

Comparison of Netbacks from Potential LNG Project with ALCAN Pipeline Project

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Econ One Review

- **Analyzed economic assumptions & netback values associated with potential LNG and pipeline projects**
 - **Port Authority proposal**
 - **Other potential LNG configurations**
 - **TransCanada proposal**
- **Reviewed Port Authority proposal, assumptions and analysis**
- **Reviewed Administration analysis of LNG and pipeline netbacks**
- **Reviewed information from various LNG specialists and government agencies**

Econ One Review

(cont'd)

- **Analyzed netback @ the inlet to GTP**
 - **\$ / MMBtu**
 - **Total value of netback**
 - **Nominal \$**
 - **Real (\$2008)**
 - **NPV-10**
- **Project that “maximizes” the netback creates highest value for resource owners**
 - **Producers**
 - **State**

Project Netback Analyses

LNG Exports to Asia

- 2.7 Bcf/d (Port Authority proposed)
- 4.5 Bcf/d (Little Susitna proposed)

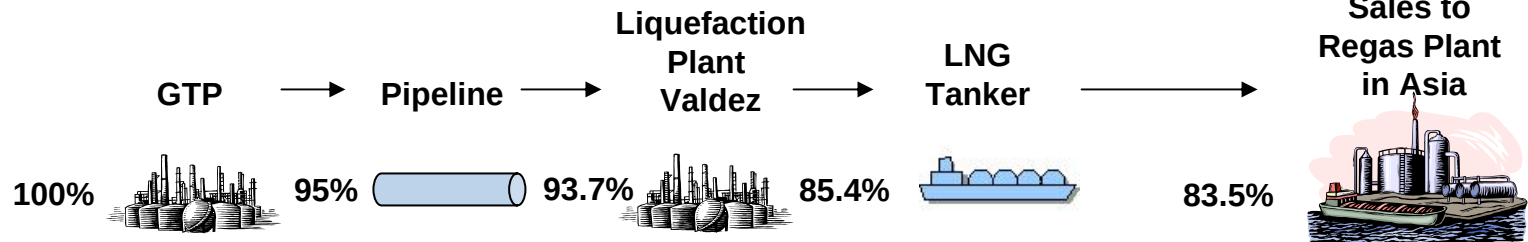
Pipeline to Alberta

- 3.5 Bcf/d (TransCanada minimum volumes)
- 4.5 Bcf/d (TransCanada base volumes)

Overview of LNG v. Pipeline Delivery

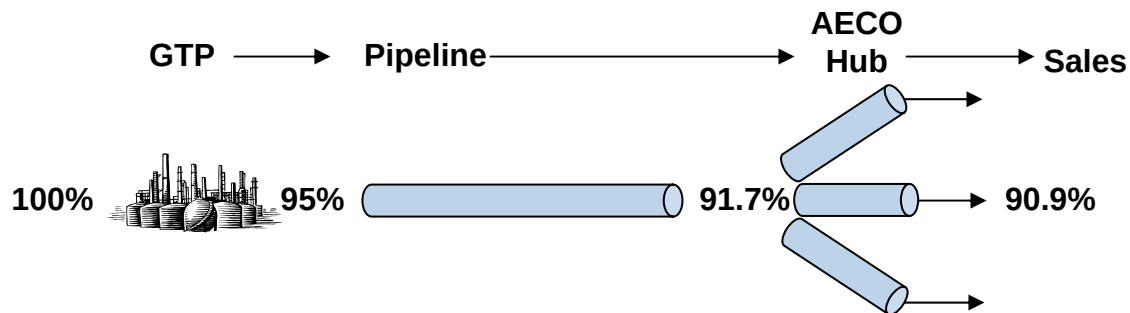
LNG and Pipeline Delivery Chain

LNG Deliveries



Aggregate Loss:
16.5%

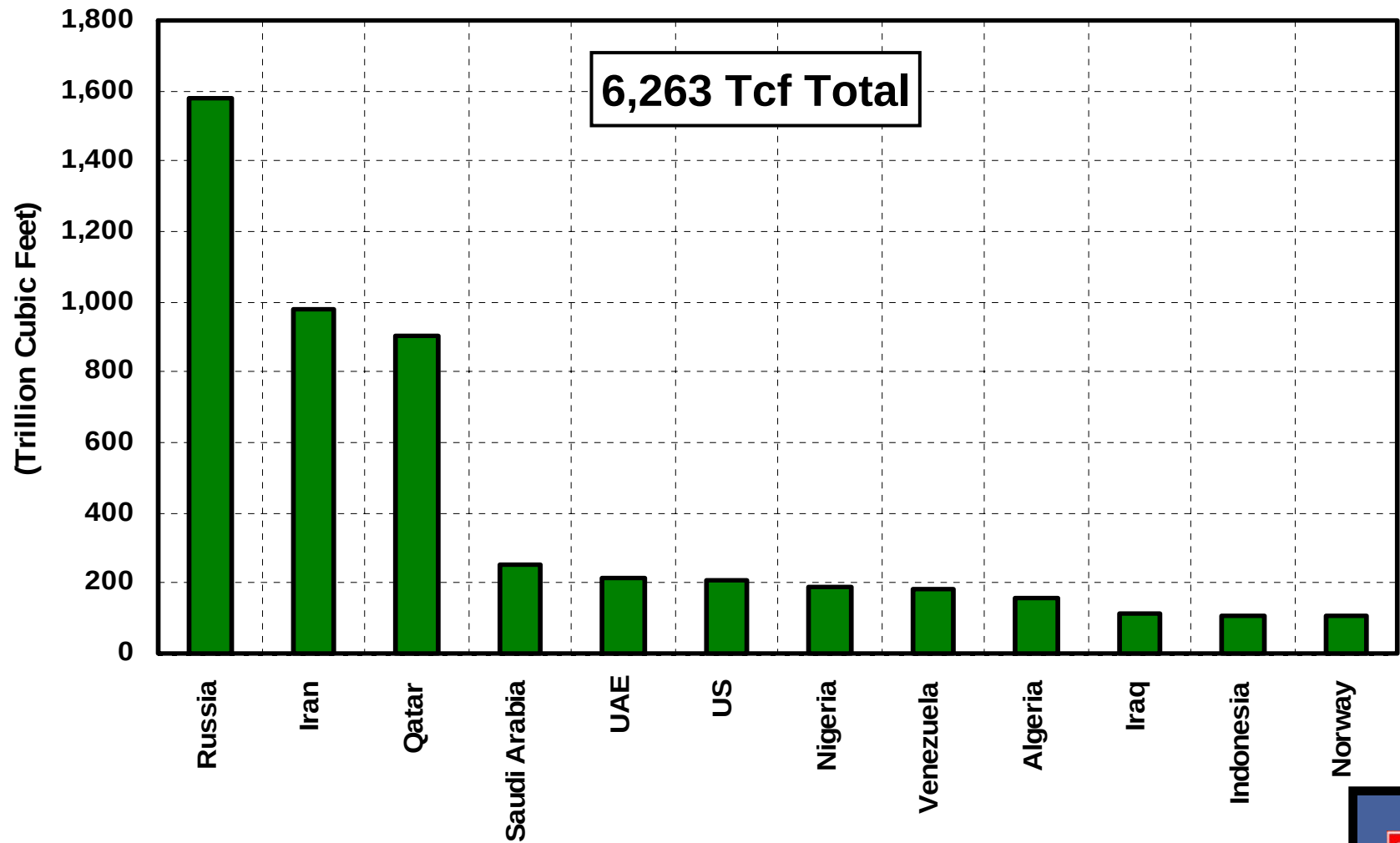
Pipeline Deliveries



Aggregate Loss:
9.1%

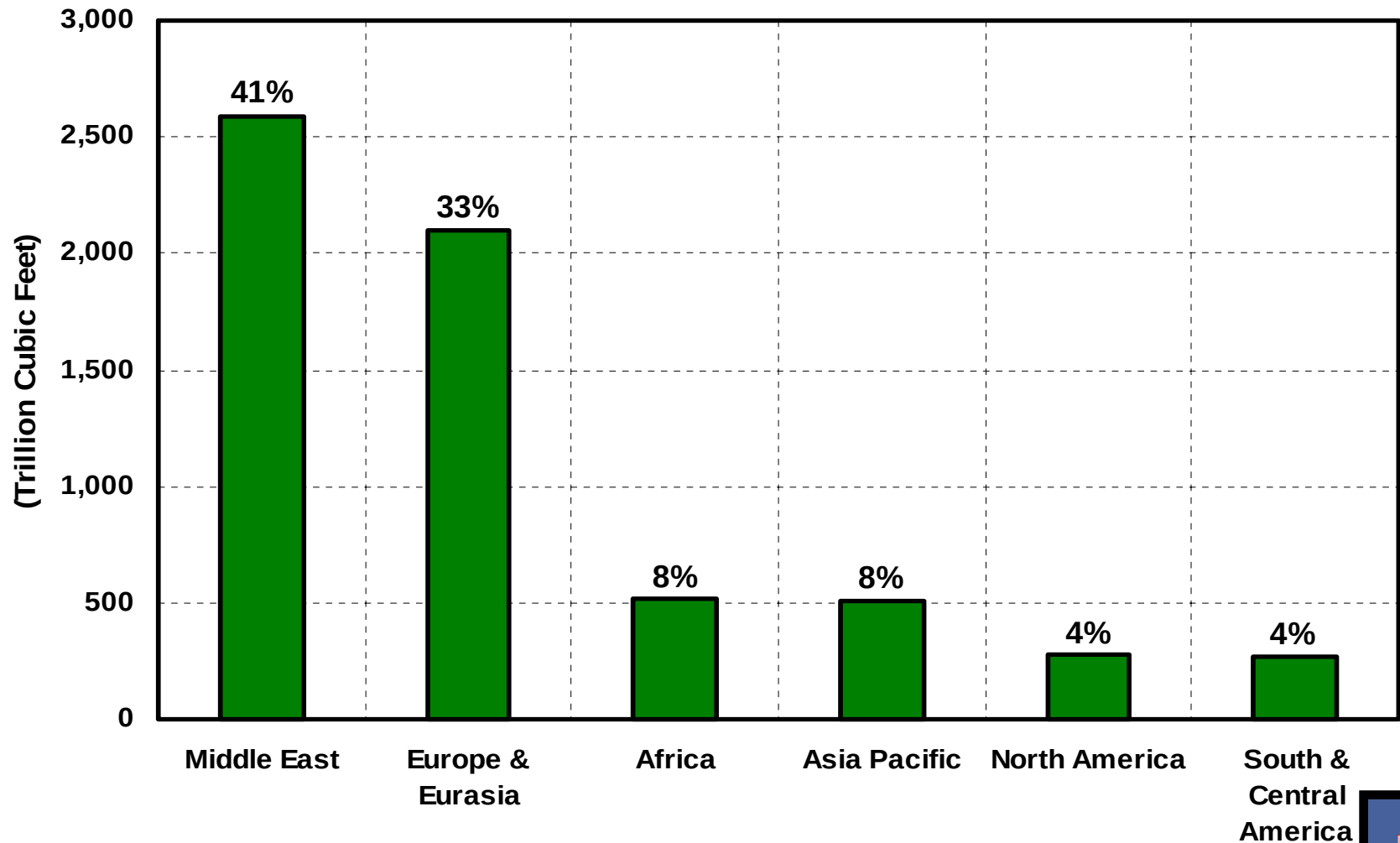
Supply / Demand

Worldwide Proved Gas Reserves



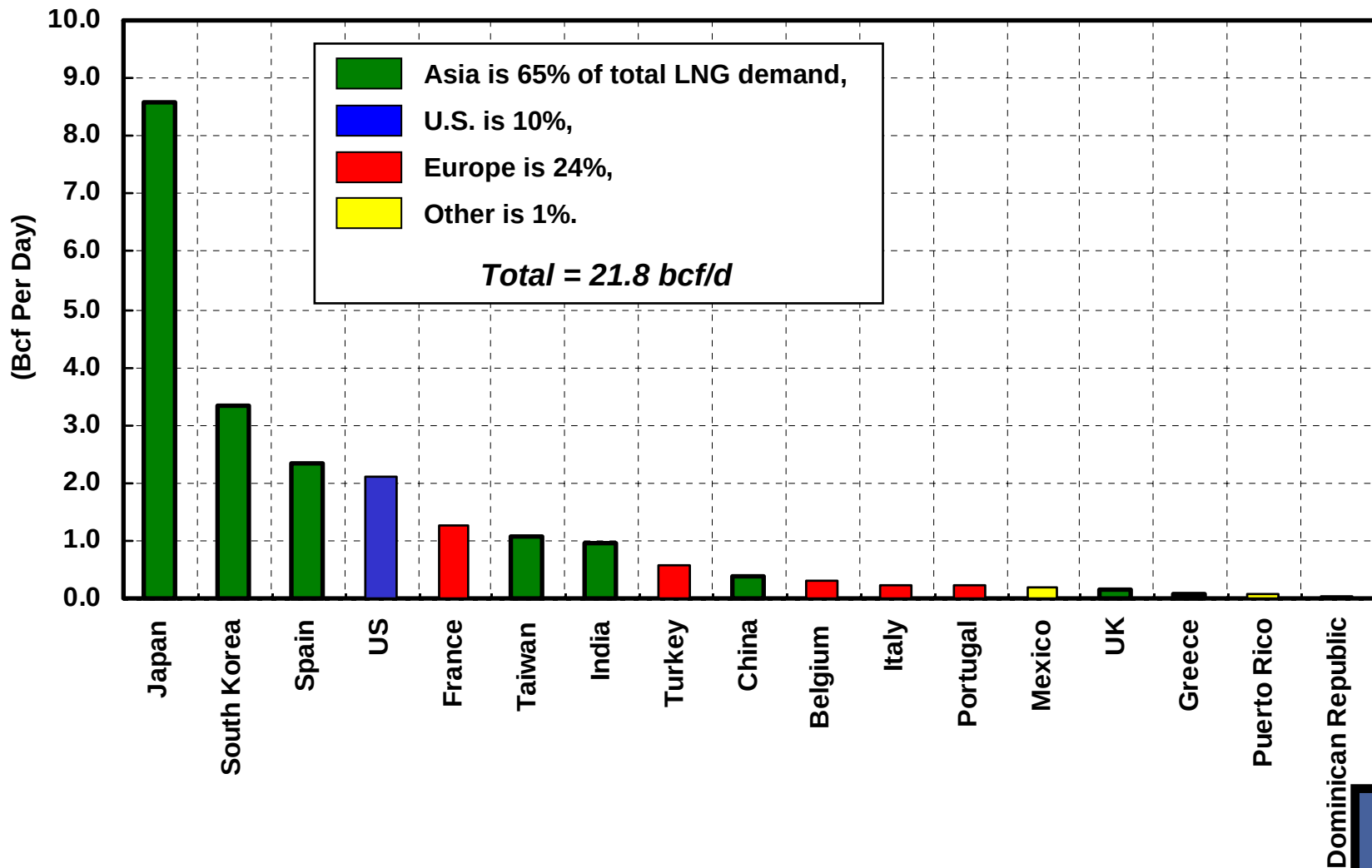
Source: BP Statistical Review 2008;
Represents 80% of known reserves in 2007.

Worldwide Proved Gas Reserves by Region



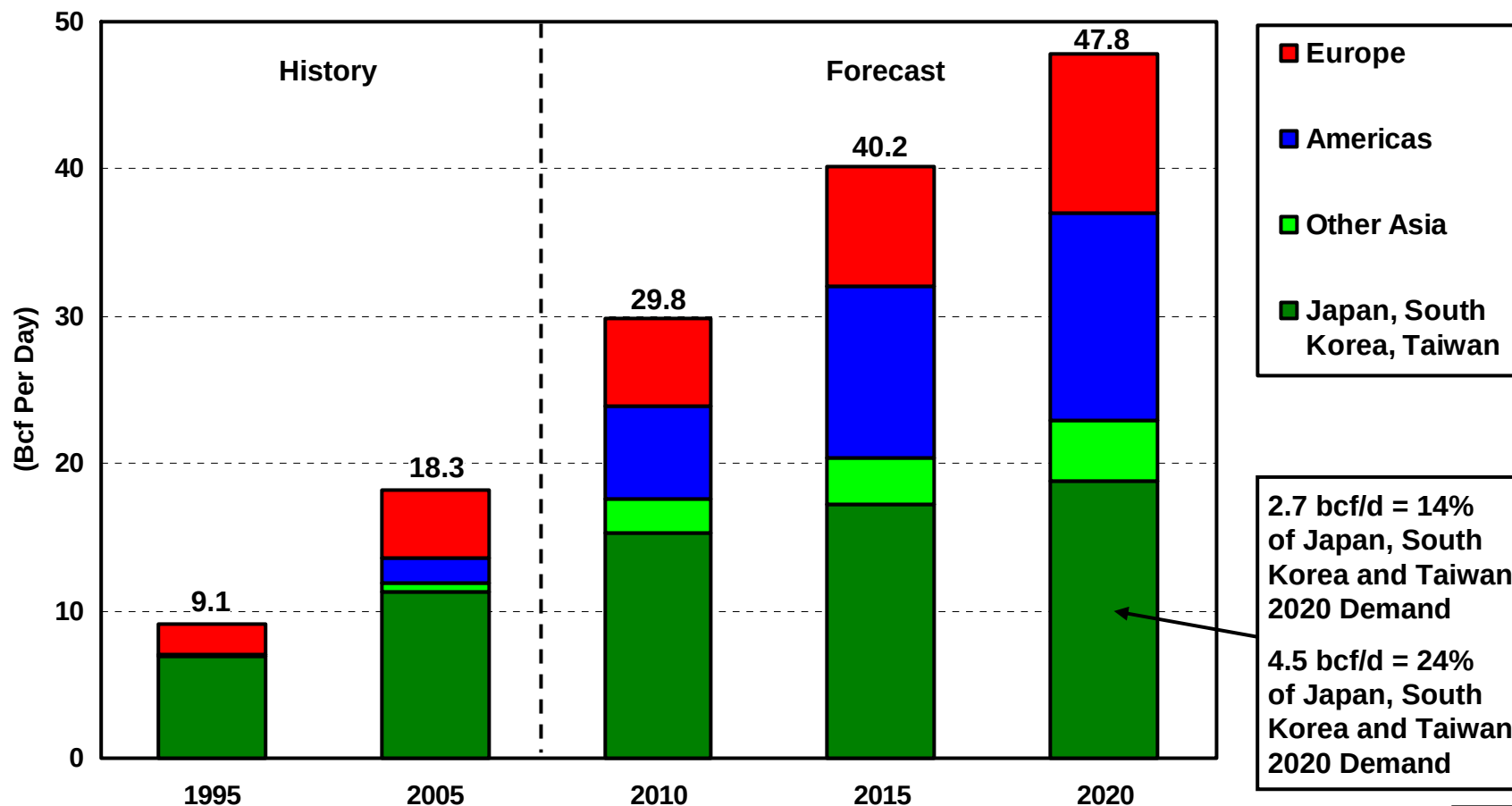
Source: BP Statistical Review 2008.

Current Worldwide LNG Demand



Source: BP Statistical Review 2008.

Projected LNG Demand by Region



Source: National Petroleum Council ;
Jensen Associates, August 2007

Liquefaction Plant Capacities by Region

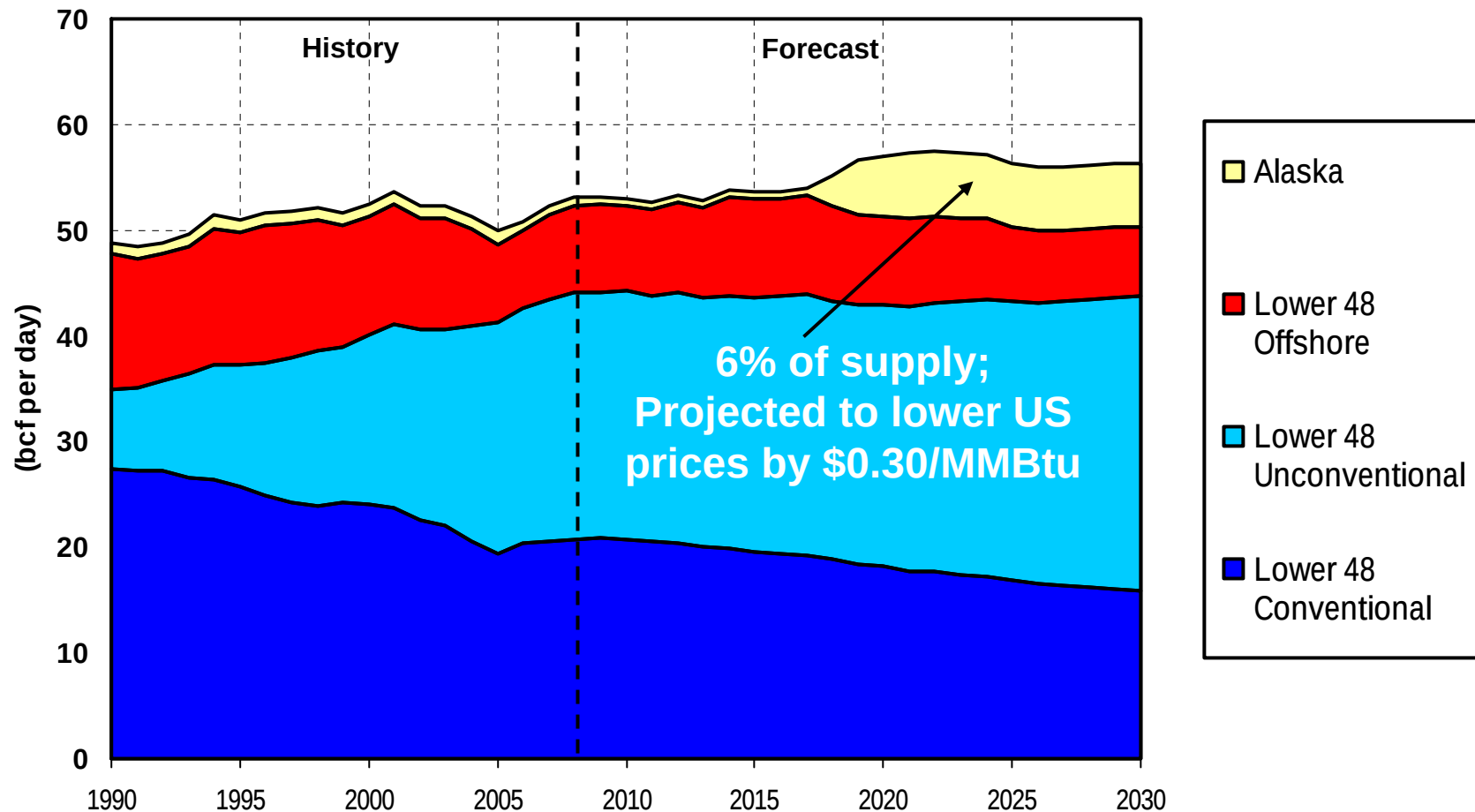
(Pacific Trade)

Pacific Basin	
Category	Capacity
	(Bcf/Day)
(1)	(2)
Operating	9.85
Under Construction	3.50
Under Consideration	6.24
Total	19.59

Middle East	
Category	Capacity
	(Bcf/Day)
(3)	(4)
Operating	6.06
Under Construction	6.84
Under Consideration	4.63
Total	17.53

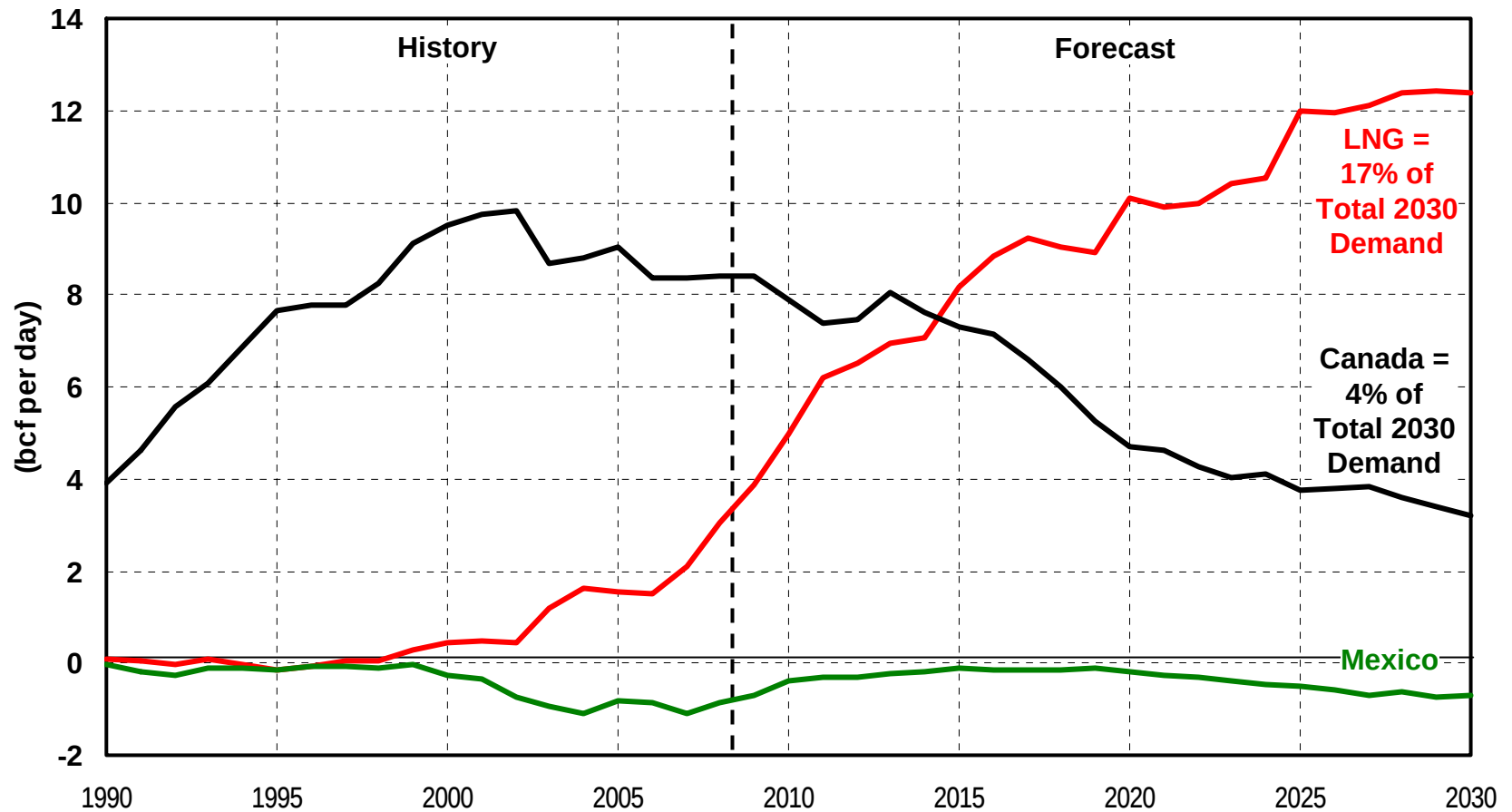
U.S. Gas Production by Source

(1990 - 2030)



U.S. Net Natural Gas Imports

(1990 - 2030)

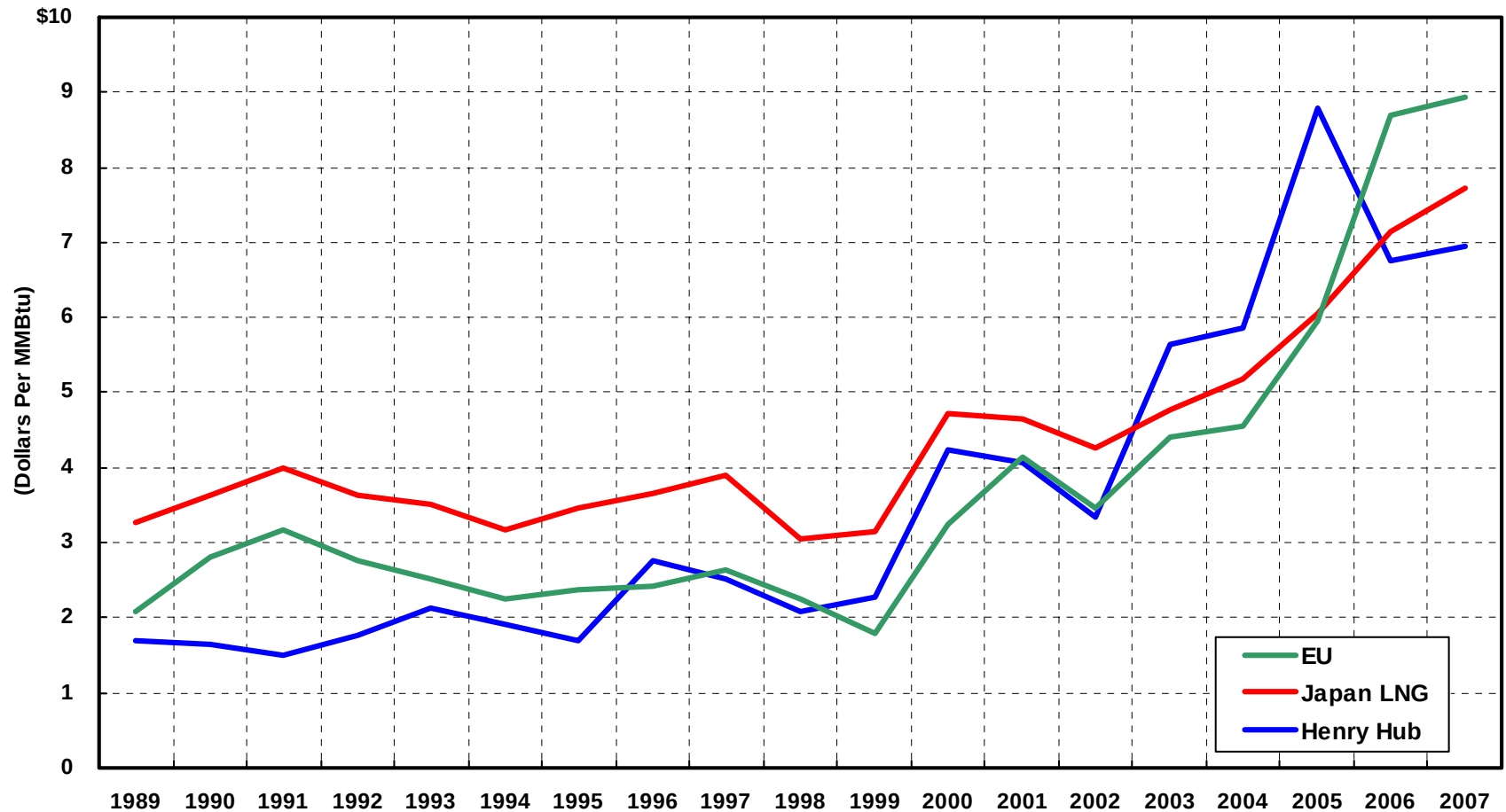


Source: EIA AEO 2007.

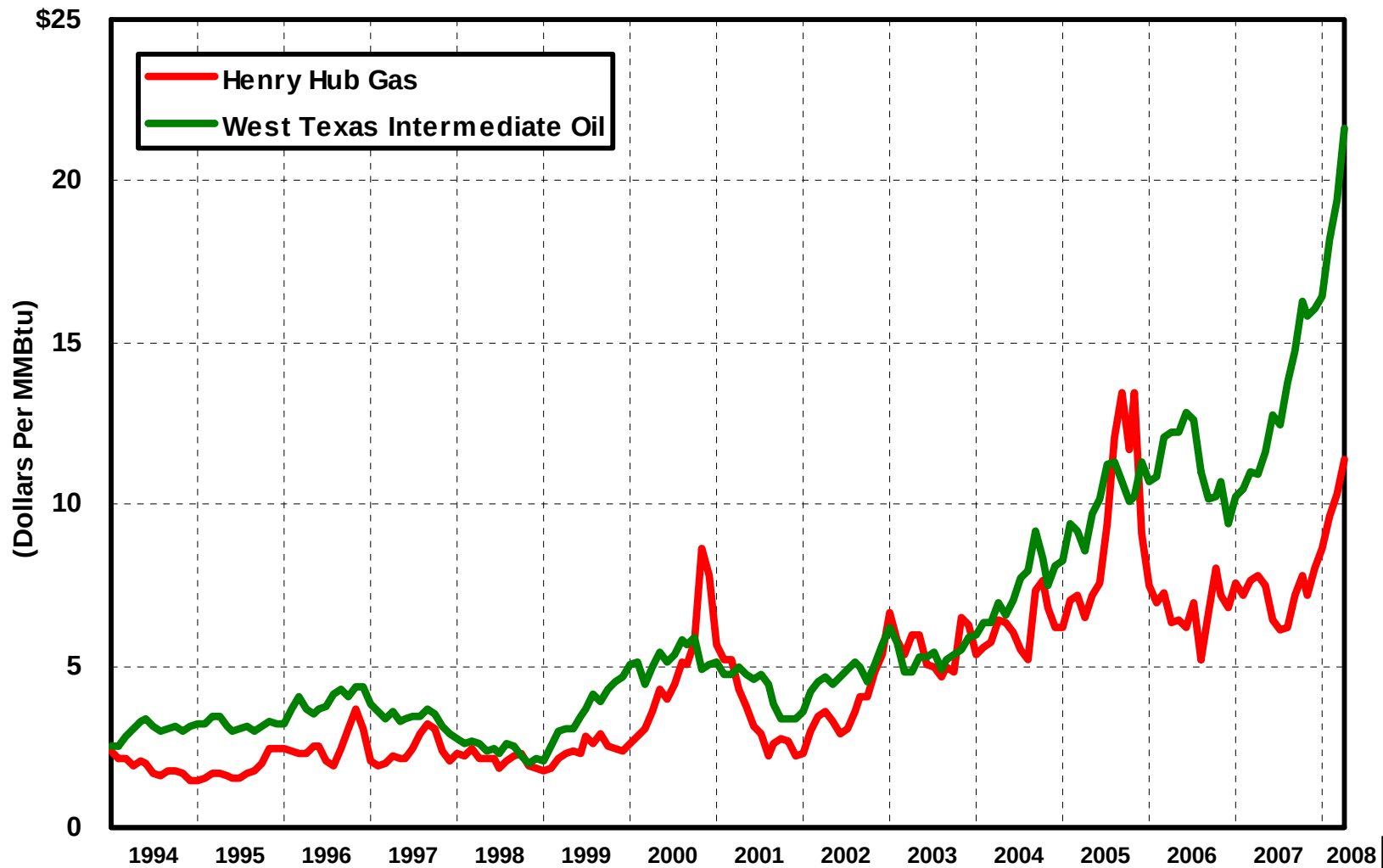
Historical Pricing

Historical Gas Prices

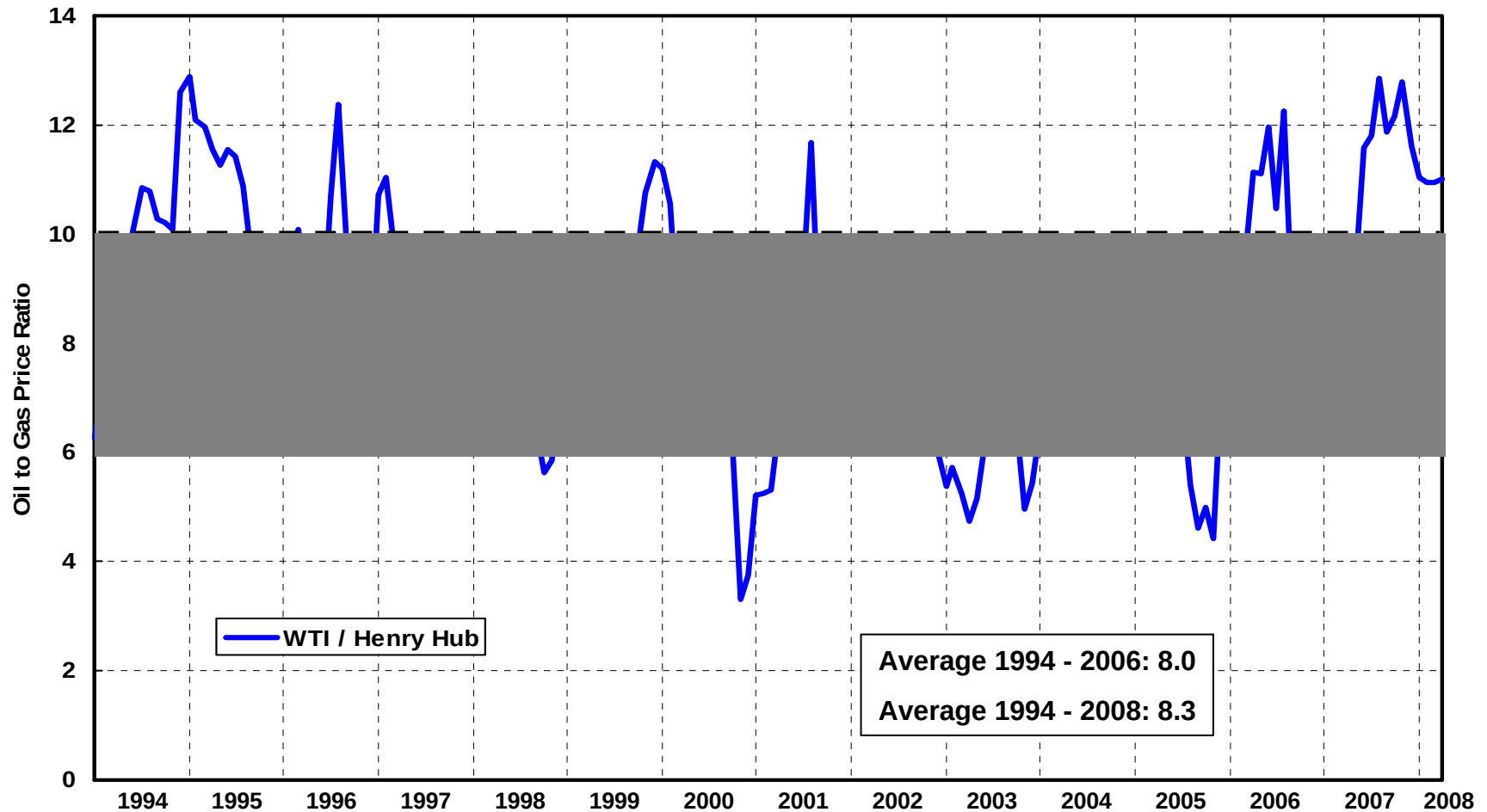
(U.S., Japan and Europe)



U.S. Natural Gas and Crude Oil Prices (1994 - 2008)

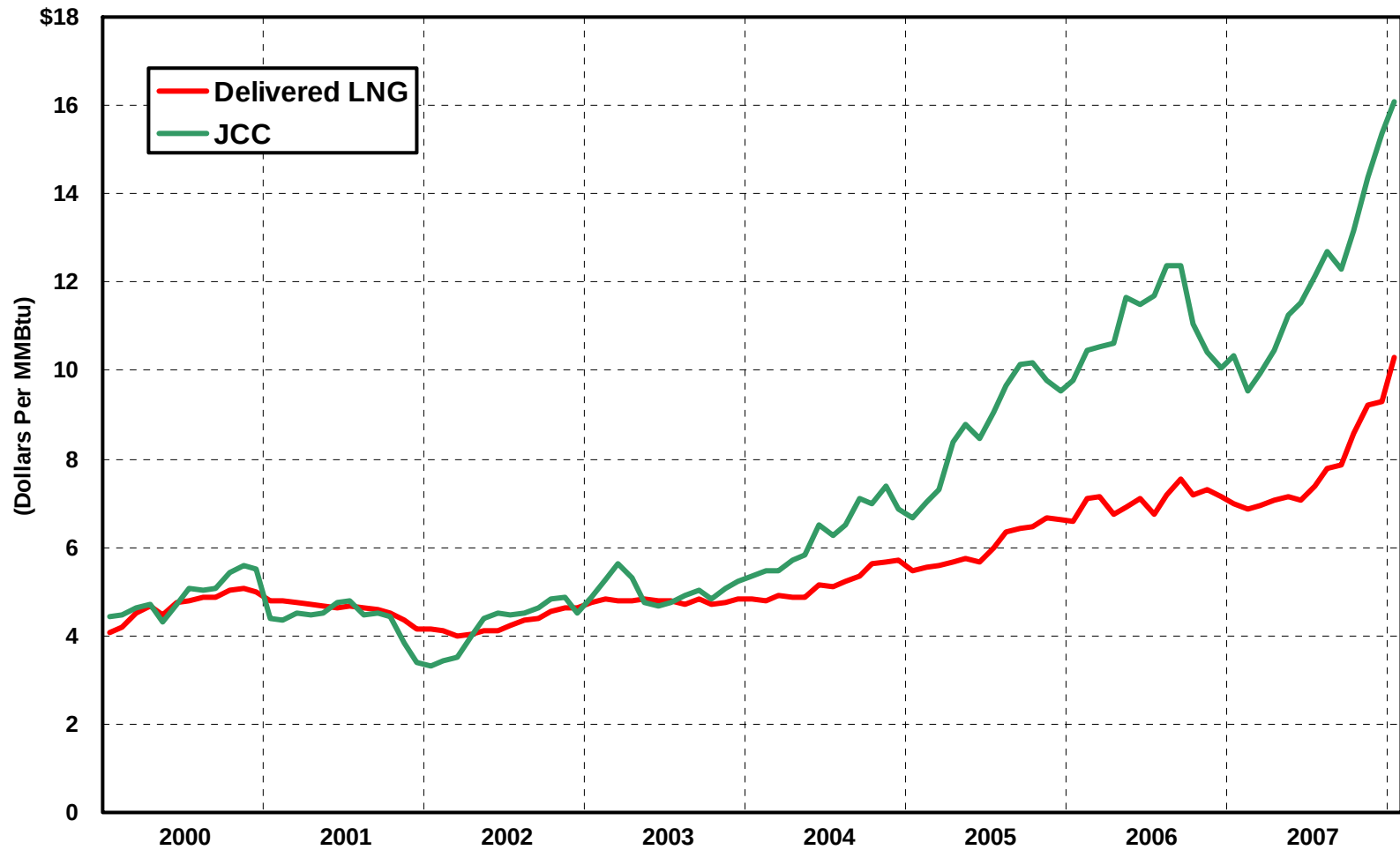


Historical Relationship Between Oil and Gas Prices in the U.S.



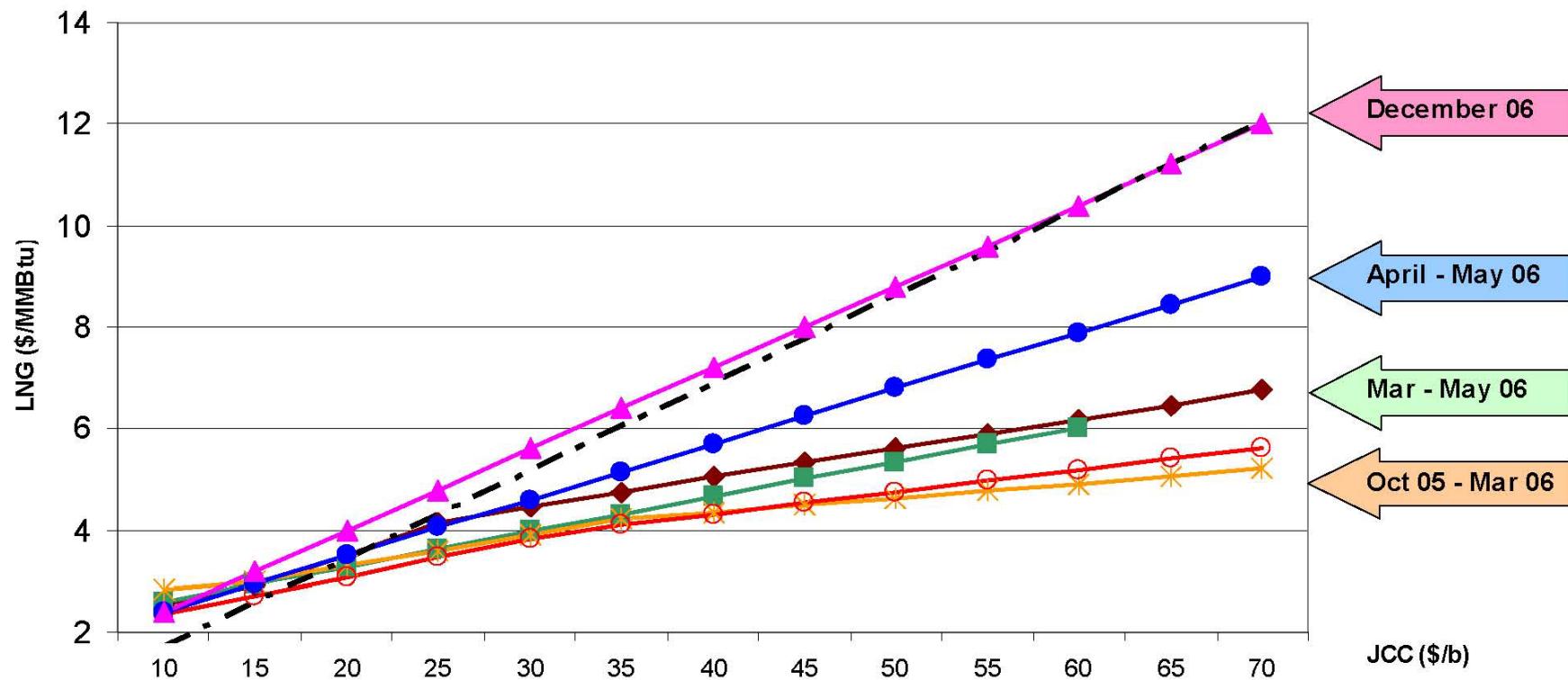
Japanese Crude Oil and Gas Prices

(2000 - 2008)



Evolution of LNG Pricing in Asia

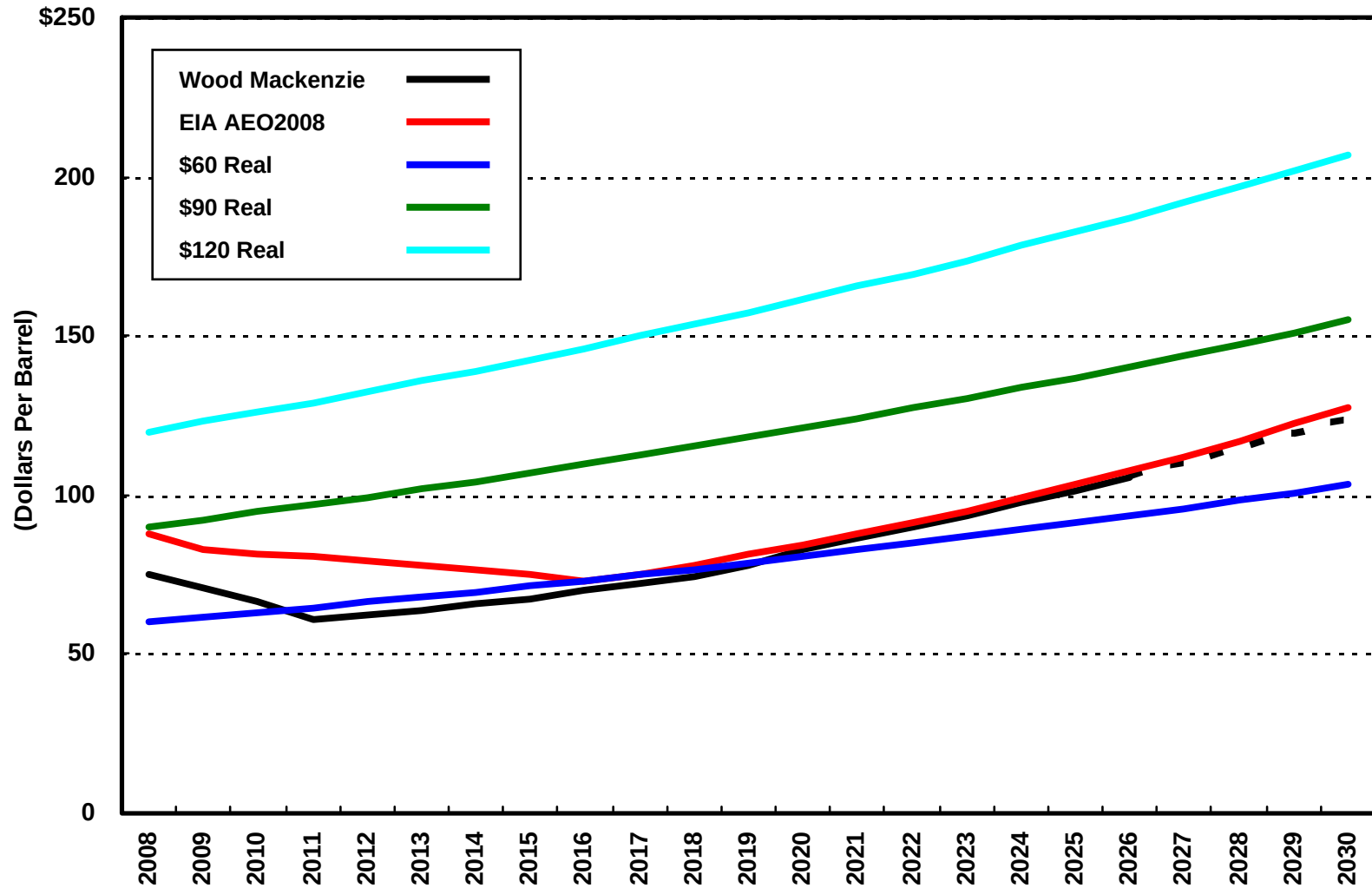
(Relationship of Gas to Oil Prices Seen in Recent Contracts)



Source: Facts Global Energy, "Evaluating Natural Gas Import Options for the State of Hawaii", April 2007.

Oil and Gas Price Forecasts

Oil Prices Used in Analyses



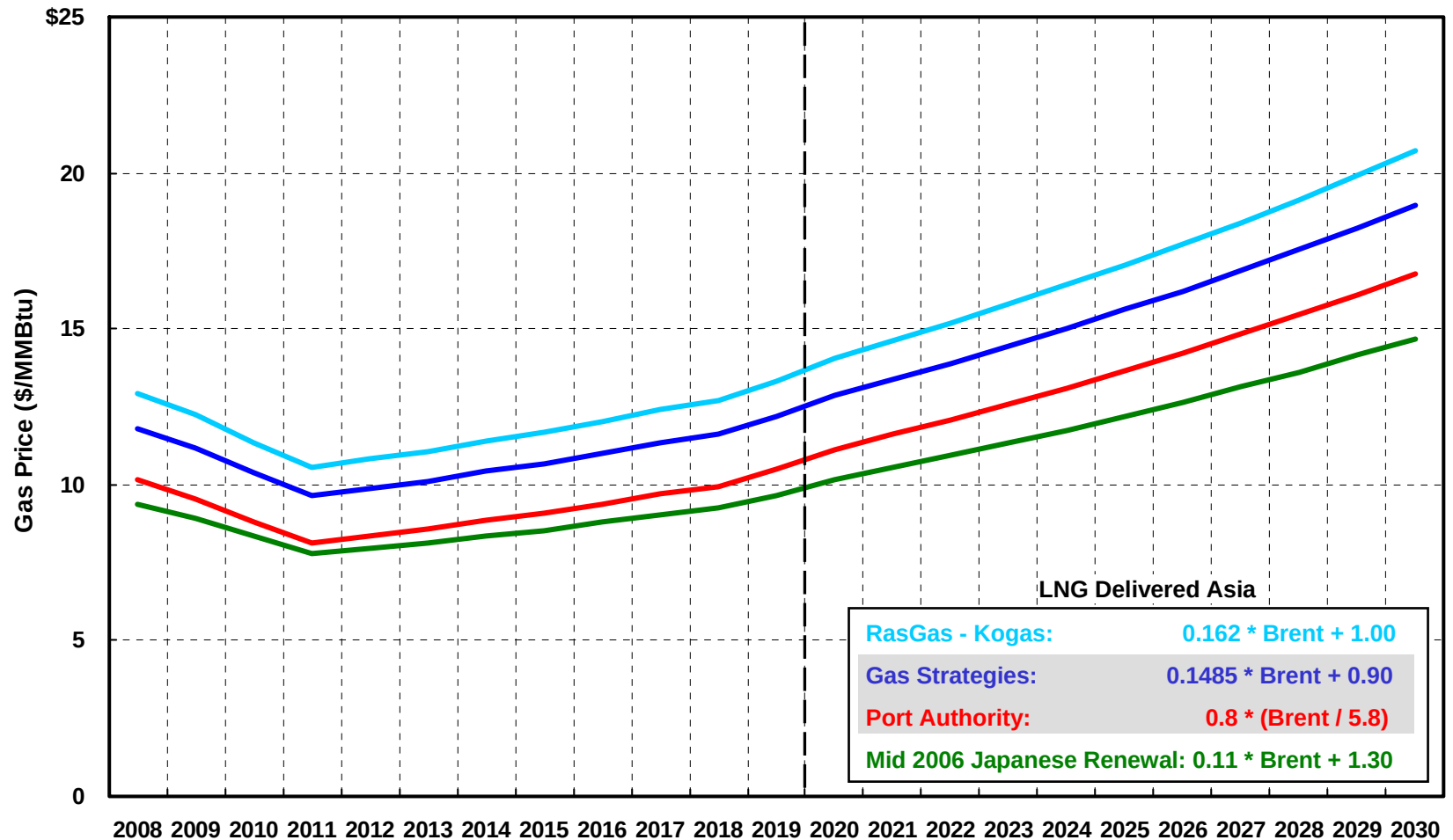
Note: 2.5% annual price inflation.

Prospects for Asian LNG Prices

- **There is a wide range of prices depending on contract vintage**
- **Recent contracts have reflected stronger links to oil**
- **Many contracts are on a provisional basis as previously (low-priced) formulas have expired or are not applicable at current oil price levels**
- **Relatively high priced opportunities in Asia will attract gas supplies to that region**
 - **Increasingly competitive among suppliers**
 - **Opportunities for buyers**
 - **Price will be dependent on the supply situation at the time of contracts**

Gas Price Forecasts Used in Analyses

(Using Wood Mackenzie Oil Price Forecast)

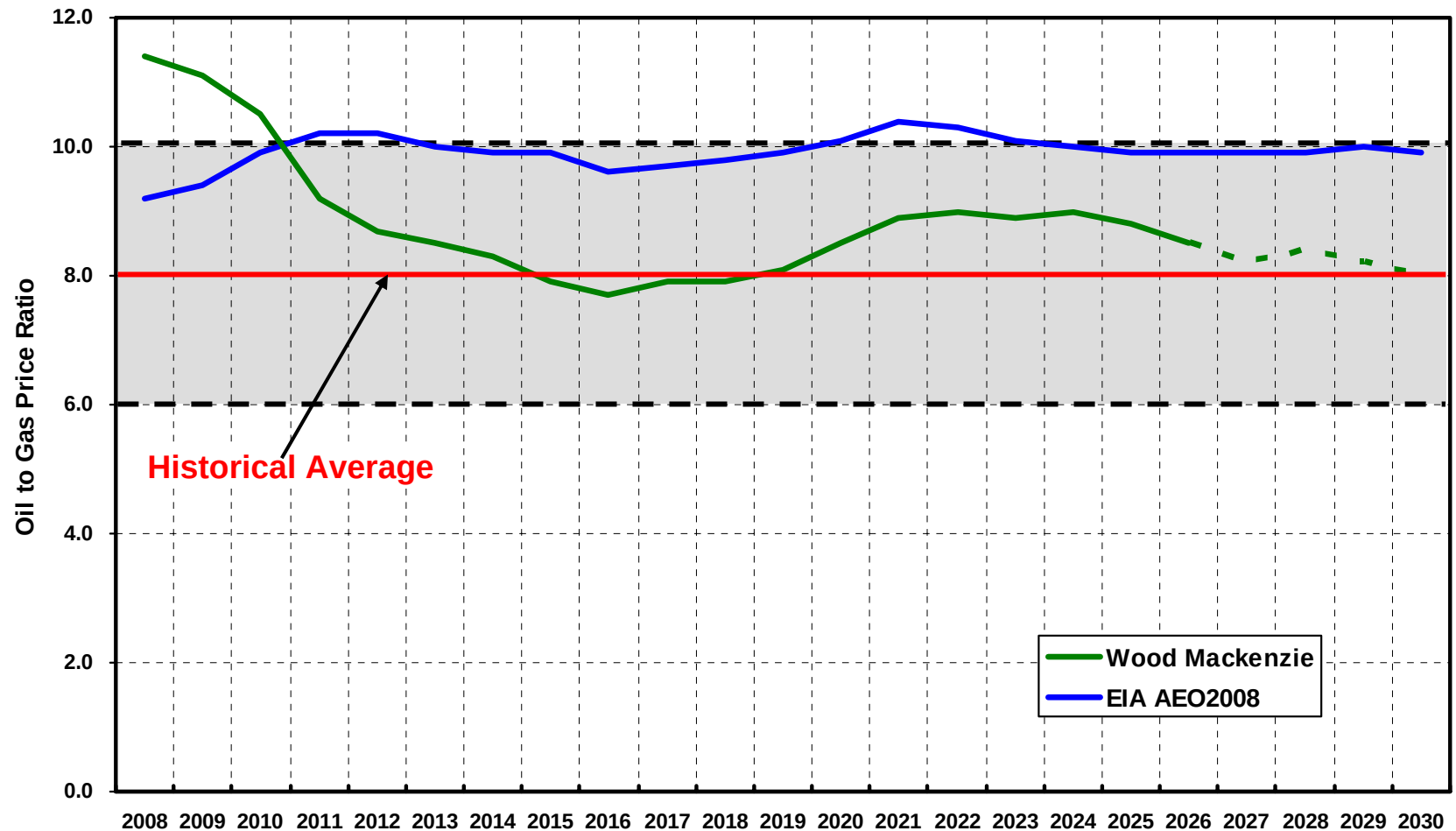


 = More Likely Price Scenarios

Prospects for U.S. Gas Prices

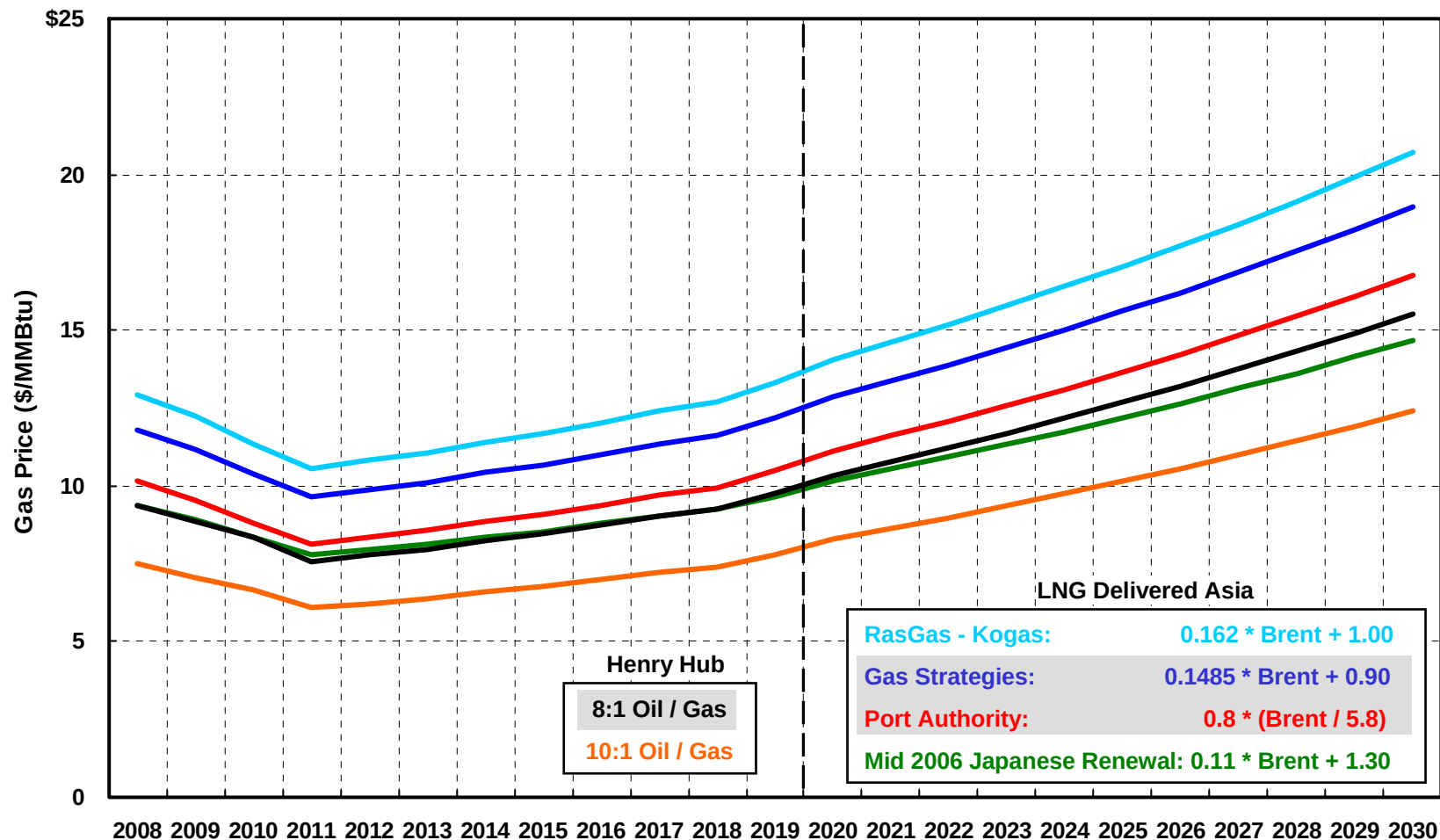
- Historically, gas has been priced between $1/6$ & $1/10$ the value of oil, with the long run average near $1/8$
- The recent run-up in oil prices & relatively abundant domestic production of natural gas have kept that relationship above historical levels
- Many see the oil/gas relationship returning to more historical levels (i.e. convergence) as:
 - Domestic supplies decline & become more costly to produce
 - LNG imports are drawn to higher priced regions (e.g. Asia)
 - Greenhouse/carbon emission concerns put coal out of favor & put natural gas in favor as the fuel of choice for electricity generation

Ratio of Forecasted U.S. Oil and Gas Prices



Gas Price Forecasts Used in Analyses

(Using Wood Mackenzie Oil Price Forecast)



= More Likely Price Scenario(s)

Assumptions Used in Comparative Netback Analyses

Assumptions Used in Comparative Netback Analyses

➤ First Gas	2020
➤ Capitalization	70% Debt; 30% Equity (pre-operation) 75% Debt; 25% Equity (post-operation)
➤ Debt Costs	5.5% Guaranteed; 7.0 % Non-Guaranteed
➤ Equity Returns	14%
➤ Capex/Opex	Administration (Westney): GTP & pipeline segments Port Authority (Bechtel): LNG plant Sensitivity at higher costs
➤ Fuel Use	Administration (Westney) for GTP/pipeline segments Port Authority (Bechtel) for LNG plant
➤ Shipping Costs	Port Authority: Approximately \$0.75/MMBtu + Fuel
➤ Gas Composition & NGL Extraction	1.118 MMBtu / mcf Full Extraction @ Alberta Partial Extraction @ Valdez (LNG case)

Comparison of Capital Costs for LNG Project

(2.7 bcf/d LNG Project)

	Port Authority (Bechtel)	Administration (Westney)
GTP	\$3.4Bn	\$5.0Bn
Pipeline	\$13.1Bn	\$11.5Bn
Total GTP/Pipeline	\$16.5Bn	\$16.5Bn
LNG Plant	\$7.9Bn (\$470/mmta)	\$12.7Bn (\$755/mmta)
Grand Total	\$24.4Bn	\$29.2Bn

Capital Costs Used in Netback Analyses

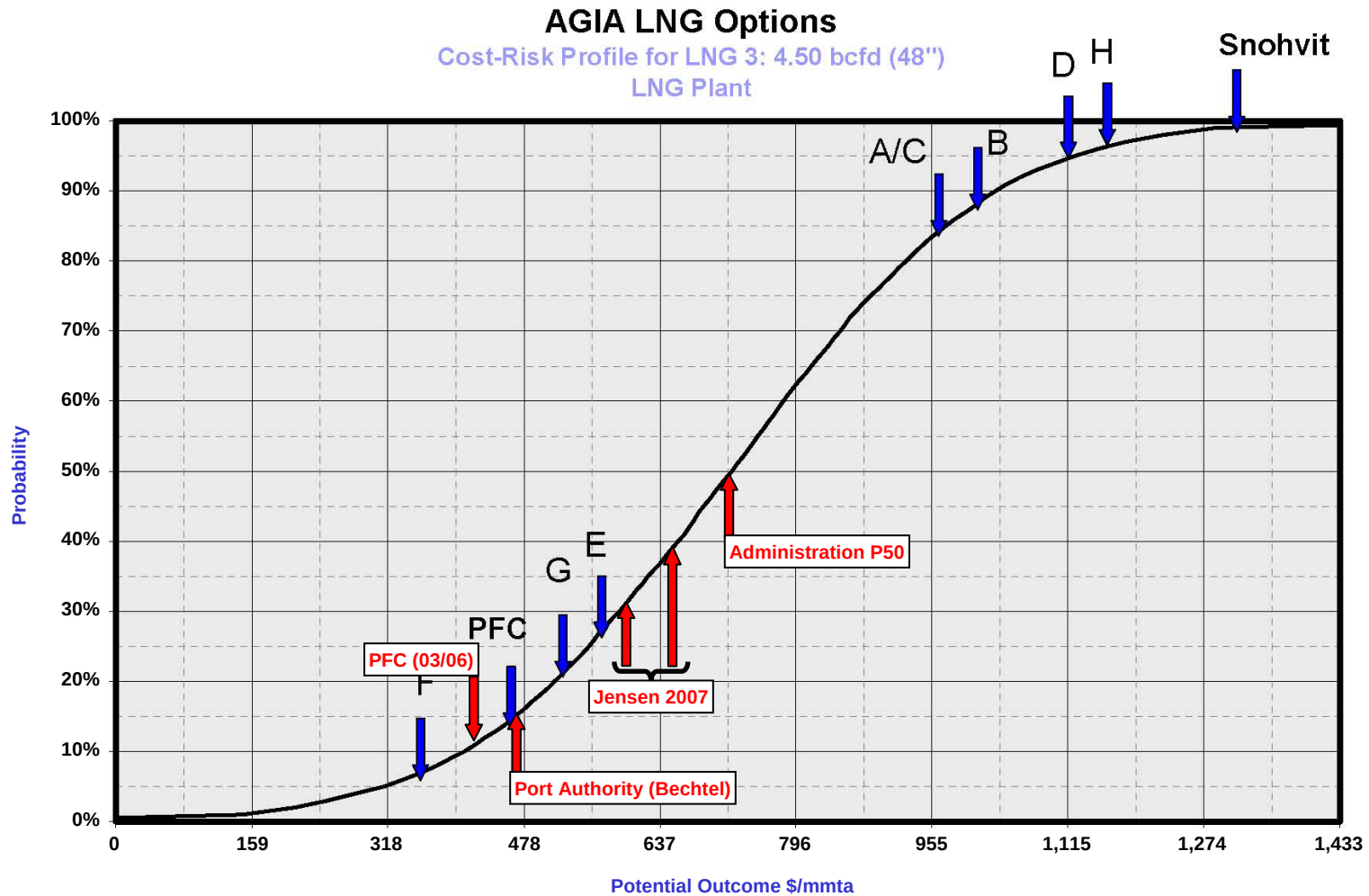
	LNG Project		Pipeline Project	
	2.7 bcf/d	4.5 bcf/d	3.5 bcf/d	4.5 bcf/d
	(Billion \$2007)			
	(1)	(2)	(3)	(4)
GTP	\$5.0	\$8.3	\$6.5	\$8.3
Pipeline				
Alaska	11.5	12.6	10.2	10.9
Canada	-	-	11.6	12.6
Total Pipeline	\$11.5	\$12.6	\$21.7	\$23.5
LNG Plant (Bechtel)	7.9	13.7*	-	-
LNG Plant (Westney)	12.7	21.1	-	-
Total (Bechtel LNG)	\$24.4	\$34.6*	\$28.2	\$31.8
Total (Westney LNG)	\$29.2	\$42.0	\$28.2	\$31.8

* Based on \$470/mt.

LNG Plant Costs

LNG Plant Costs Per Administration (Westney)

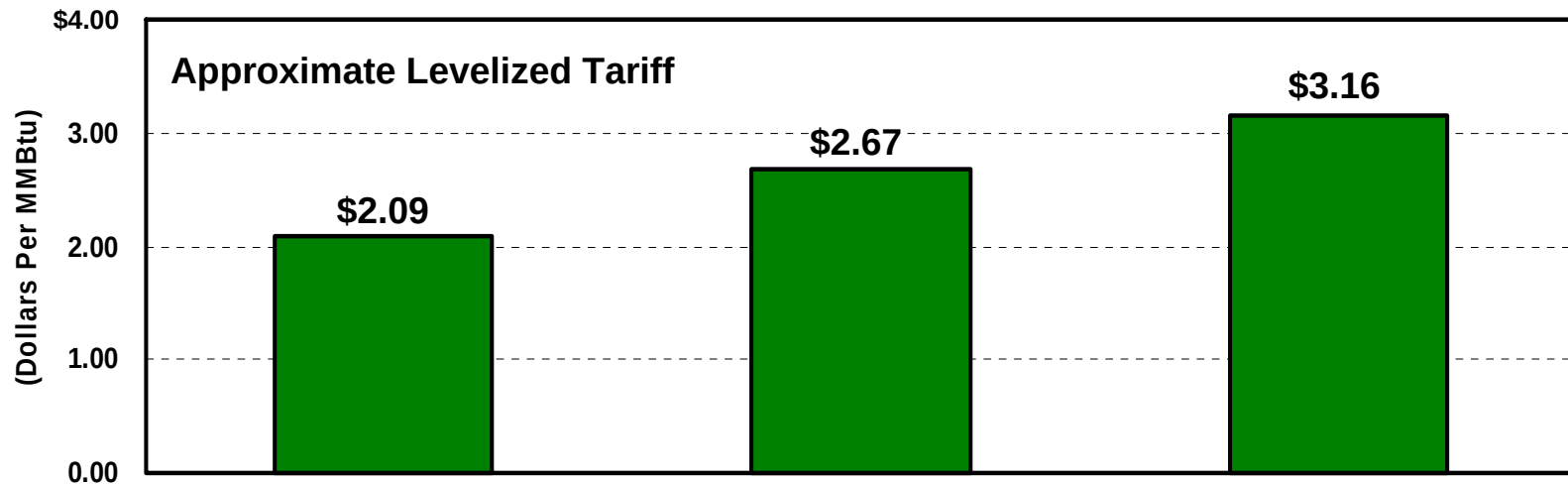
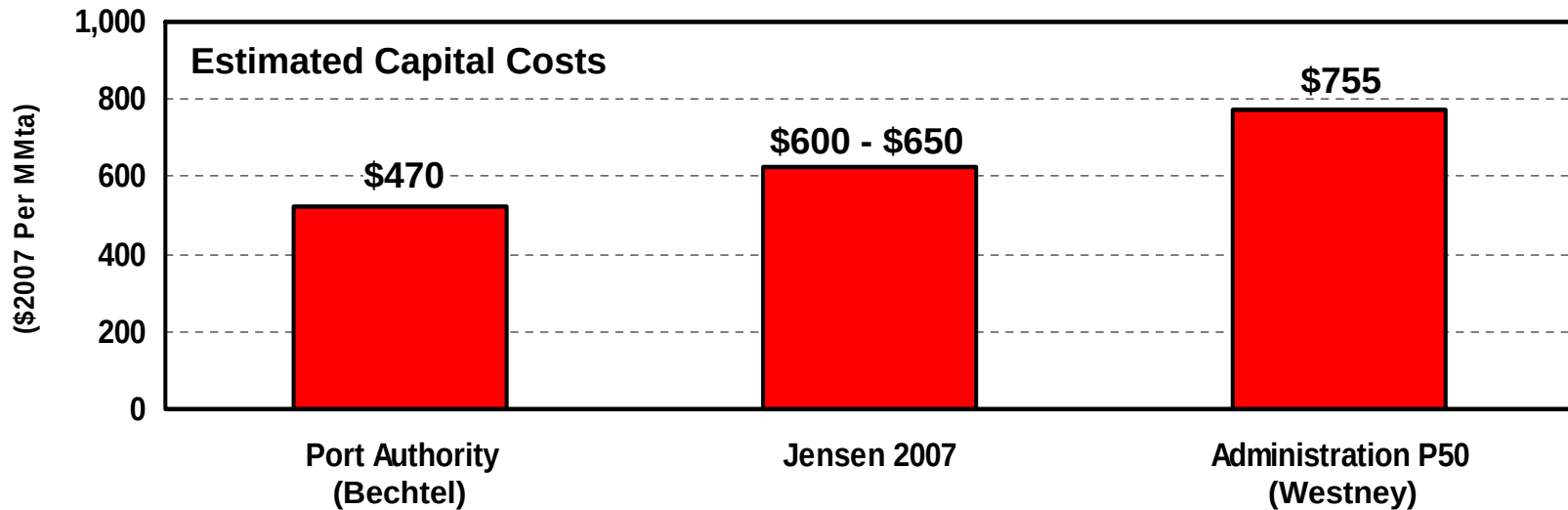
(\$2007 per mmta)



Source: AGIA Analysis Technical Team, "LNG Project Costs/Schedule", June 9, 2008.

Range of LNG Liquefaction Costs and Tariffs

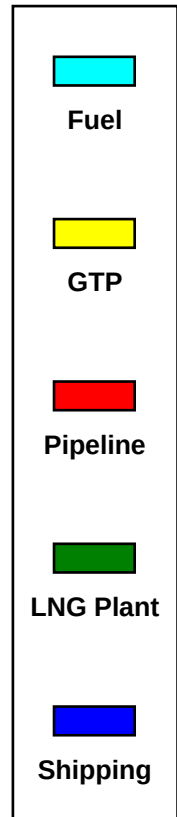
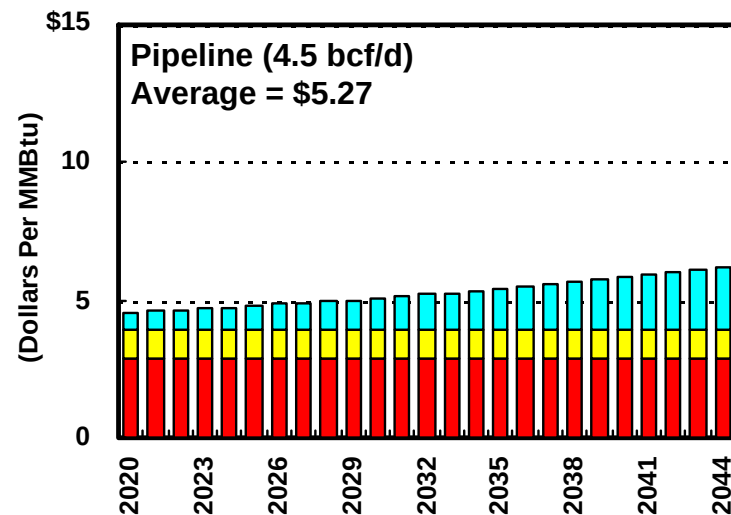
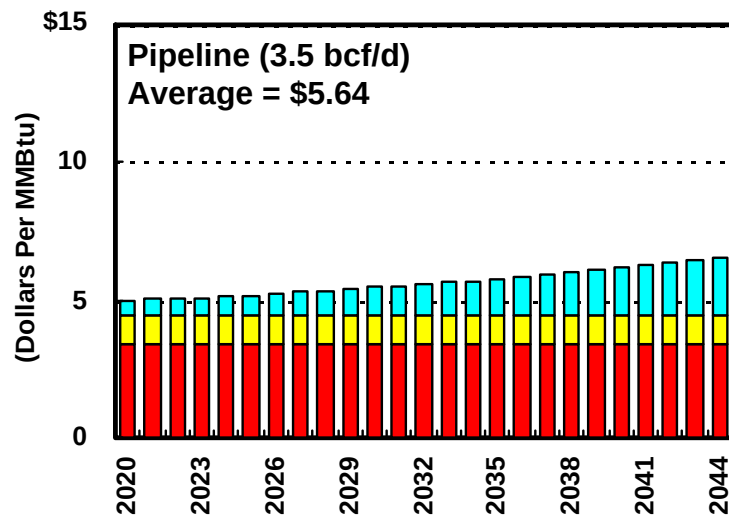
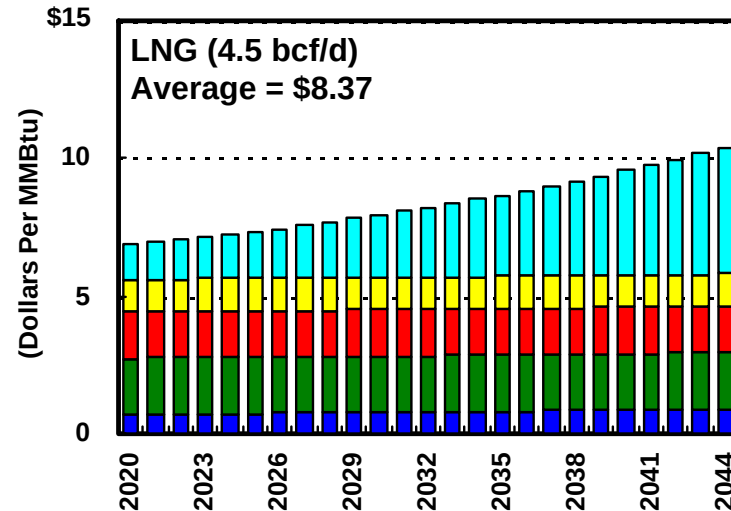
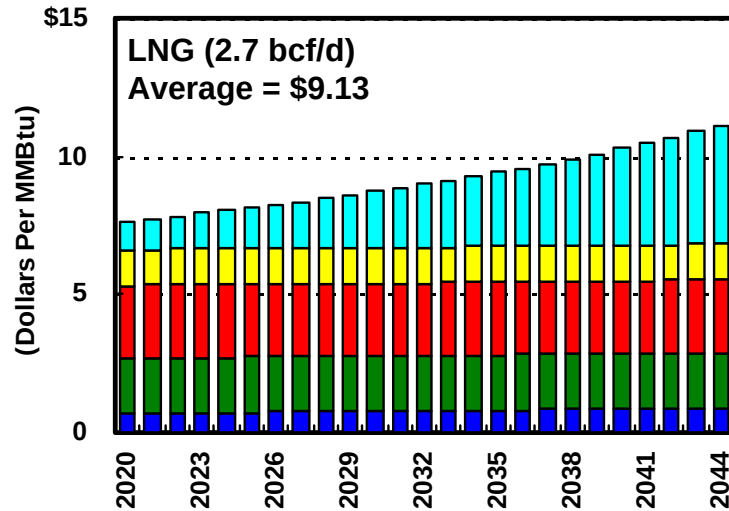
(2.7 bcf/d LNG Project)



Comparison of Netback Elements

Comparison of Potential Costs

LNG Project v. Pipeline Project 2020 - 2044

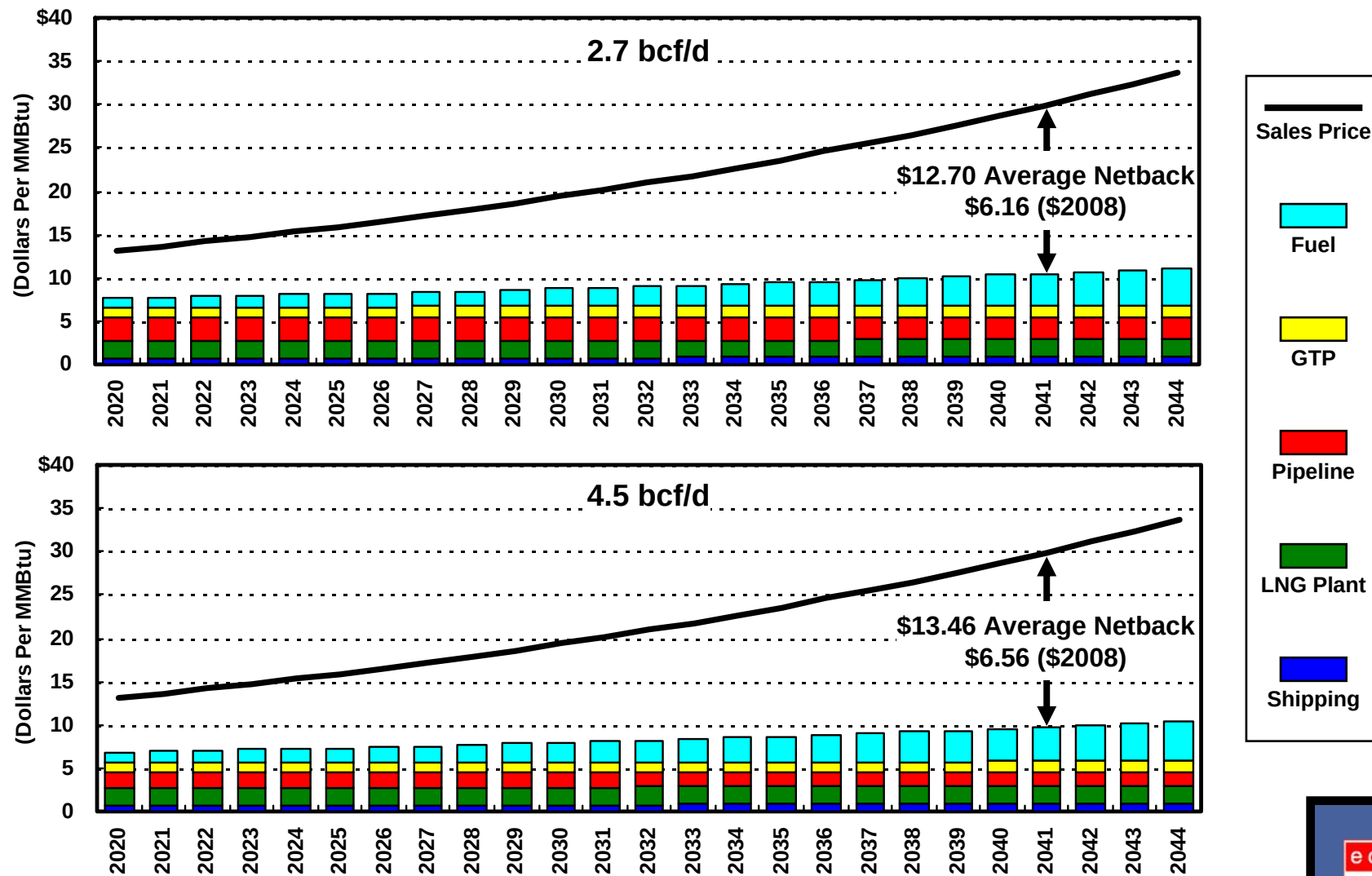


Note: Oil Prices per Wood Mackenzie forecasts with 8:1 Oil/Gas Price Ratio;
LNG Plant cost of \$470/mmta per Port Authority application;
Asia Gas Price = $0.1485 \times \text{JCC} + \0.90 (Gas Strategies).

Potential Netbacks

Potential Netbacks for LNG Delivery to Asia

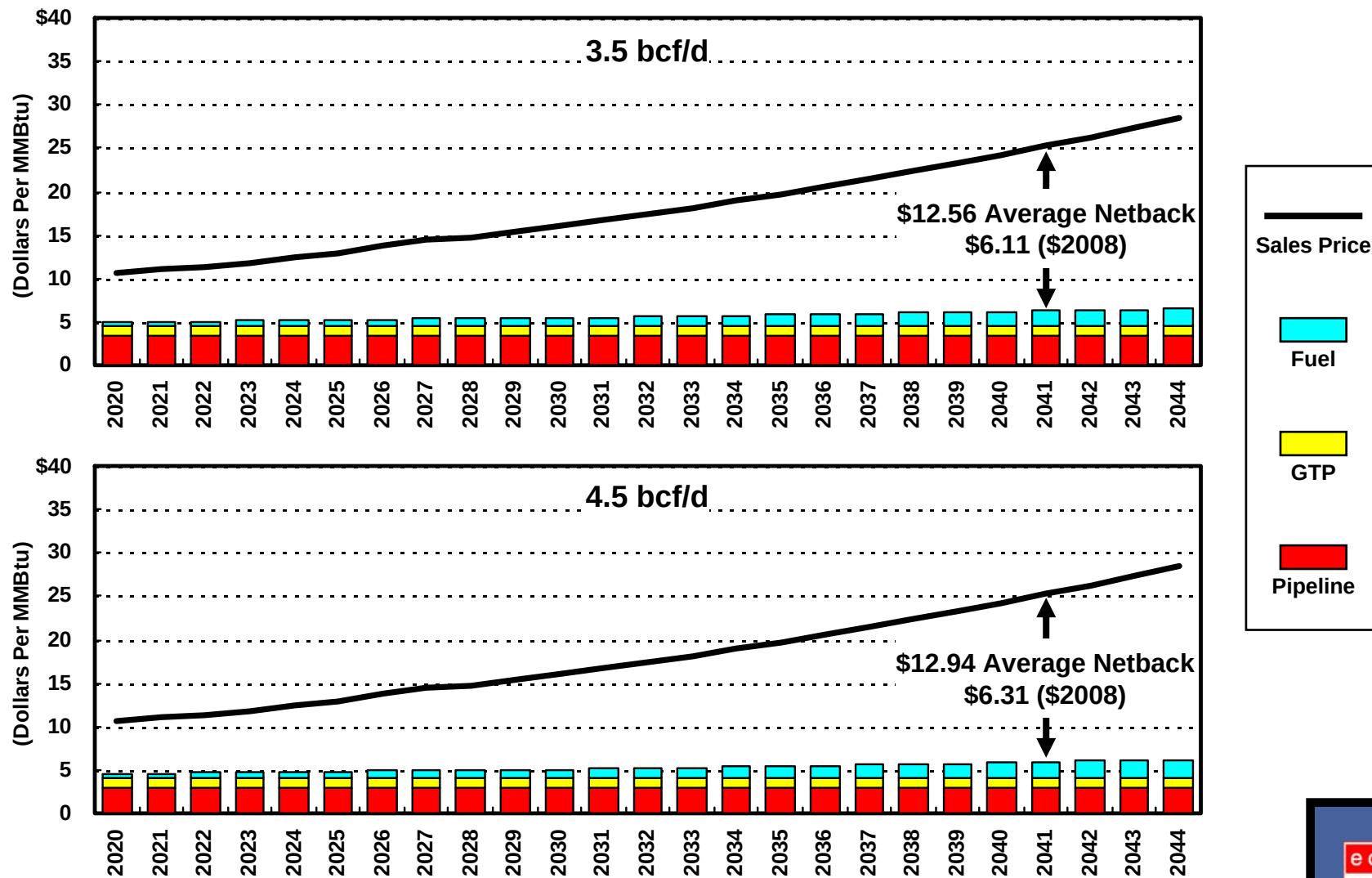
(Gas Strategies: Asia Gas Price = 0.1485 x Brent + \$0.90)



Note: Oil Prices per Wood Mackenzie forecasts;
LNG Plant cost of \$470/mmta per Port Authority application.

Potential Netbacks for AECO Pipeline Delivery

(8:1 WTI Oil/Henry Hub Gas Price Ratio)



Note: Oil Prices per Wood Mackenzie forecasts.

Comparison of Projected Netbacks

**2.7 bcf/d LNG Project
v.
3.5 bcf/d Pipeline Project**

Projected Netbacks Under Alternative Projects

(Port Authority LNG Plant Costs -- \$470/mt)

Oil Prices per Wood Mackenzie Estimates 2.7 bcf/d (LNG Project) v. 3.5 bcf/d (Pipeline Project) 2020 - 2044

	2.7 bcf/d LNG Project				3.5 bcf/d AECO Pipeline Delivery	
	High Price Asia Gas = 0.162 x Brent +\$1.00 (1)	Gas Strategies Asia Gas = 0.1485 x Brent +\$0.90 (2)	Port Authority Asia Gas = 0.8 x (Brent / 5.8) (3)	Low Price Asia Gas = 0.11 x Brent +\$1.30 (4)	8:1 Oil/Gas Price Ratio (5)	10:1 Oil/Gas Price Ratio (6)
Gas Sales Price (\$/MMBtu)	\$23.67	\$21.83	\$19.61	\$17.21	\$18.20	\$15.20
Delivery Costs (\$/MMBtu) (Including Losses)	(9.42)	(9.13)	(8.77)	(8.39)	(5.64)	(5.38)
Netback (\$/MMBtu)	\$14.25	\$12.70	\$10.84	\$8.82	\$12.56	\$9.82
Netback in \$2008 dollars (per MMBt)	\$6.93 ①	\$6.16 ②	\$5.22 ④	\$4.25 ⑥	\$6.11 ③	\$4.75 ⑤
Total Netback Dollars						
In Nominal Dollars (\$Bn)	\$396.2	\$353.1	\$301.3	\$245.2	\$472.0	\$369.1
In \$2008 dollars (\$Bn)	192.7	171.3	145.1	118.1	229.5	178.5
NPV-10 (\$Bn)	35.1 ②	31.0 ④	25.6 ⑤	20.9 ⑥	41.8 ①	31.9 ③

 = More Likely Price Scenario(s)

Comparison of Projected Netbacks

**2.7 bcf/d LNG Project
v.
4.5 bcf/d Pipeline Project**

Projected Netbacks Under Alternative Projects

(Port Authority LNG Plant Costs -- \$470/mt)

Oil Prices per Wood Mackenzie Estimates 2.7 bcf/d (LNG Project) v. 4.5 bcf/d (Pipeline Project) 2020 - 2044

	2.7 bcf/d LNG Project				4.5 bcf/d AECO Pipeline Delivery	
	High Price Asia Gas = 0.162 x Brent +\$1.00 (1)	Gas Strategies Asia Gas = 0.1485 x Brent +\$0.90 (2)	Port Authority Asia Gas = 0.8 x (Brent / 5.8) (3)	Low Price Asia Gas = 0.11 x Brent +\$1.30 (4)	8:1 Oil/Gas Price Ratio (5)	10:1 Oil/Gas Price Ratio (6)
Gas Sales Price (\$/MMBtu)	\$23.67	\$21.83	\$19.61	\$17.21	\$18.20	\$15.20
Delivery Costs (\$/MMBtu) (Including Losses)	(9.42)	(9.13)	(8.77)	(8.39)	(5.26)	(4.99)
Netback (\$/MMBtu)	\$14.25	\$12.70	\$10.84	\$8.82	\$12.94	\$10.22
Netback in \$2008 dollars (per MMBtu)	\$6.93 ①	\$6.16 ③	\$5.22 ④	\$4.25 ⑥	\$6.31 ②	\$4.96 ⑤
Total Netback Dollars						
In Nominal Dollars (\$Bn)	\$396.2	\$353.1	\$301.3	\$245.2	\$625.0	\$493.5
In \$2008 dollars (\$Bn)	192.7	171.3	145.1	118.1	304.6	239.5
NPV-10 (\$Bn)	35.1 ③	31.0 ④	25.6 ⑤	20.9 ⑥	55.9 ①	43.3 ②

 = More Likely Price Scenario(s)

Comparison of Projected Netbacks

**4.5 bcf/d LNG Project
v.
4.5 bcf/d Pipeline Project**

Projected Netbacks Under Alternative Projects

(Port Authority LNG Plant Costs -- \$470/mt)

Oil Prices per Wood Mackenzie Estimates 4.5 bcf/d (LNG Project) v. 4.5 bcf/d (Pipeline Project) 2020 - 2044

	4.5 bcf/d LNG Project				4.5 bcf/d AECO Pipeline Delivery	
	High Price Asia Gas = 0.162 x Brent +\$1.00	Gas Strategies Asia Gas = 0.1485 x Brent +\$0.90	Port Authority Asia Gas = 0.8 x (Brent / 5.8)	Low Price Asia Gas = 0.11 x Brent +\$1.30	8:1 Oil/Gas Price Ratio	10:1 Oil/Gas Price Ratio
	(1)	(2)	(3)	(4)	(5)	(6)
Gas Sales Price (\$/MMBtu)	\$23.67	\$21.83	\$19.61	\$17.21	\$18.20	\$15.20
Delivery Costs (\$/MMBtu) (Including Losses)	(8.67)	(8.36)	(8.00)	(7.60)	(5.26)	(4.99)
Netback (\$/MMBtu)	\$15.00	\$13.46	\$11.61	\$9.61	\$12.94	\$10.22
Netback in \$2008 dollars (per MMBtu)	\$7.33	\$6.56	\$5.63	\$4.66	\$6.31	\$4.96
	①	②	④	⑥	③	⑤
Total Netback Dollars						
In Nominal Dollars (\$Bn)	\$724.7	\$650.3	\$560.9	\$464.1	\$625.0	\$493.5
In \$2008 dollars (\$Bn)	353.9	316.9	271.8	225.2	304.6	239.5
NPV-10 (\$Bn)	65.3	58.2	49.0	40.7	55.9	43.3
	①	②	④	⑥	③	⑤

 = More Likely Price Scenario(s)

Sensitivities

- **High Sustained Oil Prices**
- **Impact of Project Delay**

Projected Netbacks Under Alternative Projects

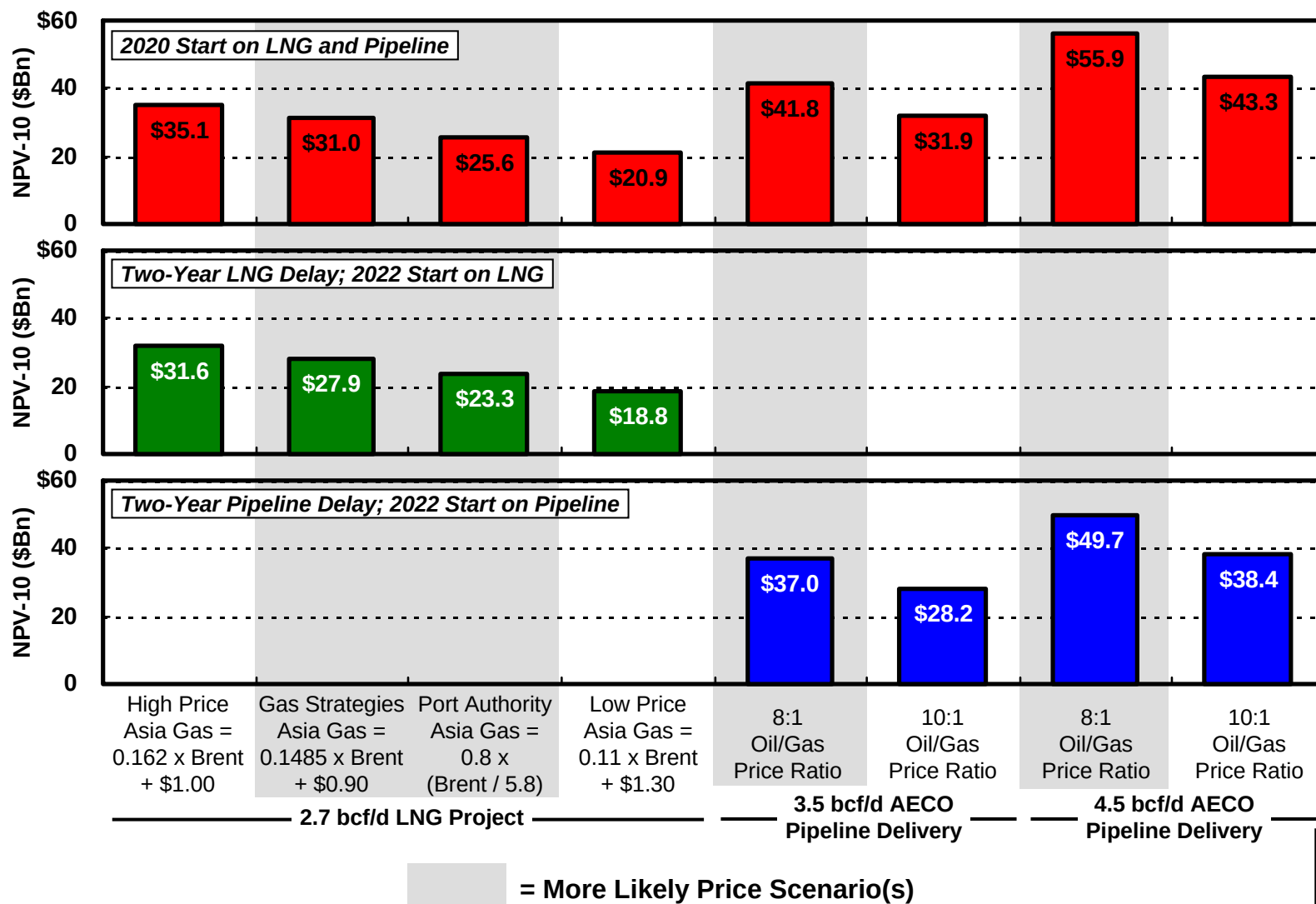
(High Price Case: Fixed \$120 Real WTI in \$2008)

Rank	Project	Pricing	GTP Inlet Netback (\$/MMBtu)
(1)	(2)	(3)	(4)
1	4.5 LNG	0.162 x Brent + \$1.00	\$25.86
2	2.7 LNG	0.162 x Brent + \$1.00	25.18
3	4.5 LNG	0.1485 x Brent + \$0.90	23.48
4	2.7 LNG	0.1485 x Brent + \$0.90	22.79
5	4.5 Pipeline	8:1 Oil/Gas	22.45
6	3.5 Pipeline	8:1 Oil/Gas	22.13
7	4.5 LNG	0.8 x (Brent / 5.8)	20.97
8	2.7 LNG	0.8 x (Brent / 5.8)	20.26
9	4.5 Pipeline	10:1 Oil/Gas	18.18
10	3.5 Pipeline	10:1 Oil/Gas	17.84
11	4.5 LNG	0.11 x Brent + \$1.30	17.24
12	2.7 LNG	0.11 x Brent + \$1.30	16.50

Rank	Project	Pricing	NPV-10 Total Netback (\$Billion)
(5)	(6)	(7)	(8)
1	4.5 LNG	0.162 x Brent + \$1.00	\$126.5
2	4.5 LNG	0.1485 x Brent + \$0.90	114.6
3	4.5 Pipeline	8:1 Oil/Gas	109.4
4	4.5 LNG	0.8 x (Brent / 5.8)	101.7
5	4.5 Pipeline	10:1 Oil/Gas	88.2
6	4.5 LNG	0.11 x Brent + \$1.30	83.8
7	3.5 Pipeline	8:1 Oil/Gas	83.7
8	2.7 LNG	0.162 x Brent + \$1.00	70.6
9	3.5 Pipeline	10:1 Oil/Gas	67.0
10	2.7 LNG	0.1485 x Brent + \$0.90	63.7
11	2.7 LNG	0.8 x (Brent / 5.8)	56.2
12	2.7 LNG	0.11 x Brent + \$1.30	45.8

Note: LNG plant costs of \$470/mmta per Port Authority.

Impact of Potential Delays on Projects



LNG Export Issues

LNG Export Issues

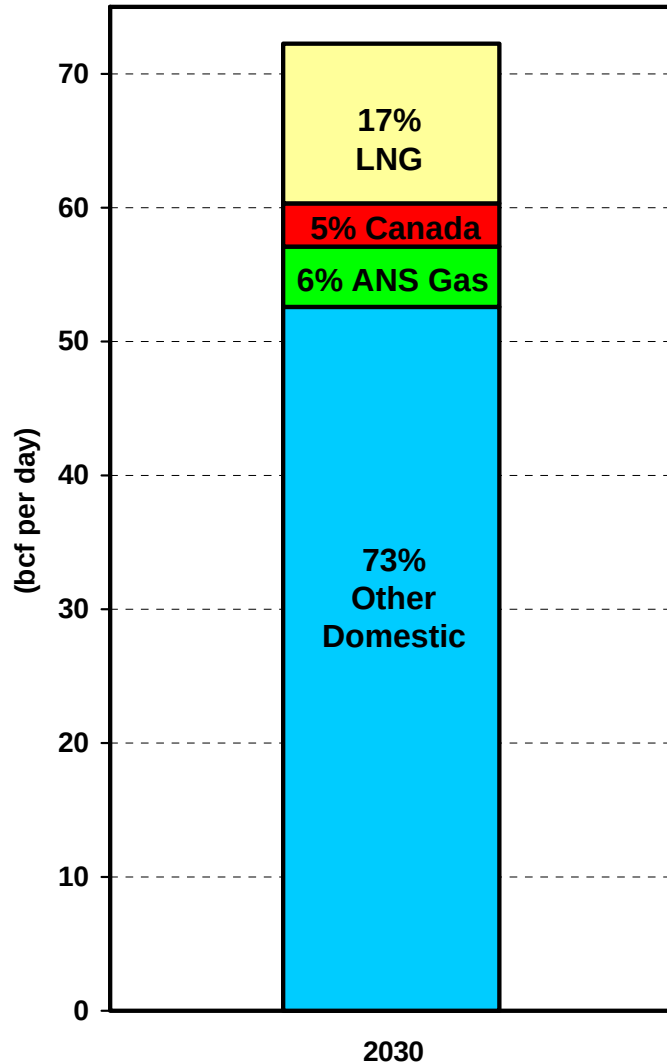
- Yukon Pacific permit for export
 - Issued in 1989
 - 14mmta (~1.9 bcf/d) to Japan, South Korea, Taiwan
 - 25 years from 1st gas
- Project will require D.O.E. review
 - Different project
 - Time elapsed
 - Different circumstances (e.g., U.S. is net importer of gas)
 - Political
- Is recent Kenai decision comparable?
 - Smaller / shorter window
 - No perceived issues outside Alaska
 - Lengthy multi-year process for renewal
- Experience with oil
 - Initial ban on exports
 - 1996 lifting of export ban, but too late to benefit Alaska
 - Still significant perception issue at Federal political level

LNG Export Issues

(cont'd)

- Exports must be “in public interest”
- Pros
 - Free trade
 - Efficiency (i.e., higher netbacks)
 - Balance of payments
 - More production for Lower-48
- Cons
 - Will lead to more LNG imports
 - Will lead to more high-cost Lower-48 production
 - Will lead to higher gas prices for U.S. consumers

Will D.O.E. Find LNG Exports in the Public Interest?



- If ANS gas is exported, it will not be available for domestic markets.
- Requires “replacement” with more expensive domestic gas or LNG imports.
- Forecasts indicate that ANS supplies @ 4.5 Bcf/day will reduce U.S. gas price by ~ \$0.30/MMBtu.
- At projected US consumption of 70 bcf/d in 2030, this is ~ \$7.5 billion annually.

LNG Export Issues

(cont'd)

- **Chance of Federal intervention**
 - **Federal government assistance with permitting and loan guarantees in 2004 likely lead to tension re: potential of exports**
 - **National security concerns**
 - **Argument that consumers in Lower-48 would be hurt**
 - **Probably little Federal support for exports if Federal gas is involved**
- **Pipeline project must also apply for export permit**
 - **But, 2004 legislation specifically addresses export to Canada**

Conclusions

Conclusions

- Gas prices in Asia are likely to maintain a premium over U.S. gas prices, though not at current levels
- U.S. prices will likely strengthen relative to Asian and European gas prices as U.S. domestic production becomes more expensive and LNG flows away from the U.S.
- LNG project would likely be viable under reasonable price scenarios, assuming gas can be exported
 - Economics of LNG delivery to U.S. West Coast would be worse than pipeline delivery under any reasonable set of assumptions
- Under the reasonable price scenarios, 2.7 bcf/d LNG project offers \$/MMBtu netbacks that are similar to pipeline netbacks
 - Difference in some cases is not large relative to potential estimation error

Conclusions

(cont'd)

- However, larger volumes for pipeline deliveries produce higher overall values (NPV) for resource owners under more likely price scenarios
 - 3.5 bcf/d pipeline > 2.7 bcf/d LNG by \$11Bn to \$16Bn
 - 4.5 bcf/d pipeline > 2.7 bcf/d LNG by \$25Bn to \$30Bn
- LNG project would produce somewhat higher NPVs if in the long run:
 - Oil prices stay high
 - Gas/Oil price ratio in Asia stays strong
 - Gas/Oil price ratio in U.S. remains weak
 - LNG can be exported and project advances at some time earlier than the pipeline

Conclusions

(cont'd)

- **Gaining Federal permission to export LNG to Asia will likely be very difficult**
 - **D.O.E. permission**
 - **Potential Federal legislation**
- **Export via Y-line will face similar challenges**
- **Federal acceptance of exporting may be more favorable if majority of gas is already flowing to U.S. markets**
 - **But don't count on it**
 - **Oil experience along those lines was not particularly favorable**

Conclusions

(cont'd)

- **Impact of potential delays**
 - **Delay in pipeline relative to LNG does not change results under more likely price scenarios**
- **Does the State have to choose between the two projects?**
 - **Market-based outcome is more favorable**
 - **Shippers can nominate to LNG project if they see it is more economic**
 - **Potential buyers of LNG can go “upstream” and negotiate to buy gas**
 - **Economics of LNG relative to pipeline not compelling enough to suggest that the State needs to “intervene” to make LNG happen at expense of pipeline**