Invest?

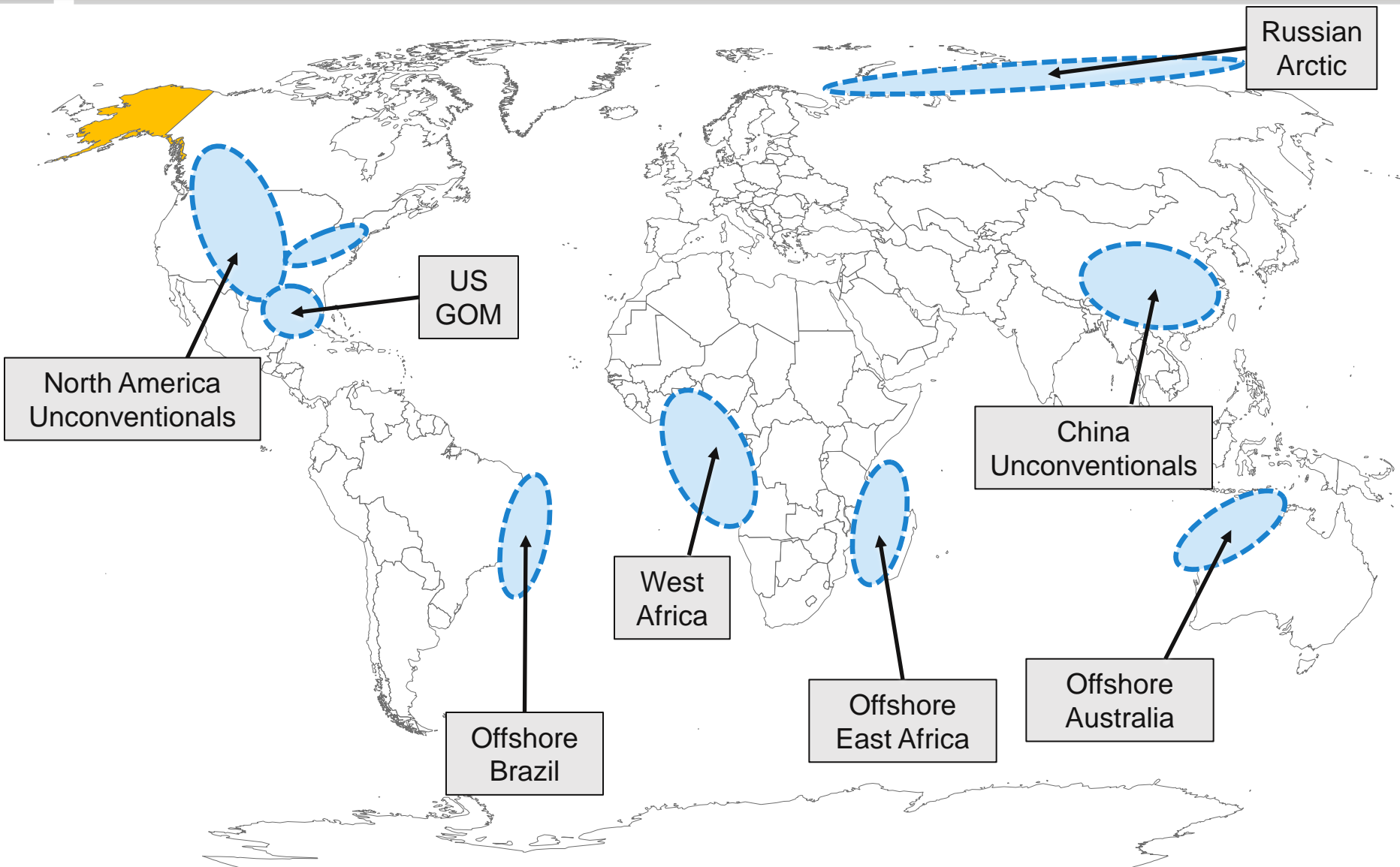


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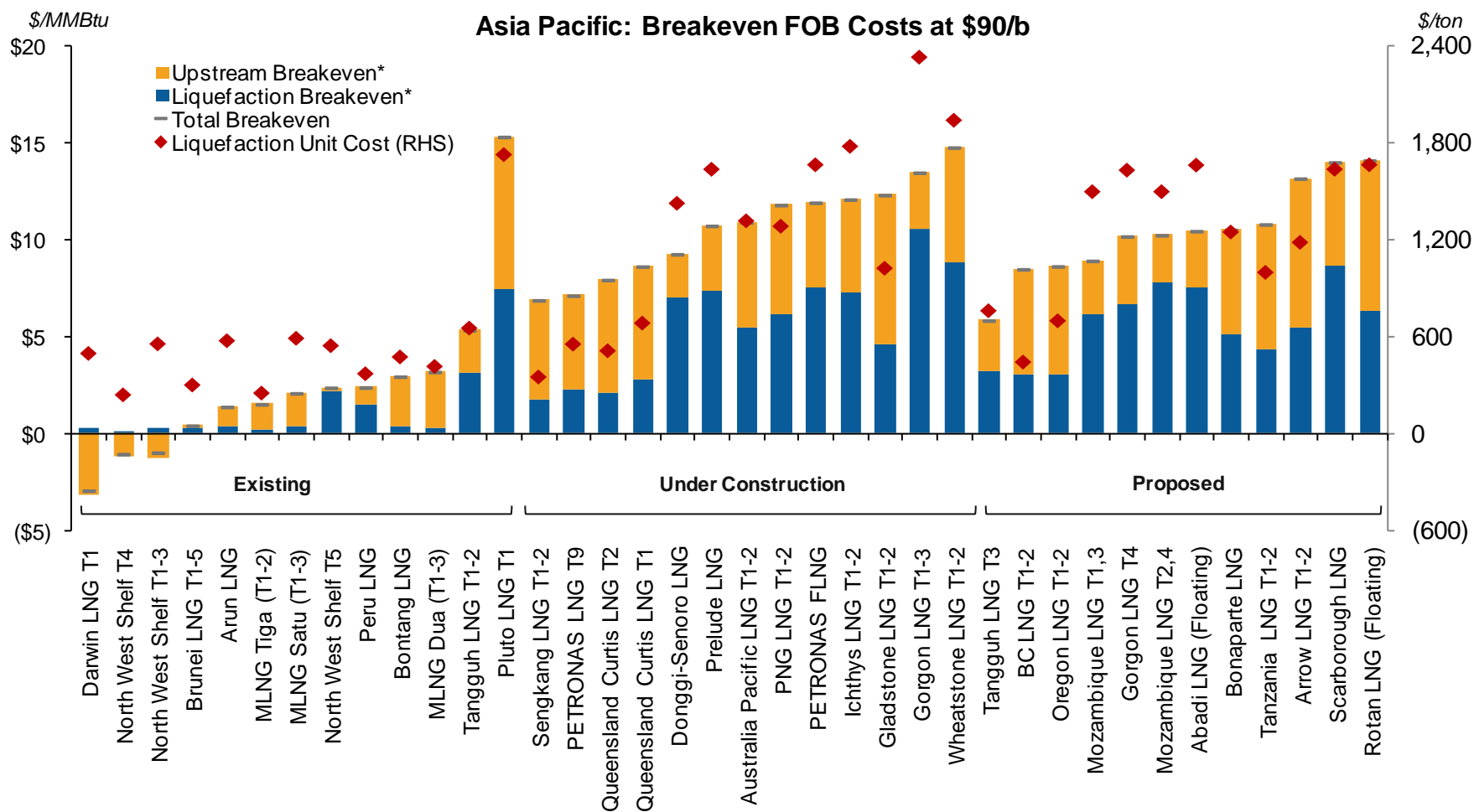
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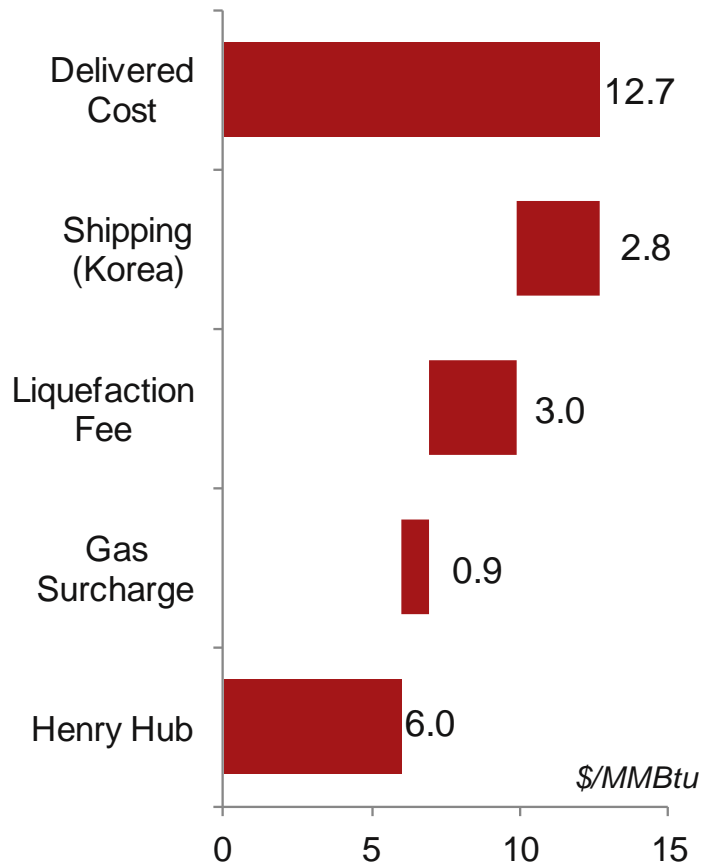
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New LNG Projects are Expensive



Lower 48 is An Alternative—But Not Necessarily Cheap; & It is Volatile

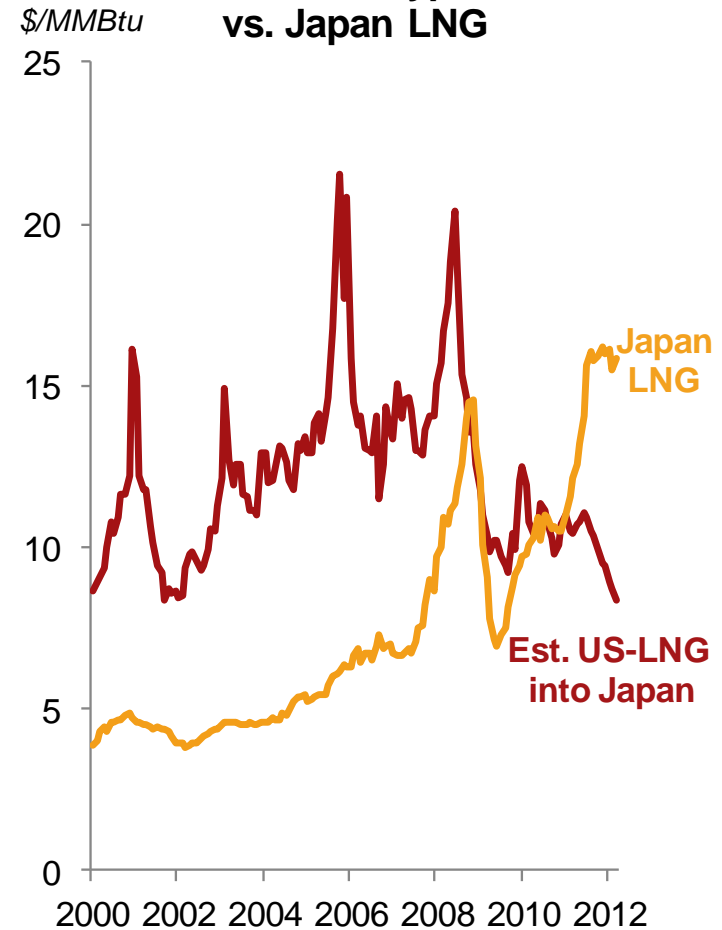
KOGAS Contract with Sabine Pass at \$6 Henry Hub



At \$6/MMBtu, US is not that cheap

Source: Global LNG Service

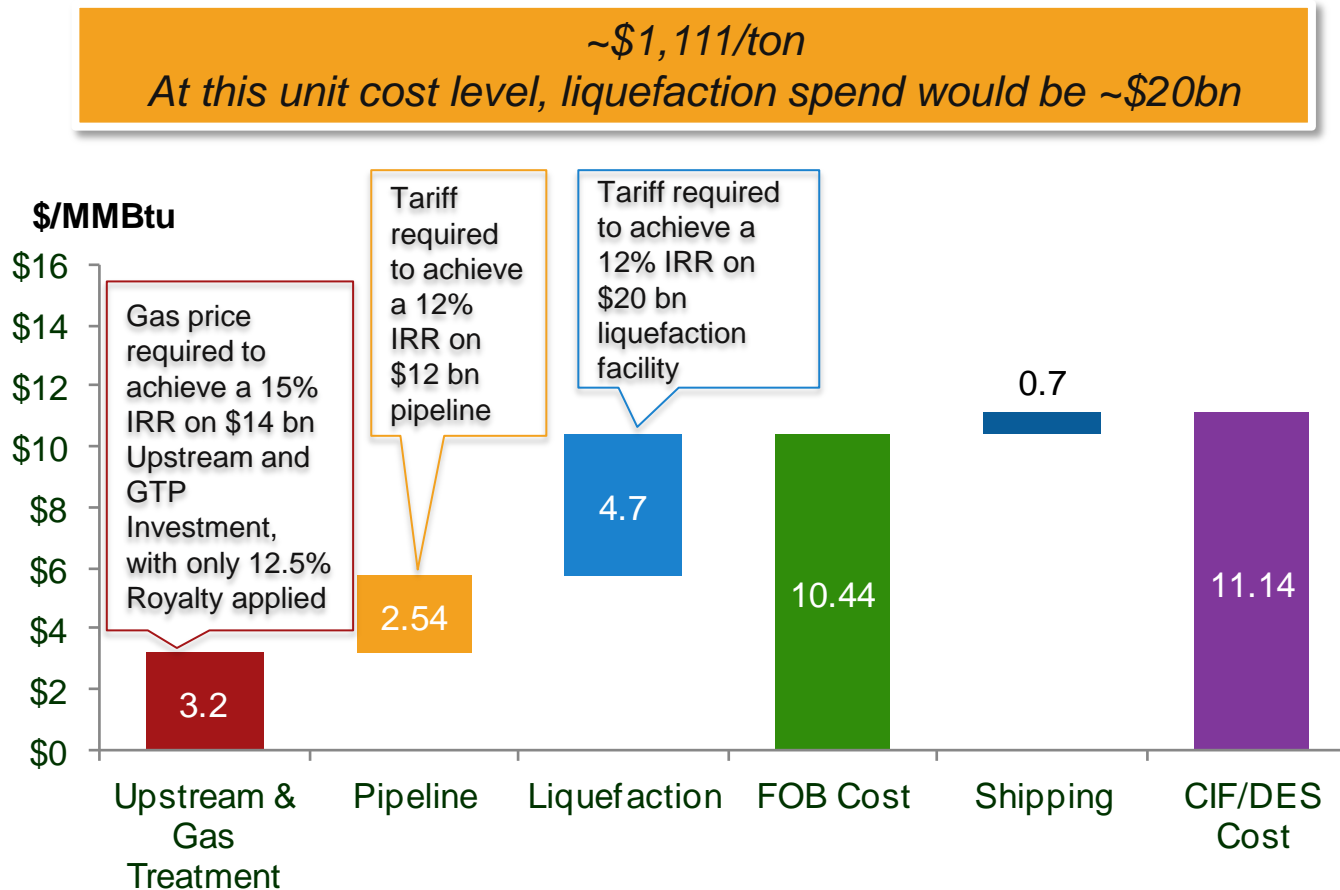
Sabine Pass-Type LNG vs. Japan LNG



Hub can be cheap but also volatile

Source: Global LNG Service

Breakeven Economics for Hypothetical \$46bn Project



What's an Upper Boundary for the LNG Project?

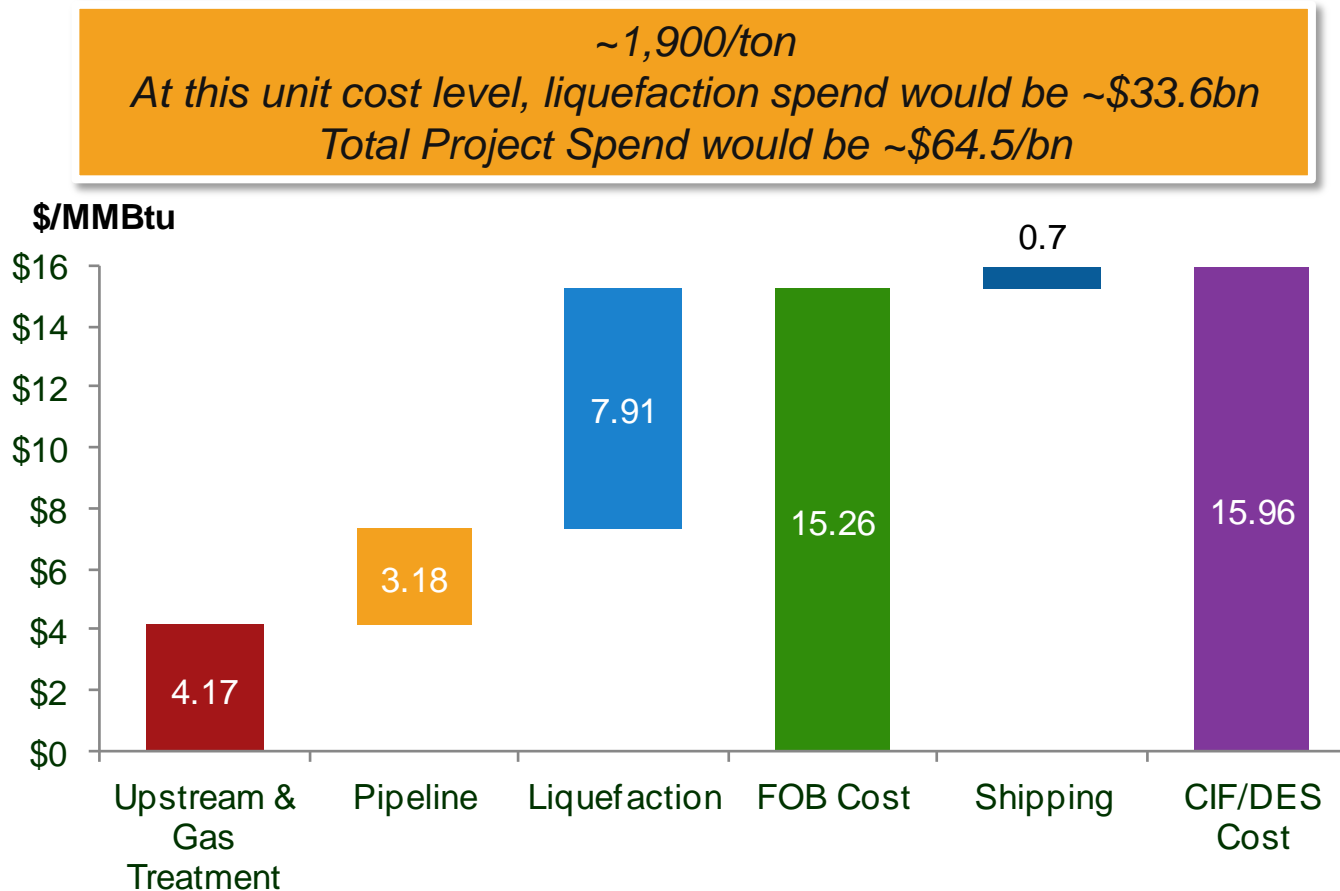


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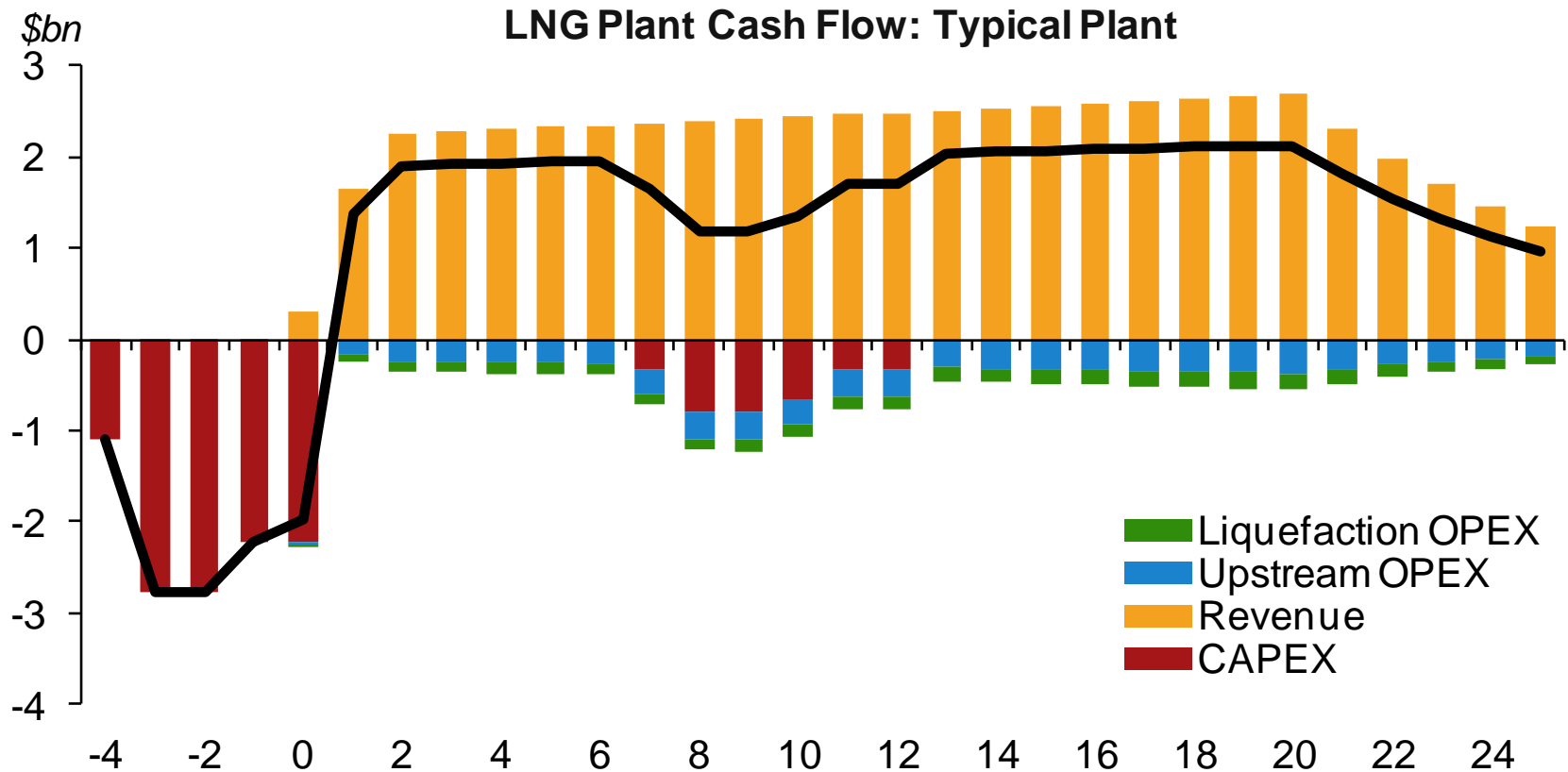
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What Does an LNG Plant Look Like?



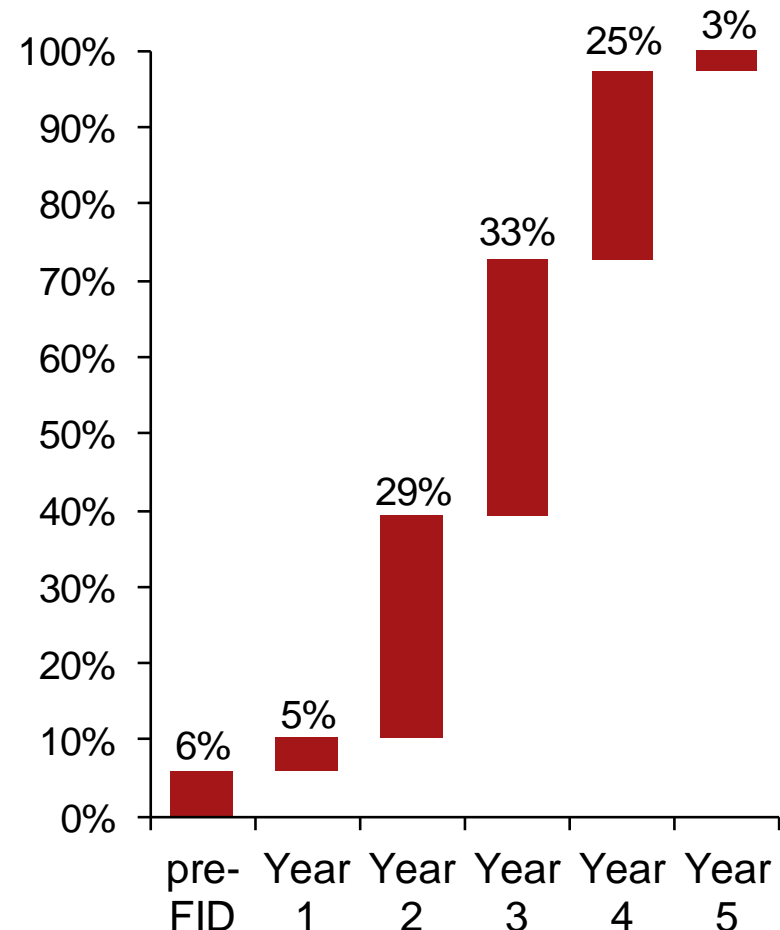
- Long **lead time** (4 years to build, several years to prepare to build)
- Large, **upfront** investment needed to develop the project (usually, tens of billions)
- Minimal **operating** expenses (only a small fraction of initial investment)
- **Long-term cash** flow (expected revenues for 20+ years)

Lots Needed Before Companies Spend Real Money

Most of the money is spent after taking a Final Investment Decision (FID); before FID, the project developers:

- Certify **reserves** to ensure that the gas is there
- Sign sales and purchase agreements (**SPAs**) with buyers, which reassure the project developers that they will be able to sell their product. These are usually long-term and obligate the buyer to take the gas
- Secure **financing**, often external and often non-resource (whereby the debt is guaranteed by the cash flow of the SPA). External financing is supported by loans and equity from the sponsors
- Award an engineering, procurement and construction (EPC) contract to a company/consortium to **build** the plant
- Finalize all **approvals** (country, local)

Indicative CAPEX for Integrated LNG Project



Main Provisions of an LNG Contract

Pricing	Most LNG contracts are priced relative to oil. In Asia, the predominant oil benchmark is the Japan Customs Cleared Price, the average price of oil imported into Japan. Typically, contracts include a ratio / discount relative to oil. In Europe, gas prices are linked either to oil (heavy / light fuel oil) or to regional hubs—the relative prevalence of the two depends on the market with some markets being almost exclusively oil-linked or hub-based. Increasingly, buyers are interested in LNG contracts that are priced against Henry Hub (the US price marker).
Duration	Long-term contracts (15-20 years) remain essential for project sanction, while there is a growing tendency to sign medium (5-10) or short-term (<5) contracts.
Destination Flexibility	In the past, LNG contracts were sold for delivery to a specific market, and the buyer could not deliver the gas to a different destination. Over time, this rigidity has lessened. Destination clauses are now illegal for contracts going into Europe. Contracts with flexible destination clauses are almost a given in the Atlantic Basin, rare in the Asia-Pacific, and have been growing in the Middle East due to Qatar.
Volume Flexibility	Buyers typically have an upward and downward allowance of ~10-20% of contracted volumes. The rest of the volumes is sold under a take-or-pay provision (where the buyer has to pay for the gas even if they choose not to lift some cargoes).
Profit Sharing	Some contracts allow the original seller to share the profit in case a cargo is diverted from its original source. Such agreements are illegal in Europe, while the lack of profit sharing has created tension in several contracts (e.g. Equatorial Guinea, Egypt, Trinidad).
Non-Compliance	Most contracts have arbitration provisions.
Renegotiation Provisions	Most contracts have some price review provisions. These may occur every 3 to 4 years, though buyers or sellers can trigger a review outside this cycle in exceptional circumstances.

The LNG Value Chain

Upstream



Liquefaction



Shipping



Buyer

- The companies that will **develop the gas fields** and supply the gas to be liquefied and exported. Usually projects have a primary supply source, but projects will often source gas from multiple fields and/or areas.
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- The buyer can purchase LNG through a short, medium or long-term **contract** or they can purchase an **individual** cargo (called a spot transaction). The buyer can deliver the gas to an end-user (e.g. power plant) or can re-sell the gas.

Options for Alaska to Participate



Option #1: Receive revenues through royalty gas

- In this case, the state receives a share of the production in the form of royalty (cash); the project partners have full responsibility and ownership to pipe the gas, liquefy it and sell the gas (FOB or CIF/DES).
- The key goal in this commercial structure is to create a “fair” transfer price:
 - Delivers value to the state of Alaska
 - Recognizes the risk/reward and capital commitment of each partner

Option #2: Participate as an equity partner

- In this case, the state of Alaska participates as an equity partner in the LNG project. Usually this is done through either a national oil company or other state-sponsored investment vehicle. In this structure, the state of Alaska could take royalty in kind and be a supplier into the project.
- The key questions are: where in the chain will the state participate (upstream, pipeline, liquefaction, shipping); with what equity stake; and in what form?

Selecting the proper option depends on

- What is the appetite for risk and what kind of risk?
- How to create better alignment between the project partners?
- What kind of commitment will the state make?

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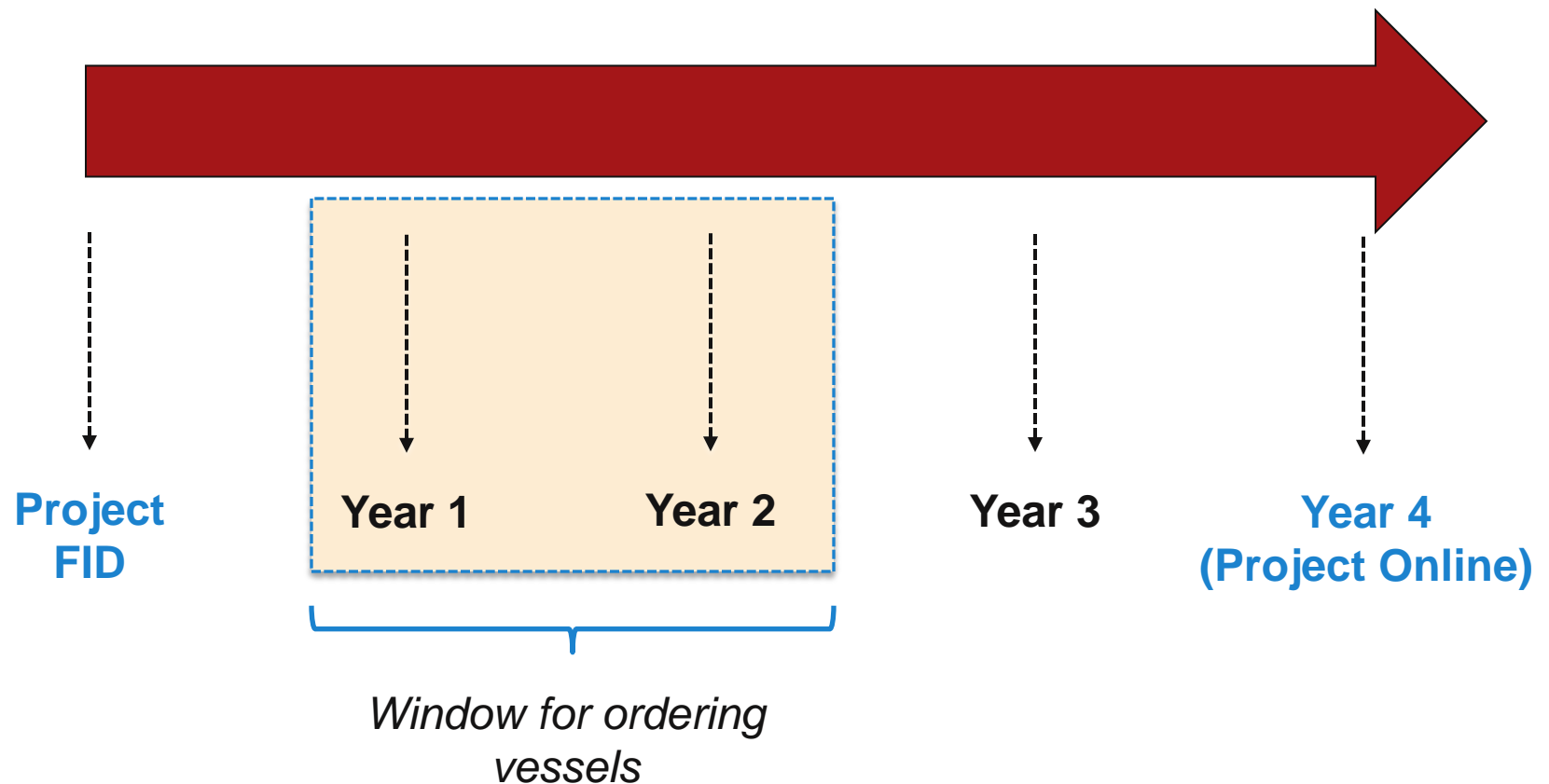
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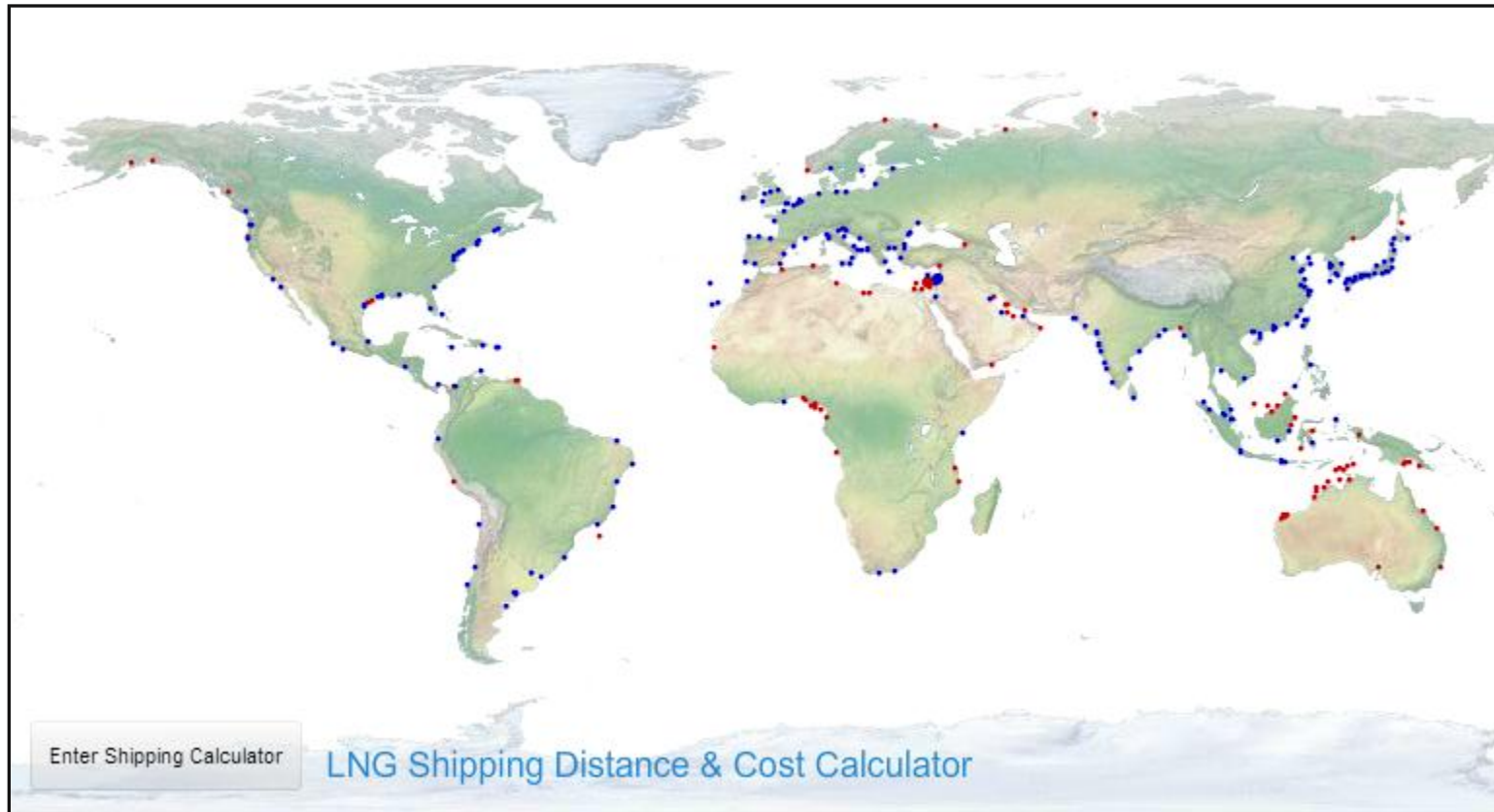
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Alaska Doesn't Have to Worry About Ships—Yet



The Geography of LNG Shipping



Does Alaska Have a Shipping Advantage?

Shipping Cost (\$/MMBtu) – Panama Canal Access

	Japan / S. Korea	China	India
Southern Alaska	0.67	0.83	1.44
Western Canada	0.82	0.99	1.65
US - GOM	1.89	2.06	1.88
Australia	0.60	0.60	0.62
East Africa	1.18	0.97	0.58

- Alaska's shipping costs are an advantage
 - Generally superior to East Africa
 - Considerably less than expected shipping costs from projects located in US GOM
 - But more expensive than Australia

Executive Summary

- Gas is a fast growing segment of the global energy system—and LNG is the fastest growing segment within gas.
- Much of the growth in energy, gas and LNG is coming from Asia—meaning that Alaska is well positioned geographically to capture this market.
- But the opportunity set for the gas producers and for LNG buyers are widening; the question is why Alaska? Why should a company invest in Alaska? Why should a buyer come to Alaska to secure LNG?