Indicative Costs and Economics for LNG Projects

Anchorage, AK
August 5-9, 2013

North Slope Gas & LNG Symposium

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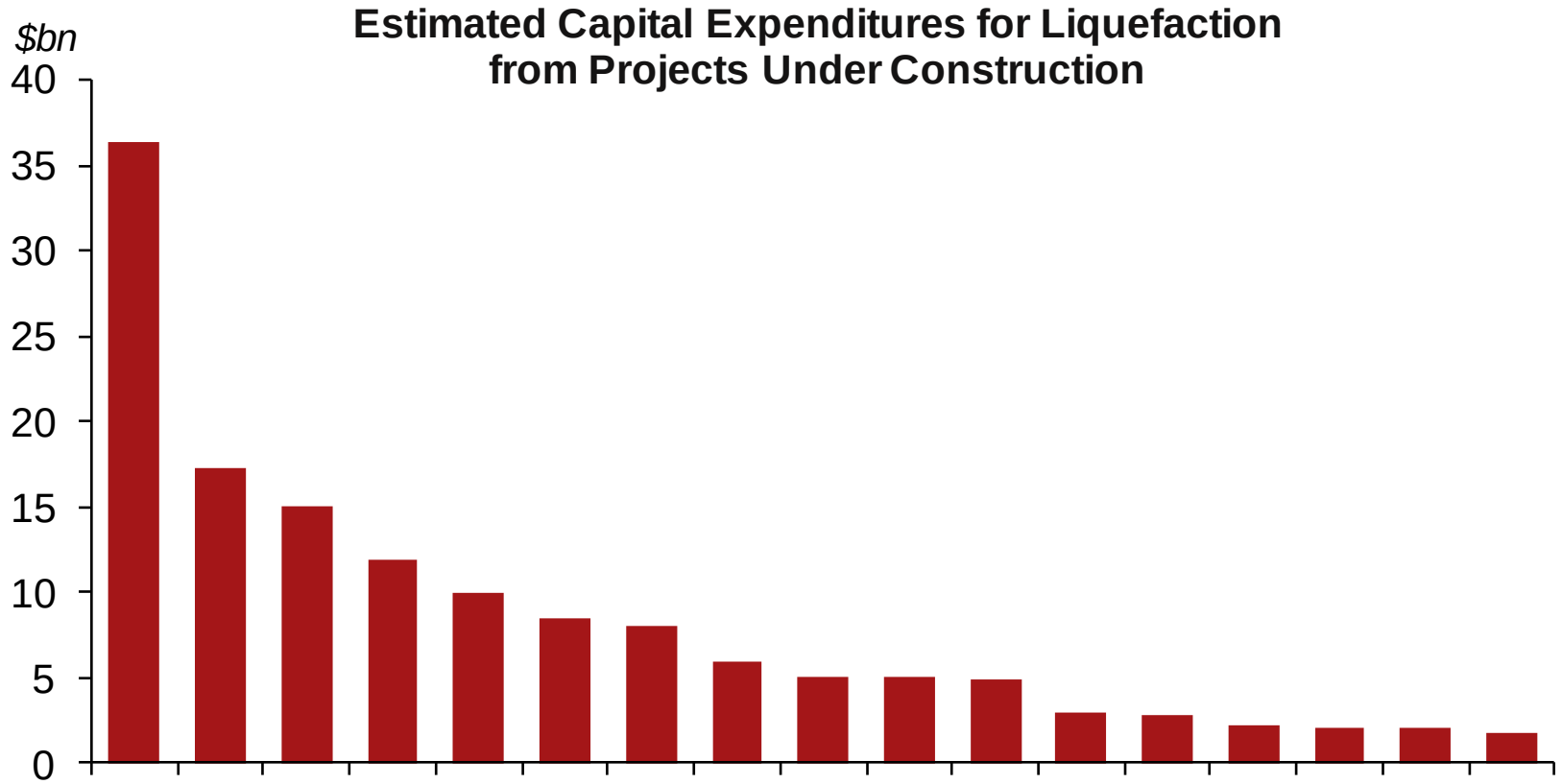
LNG Projects Require Sizeable Investments



- Of LNG projects under construction, 5 will spend over $10 billion just on liquefaction
- Even “cheaper” need ~$2 billion in liquefaction investment

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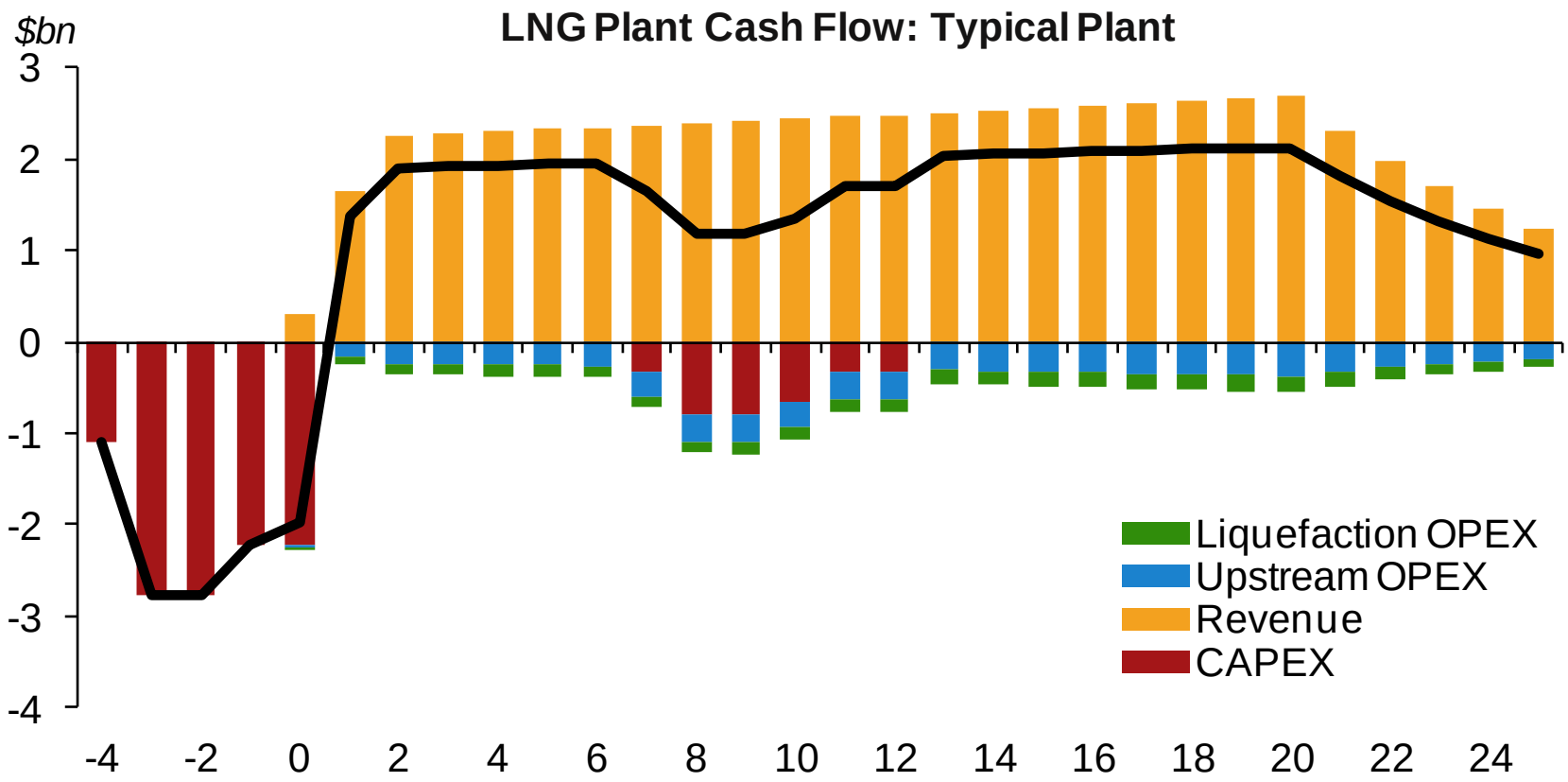
What Does an LNG Liquefaction Plant Look Like?



- 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)

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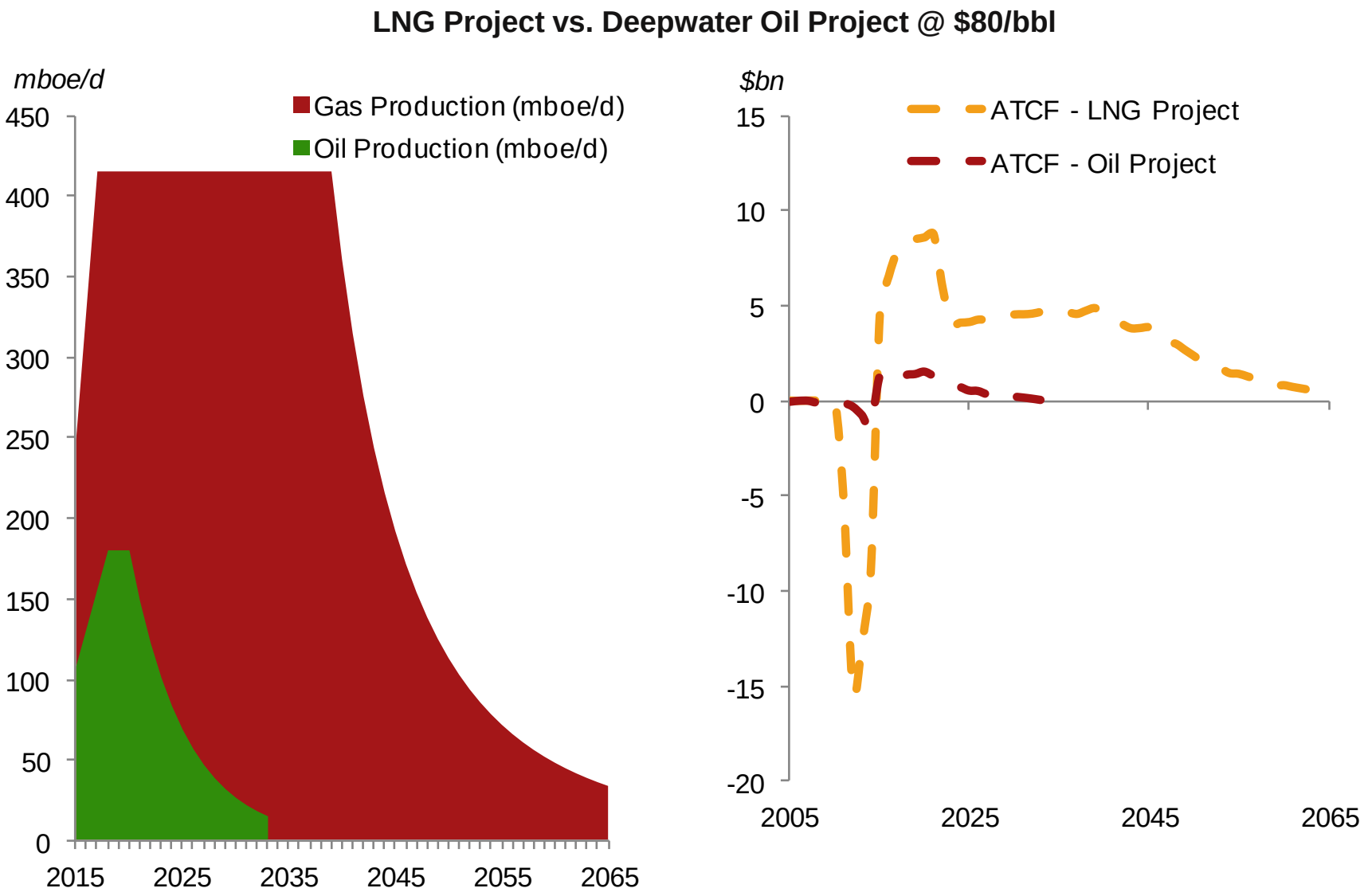
Oil and Gas Have Different Production / Economic Profiles…



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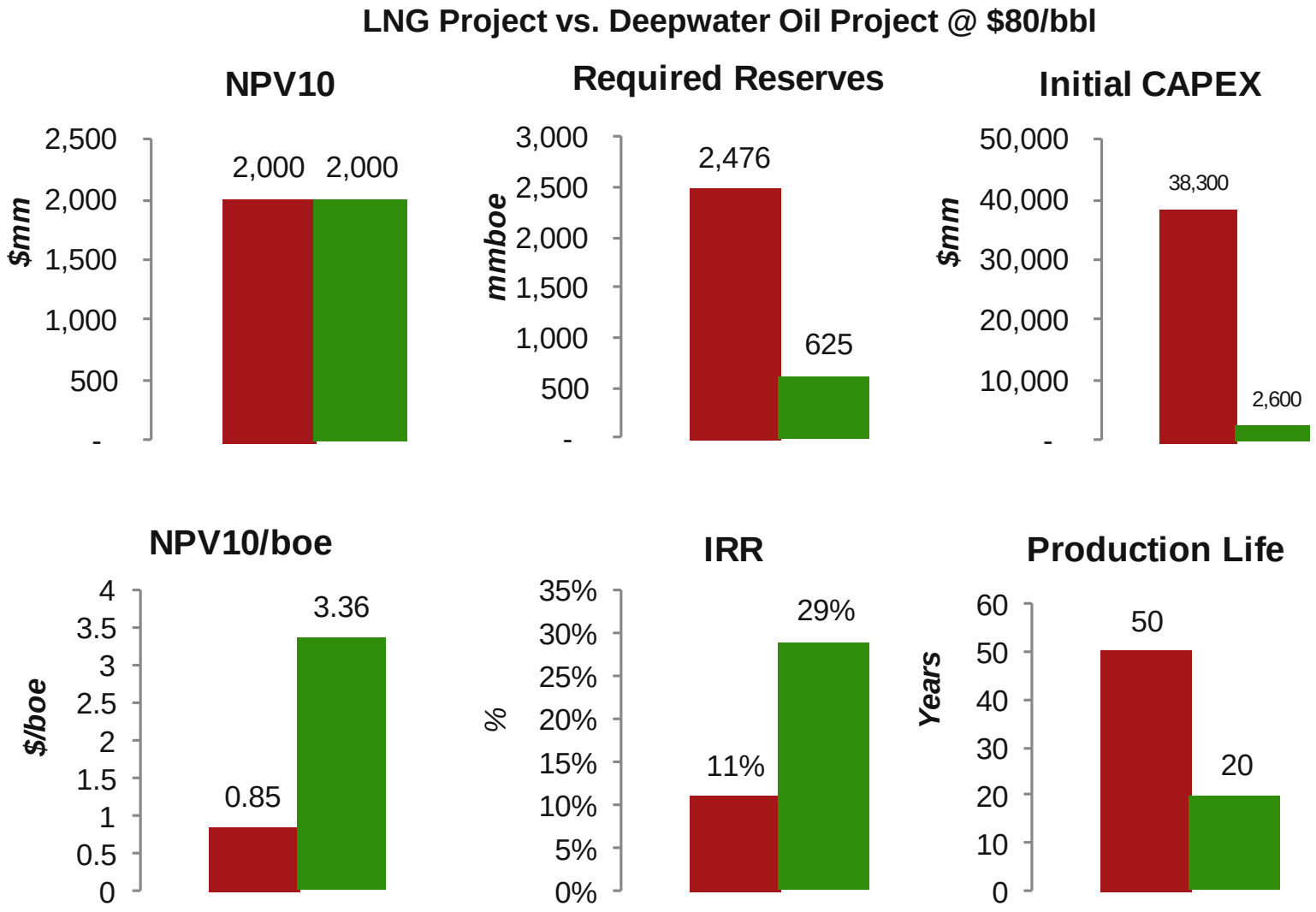
… and Different Economic Outcomes



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Oil-Indexed Pricing to Asian Markets

Contract Sales Price Slope --->	0.13x	0.14x	0.15x	0.16x
$60/bbl Brent	$7.80	$8.40	$9.00	$9.60
$80/bbl Brent	$10.40	$11.20	$12.00	$12.80
$100/bbl Brent	$13.00	$14.00	$15.00	$16.00
$120/bbl Brent	$15.60	$16.80	$18.00	$19.20
$140/bbl Brent	$18.20	$19.60	$21.00	$22.40

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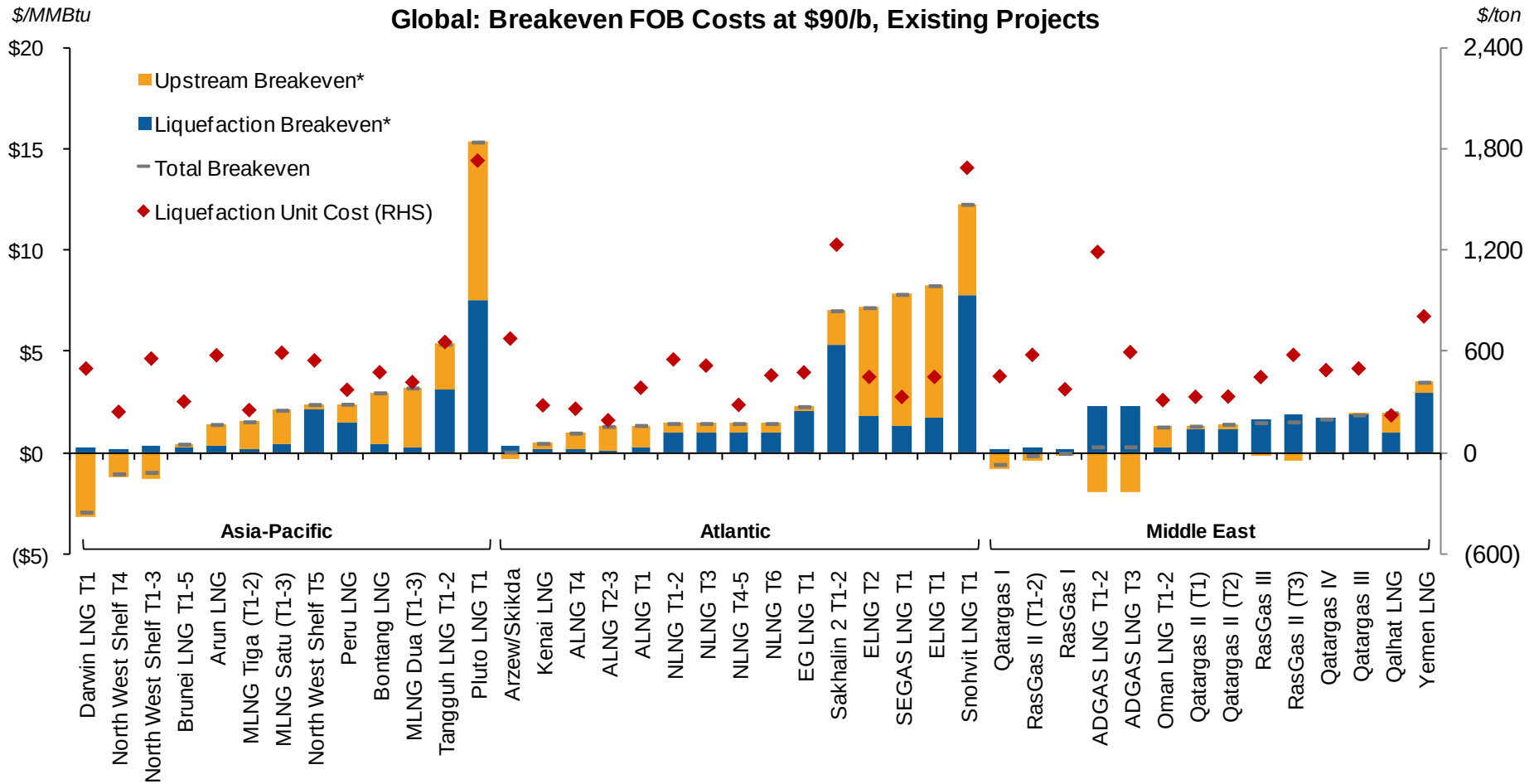
Newer LNG Projects Have Needed Highest Breakeven Prices Yet Seen…



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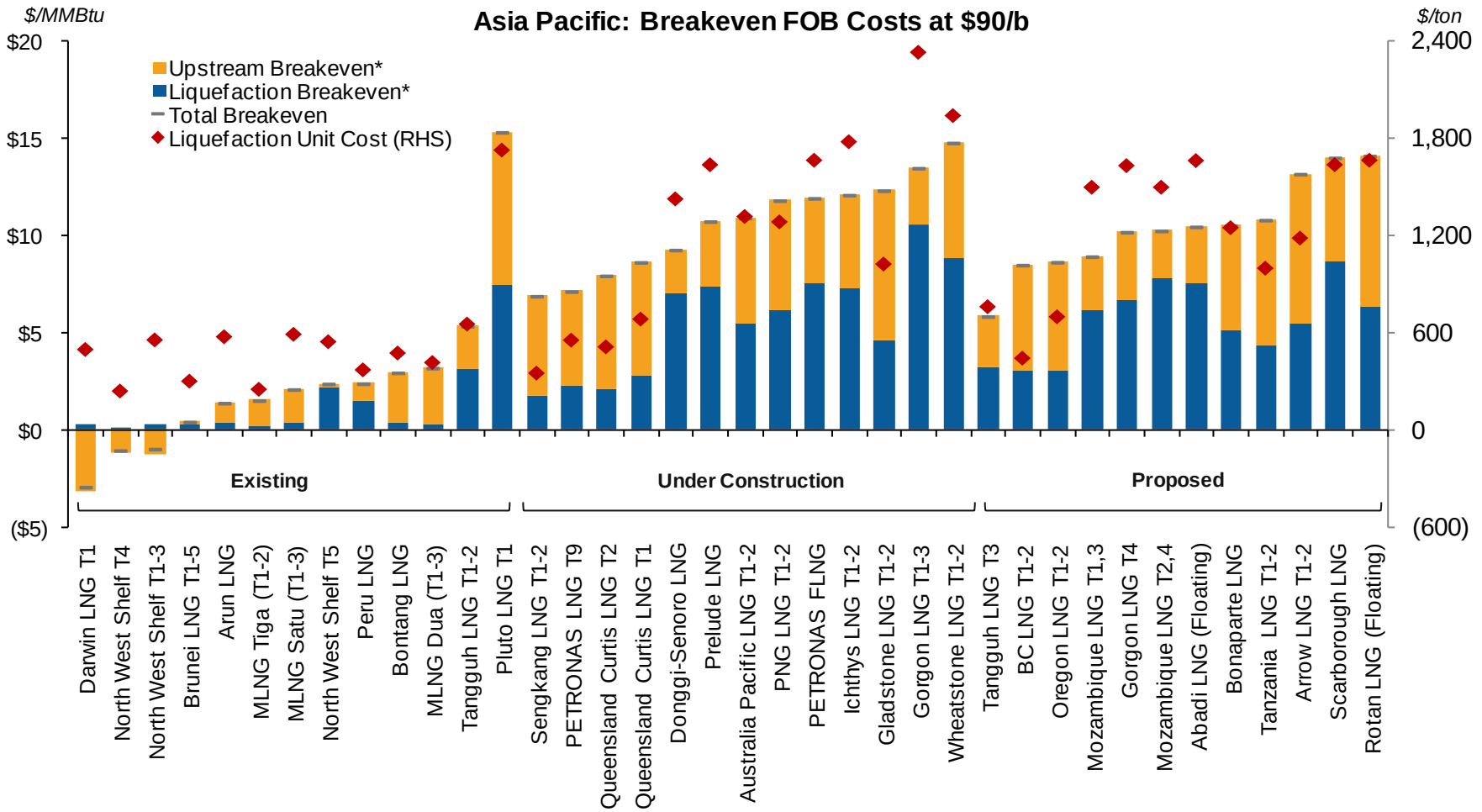
…a Trend Continued by Projects Under Construction in Asia-Pacific, Largely Due to Australia Cost Escalation



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Project Cost Escalation Drivers

Recent Cost Revisions at Major LNG Projects						
	At FID		Latest		% Change	
Project	$/ton	$/MMBtu	$/ton	$/MMBtu	$/ton	$/MMBtu
Gorgon LNG T1-3	2,467	10.42	3,712*	13.72	50%	32%
Pluto LNG T1	2,256	11.84	3,477	15.34	54%	30%
PNG LNG T1-2	2,273	10.15	2,754	12.99	21%	28%
QC LNG T1-2	1,765	6.54	2,400	8.43	36%	29%
Gladstone LNG T1-2	2,051	9.79	2,372	10.95	16%	12%
Angola LNG T1	1,346	7.18	1,923	10.91	43%	52%

**Press indicates Gorgon LNG's cost review will reveal a substantial increase.*

- Five sanctioned projects announced cost increases in 2012 alone
  - Costs rose 30% on average relative to figures quoted at FID.
- Major factors:
  - **Australia:** Rising labor costs; Australian dollar appreciation; weather-related delays; labor union disputes; local content cost increases; scope of work changes; additional regulatory compliance costs; acceleration of upfront upstream capital
  - **Papua New Guinea:** Australian dollar appreciation; land rights disputes; weather-related delays
  - **Angola:** Rising construction costs

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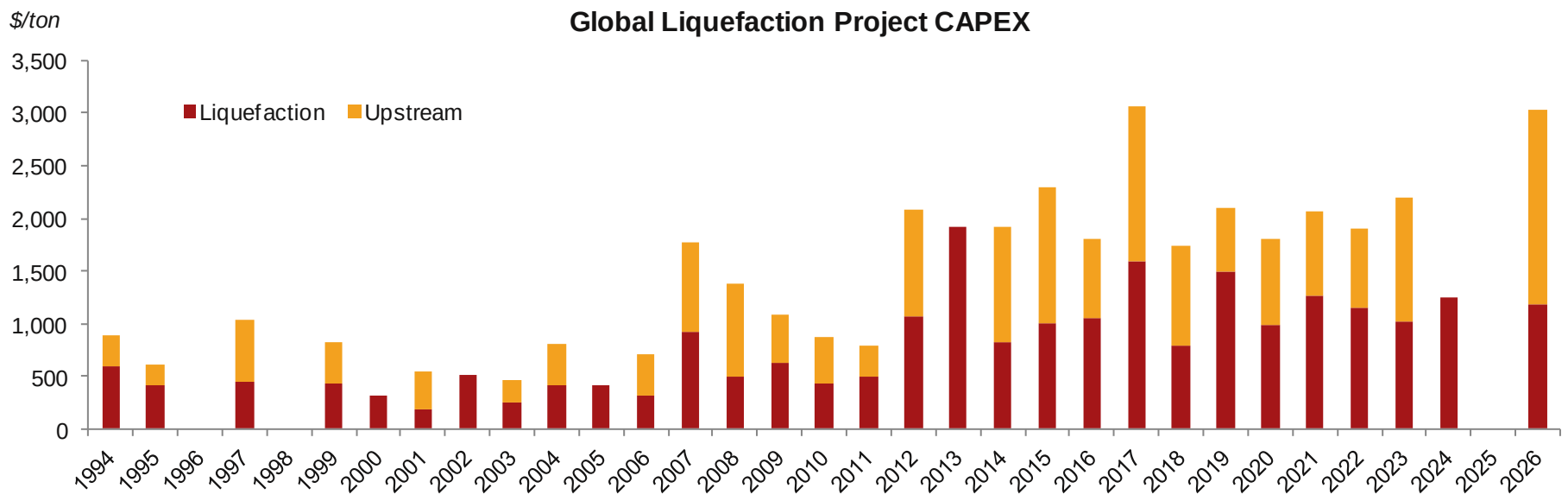
Average LNG Project Segment Costs

- Total spending on liquefaction projects has increased dramatically over the past decade
- Global liquefaction CAPEX increased from an average of $505/ton between 2000 and 2009 to a projected $1,043/ton between 2010 and 2019

Greenfield Asia Pacific Projects	Liquefaction	Upstream
	$/ton	
Existing	640	558
Under Construction	1,331	1,308
Proposed	1,168	1,121



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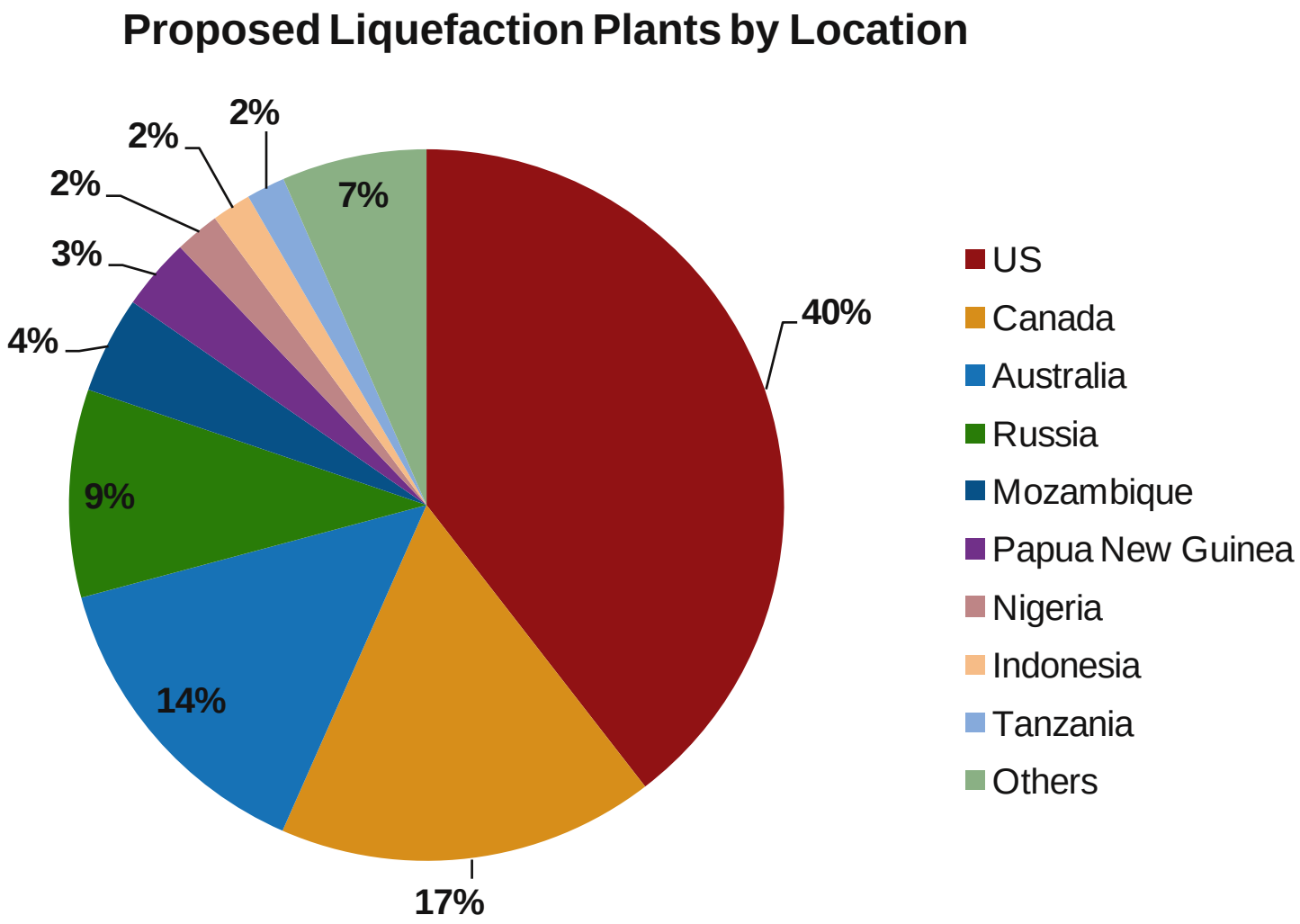
North America is Largest Prospective Supplier



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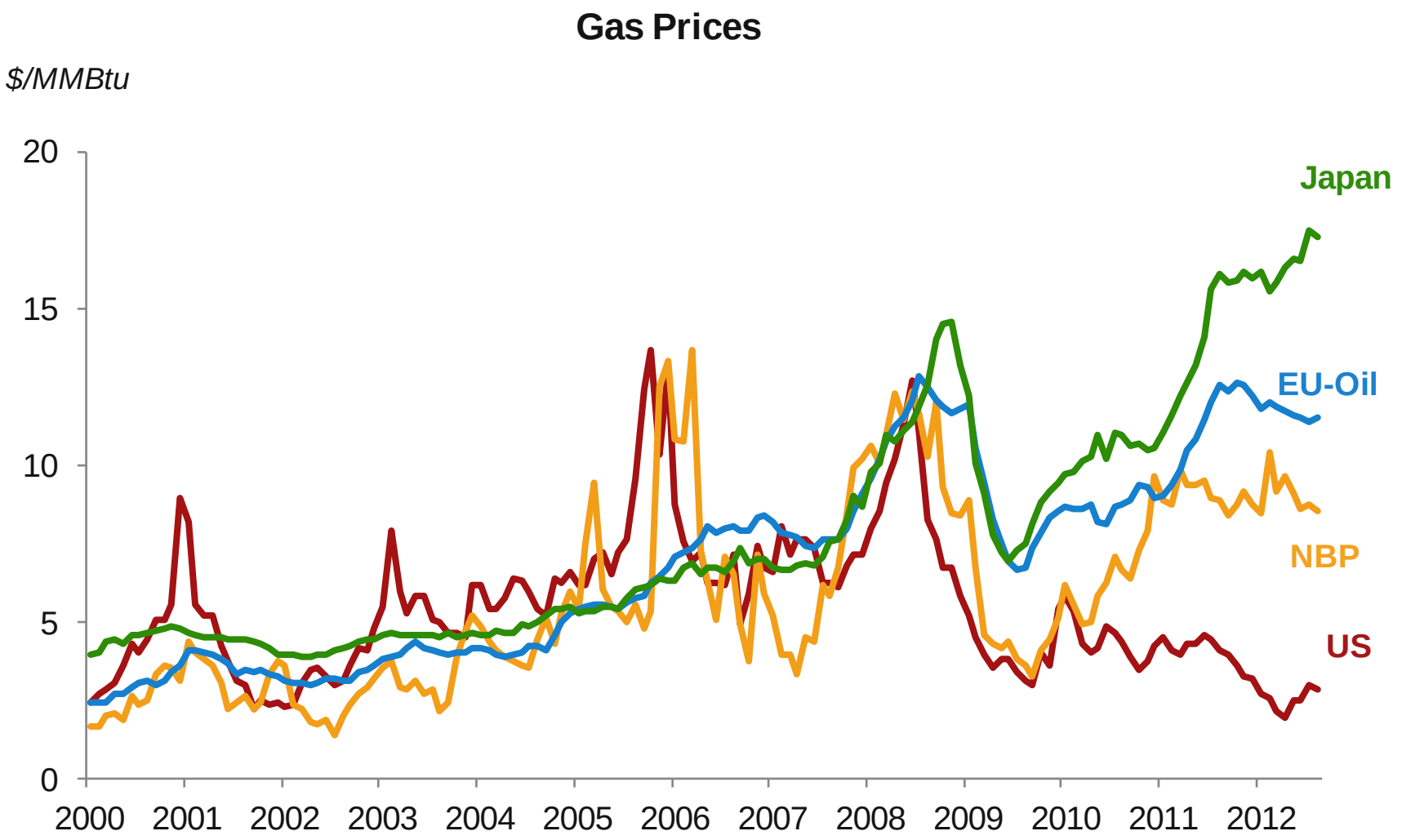
North American Export Projects Driven by Divergence in Gas Prices…



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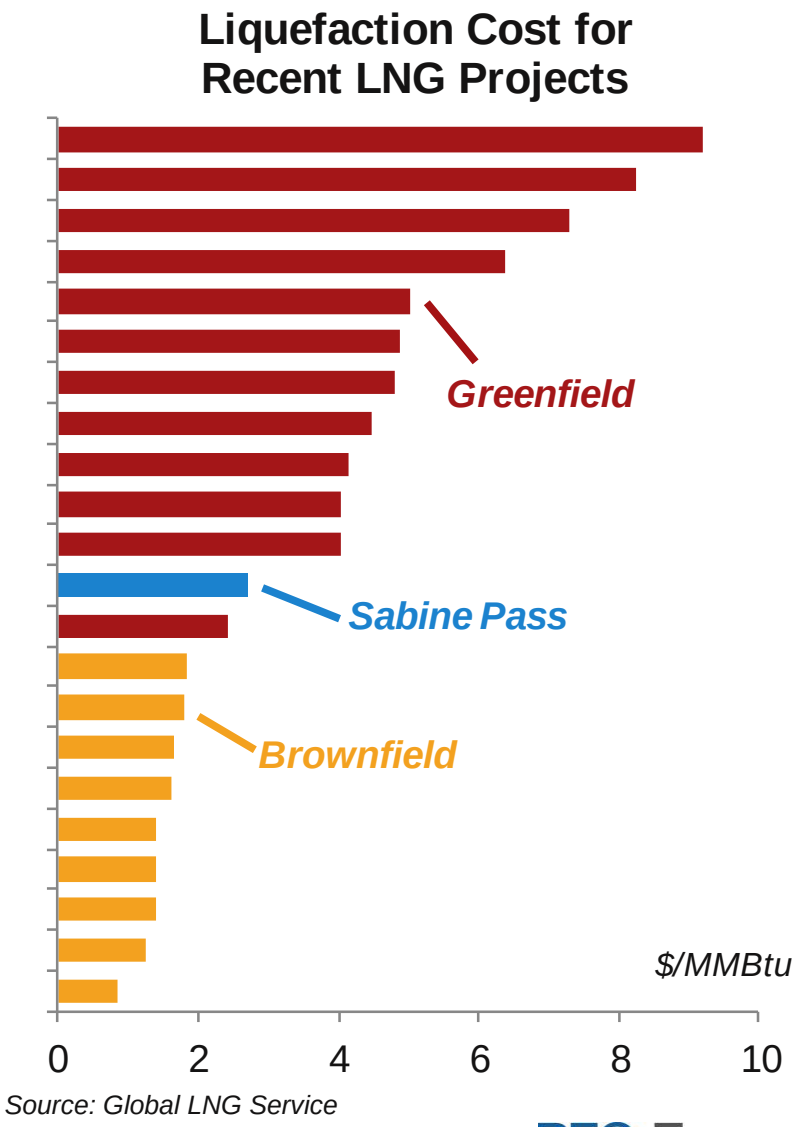
…As Well as the Benefits of Brownfield Economics…

- Building liquefaction facilities on the site of a regasification terminal yields a lower unit cost
- Sabine Pass' average charge of $2.72/MMBtu is on below almost all recently sanctioned or recently completed brownfield facilities



Source: Global LNG Service

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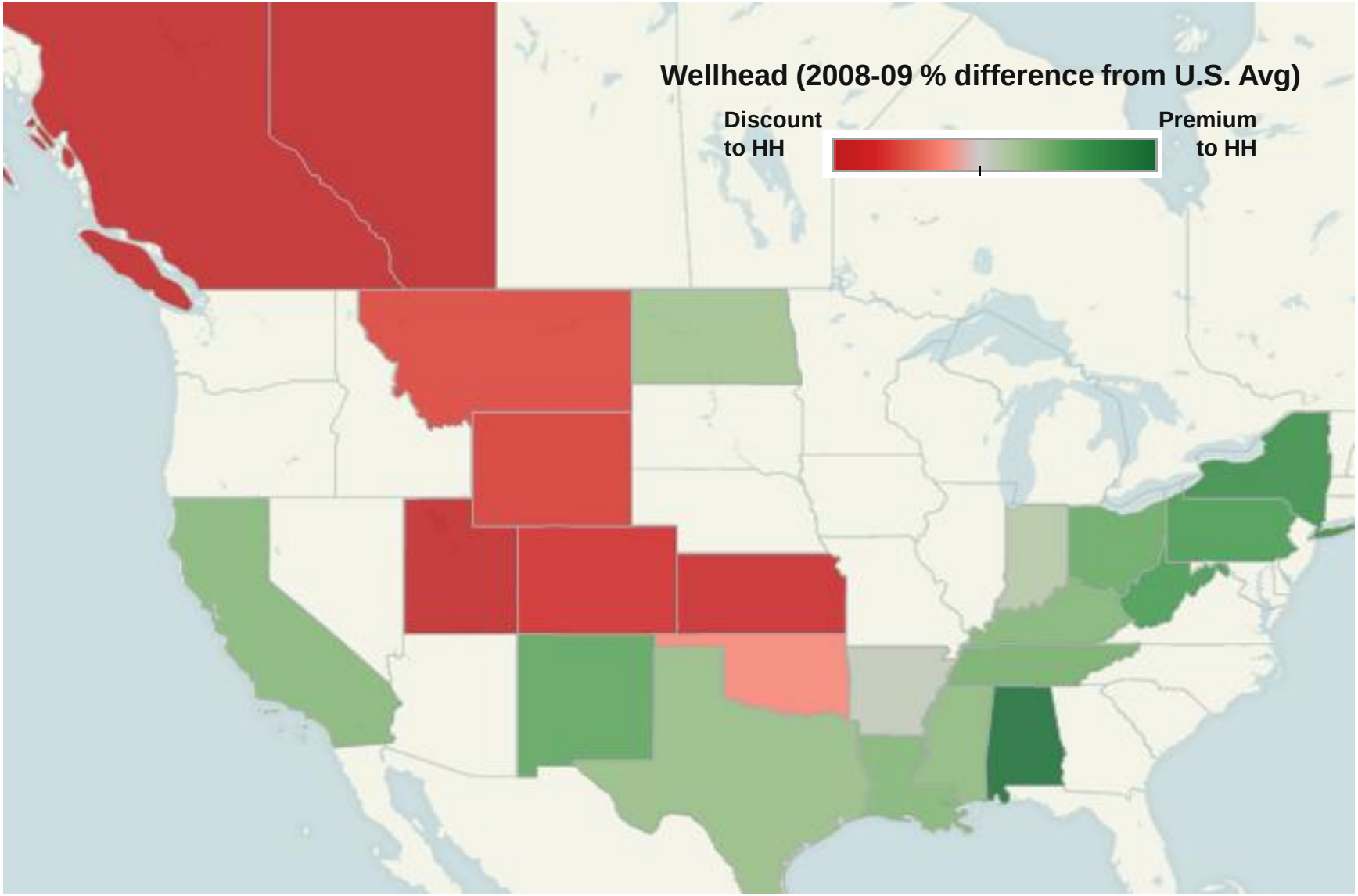
…and Substantial Amounts of Semi-Stranded Gas



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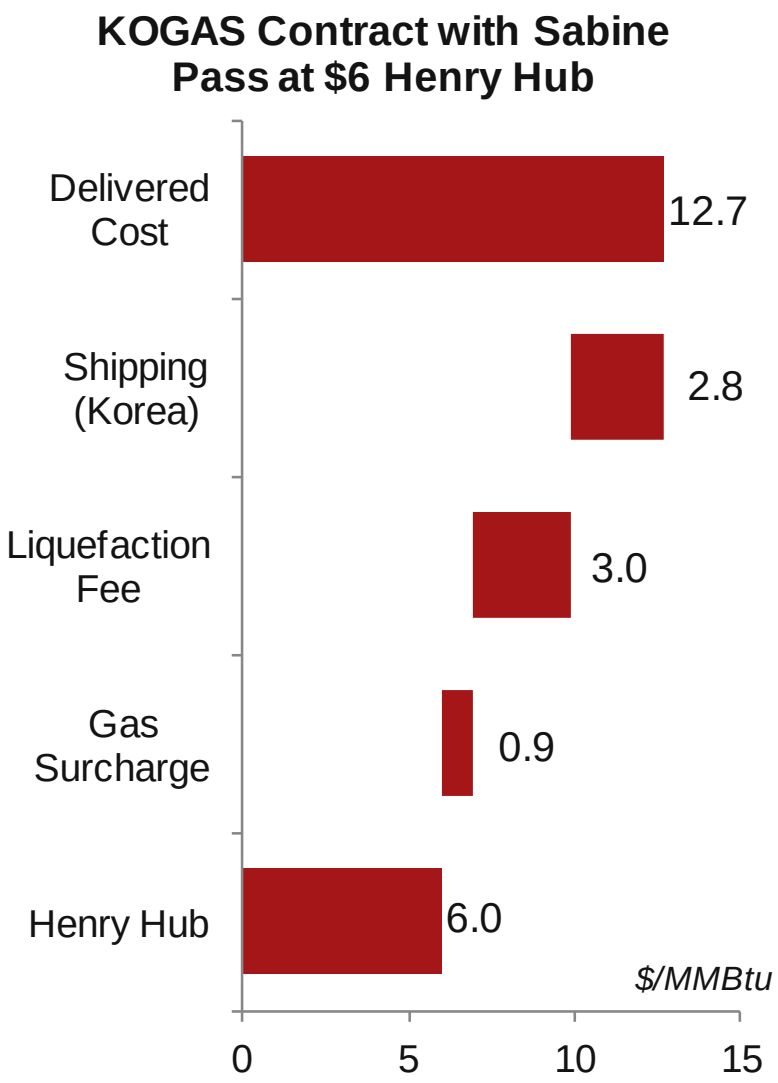
How LNG From the Lower 48 is Priced

- As the first US-based LNG project to start construction, Sabine Pass set the pricing expectations for US-based LNG. The Sabine Pass contracts are structured as follows:
- **Henry Hub x 115%.** The 15% "mark-up" covers the gas lost during the conversion process (6-8%) as well as any basis differentials and other risks that Cheniere undertakes in procuring the gas.
- **Liquefaction charge.** Ranging from $2.25/MMBtu (first contract) to $3/MMBtu, this covers the CAPEX for the facility.
- **Shipping.** This cost is taken on by the buyer. Shipping to Europe is estimated at $1/MMBtu and shipping to Asia is estimated at $2 to $3/MMBtu (India / NE Asia).
- **Regasification.** In Europe, comparing US-based LNG to pipeline gas would requires regasification charges of $0.40 to $1/MMBtu.
- Although other projects will not track these economics 100%, they are assumed to be similar.



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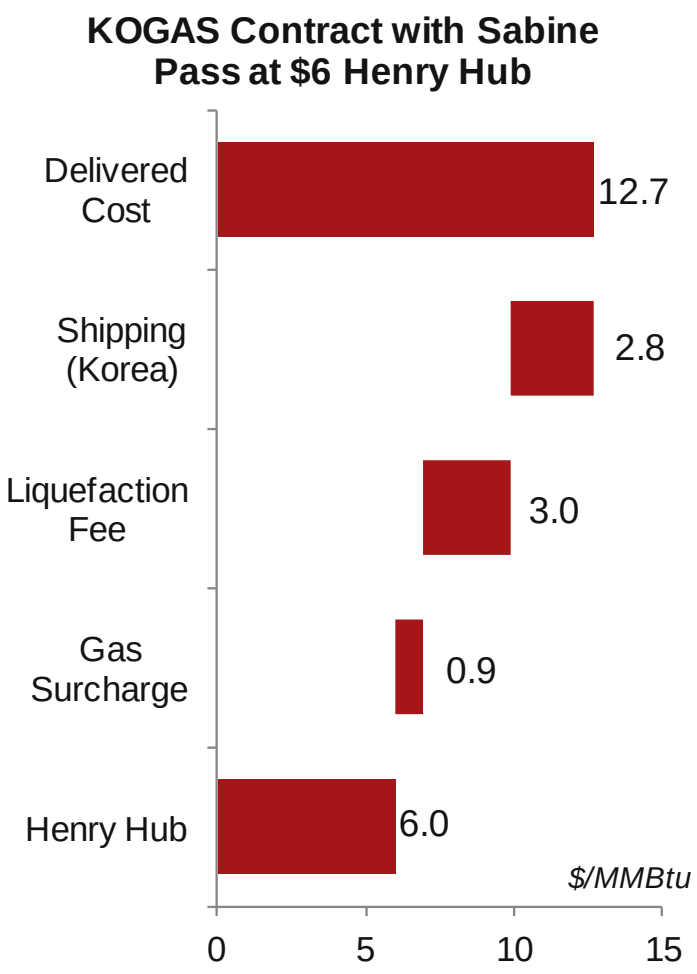
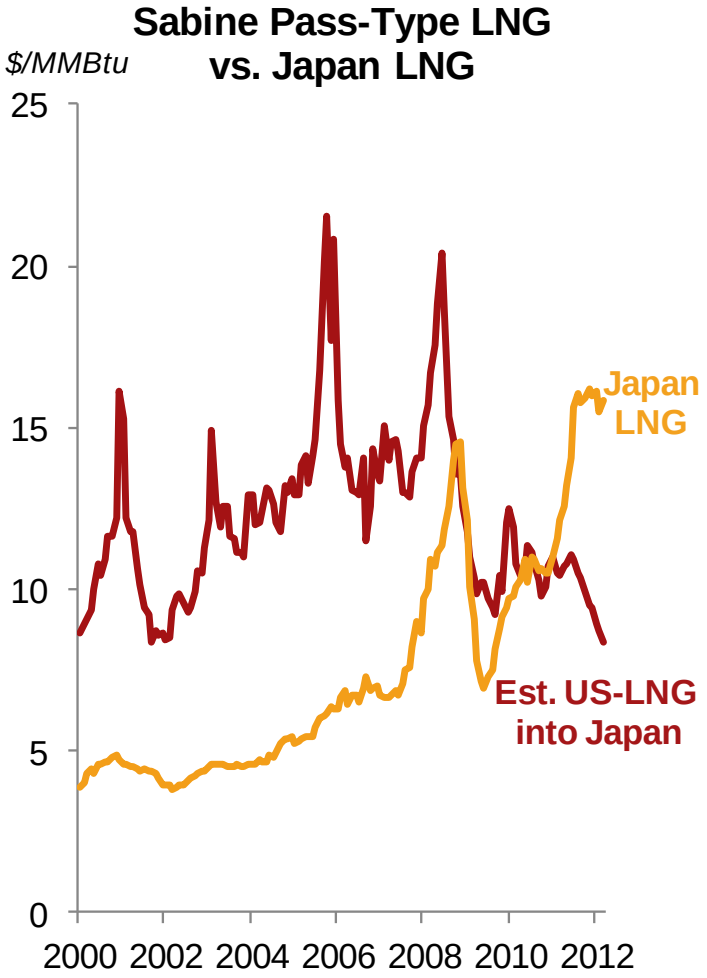
US-Based LNG Not Necessarily Cheap; & Volatile



At $6/MMBtu, US is not that cheap

Source: Global LNG Service



Hub can be cheap but also volatile

Source: Global LNG Service

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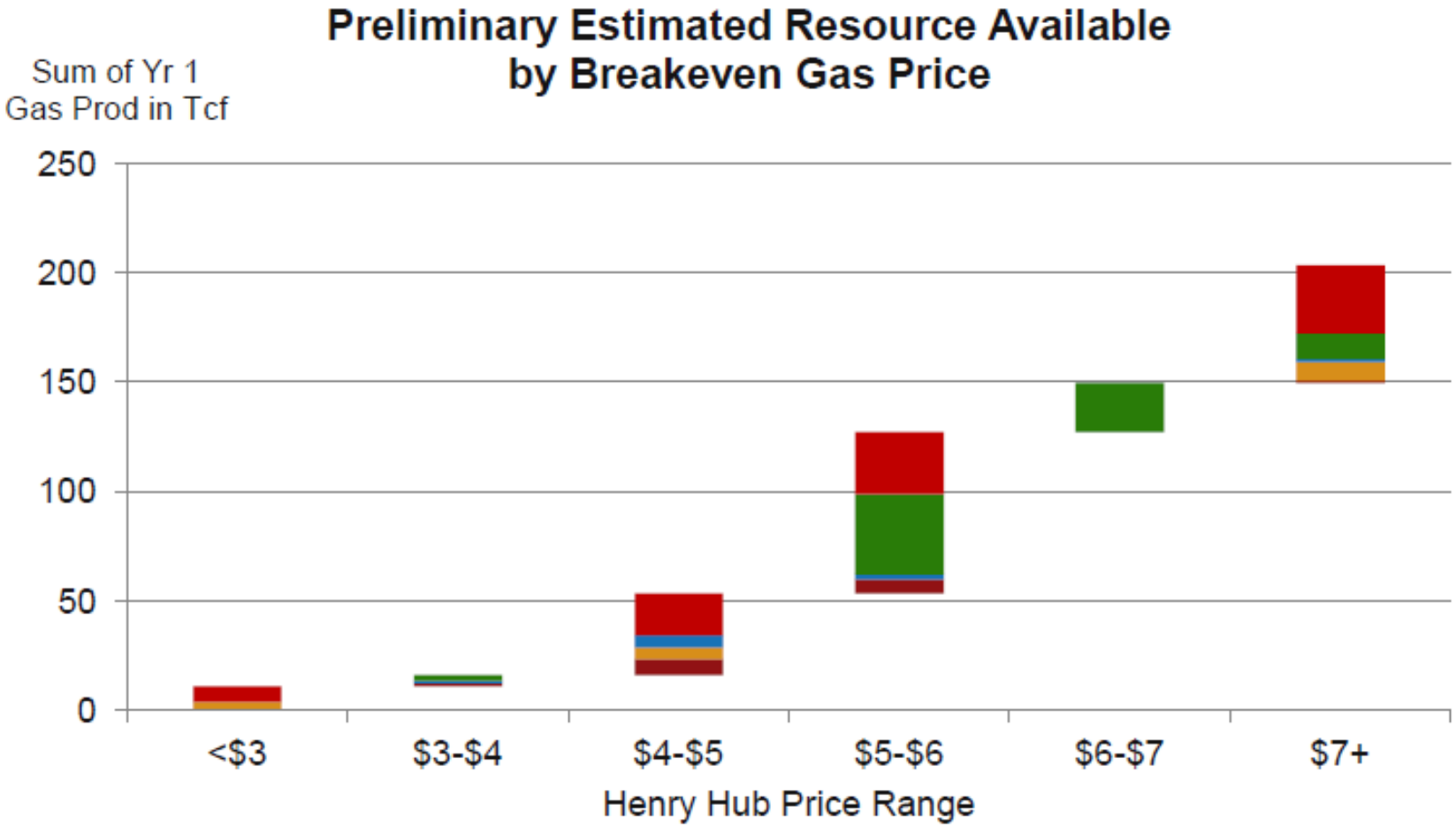
US Gas Supply Cost Curve



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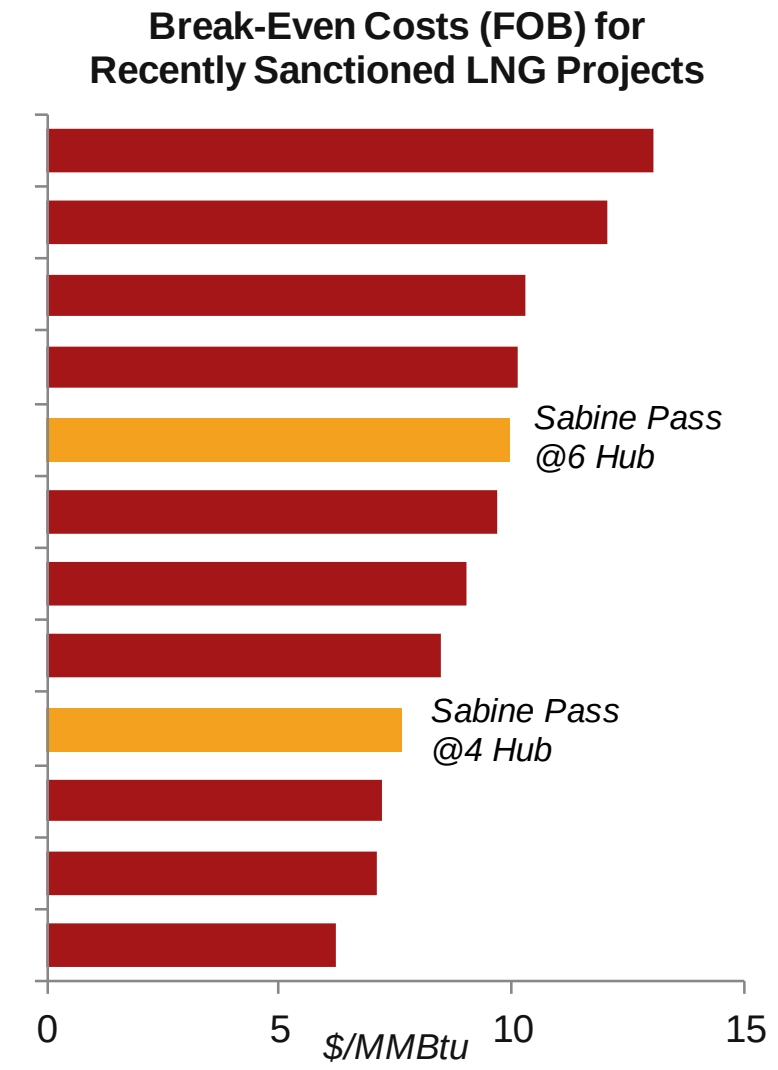
How Competitive is US L48 LNG @ $4 or $6 Henry Hub?

- Given cost inflation in Australian LNG projects, US LNG exports (following the Cheniere structure) can be competitive at $4/MMBtu Henry Hub
- Exports are less competitive at $6/MMBtu, especially given the extra shipping cost from the Gulf of Mexico to Asia
- Can US LNG exports compete with brownfield expansions in the 2020 timeframe?



Source: Global LNG Service

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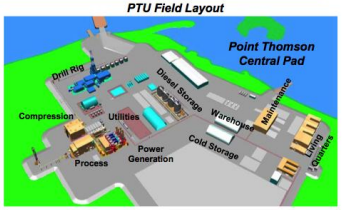
AK South Central LNG Concept

SCLNG Concept Summary - Upstream

Alaska SCLNG Project
Concept Information

PTU (62 miles east of PBU/GTP area)
- Initial Production System (IPS) project in progress - 2016 SU
- Preliminary SCLNG design basis for PTU:
  - Leverage IPS facilities, add fourteen new wells
  - Add new gas facilities to existing central pad / facilities
  - New 30" gas line from PTU to GTP in Prudhoe Bay
  - Peak workforce – 500-1,500 people

PTU Field Layout



PBU Tie-in (adjacent to proposed GTP location)
- Installation / tie-in managed by Prudhoe Bay Operator
  - Tie into existing CGF, deliver gas to new Gas Treatment Plant
  - Gas project / deliveries tied to future PBU operations
- Preliminary plan is to inject CO_2 using existing injection systems as appropriate

PBU Central Gas Facility Tie-in

2

Work Product In Progress

SCLNG - Concept Summary – Downstream

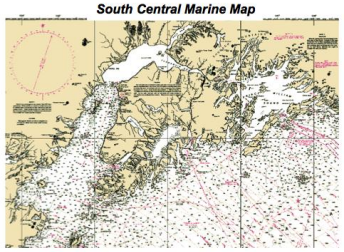
Alaska SCLNG Project
Concept Information

LNG Plant and Storage
- Three 5.8 million tons per annum (MTA) LNG trains
  - Plant receives 2.2 - 2.5 billion cubic feet per day to liquefy
  - LNG production varies with ambient temp (4.9 - 6.3 MTA)
  - Small volume of stabilized condensate produced (~1,000 bbl/day)
- Integrated utility system with all utilities on site
- Two-three 160,000 cubic meter LNG storage tanks
- Peak workforce – 3,500 – 5,000 people

SCLNG Plant and Storage

Marine Offloading Facility
- Conventional jetty and trestle design
- Two berths
- Design based on 15-20 LNG carriers
- Marine support system includes required tugs, security boats
- Peak workforce – 1,000 – 1,500 people

South Central Marine Map



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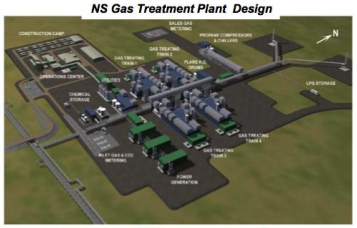
Work Product In Progress

SCLNG - Concept Summary - Midstream

Alaska SCLNG Project
Concept Information

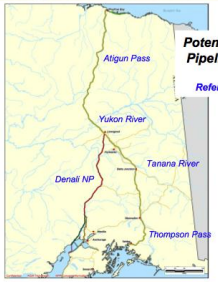
NS Gas Treatment Plant
- Designed to remove gas impurities
- Four amine trains with compression, dehydration and chilling
- Prime power generation (5 units, 54kHP)
- All required utilities, infrastructure and camps
- Facility will be modularized, sealifted to location
- Peak workforce – 500-2,000 people

NS Gas Treatment Plant Design



Gas Pipeline and Compression Stations
- 800+ mile 42" x80 pipeline
- 3-3.5 billion cubic feet gas per day
- Eight compressor stations (30kHP each)
- Pipeline contents will be treated gas, impurities removed
- Designed to manage continuous and discontinuous permafrost regions
- Expansion potential with additional compression if appropriate
- Five off-take points for Alaska gas delivery
- Peak workforce – 3,500 - 5,000 people

Potential SCLNG Pipeline Routes



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Work Product In Progress

Estimated total cost:
$45 - $60 bn (2011 real dollars)

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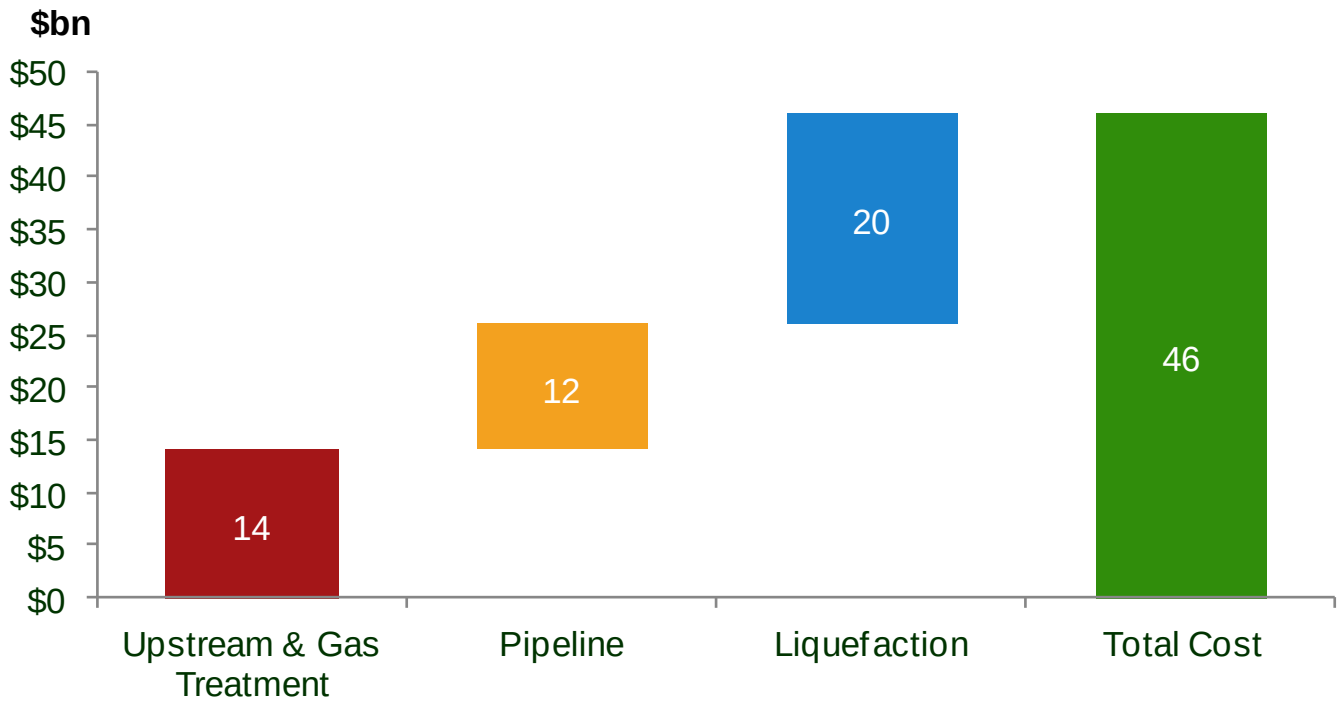
Hypothetical Cost Breakdown



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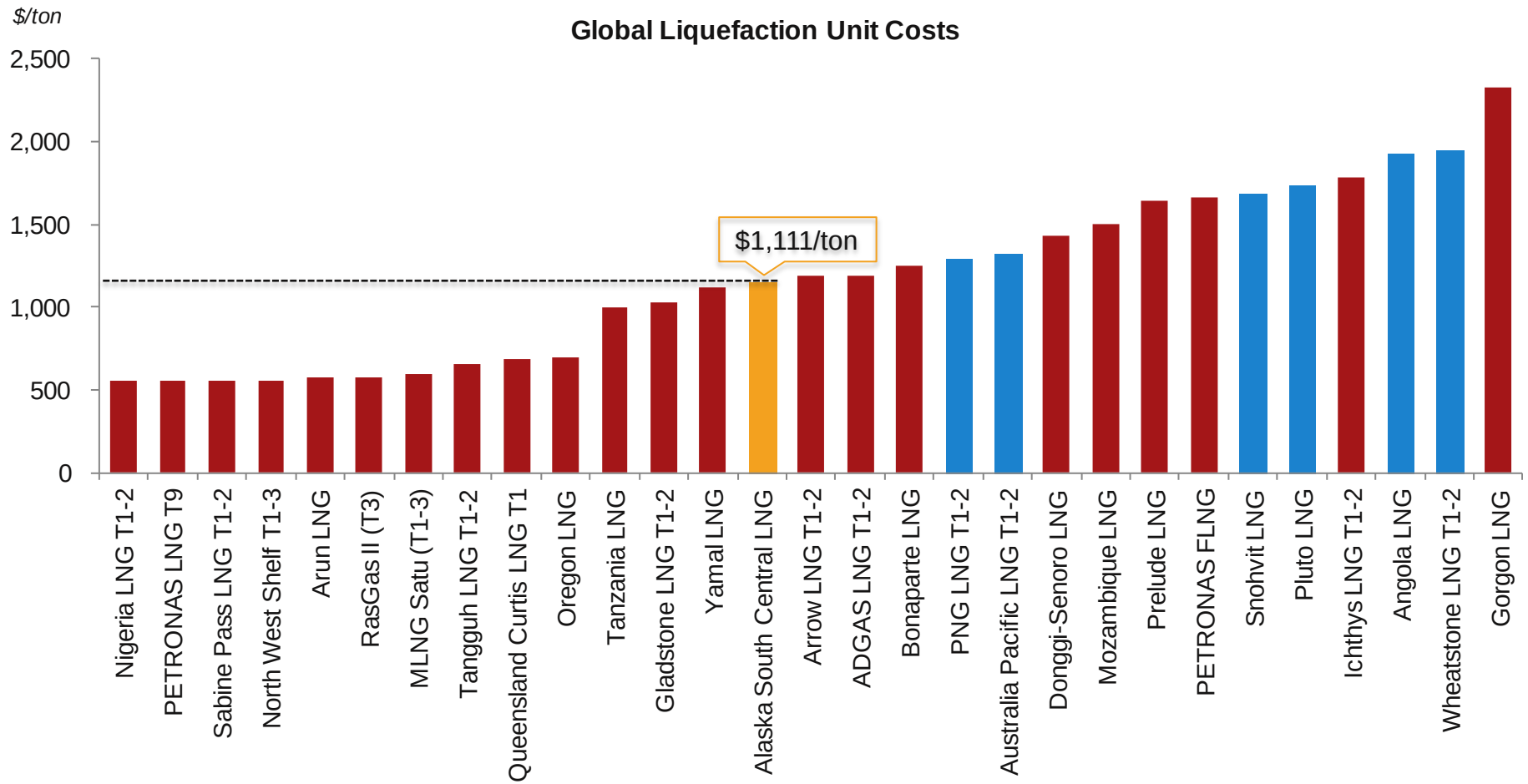
How Would $20bn for an 18 mmtpa Liquefaction Facility Compare With Other Recent Projects?



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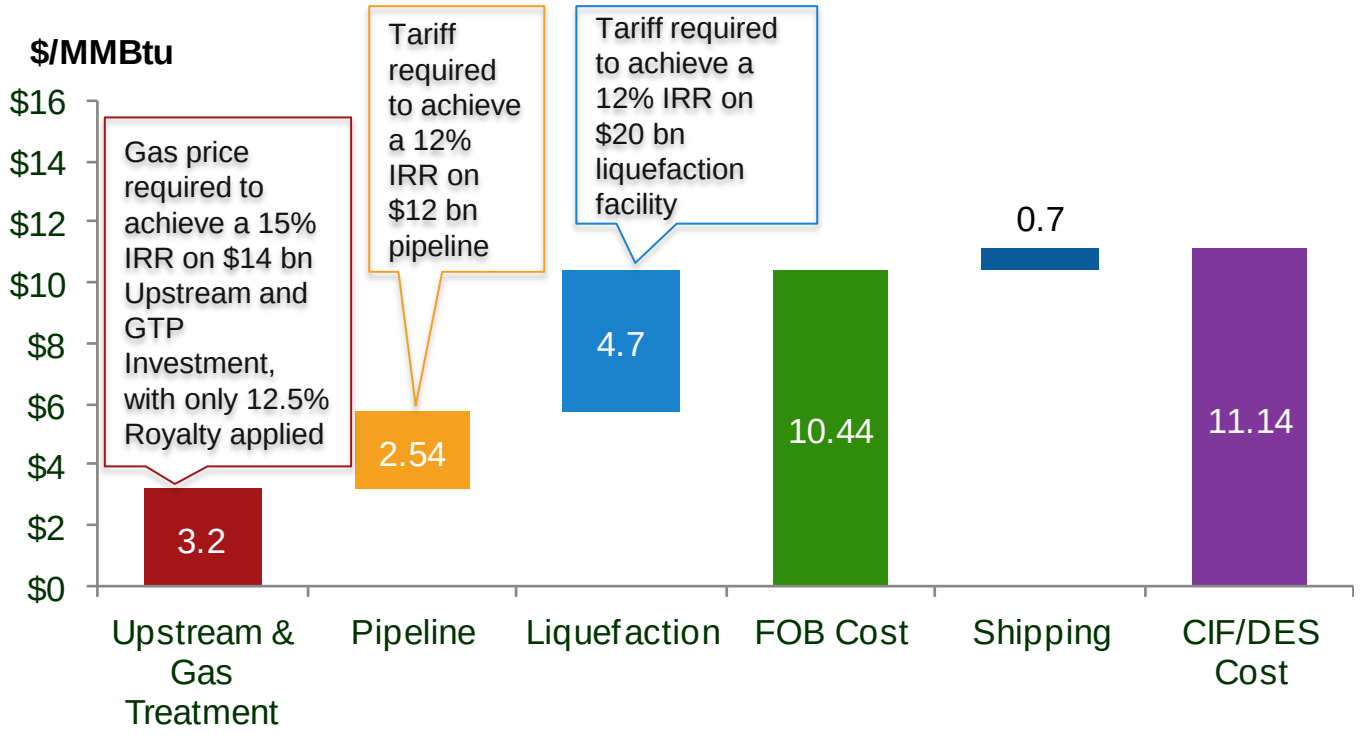
Breakeven Economics for Hypothetical $46bn Project

~$1,111/ton
At this unit cost level, liquefaction spend would be ~$20bn



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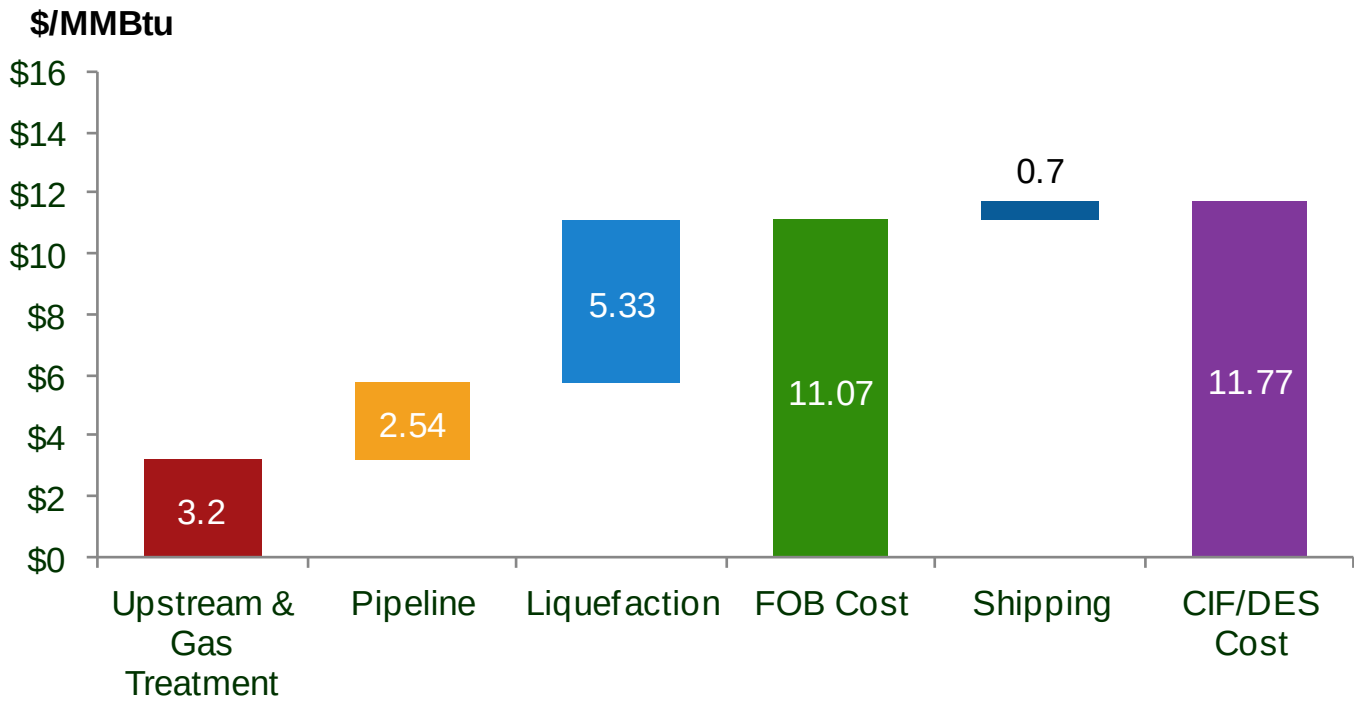
What if Liquefaction Cost Reached $/ton Costs of Asia-Pacific LNG or PNG LNG?

~$1,300/ton
At this unit cost level, liquefaction spend would be ~$22.7bn



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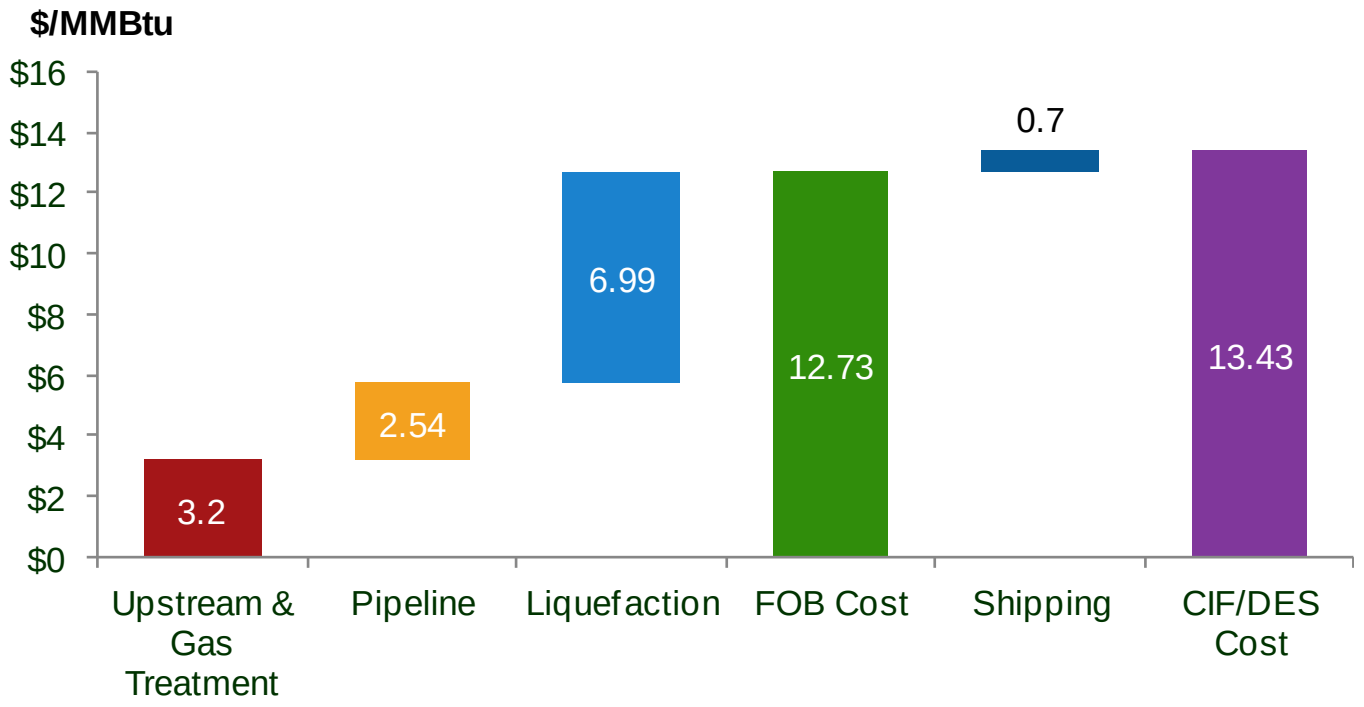
What if Liquefaction reached $/ton costs of Pluto LNG or Snohvit LNG?

~1,700/ton
At this unit cost level, liquefaction spend would be ~$29.7bn



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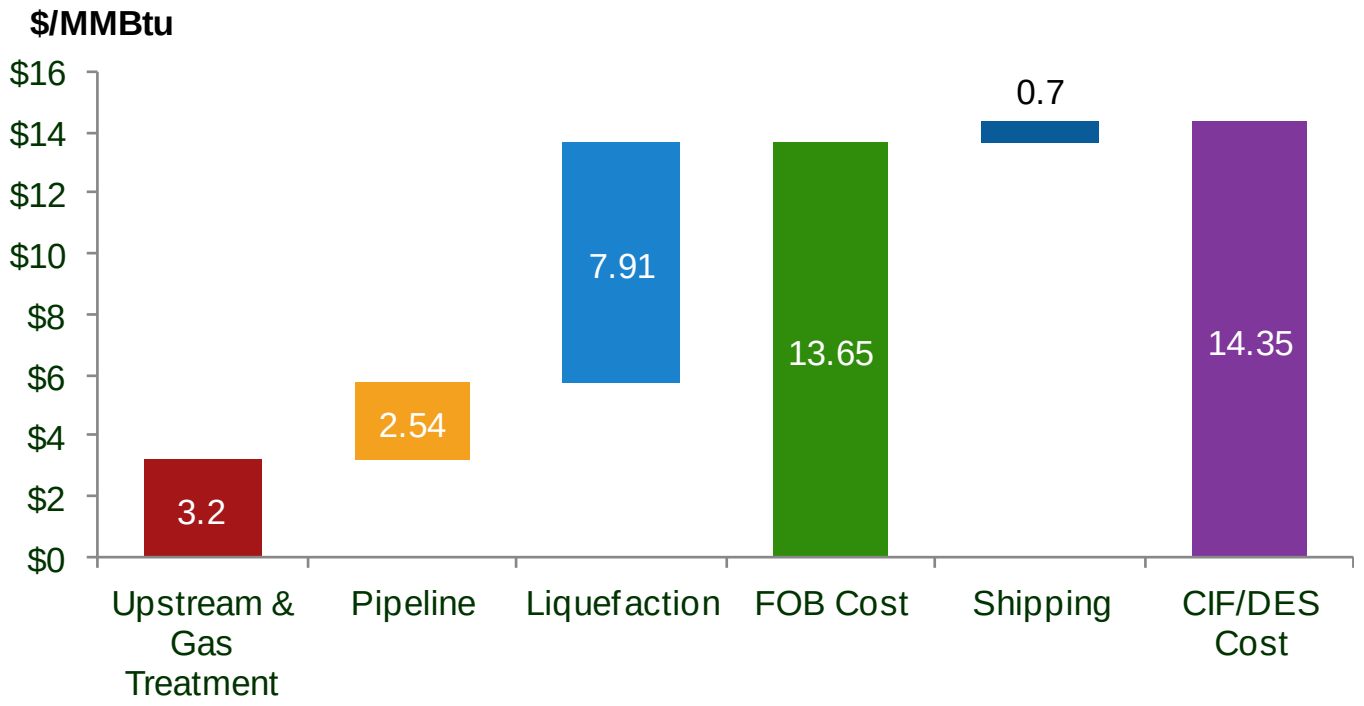
What if Liquefaction reached $/ton costs of Angola LNG or Wheatstone LNG?

~1,900/ton
At this unit cost level, liquefaction spend would be ~$33.6bn



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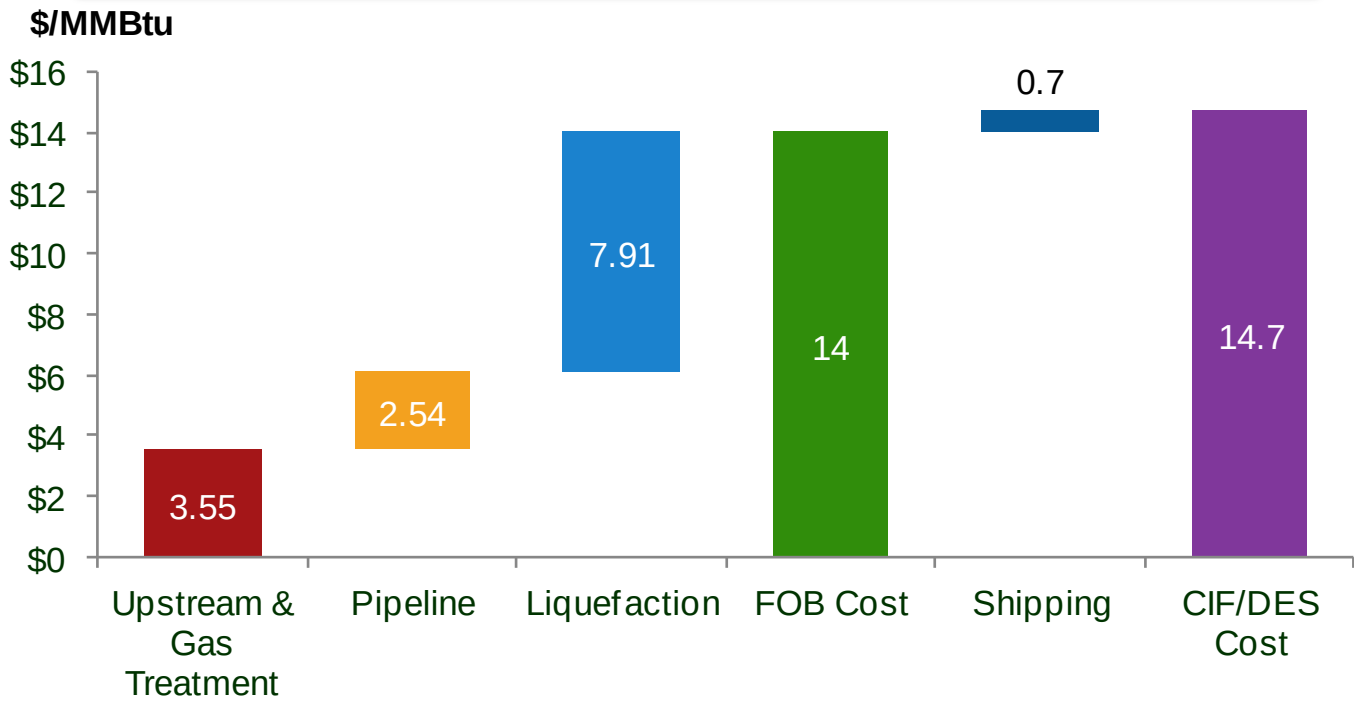
What if Upstream Production Also Faced a 16.7% Royalty and a 33% Production Tax?

~1,900/ton
At this unit cost level, liquefaction spend would be ~$33.6bn
Total Project Spend would be ~$58/bn



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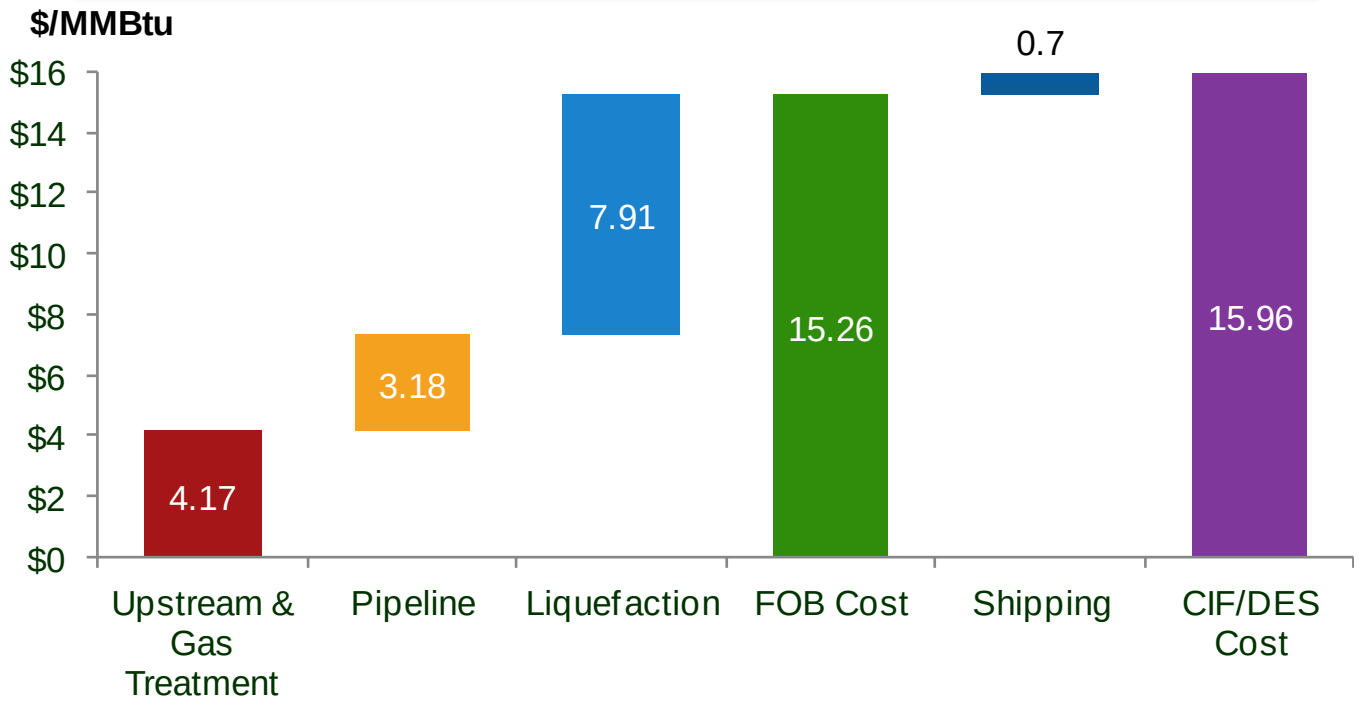
And What If Upstream and Pipeline Costs Were Also 25% Above Base Case?

~1,900/ton
At this unit cost level, liquefaction spend would be ~$33.6bn
Total Project Spend would be ~$64.5/bn



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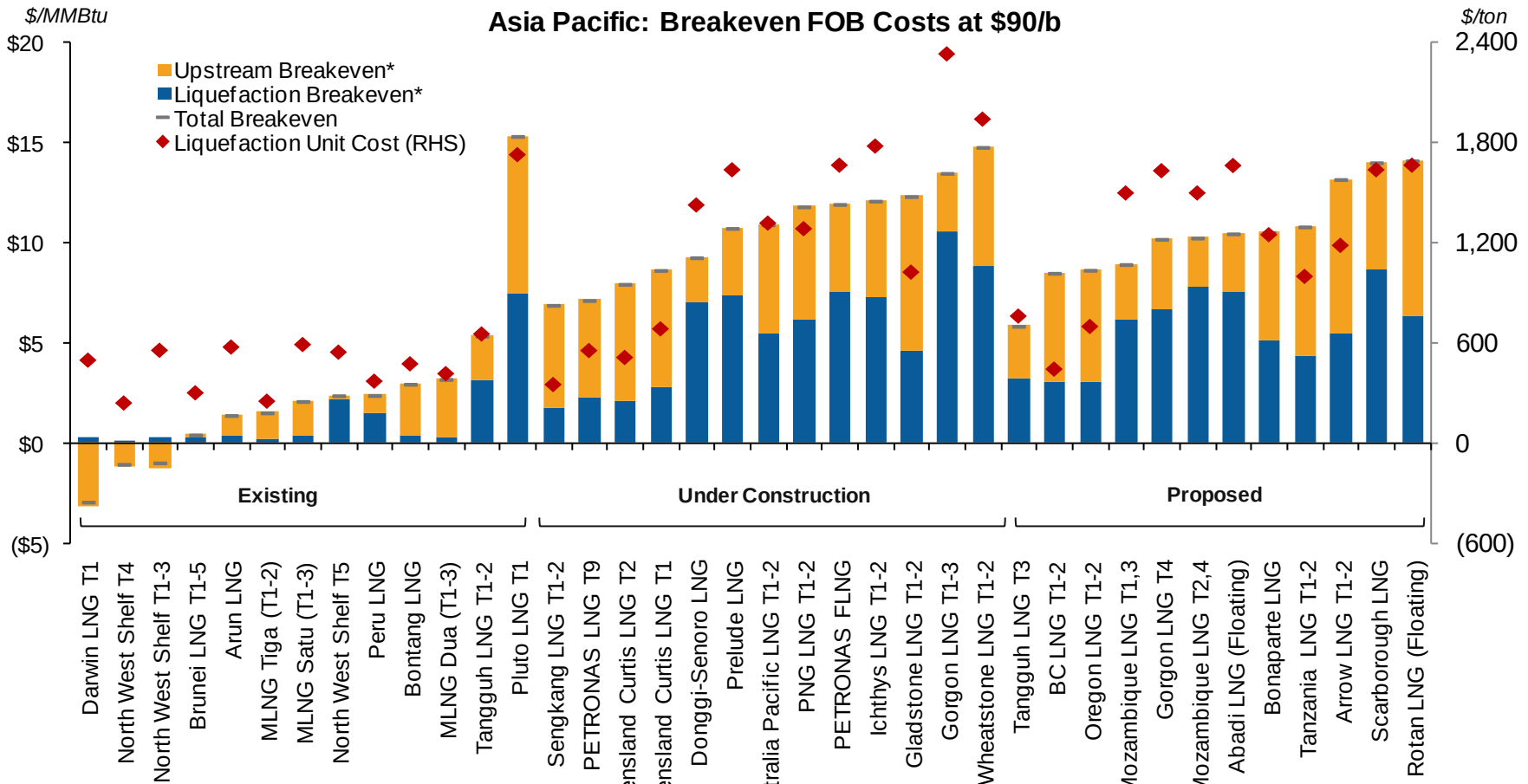
Benchmark Against Asia Pacific Breakeven Costs



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