

AK LEGISLATURE SPECIAL COMMITTEE FILES SCOMM 155 3318

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2. LNG Project Economics

LNG Project Analyses Presented to Legislature

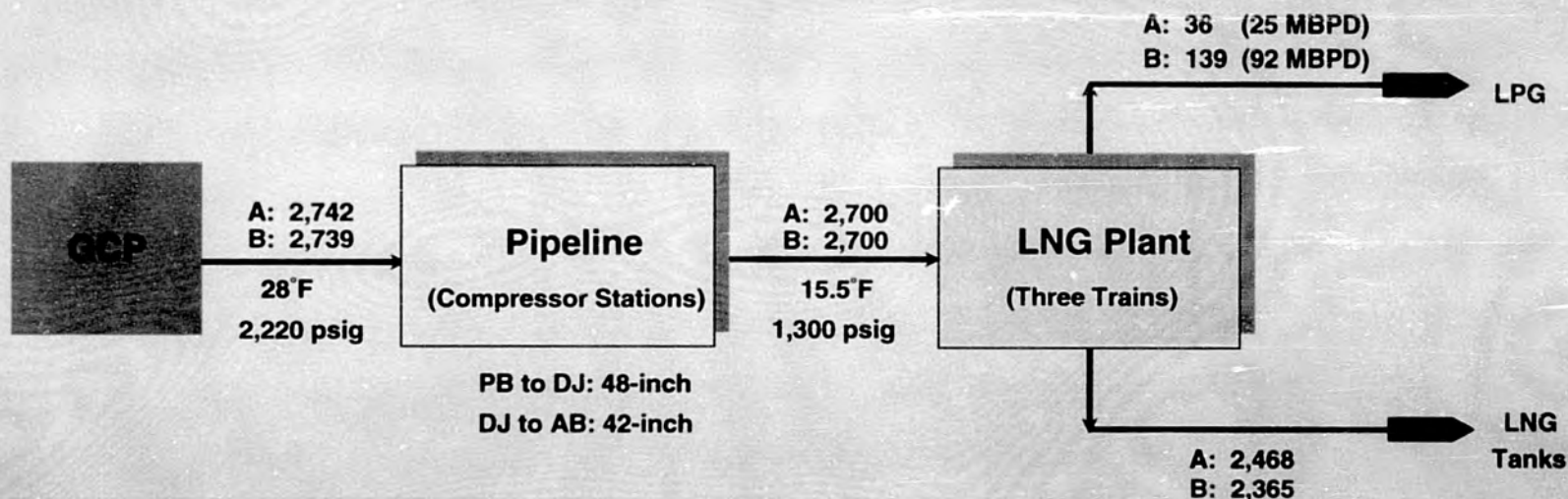


- Economics of an LNG project vs. Pipeline to Canada
 - Port Authority: LNG more attractive than pipeline to Canada
 - Administration: LNG less attractive than pipeline to Canada
 - EconOne: LNG either more or less attractive, depending on assumptions
 - Assumptions used are key:
 - capital cost of project components
 - difference in prices in Asian LNG market and Alberta gas market
- ⇒ different assumptions result in different netback prices

Port Authority Project



OVERALL FLOW SCHEME (Gas Compositions Year 2007 Winter Conditions)



Legend:

A. Lean Gas Case

B. Rich Gas Case

Notes:

All flow rates are in MMSCFD; Base Case LNG Plant Availability Assumption: 95%

PB: Prudhoe Bay; DJ: Delta Junction; AB: Anderson Bay

The difference between the inlet and outlet streams is fuel consumption

Capital Cost Assumption Comparison



	Port Authority	Administration (P50)
Pipeline from Prudhoe Bay to Valdez	\$13.2 billion	\$11.4 billion
LNG Facilities	\$8 billion	\$14 billion

- 2.7 Bcfd LNG Project
 - Cost estimate includes EPC costs, owner's costs during construction, and development costs
 - escalation after 2007, property taxes during construction, and AFUDC are excluded
- ⇒ Administration uses substantially higher capital costs for the LNG Facilities

LNG Plant Capital Cost Estimates



Bechtel's "bottom-up" EPC cost estimate for LNG Plant:

- 2007 EPC cost estimate
- Extensive technical work
- Site-specific and project-specific conditions accounted for
- Proven, well-established plant design
- Fewer cost uncertainty factors than the pipeline

Administration's "top-down" LNG plant capital cost:

- Not developed from detailed project-specific technical work
- Derived by "data mining" of database of other LNG projects
- Generic cost-per-ton estimate applied to Anderson Bay

Note: Administration's methodology as described in Chapter 4, Section E.3 of the Written Findings and Determination by the Commissioners of Natural Resources and Revenue for Issuance of License under AGIA

LNG Plants Are Not the Same



- LNG projects are not the same: project location, project scope, feed gas composition and other project-specific factors make valid project comparisons difficult
- Variations in LNG plant scope and configuration:
 - many LNG projects include cost of gas treatment
 - liquid slug removal
 - condensate stabilization
 - acid gas removal
 - water removal
 - mercury removal
 - for the Alaska LNG project, gas treatment occurs at the GCP on the North Slope

LNG Plants Are Not the Same (2)



- Feed gas pressure
 - high pressure feed gas from the pipeline to Valdez
 - significant reduction in the cost of compression at the Valdez LNG Plant
- Ambient temperatures at project site
 - most LNG projects in warm climate
 - Valdez plant benefits from cold climate
- Site preparation, marine terminal facilities, etc: highly location-specific
 - Bechtel estimate based on Anderson Bay site
- Different EPC market conditions for different projects

"Bottom-Up" Approach is Preferable



- Limitations of "database mining" approach should be recognized
 - inherent difficulty in comparing projects of different scope, in different locations and subject to different conditions
- Mixing the "top-down" approach for LNG Plant with a "bottom-up" approach for the pipeline:
 - introduces an inconsistency in methodologies
 - validity of economic comparison between the two projects is compromised

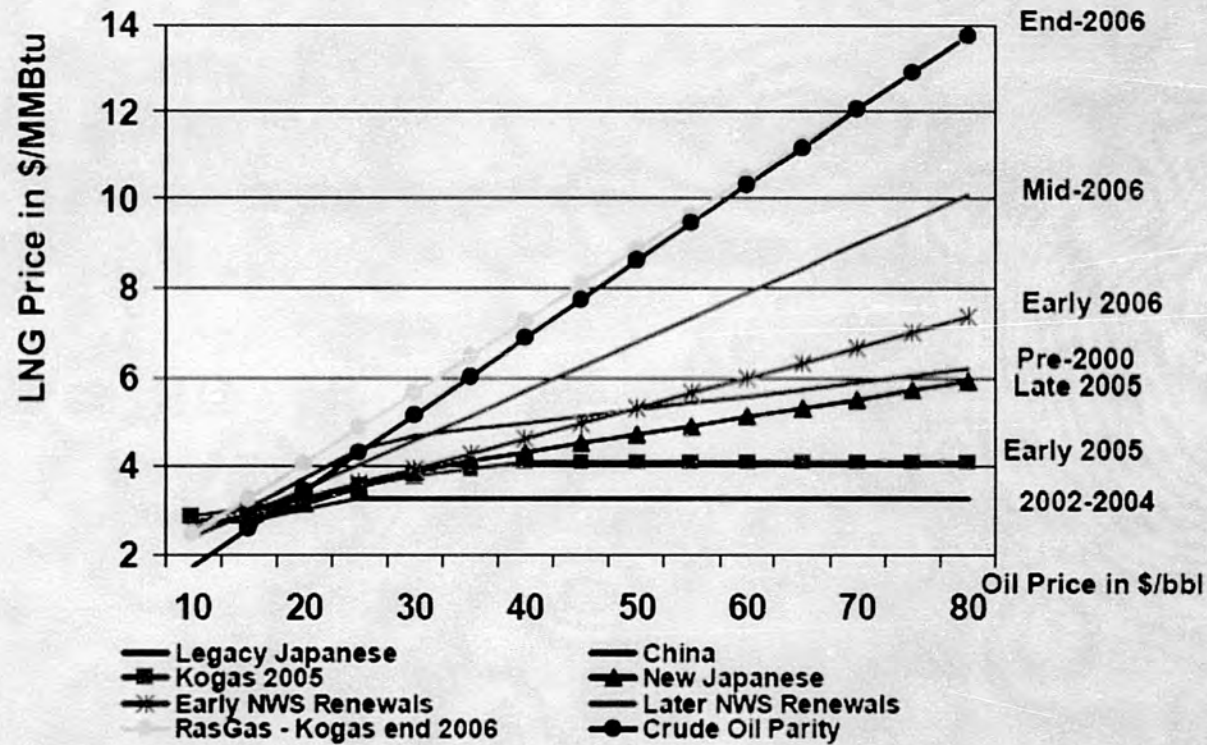
Asian LNG and North American Gas Prices



- Asian LNG Prices:
 - bilateral, long-term sales and purchase agreements
 - price formulas with oil price indexation provisions
 - pricing provisions reflect market supply and demand dynamics at time of contract execution
 - at each point in time, multiple active supply contracts, negotiated at different times, with varying pricing provisions

- North American gas prices
 - price discovery is driven by a gas spot market at regional trading hubs (e.g., Henry Hub, AECO, etc.)

Evolution of Asian LNG Prices



Source: Gas Strategies Consulting

- Recent LNG sales contracts in the Asian LNG market have been executed on terms highly favorable to sellers
- Kogas contract from late 2006: LNG price formula reportedly above parity with oil

Price Assumption for Alaska LNG (E. Asia DES)



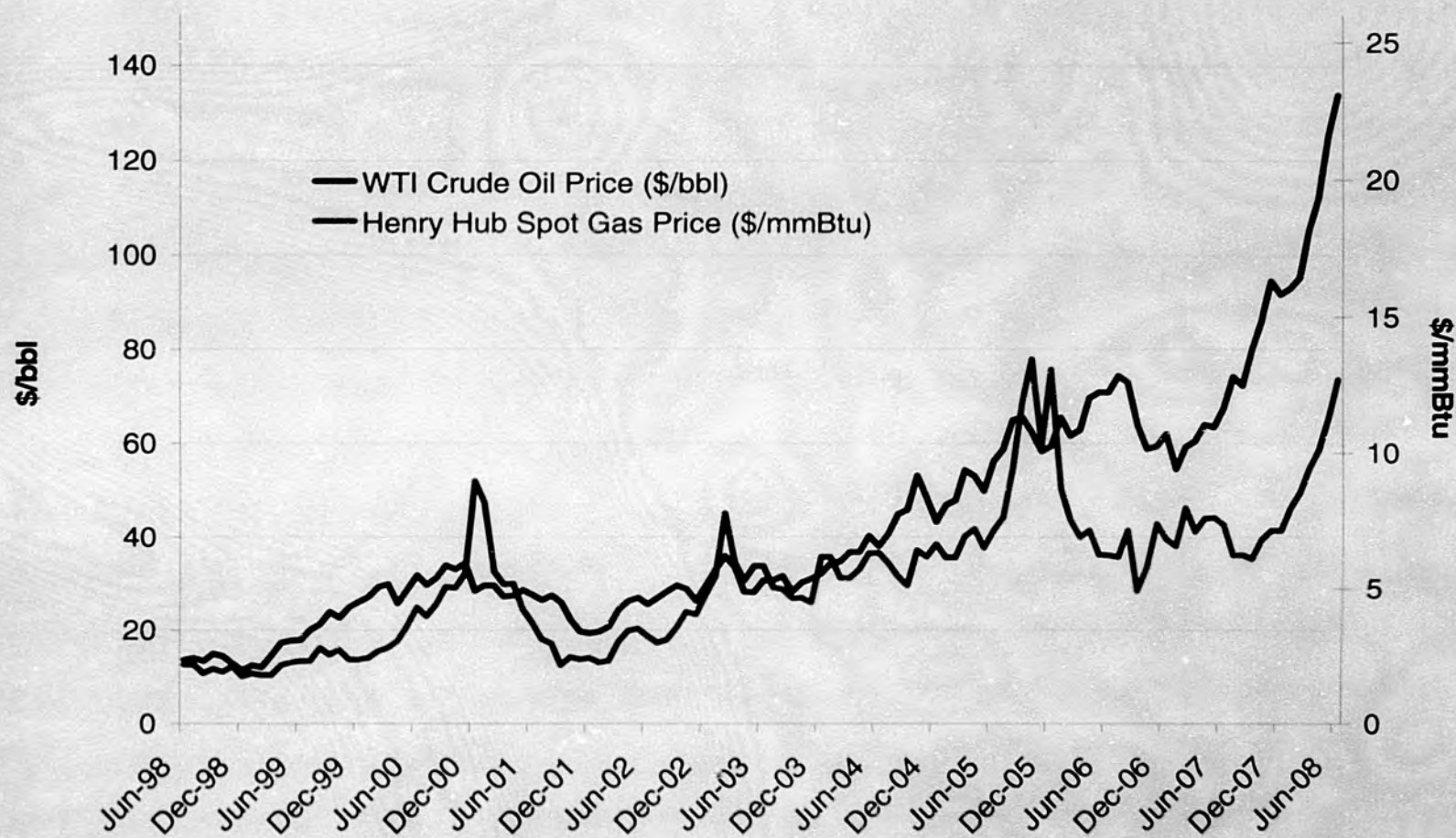
- Gas Strategies' report to the Administration projects the following price scenarios for Alaska LNG (LNG Price in \$/mmBtu, Oil Price in \$/bbl)*
 - Base Case: $\text{LNG Price} = 0.1485 * \text{Oil Price} + 0.90$
 - High Case: $\text{LNG Price} = 0.162 * \text{Oil Price} + 1.00$
 - Low Case: $\text{LNG Price} = 0.9 * \text{Henry Hub} - 0.50$
- The Port Authority assumptions:
 - current highly seller-favorable market expected to swing back towards relatively more buyer friendly terms
 - Gas Strategies' Base Case forecast appears reasonable and has been incorporated in Port Authority analysis
 - High Case generates very favorable results for the Alaska LNG Project

* Note: For simplicity, this presentation uses the term "Oil Price" interchangeably with JCC, Brent and WTI prices. In a detailed analysis, the price variations between different crude prices should be taken into consideration.

North American Prices: WTI and Henry Hub



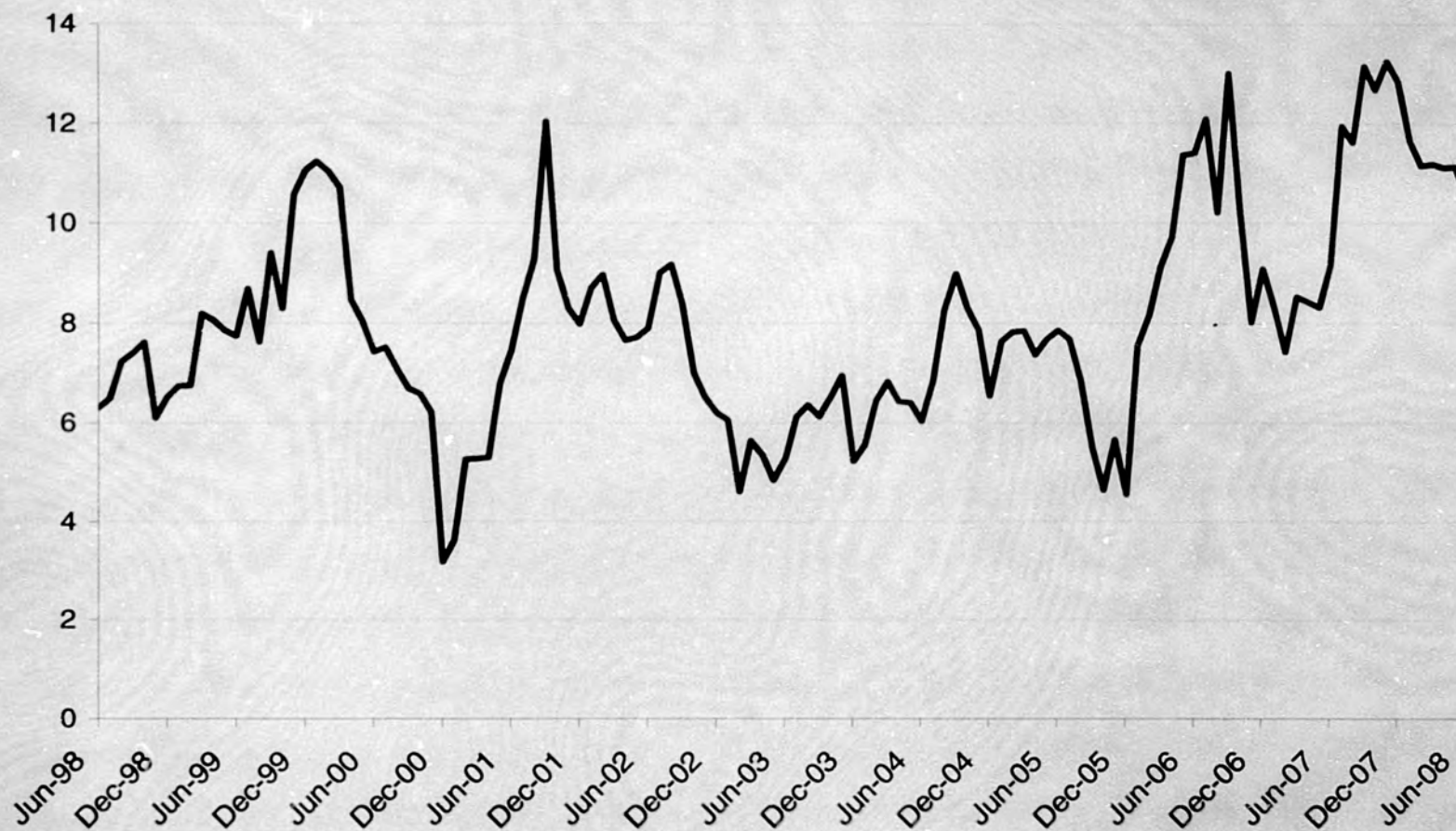
WTI and Henry Hub Historical Prices (monthly averages)



WTI and Henry Hub Price Ratio



WTI to Henry Hub Price Ratio



Significance of Assumed Oil/Henry Hub Price Ratio

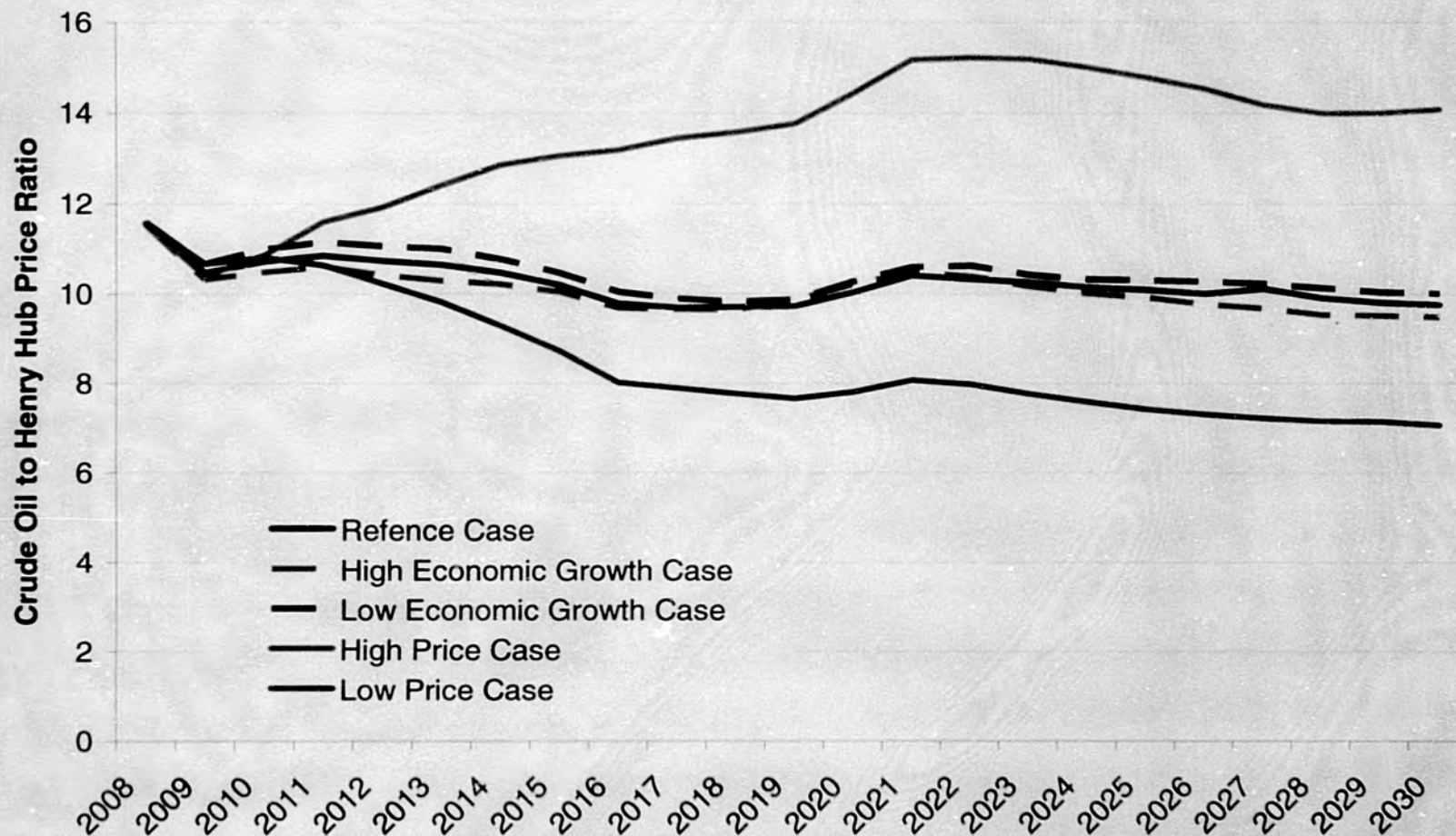


- Higher crude oil to Henry Hub price ratio means:
 - differential between Asian LNG prices and North American gas prices is higher
 - netback prices from LNG Project are relatively more attractive
- Recently observed price ratios are significantly higher than historical values
- What is the appropriate assumption for assumed crude oil to Henry Hub price ratio for the future?

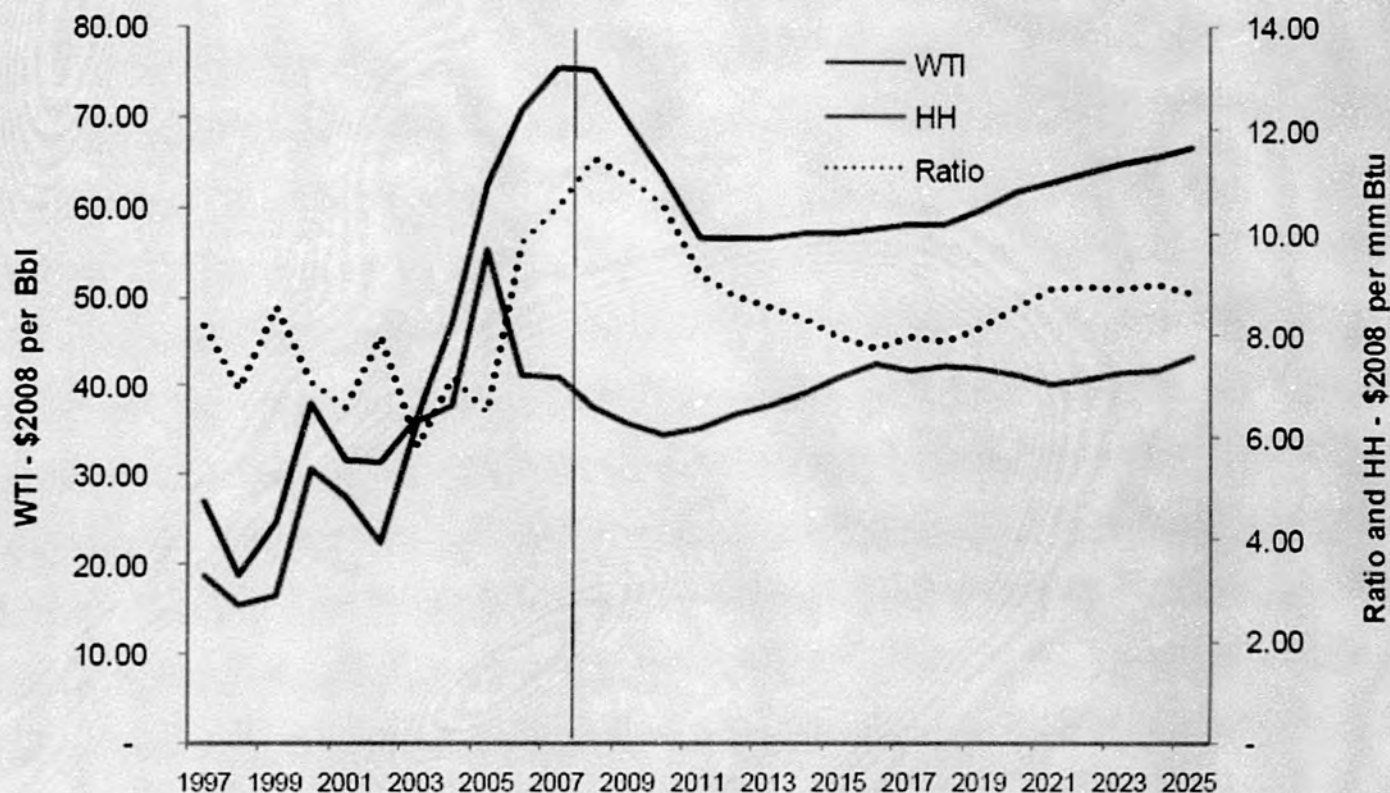
DOE EIA Forecast Price Ratios (AEO 2008)



US DOE Energy Information Administration Annual Energy Outlook 2008



Administration's Forecast (Wood Mackenzie)



Source: Commissioners' Findings, Appendix N: Wood Mackenzie Gas and Power Long Term Outlook Briefing Paper

Price Ratio Forecast Comparison



- Crude oil to Henry Hub price ratios:
 - historical average 1998-2008: 8.1
- DOE EIA Annual Energy Outlook 2008 (average 2008-2030):
 - Reference Case: 10.2
 - High Growth Case: 10.1
 - Low Growth Case: 10.5
 - High Price Case: 13.4
 - Low Price Case: 8.5
- NYMEX futures market recent prices (average 2008-2016): 12.5
- Wood Mackenzie (Administration's analysis)*
 - above 10 until 2011
 - decreases to around 8-to-9 from 2012

* Source: Commissioners' Findings, Appendix N: Wood Mackenzie Gas and Power Long Term Outlook Briefing Paper

Netback Comparison: Capital Cost Assumptions



	2007 billions	Source of Assumption
<u>Development Phase Costs:</u>		
LNG Project	0.65	Administration
Pipeline to Canada Project	0.69	Administration
<u>Execution Phase Capital Costs:</u>		
GCP for 2.7 Bcfd LNG Project	4.9	Administration
GCP for 4.5 Bcfd Pipeline Project	8.2	Administration
GCP for 3.5 Bcfd Pipeline Project	6.4	Administration
2.7 Bcfd Pipeline Prudhoe Bay-Valdez	11.1	Administration
4.5 Bcfd Pipeline Prudhoe Bay-Border	10.5	Administration
4.5 Bcfd Pipeline Yukon-Alberta	12.4	Administration
3.5 Bcfd Pipeline Prudhoe Bay-Border	9.7	Administration
3.5 Bcfd Pipeline Yukon-Alberta	11.4	Administration
LNG Facilities	7.8	Bechtel/Port Authority

Netback Comparison: Other Assumptions



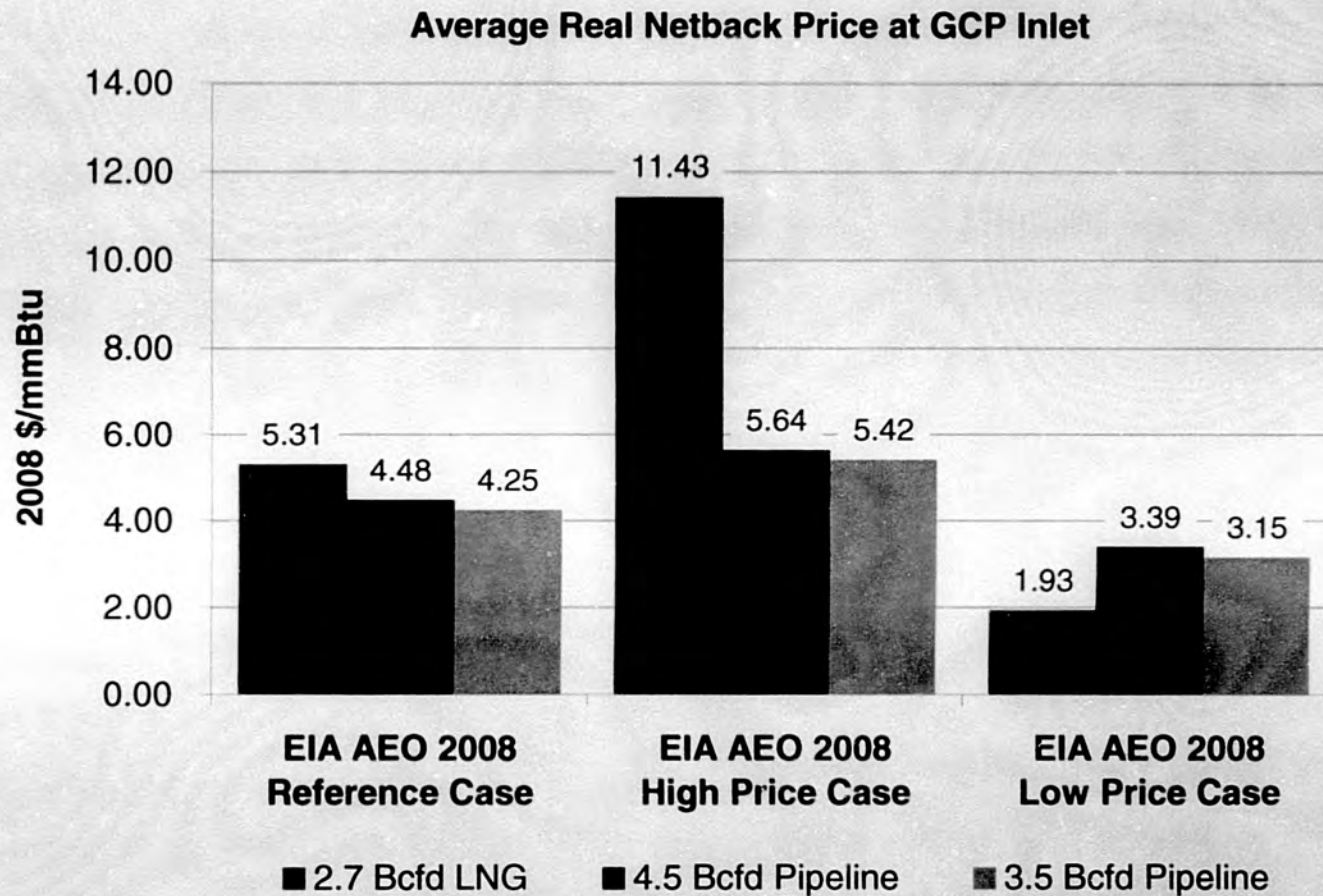
	Assumption	Source of Assumption
D:E for Tariff (Pre-Completion)	70:30	Admin/TCPL
D:E for Tariff (Pre-Completion)	75:25	Admin/TCPL
Return on Equity	14%	Admin/TCPL/EconOne
Cost of Guaranteed Debt	5.50%	EconOne
Cost of Non-Guaranteed Debt	7.00%	EconOne
LNG Plant Availability Factor	95%	Bechtel
LNG Sales Price (DES E. Asia)	$0.1485 * JCC + 0.90$	Administration
LNG Shipping Costs (incl. fuel and boil-off)	$\sim \$1.10 / \text{mmBtu}^1$	MOL / PA
Pipeline Gas HHV	1133 Btu/scf	Administration
Capex Escalation	4% p.a.	Administration
Opex Escalation	3% p.a.	Administration

Notes: ¹ Nominal dollars in 2019

Netback Prices: EIA Price Forecasts



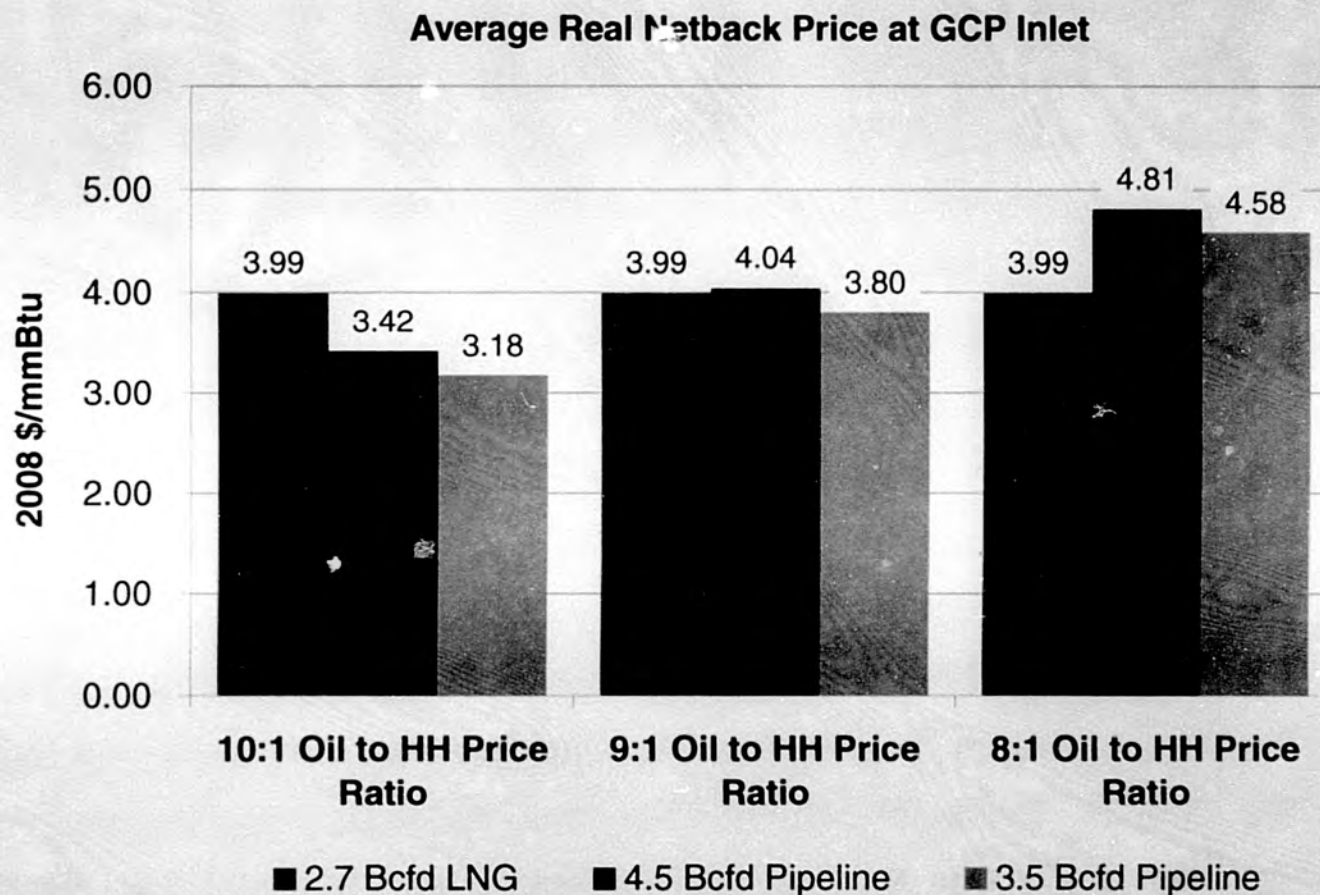
- Oil and HH prices from DOE EIA's 2008 Annual Energy Outlook
- 3 price scenarios shown: Reference Case, High Price and Low Price Cases



Netback Prices: \$60/bbl Oil Price Cases



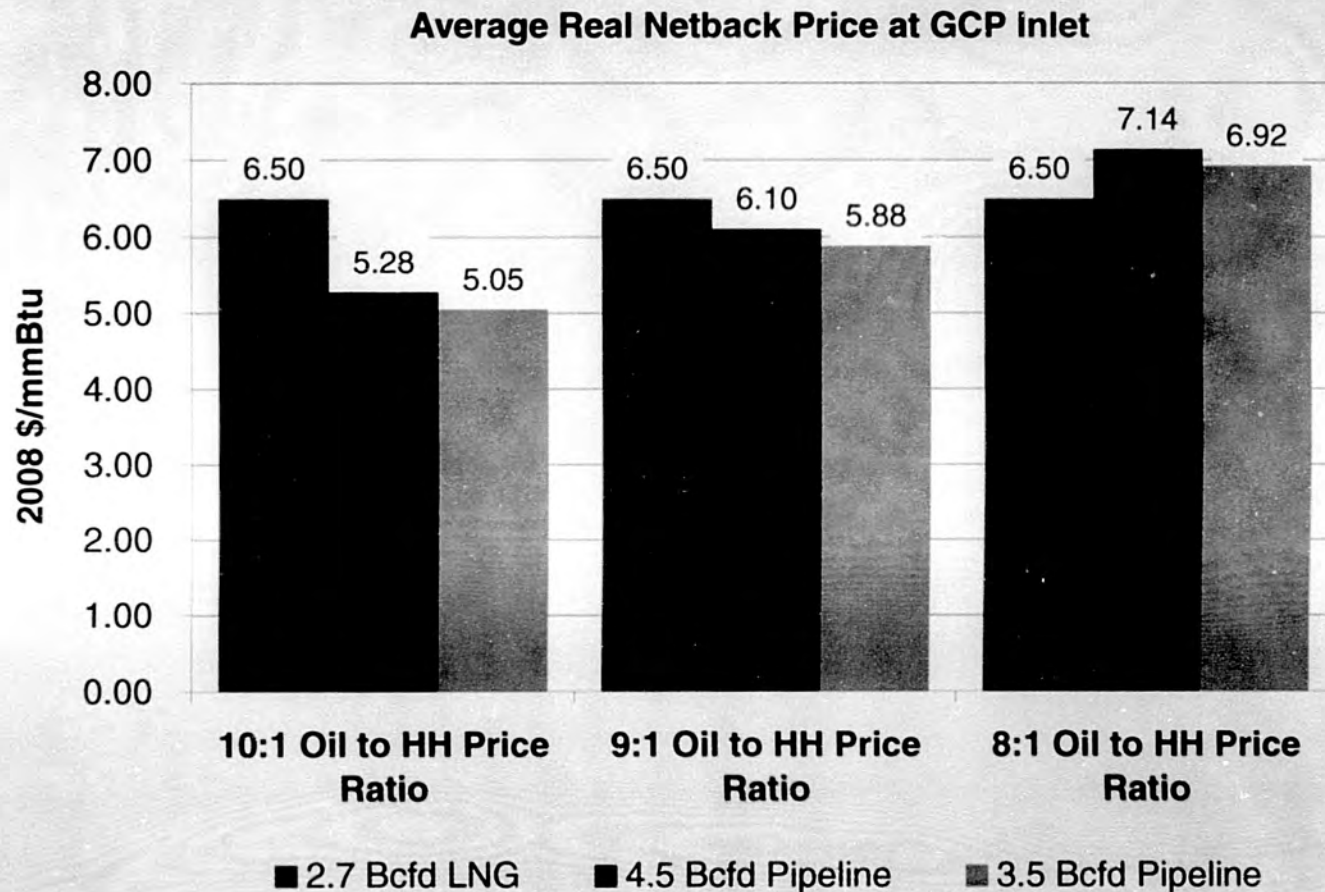
- Flat \$60/bbl oil price (constant 2008 USD)
- 3 scenarios for oil/HH price ratio: 10:1, 9:1 and 8:1



Netback Prices: \$80/bbl Oil Price Cases



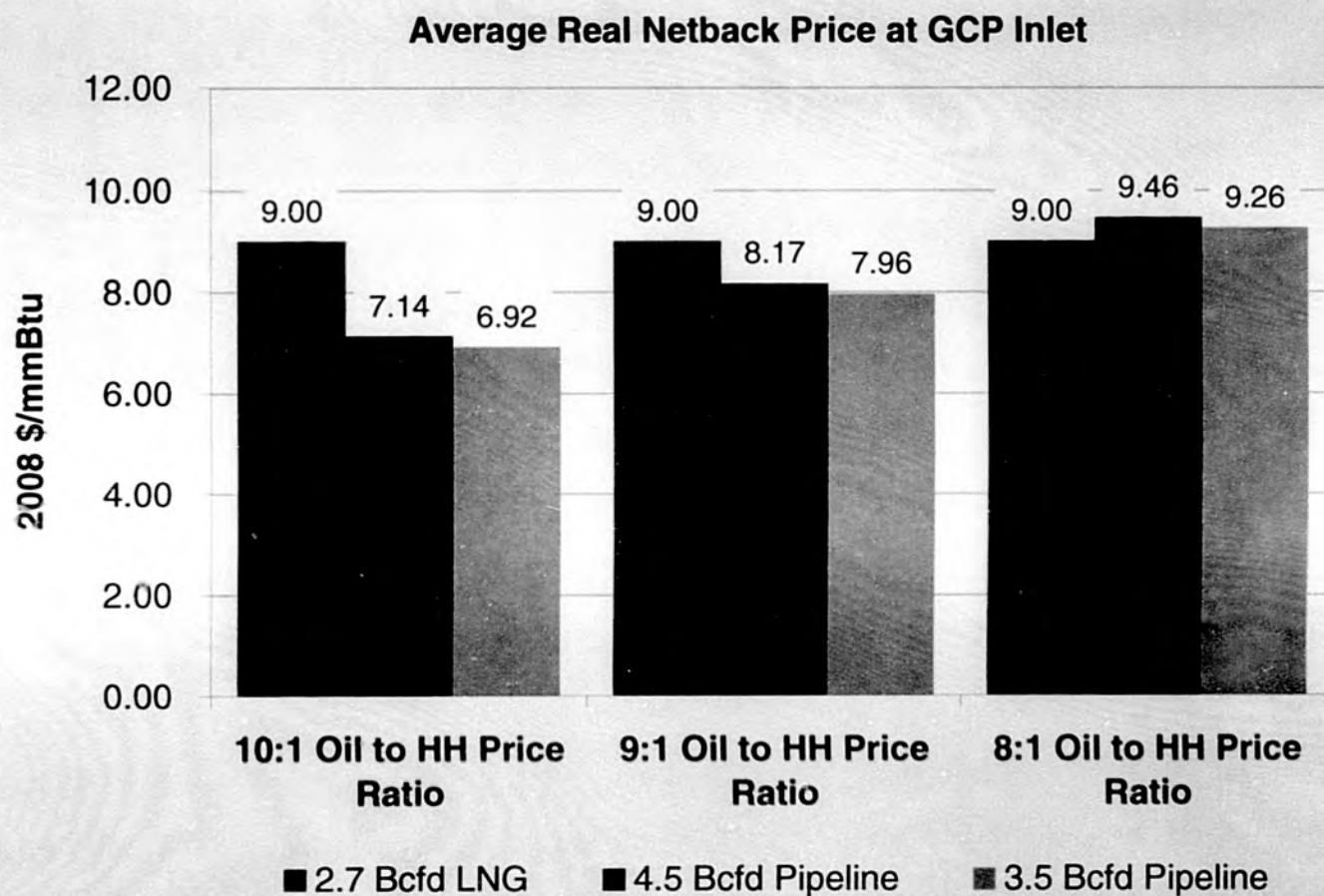
- Flat \$80/bbl oil price (constant 2008 USD)
- 3 scenarios for oil/HH price ratio: 10:1, 9:1 and 8:1



Netback Prices: \$100/bbl Oil Price Cases



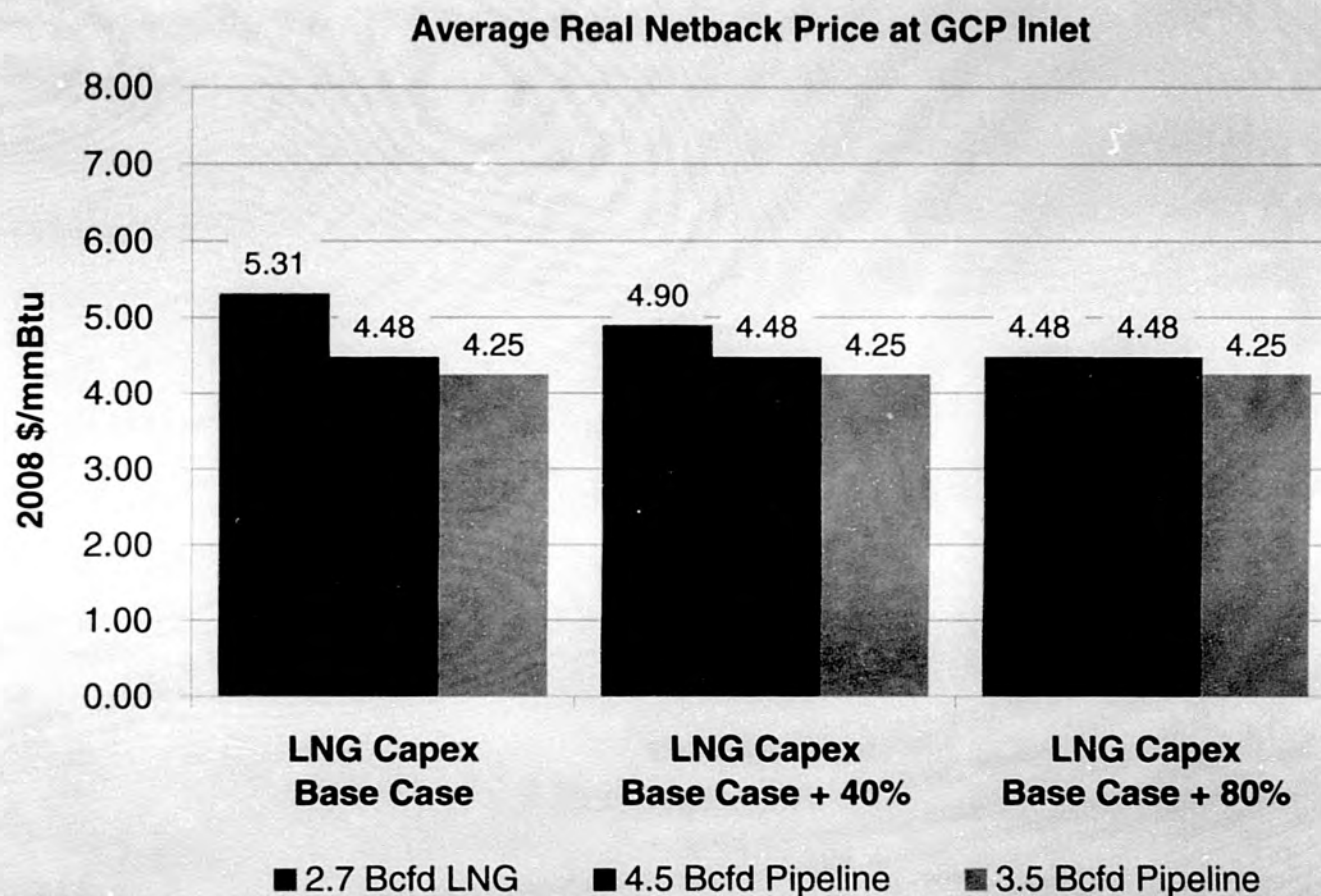
- Flat \$100/bbl oil price (constant 2008 USD)
- 3 scenarios for oil/HH price ratio: 10:1, 9:1 and 8:1



Netback Prices: LNG Capex Sensitivity



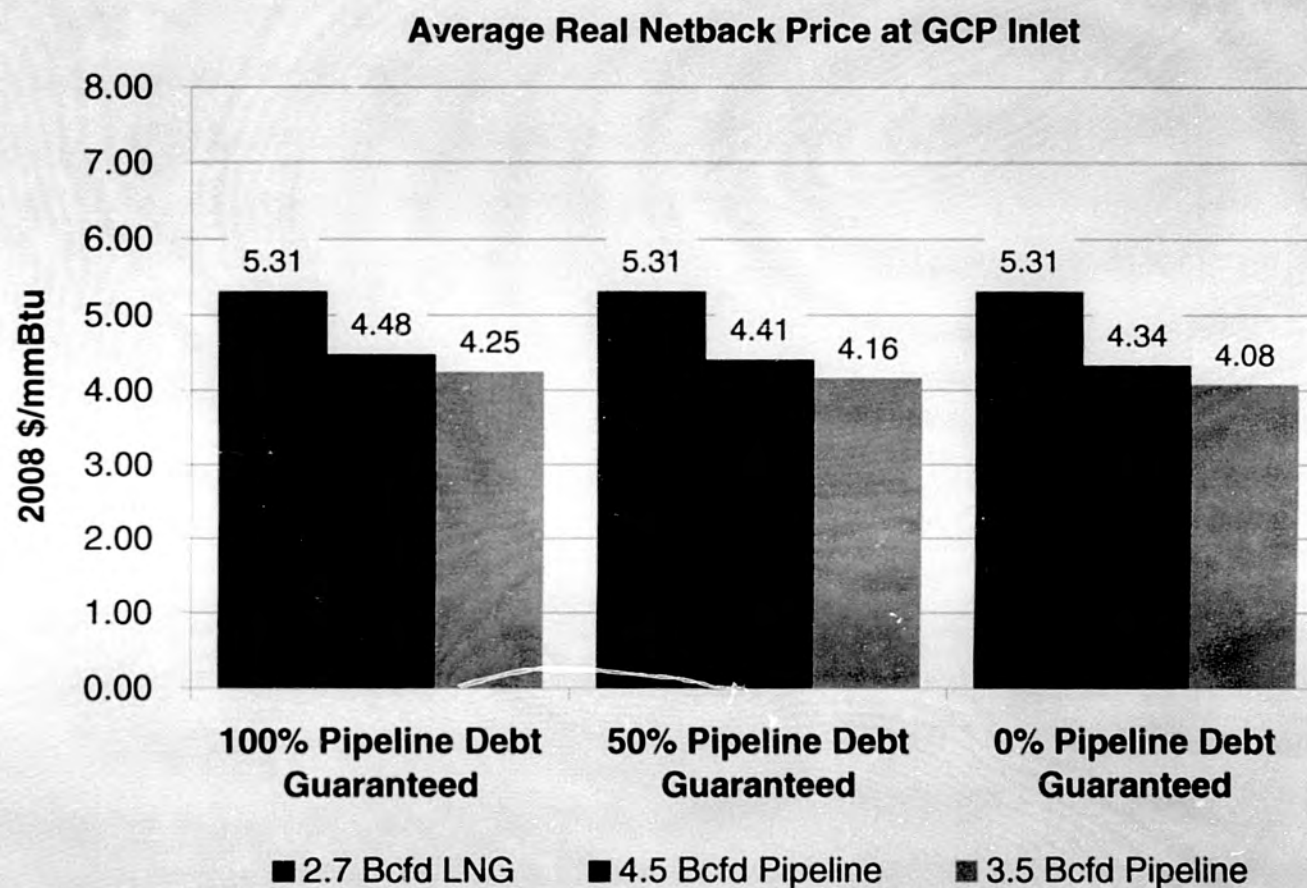
- Oil and HH prices from EIA 2008 Annual Energy Outlook – Reference Case
- 3 LNG Plant capital cost scenarios: Base Case, 40% increase and 80% increase



Netback Prices: Debt Guarantee Sensitivity



- Oil and HH prices from EIA 2008 Annual Energy Outlook – Reference Case
- Pipeline to Canada debt cases: 100%, 50% and 0% Federal guarantee



Netback Comparison Conclusions



- LNG generates higher netback prices than a Canadian pipeline under a wide range of oil and gas price assumptions
 - Gas Strategies High Case LNG price scenario, not used in this analysis, results in greater netback price advantage
 - High netback prices for LNG are preserved under substantial LNG plant cost increases
- Under comparable assumptions, Port Authority and EconOne analyses arrive at similar results

Netback Comparison Conclusions (cont'd)



- LNG Project achieves higher per-unit netback prices but lower absolute cash flow NPV, due to smaller gas volume
 - Port Authority views lower volume requirements as an advantage that enhances likelihood of success
 - LNG and pipeline to Canada should proceed – there are sufficient ANS gas resources for both
 - The first 2.7 Bcf/d volumes could be monetized at highest value via LNG, with subsequent expansions allowing for full ANS gas monetization
 - Stand-alone analysis of 2.7 LNG vs. 4.5 Pipeline ignores expansion potential

Financial Projections Disclaimer



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AGIA

The Alaska Gasline Inducement Act

Gas Pipeline Implementation

- Monitor and audit pipeline expenditures.
- Facilitate the issuance of environmental permits and other government approvals.

AGIA Gas Pipeline Implementation

- DNR, DOR, and the Governor's Office have roles in achieving a successful project
 - Monitor TC Alaska activities to ensure that it fulfills its license obligations
 - Work to ensure that the first open season is successful.
 - Monitor and audit pipeline expenditures.
 - Facilitate the issuance of environmental permits and other government approvals.

Conformance with License

- TC Alaska required to diligently pursue its work plan. A team will be assembled to ensure that it does so.
- The experts and [“]team[”] that is working to ensure compliance with the License terms will also seek out ways to work with TC Alaska to help ensure a successful open season.

[“]team[”] similar to team[”] RFA - legal and consultant expert

Commercial Developments and Conditions

- Implement AGIA's upstream inducements:
 - Royalty Valuation and RIV/RIK switching regulations
 - Possible fiscal certainty regulations

- Determine possible additional state inducements to help ensure success of the first open season

Team of - Technical / Financial / Commercial / Legal consultants

- * – Resource assessments, manage State's relationship with TC Alaska, ongoing assessment of project costs and economic conditions
 - Examination of Alaska's gas fiscal regime

* Resource assessments - looking at available gas markets/consumers
Obligated to monitor TC project design/engineering/market conditions

Funding will provide DNR, DOR, and
the Governor's Pipeline Coordinator
with Outside Expertise to Perform
These Activities

Types of expertise needed:

- Tariffs and ratemaking
- Policies of the FERC, RCA, and NEB
- Gas pipeline access
- Engineering and Project costs
- Project Economics
- Federal loan guarantees
- Project management
- Worldwide gas investment opportunities
- Pipeline development accounting
- Environmental oversight
- Project management

Budget

1. Conformance with license provisions	\$7,500,000
2. Monitor commercial developments and conditions	\$6,500,000
3. Oversight & Environmental Permit Coordination	<u>\$1,000,000</u>
Total	\$15,000,000

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Fourth Special Session
Twenty-Fifth Legislature

Senate Special Committee on Energy

Tuesday July 22, 2008

Senate Finance Room 532

1:00-3:00 p.m.

SB 3001 Approving AGIA License for Natural Gas Pipeline Project as proposed by TransCanada Alaska Company, LLC and Foothills Pipelines Ltd. (TC Alaska) to the State of Alaska

➤ **Alaska Gasline Port Authority: Export License Issues;
Project Economics and Feasibility**

- Bill Walker, Project Director, AGPA
- Craig Richards, Attorney, AGPA
- Radoslav Shipkoff, Financial Advisor, Greengate LLC

Teleconference
Testimony – By Invitation

Juneau

July 22, 2008

presented to SENR com

AGPA presentation

re: Export Issues

Project Economics & Feasibility

REPORT TO THE STATE OF ALASKA LEGISLATURE
ON FEDERAL LAW GOVERNING THE ISSUANCE OF AN EXPORT
LICENSE FOR ALASKA NORTH SLOPE GAS

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the
This report analyzes the law relevant to the export of Alaska North Slope natural gas. As will be discussed, two federal actions are required. Unique to North Slope gas, the President of the United States ("U.S.") must find the quantity, quality or price of the energy supplies available to U.S. consumers will not be effected by export. Additionally, for all domestically produced gas the Department of Energy ("DOE") must authorize export to any country for which U.S. does not have a free trade treaty (e.g., not Canada and Mexico).

0 (The only authorization to export Alaska North Slope gas was to the Yukon Pacific Corporation ("YPC") in 1989. After the requisite Presidential finding, DOE authorized the export for sale to Japan, South Korea, and Taiwan a total of up to 250 million metric tons ("MMT") of liquefied natural gas ("LNG"), at an average annually volume of 14 MMT – a bit less than 2 billion cubic feet per day ("bcfd") – for a period of 25 years beginning on the date of the first delivery.¹ The only other authorizations to export U.S. gas to a country to which the U.S. does not have a free trade treaty that the authors could locate involve the export of Cook Inlet natural gas from ConocoPhillips/Marathon facility in Kenai, meaning prior DOE authorizations to export Alaskan gas is the controlling law.

I. Legal Standards Under Which DOE Authorizes Export of North Slope Gas

A. The Natural Gas Act

Section 3 of the Natural Gas Act, 15 U.S.C. § 717b (2006) ("NGA"), provides the Secretary of Energy shall allow the export of gas unless he finds it will not be consistent with the public interest. If the export is to a country with which the United States has a free trade agreement covering natural gas, the export is deemed to be in the public interest and approved automatically.² If not, the DOE must consider whether the export is in the public interest.

"Section 3 creates a rebuttable presumption that a proposed export of natural gas is in the public interest and that the Department of Energy ("DOE") must grant such an application unless those who oppose the application overcome that presumption."³

DOE has issued a set of guidelines to help interpret Section 3, the goals of which "are to minimize federal control and involvement in energy markets and to promote a balanced and mixed energy resource system."⁴ "In effect the guidelines represented a determination that it is in the public interest to let market forces, with a minimum of

¹ *Order Granting Authorization to Export Liquefied Natural Gas from Alaska*, Department of Energy Order and Opinion No. 350, 1 F.E. 71,115, 71,144-45 (November 16, 1989), as amended by *Order Denying Requests for Rehearing and Modifying Prior Order for Purpose of Clarification*, Opinion and Order No. 350A, 1 F.E. 70,303, 71,273 (March 8, 1990).

² 15 U.S.C. § 717b (2006).

³ *Order Granting Authorization to Export Liquefied Natural Gas from Alaska*, Department of Energy Order and Opinion No. 2500 at 43 (June 3, 2008).

⁴ Order No. 2500 at 44.

regulatory constraints, define efficient energy production and consumptions.”⁵ Although the guidelines were originally promulgated for cases relating to the import of natural gas, DOE subsequently held the same policies will be applied to natural gas export applications.⁶

The federal government’s primary responsibility in authorizing imports [or exports] will be to evaluate the need for the gas and whether the import [or export] arrangement will provide the gas on a competitively priced basis for the duration of the contract while minimizing regulatory impediments to a freely operating market.⁷

DOE has also stated that “the principal focus of this agency’s review of export applications in decisions under current delegated authority has continued to be the domestic need for the natural gas proposed to be exported.”⁸

For YPC, and presumably for another North Slope export project, DOE set forth a three-pronged approach for evaluating domestic need.

First, the DOE determines whether national or regional demand can reasonably be expected to exceed anticipated available domestic supplies over the term of the proposed export. If there is a reasonable expectation of demand in excess of available domestic supplies, the DOE determines the extent to which this excess demand can be met by other energy sources as or more efficiently than the proposed export. If there are sufficient alternative sources, the DOE analyzes whether there is any reason the public interest requires the proposed export, in particular, be used to meet the excess demand.⁹

As to the last prong, although “[d]omestic need is the only explicit public interest consideration identified by DOE in Delegation Order No. 0204-111 . . . the Department considers the potential effects of proposed exports on other aspects of the public interest. These other considerations include Alaskan interest, international effects, and the environment.” DOE has in the past also looked at the effect of the export project on energy security.¹⁰

B. ANGTA and the Reagan Findings

⁵ Order No. 350, 1 F.E. at 71,121.

⁶ Order No. 2500 at 44 (citing Order No. 1473 at 14 and citing Yukon Pacific, Opinion and Order No. 350, 1 F.E. 70,259 at 71,128).

⁷ Order No. 2500 at 44 (quoting *New Policy Guidelines Relating to the Regulation of Imported natural Gas*, 49 Fed. Reg. 6684 (February 22, 1984) (brackets in original)).

⁸ Order No. 2500 at 44-45 (citing DOE Delegation Order No. 0204-111 which, although no longer in effect, directed in part that exports be regulated based on a consideration of the domestic need for the gas to be exported and such other matters as found in the circumstances of a particular case to be appropriate).

⁹ Order No. 350, 1 F.E. at 71,129.

¹⁰ *Id.* at 71,134.

The Alaska Natural Gas Transportation Act of 1976, 15 U.S.C. § 719j (2006) ("ANGTA"), provides that before exportation of Alaska gas "to any nation other than Canada or Mexico, the President must make and publish an express finding that such exports will not diminish the total quantity or quality and not increase the total price of energy available to the United States."

In 1998 President Reagan issued a finding that export of North Slope gas would not affect adversely the quantity, quality or price of the energy supplies available to U.S. consumers.¹¹

In particular, the President found that 'there exist adequate, secure, reasonably priced supplies of natural gas to meet the domestic demand of American consumers for the foreseeable future.' The president acted to let 'the marketplace undertake a realistic consideration of various options concerning Alaska natural gas' by allowing 'any private party to develop this resource' and setting 'up competition for this purpose.' The President's Findings stated that 'operation of market forces is the best guarantee that Alaska natural gas will be developed efficiently and that there will be incentive to find additional reserves.'¹²

If an off-slope liquefied natural gas ("LNG") project sought a new export license, rather than update the one issued to Yukon Pacific Corporation ("YPC") in 1989, a new Presidential finding would likely be required. Note, however, that Congress granted the President broad power to limit natural gas exports (whether from Alaska or other locations) in the Energy Policy and Conservation Act of 2005, 42 U.S.C. § 6212 (2006), significantly diminishing the significance of an upfront Presidential finding for export of Alaska natural gas under ANGTA.¹³

As to YPC's export license, DOE determined a North Slope export proposal will be viewed in light of ANGTA, and in fact a significant condition called the "ANGTA Condition" on the YPC export license prevented YPC from taking any action that would compel change of the ANGTA route or project timing.¹⁴ DOE expressly stated, however, that the ANGTA condition did not apply to market decisions relating to access or development of North Slope reserves, and it instead related to increased costs of ANGTA infrastructure resulting from the export project.¹⁵

Since, in order to avoid the \$10 billion liability associated with the ANGTA project legacy, TransCanada is no longer sponsoring an ANGTA project in Alaska, and the Alaska Natural Gas Pipeline Act of 2004, 15 U.S.C. § 720a(a) (2006) ("ANGPA"),

¹¹ *Presidential Finding Concerning Alaska Natural Gas*, 53 Fed. Reg. 999 (January 15, 1988).

¹² Order No. 350, 1 F.E. at 71,122 (emphasis eliminated).

¹³ Section 6212 provides that the President may restrict exports of: "(1) coal, petroleum products, natural gas, or petrochemical feedstocks, and (2) supplies of materials or equipment which he determines to be necessary (A) to maintain or further exploration, production, refining, or transportation of energy supplies, or (B) for the construction or maintenance of energy facilities within the United States."

¹⁴ Order No. 350, 1 F.E. at 71,128, 142.

¹⁵ *Id.* at 71,142.

specifically authorized non-ANGTA Canadian highway projects, it would appear ANGTA no longer has relevancy to the exportation of North Slope gas and will be ignored in this analysis except as to the requirement of a Presidential finding.

III. Various Parties' Position Before DOE Regarding a YPC Export License

In analyzing various arguments that could be made today about why an export license should or should not be issued for North Slope gas, it is helpful to understand some of the positions of the same parties before DOE almost 20 years ago. Many arguments that would be made today have already been addressed and decided by the department.

A. TransCanada

TransCanada's predecessor sponsors of the Alaska Natural Gas Transportation System ("ANGTS") Canadian highway line, Alaskan Northwest and Foothills (hereinafter "TransCanada"), held the right to build the Alaskan portion of the highway line under ANGTA. It was the only major opposing party to the issuance of a YPC export license, and TransCanada prosecuted its case vehemently.

For instance, TransCanada said YPC's application did not contain enough information to be evaluated since YPC did not have gas purchase or resale contracts, sufficient details on project infrastructure, a completed environmental impact statement or a description of all the project's participants.¹⁶

TransCanada also asserted North Slope gas would be needed in the lower-48.

They contend that the excess demand in the lower-48 states cannot be met by other energy resources as or more efficiently than by the proposed export volumes. The ANGTS sponsors assert that substitute fuels for North Slope gas, such as coal and oil, would be environmentally inferior to natural gas, which burns cleaner. They maintain that increasing dependence on coal and oil would contribute to ozone layer depletion in the atmosphere, 'acid rain', and the 'greenhouse' problem of global warming, and alternative gas supplies, such as development of Canadian frontier gas, would be more costly. In addition, they assert that the commitment of North Slope gas reserves to foreign interests would jeopardize national energy security by depriving the U.S. of a source of available reserves to offset the declining energy base in the lower-48 states, and by increasing U.S. dependence on oil imports.¹⁷

TransCanada additionally argued that an LNG project would impair completion of a Canadian line because "there are not enough proven reserves of gas on the North Slope

¹⁶ *Id.* at 71,125.

¹⁷ *Id.*

to support both . . . projects.”¹⁸ The Canadian Government through the State Department shared similar concerns.¹⁹ TransCanada actually sought a condition on the export license that its project have “first call on North Slope gas for delivery to the lower-48 states, if needed to meet contractual obligations and to preserve the project’s economic viability[.]”²⁰

Finally, TransCanada urged “that any final authorization issued be subject to suspension, modification, or revocation upon a showing that continuation of the proposed export is no longer in the public interest.”²¹ That is, TransCanada wanted YPC’s export license to be subject to future reopening for additional public interest before export occurred. As will be seen, DOE rejected all of these arguments.

B. State of Alaska and Exxon

The State of Alaska intervened on behalf of an export license because of the benefits to Alaska that an off-slope pipeline would bring. However, it had no preference for an LNG versus Canadian project asserting that the market would decide which (or how many) systems get built, and opposed the imposition of conditions on export that would favor one gas development project over another.²²

Exxon supported President Reagan’s Findings for export and urged market-responsive development of Alaskan natural gas. It asked that DOE not impose terms and conditions “that would, in effect, place a stamp of approval on only one project or approach to development of Alaskan resources and discourage other projects or approaches.”²³

C. Statoil

Statoil, the Norwegian national oil company, stated its LNG exports and those of other over-seas suppliers would be able to meet any U.S. gas demand that might go unserved if North Slope gas was exported.

IV. DOE’s 1989 Decision Authorizing Export of North Slope Gas

Unfortunately since 1989 little has changed in the debate about whether DOE should allow the export of North Slope gas. On the bright side, risks associated with seeking an export license have been significantly reduced given DOE has already addressed many of the arguments a party opposing export can make. It is thus useful to review in detail DOE’s rationale for issuing YPC an export license under Section 3 of NGA.

¹⁸ *Id.* at 71,125.

¹⁹ *Id.* at 71,126.

²⁰ *Id.*

²¹ *Id.*

²² *Id.*

²³ *Id.* at 71,126-27.

A. Use of Economic Studies

YPC and TransCanada both presented to DOE economic studies regarding when North Slope gas would become competitive in the lower-48. Quoting TransCanada, DOE held such studies were not useful in assessing the future of a particular project because the world was too complex and subject to change to forecast 12 or 20 years into the future.²⁴ "In fact, the inherent imprecision of using economic studies to predict the performance of a particular project is one reason that led to the shift from a government-mandated regulatory approach to a market-oriented approach that leaves private commercial parties with the flexibility to determine the basics of their projects."²⁵

DOE also rejected out of hand that the need for North Slope gas in domestic markets is evidenced by the many economic models predicting North Slope gas will be used to meet domestic demand.

Unlike the real world where private parties take a hard look at the actual costs of bringing competing supplies to market, an economic model selects the 'competitive' supply on the basis of assumptions . . . In the case of ANGTS, most economic models put the cart before the horse since they automatically assume North Slope gas will be used in the domestic market and then speculate when producers, pipeline sponsors, and financial institutions will agree that the market justifies the commitment of billions of dollars to provide the means necessary to make this 'a priori' modeling assumption feasible in the real world.²⁶

However, although DOE did not find economic forecasts and studies useful in evaluating specific projects, DOE did find their information on supplies of various energy sources and anticipated demand helpful in evaluating domestic need as required under NGA Section.

B. Domestic and Regional Need

As previously stated, in looking at future domestic need over the life of the license, the DOE first looks at whether national or regional demand will exceed domestic supplies over the term of the proposed export. If so, DOE looks at whether excess demand can be met with alternative energy sources as efficiently as by the proposed export. Finally, if there are sufficient alternative energy sources, DOE analyzes whether for some other reason the public interest nonetheless requires the proposed exported gas to be used to meet excess domestic demand.

1. Regional Need

²⁴ *Id.* at 71,129-30.

²⁵ *Id.* at 71,130.

²⁶ *Id.* at 71,129 n. 36. See also Order No. 350A, 1 F.E. at 71,270 (reaffirming that the inclusion of North Slope gas in various economic studies does not demonstrate a domestic need for it).

In YPC's case, DOE held regional need in Alaska was not a relevant issue for North Slope gas.²⁷ Interestingly, this is exactly the opposite position DOE took in granting the most recent extension for the Kenai export license. For Cook Inlet gas, DOE only looked at regional and not domestic supply and demand dynamics.²⁸ Given the Cook Inlet basin is maturing and will not be able to fully supply South Central – much less the Alaskan Interior – for the term of a Valdez export license (e.g., 25 years from first export), both domestic and regional supply and demand would likely be a factor if DOE revisits whether exportation of North Slope gas is in the public interest. Those advocating export of North Slope gas would argue that an LNG project would help meet projected gas shortfalls from Cook Inlet and would provide gas to new Alaskan markets in a manner more rapid than a project through Canada which would, if accepted by DOE, help the case for export.

2. *Domestic Need – Lower-48 Supply and What Reserves DOE Will Consider in its Analysis*

In analyzing future projected domestic supply of natural gas, DOE rejected TransCanada's argument that only proven reserves in the lower-48 could be counted as available supply. Instead DOE decided it would take a broad view of sources of gas that would be viewed as available to meet projected domestic demand. Thus for instance, DOE included in reserves estimates both unconventional (tight sands, Devonian shale, coal seams, enhanced recovery, etc.) and conventional gas, and for conventional gas included allowances for reserves growth and additional exploration.²⁹

DOE also rejected TransCanada's argument that North Slope gas was needed because its cost of delivery to American consumers on a per molecule basis (i.e., in-field and transportation costs) would be lower than the cost of delivery of many of the other sources of gas included in DOE's estimate of national reserves.³⁰ Rather DOE thought the proper inquiry was whether "the costs of bringing some supplies to market may be so significantly higher than the anticipated market price that their use would be precluded in an efficient market."³¹ So in looking at whether North Slope gas is needed domestically, the DOE will not compare the cost of delivery of North Slope gas vis-à-vis other gas supplies, but whether the non-North Slope supplies can be developed given anticipated market prices.

²⁷ Order No. 350, 1 F.E. at 71,129 n. 35.

²⁸ DOE seemed to accept the applicants' assertions that there was no practical market for Cook Inlet gas in the U.S. because of the Jones Act, a lack of West Coast receiving terminals, and the prohibitive cost of reaching East Coast receiving terminals. Order No. 2500 at 14 ("The Applicants emphasize that the . . . Jones Act, would present a substantial regulatory hurdle. The Applicants also emphasize that there are not existing U.S. west coast LNG receiving terminals and the cost of shipping Kenai LNG to U.S. east coast or gulf coast LNG Receiving terminals would vastly exceed the cost of transporting the same LNG to Japan and/or another customer in the Pacific Rim due to the distances involved.").

²⁹ "Gas supply assumptions that focus solely on proved reserves and do not take into account the potential for reserve additions and production experience would severely distort forecasts of domestic need." Order No. 350, 1 F.E. at 71,131.

³⁰ *Id.* at 71,269.

³¹ *Id.*

After reviewing various studies, DOE ultimately concluded that during the term of YPC's export proposal domestic need could be met by production from reservoirs in the lower-48 states without North Slope gas.³² An argument could be made that DOE might not reach the same conclusion today,³³ although this is a technical decision that DOE would make only after it reviewed projected domestic supply and demand as it did in the Kenai and YPC decisions.

3. *Domestic Need – Alternative Supply*

Even though DOE said in 1989 that North Slope reserves were not needed domestically, DOE nonetheless stated that it is not necessary for the purpose of a NGA § 3 determination that DOE find all future U.S. natural gas demand will be met by production in the lower-48 states. DOE may also look to alternative supplies, particularly gas imports. This includes whether import of LNG from overseas (e.g., East Coast imports), when combined with North American supply, will be sufficient to meet domestic demand without North Slope gas.³⁴

4. *Domestic Need – Public Interest of Domestic Use of North Slope Gas Rather than Available Alternative Supply*

After examining whether lower-48 and alternative supplies are sufficient to meet domestic demand, DOE's next considers whether there is a public interest in the North Slope gas proposed to be exported (rather than other energy supplies) being used to meet any anticipated demand in excess of domestic supply. Harmonizing its NGA § 3 analysis with ANGTA Presidential finding requirements, DOE looked at whether the proposed project's export of North Slope gas would have an impact on matters of supply, price and quality of domestic gas.

a. *Quantity*

A proposed export of North Slope gas will adversely affect the quantity available to American consumers only if it will cause available domestic supplies to be inadequate. Since DOE concluded at the time there were adequate lower 48 and alternative supplies, DOE determined an export of about 2.0 billion cubic feet per day from Alaska would not adversely affect American consumers.³⁵ Additionally, DOE said in the context of global

³² *Id.* at 71,130-32.

³³ For instance, in 2004 when ANGPA was passed, it was the "sense of Congress" that "gas delivered from Alaskan North Slope will not displace or reduce the commercial viability of Canadian natural gas produced from the Mackenzie Delta or production from the 48 contiguous States." 15 U.S.C. § 7201 (6) (2006). In support of that proposition, it was also the sense of Congress both that "natural gas production in the 48 contiguous States and Canada will not be able to meet all domestic demand in the coming decades" and "Federal and State officials should acknowledge that the smaller scope, fewer permitting requirements, and lower cost of the Mackenzie Delta project means it will most likely be completed before the Alaska Natural Gas Pipeline." 15 U.S.C. § 7201 (2) and (4) (2006).

³⁴ Order No. 350, 1 F.E. at 71,134-35.

³⁵ *Id.* at 71,134.

energy interdependence it cannot necessarily be concluded that export of gas would diminish that available to American consumers.

[W]ith respect to North Slope gas, it would be unduly simplistic to conclude that exports will necessarily diminish the quantity of energy available to American consumers. In this case, the alternative to exporting North Slope gas may be that it remains undeveloped, and therefore available to no one; conversely, exporting such gas may make available on the American market gas from foreign sources that would otherwise have gone to the Pacific Rim.³⁶

Thus even if domestic and alternative supplies of gas were projected to be inadequate over the term of the license, export would still be authorized if it was demonstrated that export would not diminish gas available to American consumers. This might be because, for instance, the gas would remain undeveloped without export, export of Alaskan gas would free up other supplies that would be made available to U.S. markets, or an export project would open the North Slope basin to exploration that would in turn result in additional gas being available to go to U.S. markets (either via LNG or a line through Canada).

b. Quality

In looking at the impact on the export of North Slope gas on the "quality" of energy available to American consumers, DOE focused on arguments made by TransCanada regarding the effects of export on the environment and U.S. energy security. DOE did not believe export of natural gas from the North Slope would lead to the use of less environmentally friendly energy sources (e.g., coal).³⁷

DOE also rejected TransCanada's argument that export of North Slope gas would increase imports and thereby decrease energy security on the grounds that energy security must be viewed in global terms and the development of North Slope gas would contribute to the overall performance of the North American energy market.³⁸ "DOE believes that true energy security lies in encouraging the most efficient operation of the North American and global energy market."³⁹

c. Price

In performing the public interest analysis and looking at whether North Slope gas should not be exported, notwithstanding there are sufficient projected lower-48 or alternative supplies, DOE will consider whether American consumers will pay more than they would if North Slope gas was not exported.

³⁶ *Id.* at 71,134.

³⁷ *Id.* at 71,135.

³⁸ *Id.*

³⁹ *Id.*

In general, conditions in the domestic market will establish the price for whatever natural gas is used to meet domestic need, regardless of the source of that gas. Neither North Slope gas nor any other specific supply will be the tail that wags the market price of natural gas. The export of a particular gas supply, such as North Slope gas, would exert upward pressure on the market price only if there were not adequate alternative supplies of energy to meet domestic need at a market-responsive price. Even then, the export would exert upward pressure only if the costs of producing and delivering the exported gas to the domestic market would be less than the costs of the energy supplies actually used to meet the marginal demand.⁴⁰

In YPC's case, DOE felt export of North Slope gas would not have an impact on domestic prices, and found the presented economic studies "did not constitute the substantial evidence necessary to overcome the DOE's analysis of the fundamental market conditions, the section 3 presumption in favor of export approval, and the President's Finding."⁴¹

B. Other Public Interest Considerations

In addition to the NGA § 3 analysis relating to domestic need for North Slope gas, DOE considered a number of other public interest factors.

1. *Export's Impact on North Slope Exploration and Development*

TransCanada indicated that the proposed export of North Slope gas might result in the non-production of some North Slope gas and questioned whether competition will spur exploration for and development of North Slope gas.⁴² DOE disagreed and stated an export project would spur development of the 100 + trillion cubic feet of stranded proven and potential gas reserves.

Thirteen years have passed since the passage of ANGTA and no North Slope natural gas has been produced commercially. The introduction of competition will encourage a realistic assessment of the potential of North Slope natural gas and its early and more efficient development. It also will provide an incentive for discovering and developing additional reserves of natural gas on the North Slope.⁴³

2. *Alaskan Interests*

⁴⁰ *Id.*

⁴¹ *Id.* at 71,136.

⁴² *Id.* at 71,137.

⁴³ *Id.*



**Presentation to
Alaska State Senate**

July 22nd, 2008

Juneau, Alaska



1. LNG Export Issues

Export License – Overview of Federal Law



- ANGTA requires Presidential finding before North Slope gas can be exported
- NGA requires DOE to authorize all U.S. gas exports
 - Export approval for Canada and Mexico automatic
 - DOE has only addressed export for Kenai and YPC
- 1969 to present DOE authorized Kenai export
- 1990 DOE finalized authorization for YPC to export 14 MMT (~1.9 bcf/d) for 25 years starting at first delivery

3

Export License – DOE's Market Driven Approach



- NGA creates rebuttable presumption that license will issue
- DOE's stated goal
 - let market forces define efficient energy markets
 - minimize federal involvement

"Competition in world energy markets promotes the efficient development and consumption of energy resources, as well as lower prices, whereas economic distortions can arise from artificial barriers to the free flow of energy resources. Accordingly, the DOE believes that the public interest in free trade generally supports approval of proposed exports." (DOE Order 350).

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Export License – Domestic Need



DOE uses a three pronged public interest analysis to determine if the presumption to allow export has been overcome:

1. *Will national or regional demand exceed available domestic supply?*
2. *If insufficient domestic supply, are alternative supplies available to meet demand?*
3. *If there is sufficient domestic or alternative supply, does some other public interest overcome presumption of export?*
 - a. Environment
 - b. Alaskan interests
 - c. Energy security
 - d. International effects
 - e. Impact on North Slope development
 - f. Lower-48 natural gas prices

Source DOE Order No. 350 (YPC); DOE Order No. 2500 (2008 Kenai).

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Export License – Domestic Need



1. Will domestic demand exceed available domestic supply?

- U.S. supply and demand over term of license estimated
- DOE takes a broad view of available U.S. reserves, including allowance for
 - reserves growth
 - new discoveries
 - non-conventional gas resources
 - E.g., Tight sands, shale, coal seams and enhanced recovery
- In 1989 DOE said domestic supply sufficient to meet anticipated U.S. need
- Today, domestic reserve additions from shale gas have potential to fulfill domestic need

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Export License – Alternative Supply



2. Are alternative supplies available to meet demand if DOE projects insufficient domestic supply?

- DOE looks at availability of gas for import including LNG from overseas
- "unduly simplistic to conclude that [ANS] exports will necessarily diminish the quantity of energy available to U.S. consumers"
 - Alternative may be ANS gas is stranded
 - Export will open ANS to exploration and development
 - ANS LNG to Asia may free up other LNG to go to U.S.
- DOE recognizes gas markets are global
- Today, increased global LNG production and U.S. receiving capacity means alternative supplies are available

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Export License – Public Interest Factors



3. If there is sufficient supply, does some other public interest overcome presumption of export?

Energy Security

- "DOE believes that the true energy security lies in encouraging the most efficient operation of the North American and global energy markets."
- Also since 2005 President has broad authority to stop export of all gas

International Effects

- Competition promotes efficiency and lower prices
- Impact on Asian balance of payments and trade imbalances significant

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Export License – Public Interest Factors



U.S. Prices

- DOE wants to insure exporting ANS gas will not drive up lower-48 natural gas prices
- DOE does not consider
 - Various projections anticipating ANS gas will go to U.S.
 - Economic studies of Canadian vs. LNG project
- Rather DOE asks whether available non-ANS gas can be delivered given anticipated prices?
- Answer in 1990 and now is yes!
 - By 2030 about half of U.S. demand will be met with non-conventional gas (EIA Annual Energy Outlook 2008)
 - Non-conventional gas, as marginal supplier, will set price
 - ANS gas to the U.S. will not change the cost of meeting marginal demand or thus price to U.S. consumer

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Export License – Public Interest Factor (Price)



Impact on North Slope development

- DOE unsympathetic to argument that proven ANS reserves needed for Canadian pipeline
 - Canadian project does not have right to ANS reserves
 - The market will decide
- DOE noted 13 years had passed since ANGTA and the ANS gas remained undeveloped
- DOE said export will encourage
 - Assessment of ANS potential
 - Earlier development of ANS proven reserves
 - Discovery and development of additional ANS reserves

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Export License – Looking Forward



- AGPA strongly believes
 - YPC license will be honored, and
 - Regardless a new license would issue
- YPC license update
 - DOE stated YPC could not pass project costs on to U.S. consumers
 - Filing with DOE all contracts for acquisition, transportation, and sale of gas precondition to export
- New license
 - Presidential finding
 - DOE will undertake same export analysis it did for YPC
 - Circumstances have not materially changed

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2. LNG Project Economics

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LNG Project Analyses Presented to Legislature



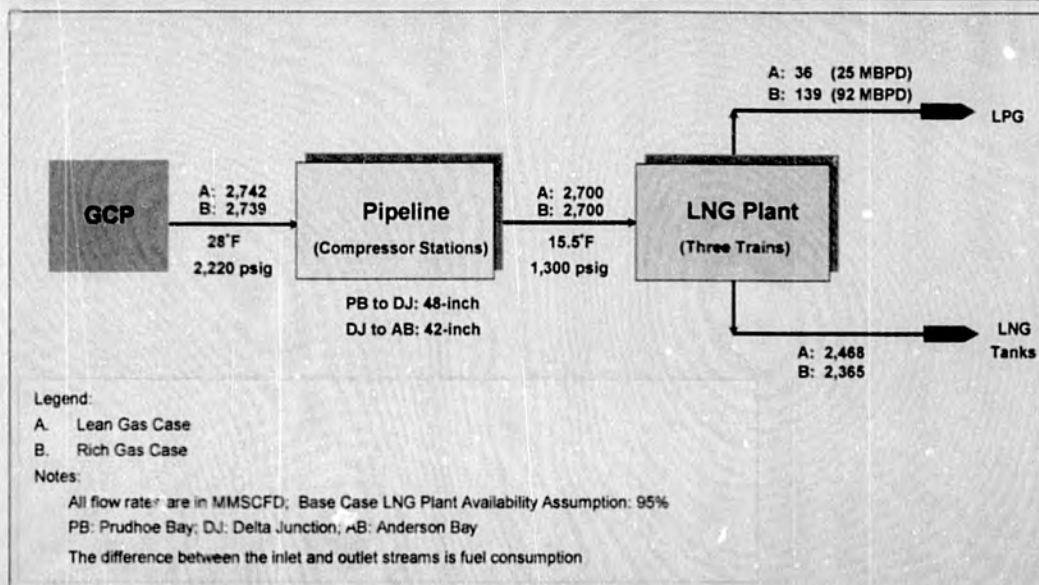
- Economics of an LNG project vs. Pipeline to Canada
 - Port Authority: LNG more attractive than pipeline to Canada
 - Administration: LNG less attractive than pipeline to Canada
 - EconOne: LNG either more or less attractive, depending on assumptions
 - Assumptions used are key:
 - capital cost of project components
 - difference in prices in Asian LNG market and Alberta gas market
- ⇒ different assumptions result in different netback prices

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Port Authority Project



OVERALL FLOW SCHEME (Gas Compositions Year 2007 Winter Conditions)



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Capital Cost Assumption Comparison



	Port Authority	Administration (P50)
Pipeline from Prudhoe Bay to Valdez	\$13.2 billion	\$11.4 billion
LNG Facilities	\$8 billion	\$14 billion

- 2.7 Bcfd LNG Project
 - Cost estimate includes EPC costs, owner's costs during construction, and development costs
 - escalation after 2007, property taxes during construction, and AFUDC are excluded
- ⇒ Administration uses substantially higher capital costs for the LNG Facilities

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LNG Plant Capital Cost Estimates



Bechtel's "bottom-up" EPC cost estimate for LNG Plant:

- 2007 EPC cost estimate
- Extensive technical work
- Site-specific and project-specific conditions accounted for
- Proven, well-established plant design
- Fewer cost uncertainty factors than the pipeline

Administration's "top-down" LNG plant capital cost:

- Not developed from detailed project-specific technical work
- Derived by "data mining" of database of other LNG projects
- Generic cost-per-ton estimate applied to Anderson Bay

Note: Administration's methodology as described in Chapter 4, Section E.3 of the Written Findings and Determination by the Commissioners of Natural Resources and Revenue for Issuance of License under AGIA

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LNG Plants Are Not the Same



- LNG projects are not the same: project location, project scope, feed gas composition and other project-specific factors make valid project comparisons difficult
- Variations in LNG plant scope and configuration:
 - many LNG projects include cost of gas treatment
 - liquid slug removal
 - condensate stabilization
 - acid gas removal
 - water removal
 - mercury removal
 - for the Alaska LNG project, gas treatment occurs at the GCP on the North Slope

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LNG Plants Are Not the Same (2)



- Feed gas pressure
 - high pressure feed gas from the pipeline to Valdez
 - significant reduction in the cost of compression at the Valdez LNG Plant
- Ambient temperatures at project site
 - most LNG projects in warm climate
 - Valdez plant benefits from cold climate
- Site preparation, marine terminal facilities, etc: highly location-specific
 - Bechtel estimate based on Anderson Bay site
- Different EPC market conditions for different projects

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"Bottom-Up" Approach is Preferable



- Limitations of "database mining" approach should be recognized
 - inherent difficulty in comparing projects of different scope, in different locations and subject to different conditions
- Mixing the "top-down" approach for LNG Plant with a "bottom-up" approach for the pipeline:
 - introduces an inconsistency in methodologies
 - validity of economic comparison between the two projects is compromised

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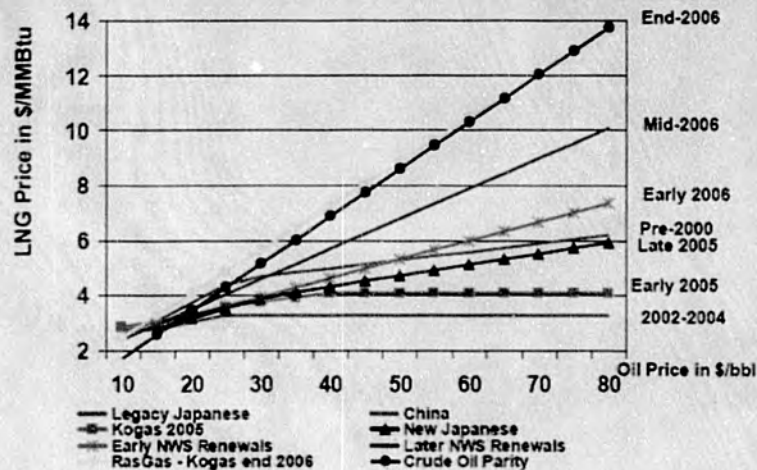
Asian LNG and North American Gas Prices



- Asian LNG Prices:
 - bilateral, long-term sales and purchase agreements
 - price formulas with oil price indexation provisions
 - pricing provisions reflect market supply and demand dynamics at time of contract execution
 - at each point in time, multiple active supply contracts, negotiated at different times, with varying pricing provisions
- North American gas prices
 - price discovery is driven by a gas spot market at regional trading hubs (e.g., Henry Hub, AECO, etc.)

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Evolution of Asian LNG Prices



- Recent LNG sales contracts in the Asian LNG market have been executed on terms highly favorable to sellers
- Kogas contract from late 2006: LNG price formula reportedly above parity with oil

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Price Assumption for Alaska LNG (E. Asia DES)



- Gas Strategies' report to the Administration projects the following price scenarios for Alaska LNG (LNG Price in \$/mmBtu, Oil Price in \$/bbl)*
 - Base Case: LNG Price = $0.1485 * \text{Oil Price} + 0.90$
 - High Case: LNG Price = $0.162 * \text{Oil Price} + 1.00$
 - Low Case: LNG Price = $0.9 * \text{Henry Hub} - 0.50$
- The Port Authority assumptions:
 - current highly seller-favorable market expected to swing back towards relatively more buyer friendly terms
 - Gas Strategies' Base Case forecast appears reasonable and has been incorporated in Port Authority analysis
 - High Case generates very favorable results for the Alaska LNG Project

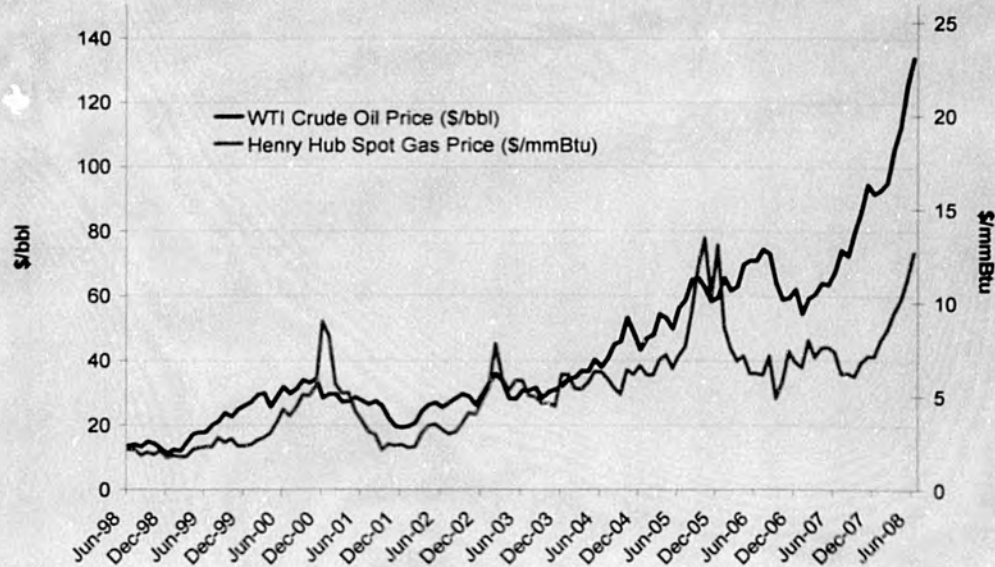
* Note: For simplicity, this presentation uses the term "Oil Price" interchangeably with JCC, Brent and WTI prices. In a detailed analysis, the price variations between different crude prices should be taken into consideration.

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North American Prices: WTI and Henry Hub



WTI and Henry Hub Historical Prices (monthly averages)

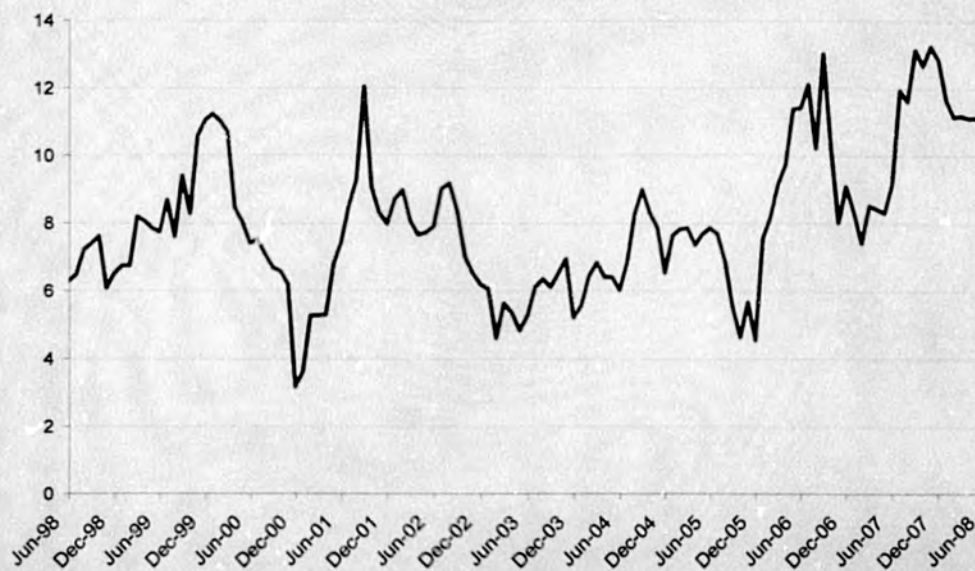


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WTI and Henry Hub Price Ratio



WTI to Henry Hub Price Ratio



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Significance of Assumed Oil/Henry Hub^b Price Ratio



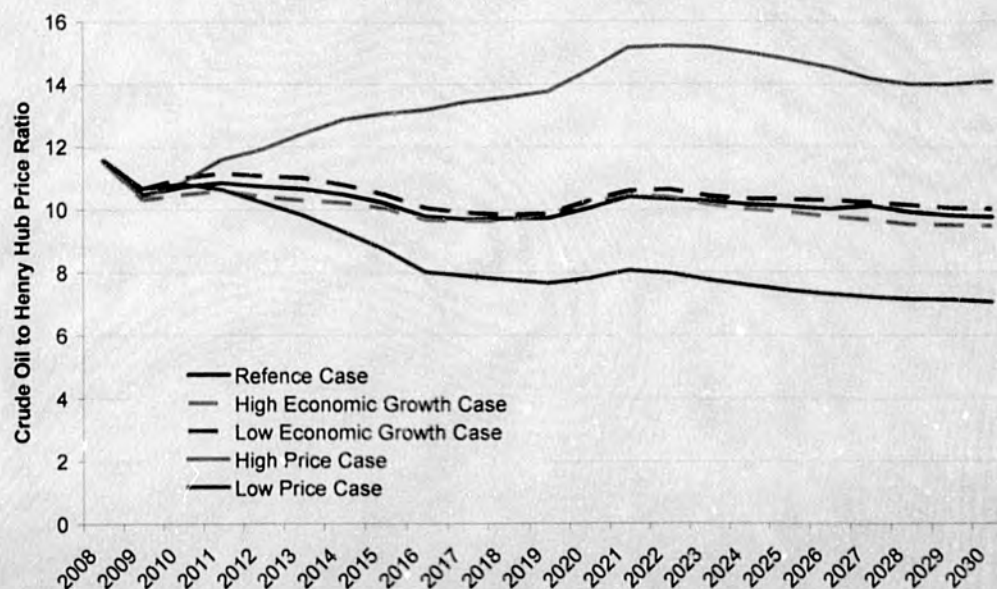
- Higher crude oil to Henry Hub price ratio means:
 - differential between Asian LNG prices and North American gas prices is higher
 - netback prices from LNG Project are relatively more attractive
- Recently observed price ratios are significantly higher than historical values
- What is the appropriate assumption for assumed crude oil to Henry Hub price ratio for the future?

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DOE EIA Forecast Price Ratios (AEO 2008)



US DOE Energy Information Administration Annual Energy Outlook 2008



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