

Economic Assessment Results, Price-Supply Graphs

The economic assessment model integrates the preceding geologic assessment with engineering analysis. Numerous input variables are used to simulate the discovery and development of pools grouped into geologic plays. Trials with profitable simulations are aggregated into play and province totals. The results of the assessment can be presented in tables or graphs. Numbers in tables imply precision, but graphs are a more realistic view of the continuous range of possible outcomes.

“Price-supply” curves indicate the portion of the undiscovered resource base that would become economic with increasing price. They are constructed from numerous modeling runs, where development simulations are repeated at \$2 price increments (see Figure 1). “Price” values (Y-axis) are the market prices needed to support the profitable discovery, development, and production of oil and gas resources. Prices are in constant 2005 dollars. “Supply” (X-axis) is the volume of resources theoretically present in the province. Despite this format, price is the independent variable and resource volume is the dependent variable. Higher prices support the recovery of more resources because the higher unit costs of developing smaller pools can be overcome. What is not shown by the curves is the time needed to develop and deliver the resources to market. “Price-supply” suggests that resources could be quickly available to meet demand. Realistically, exploration and development could take many decades because the oil and gas pools are undiscovered at the present time.

Oil and gas simulations are run together in the economic model. Operations are modeled in the same timeframe, although commodities could be transported to different market locations. Oil and gas prices are also linked (based on an energy equivalent conversion combined with an oil premium adjustment factor). All petroleum commodities could contribute to the economic results. Gas-prone provinces could contain significant volumes of associated liquid hydrocarbons (crude oil and gas-condensate). Oil-prone provinces could contain large amounts of associated (solution) gas. In many cases, gas production may not be possible without oil production to support initial infrastructure. Likewise, liquid hydrocarbon sales might depend on commercial gas production to initiate development in gas-prone provinces. This means that oil and gas curves for a province cannot be separated conceptually (e.g. “gas-only” development).

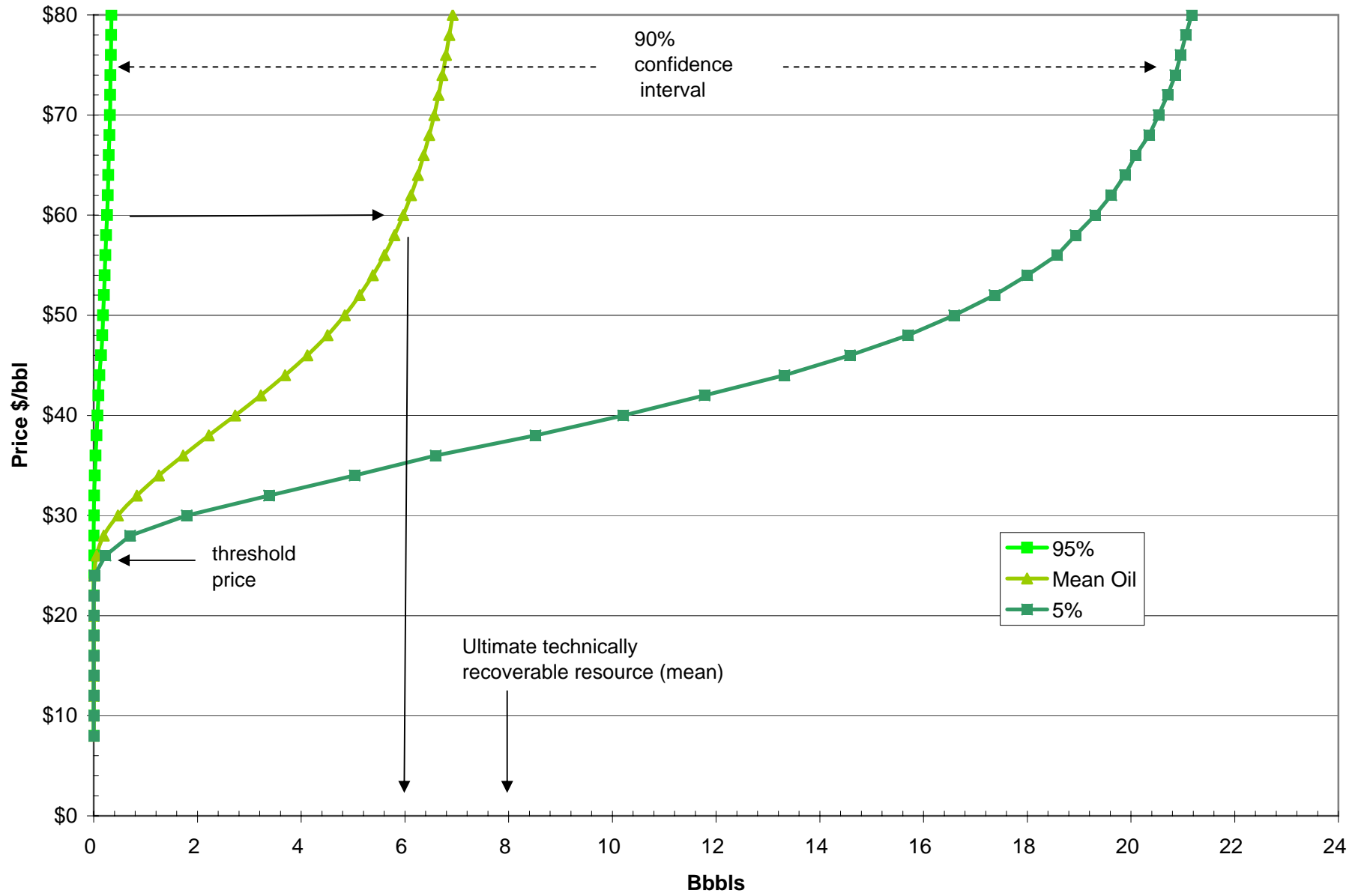
Price-supply curves can be generated at different probability levels to bracket the range of possible results. Total oil and total gas curves are usually compiled at the mean resource level. This is a statistical average of all trials, including the trials with no economic recovery. In financial terms, the mean is the “expected value” and includes both geologic and economic risks. Total oil volumes include both crude oil and gas-condensate that occur as liquids at surface conditions. Total gas volumes include gas pools and associated-solution gas recovered during oil production, both of which occur as gas at surface conditions. The 95% curve indicates a 19-in-20 chance that a relatively low resource volume is recoverable. The 5% curve indicates a 1-in-20 chance that a relatively high resource volume is recoverable. The range between the 95% and 5% curves represents a 90% confidence interval for the assessment results. The broad range,

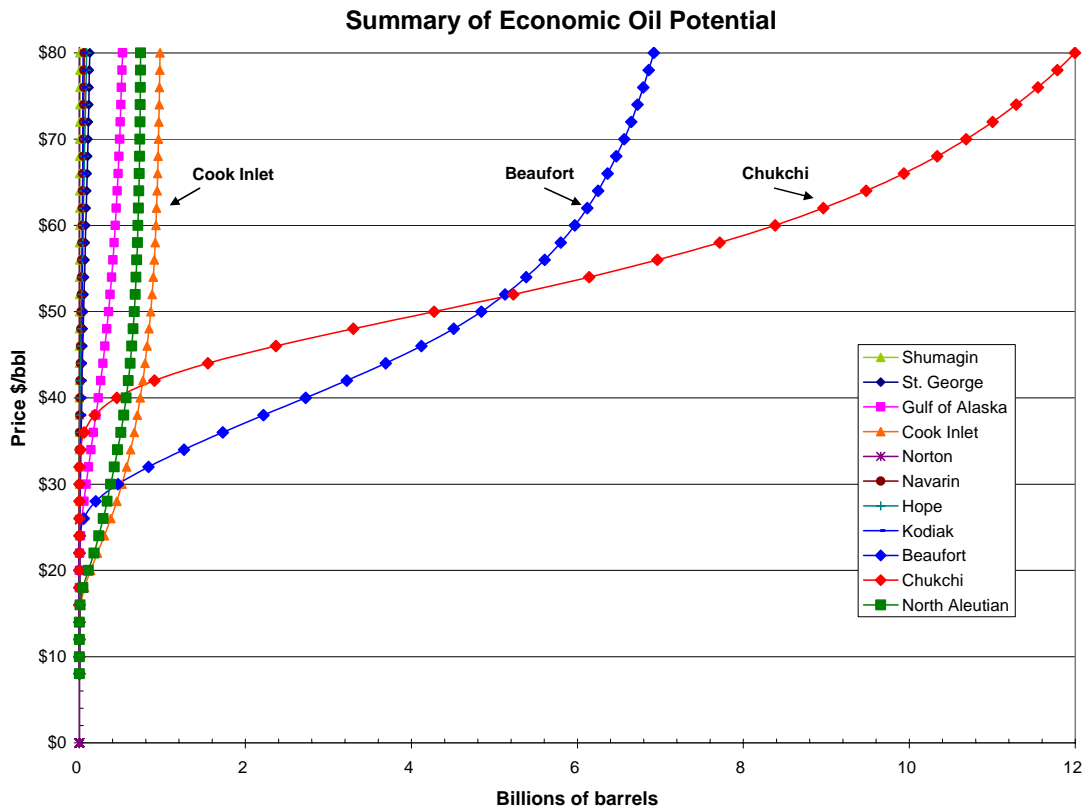
rather than a single point estimate like the mean, is a more accurate representation of the precision of the economic results because of the many uncertainties inherent in resource assessments.

Price-supply curves provide direct correlations between market price and resource potential. Each price level is linked to a given resource volume. The shape of the curves also indicates the resource potential of a province. Provinces with poor geologic attributes have curves that are inelastic with respect to price, where recoverable volumes do not increase much with higher prices. Provinces with rich geologic attributes have curves that are elastic with price, where large volumes are recoverable at higher prices. Price-supply curves illustrate the geologic endowment and the favorability of the geology to contain commercially recoverable oil and gas pools.

An example price-supply curve is given in [Figure 1](#). Measurable quantities of oil become economically viable at prices above approximately \$26/barrel. This represents the most favorable simulations (biggest pools in the best locations), but these pools are very rare. No economic recovery is possible below this threshold-price level. At \$60/barrel, the resource potential ranges from 1 to 18 billion barrels in a 90% confidence interval. The risked mean (or expected) volume recoverable at \$60/barrel is approximately 6 billion barrels. Assuming the mean geologic endowment of this province is 8 billion barrels, the economic analysis indicates that 75% of this oil potential could be commercially recovered if prices are sustained at current (\$60) levels. The oil resources could be contained in many pools and full development could span decades between discovery and final production.

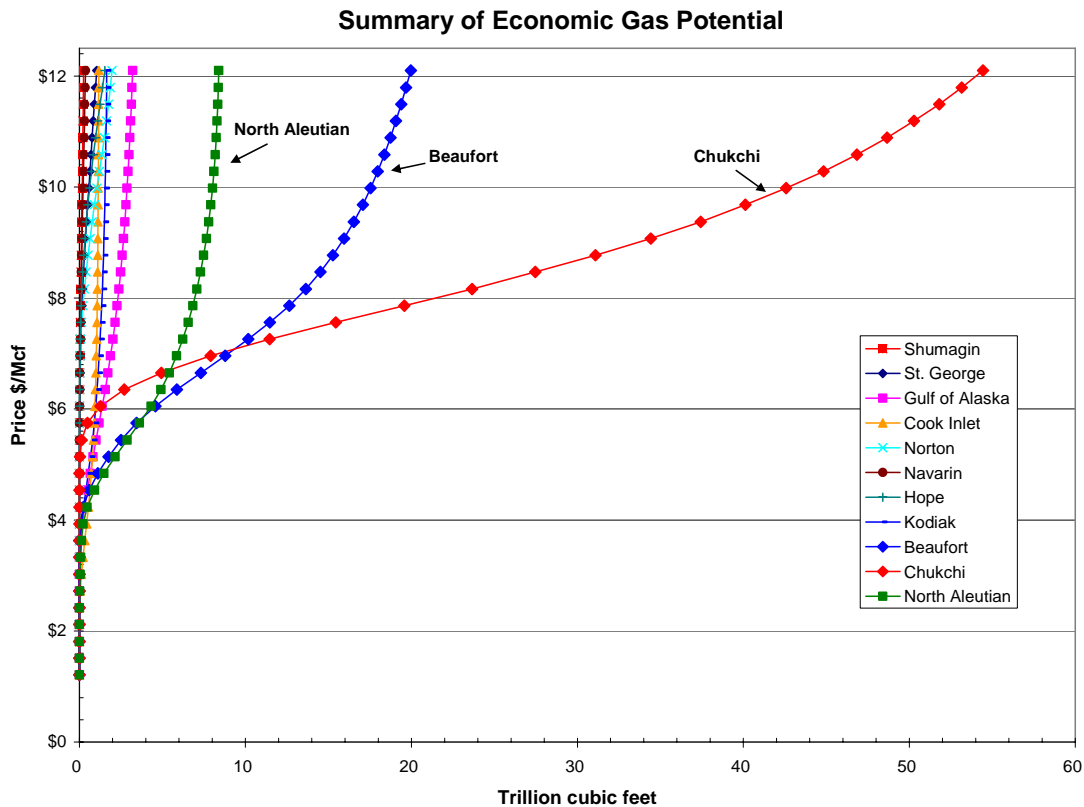
Figure 1: Oil Price-Supply Curves





Summary of Economic Oil Potential

For a better perspective of the future commercial oil potential of OCS provinces in Alaska, mean Undiscovered Economically Recoverable Resources (UERR) are shown by price-supply curves plotted on the same graph. Two families of curves are clearly evident. Most of the OCS provinces have curves that are inelastic with respect to price. That is, the UERR is limited by geologic factors and markedly higher resource volumes are not commercially viable despite higher market prices. The oil resources are simply not present. Of this resource-poor group, Cook Inlet represents the best opportunity for future commercial oil production. In contrast to the resource-poor provinces, the Beaufort and Chukchi provinces have elastic curves where resource potential increases greatly with higher prices. This implies that commercial-size pools and good reservoirs are present in these areas, and higher market prices will overcome the high costs of development and transportation. Although these provinces are far from market and there are technology challenges to overcome before the oil resources are produced, it is safe to conclude that industry interest will continue to focus on these two Arctic provinces in the foreseeable future. Consequently, the majority of Alaska OCS lease sales and offshore drilling will likely occur in these resource-rich provinces. However, considering the time delays associated with exploration and development, significant new supplies of oil from these provinces may not reach domestic markets for a decade or more even if commercial discoveries are made.

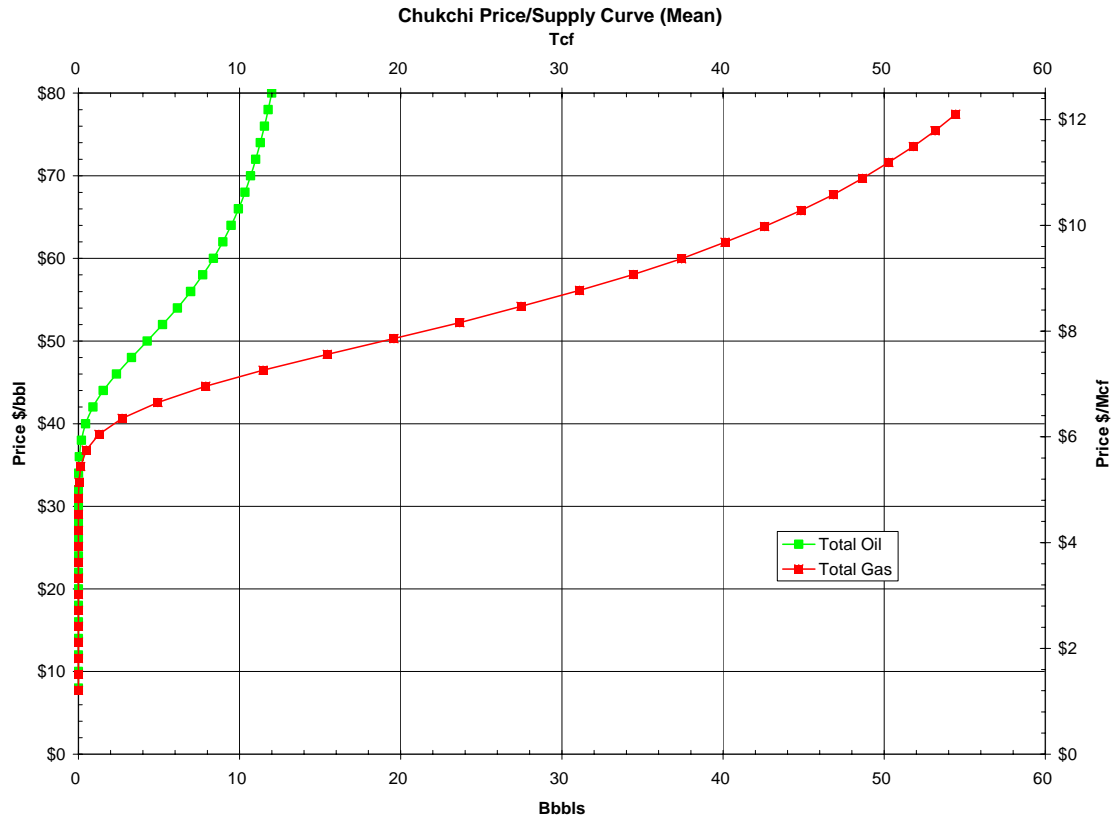


Summary of Economic Gas Potential

For a better perspective of the future commercial gas potential of OCS provinces in Alaska, mean Undiscovered Economically Recoverable Resources (UERR) are shown by price-supply curves plotted on the same graph. Two families of curves are clearly evident. Most of the OCS provinces have curves that are inelastic with respect to price. That is, the UERR is limited by geologic factors and markedly higher resource volumes are not viable despite higher market prices. Large gas resources are simply not present in these resource-poor provinces. Considering that LNG is the most feasible technology for gas transportation from remote areas, future commercial production will depend on successful exploration efforts in several provinces and shared new LNG infrastructure. The North Aleutian Basin is transitional between the resource potential families, and mean resource volume is probably sufficient to support a grassroots LNG operation if large gas discoveries are made. Commercial success in this province is also important to the neighboring provinces that cannot individually justify new LNG infrastructure. Opening one province could lead to development in several other gas-prone provinces.

The Beaufort and Chukchi provinces have elastic curves, where gas resource potential increases greatly with higher prices. This implies that commercial-size pools and good reservoirs are present in these areas, and higher market prices can overcome the high costs of development and transportation. But new gas supplies from Arctic Alaska are far from assured because there is no transportation system at the present time. A large-diameter gas pipeline project is being discussed, but in the most optimistic scenario it will not be operational until 2015. Gas development from the OCS provinces will be more costly than onshore development and will likely be delayed until excess capacity is available in the new gas pipeline. This means that significant volumes of gas from the Beaufort and Chukchi will probably not reach domestic markets before 2025.

Chukchi Shelf Province



Total Oil and Total Gas

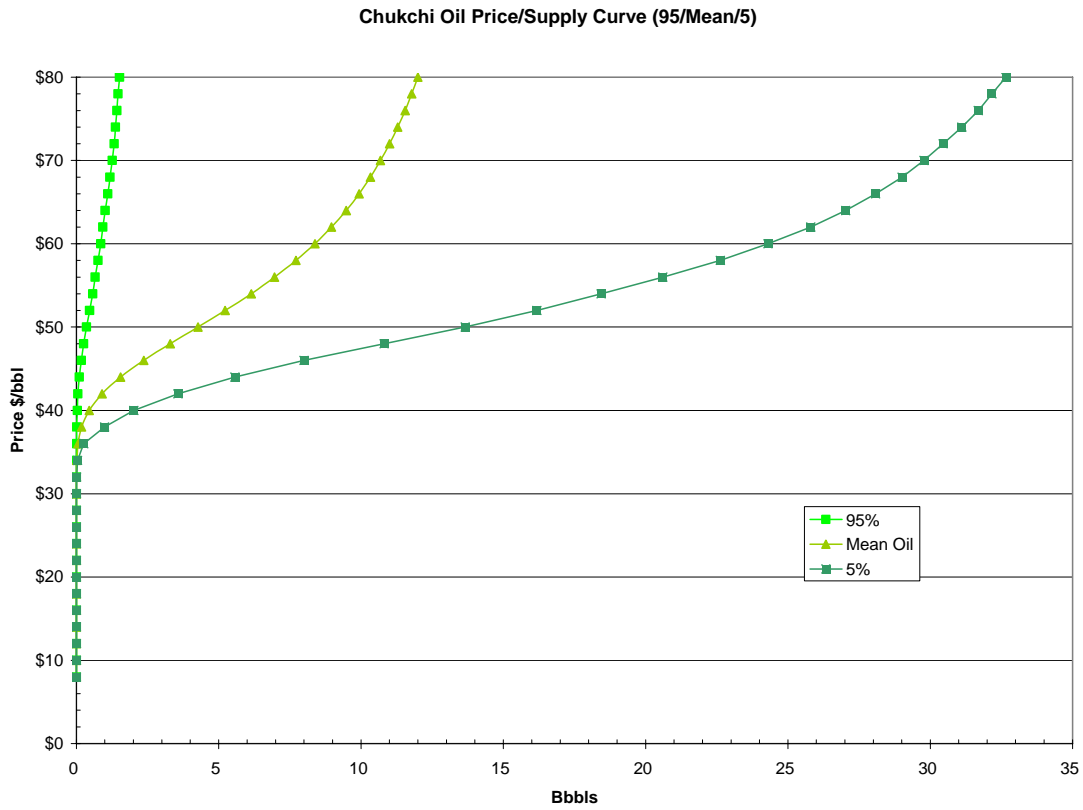
Oil production is carried by the existing TAPS and tanker system to U.S. West Coast markets. Total mean recoverable oil at current price levels (\$60 per barrel) amounts to 8.4 billion barrels (Bbbl), of which 1.3 million barrels is condensate recovered with gas production ([Table 1](#)). The mean Undiscovered Technically Recoverable Resource (UTRR) is 15.4 Bbbl, so 55% of the oil endowment would be commercially viable if current price levels continue. However, exploration costs could average \$1/barrel, suggesting that over \$8 billion in future industry spending for seismic surveys and drilling would be needed just to locate the commercial-size pools. Exploration effort has been limited to-date with only 2 OCS lease sales and 5 exploration wells drilled in the province. Clearly, this province is the most prospective of all other OCS provinces in Alaska with respect to its geology while being the most challenging from an engineering/economic standpoint.

Gas production would rely on a new gas export system originating on the North Slope. At the present time, the most likely project (still not officially proposed) is for a large diameter, high-pressure line carrying gas to the U.S. Midwest. The earliest start-up for this new pipeline is 2015. Excess capacity in the system for new gas supplies (currently unproven) could be delayed for another decade. This means that substantial volumes of gas from the Chukchi Shelf will not reach domestic markets until at least 2025. Total mean recoverable gas at a market price of \$9.07 per thousand cubic feet (Mcf) is 34.4 trillion cubic feet (Tcf). This represents 45% of the mean UTRR gas resource of 76.8 Tcf ([Table 1](#)). Associated-solution gas amounts to nearly 11 Tcf (32% of the total economic gas potential) and would be recovered through oil facilities. Shared development strategies with oil production will be needed to support new gas projects in this remote, very high-cost province.

Chukchi Sea OCS Planning Area, 2006 Assessment, Undiscovered Technically-Recoverable Oil & Gas			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	4,152	29,041	77,357
Total Gas (Tcfg)	10.316	76.772	209.527
Total Liquids (Mmbo)	2,317	15,380	40,075
Free Gas** (Tcfg)	8.070	57.140	156.879
Solution Gas (Tcfg)	2.246	19.632	52.648
Oil (Mmbo)	1,895	12,381	31,841
Condensate (Mmbc)	421	2,999	8,234
<p>* Risked, Technically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>BOE = total hydrocarbon energy, expressed in barrels-of-oil-equivalent, where 1 barrel of oil = 5,620 cubic feet of natural gas</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

Chukchi Sea OCS Planning Area, 2006 Assessment, Undiscovered Economically-Recoverable Oil (\$60.00) Gas (\$9.07)			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	1,395	14,508	42,681
Total Gas (Tcfg)	3.027	34.427	103.308
Total Liquids (Mmbo)	857	8,382	24,299
Free Gas** (Tcfg)	2.291	23.465	70.147
Solution Gas (Tcfg)	0.736	10.962	33.161
Oil (Mmbo)	730	7,049	20,265
Condensate (Mmbc)	127	1,333	4,034
<p>* Risked, Economically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>Oil price in dollars per barrel landed at market, Gas price in dollars per thousand cubic feet landed at market.</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

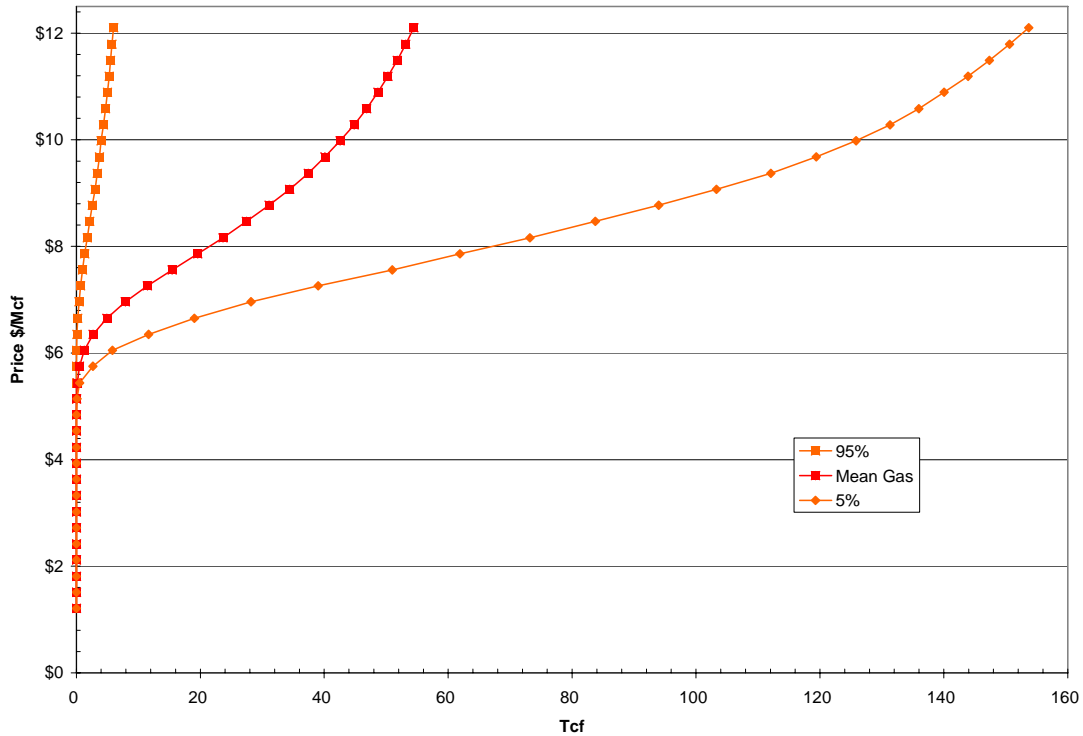
Table 1:
Comparison of technically recoverable and economically recoverable resources.



Range of Economic Oil Potential

The potential for commercial oil production is very broad, ranging from 0.857 Bbbl (95%) to 24.3 Bbbl (5%) at a \$60 price ([Chukchi.xls](#)). The uncertainty in resource estimates is related to many factors; including the high number of plays and prospects, the assumed dependency between plays, the analogies to proven plays in onshore areas, and the early stage of exploration. It is important to recognize the relationship between resource potential and probability. The 5% probability curve suggests that the province has a high up-side potential (24.2 Bbbl at \$60) and this is what attracts companies to explore the area despite difficult operating conditions and technical challenges.

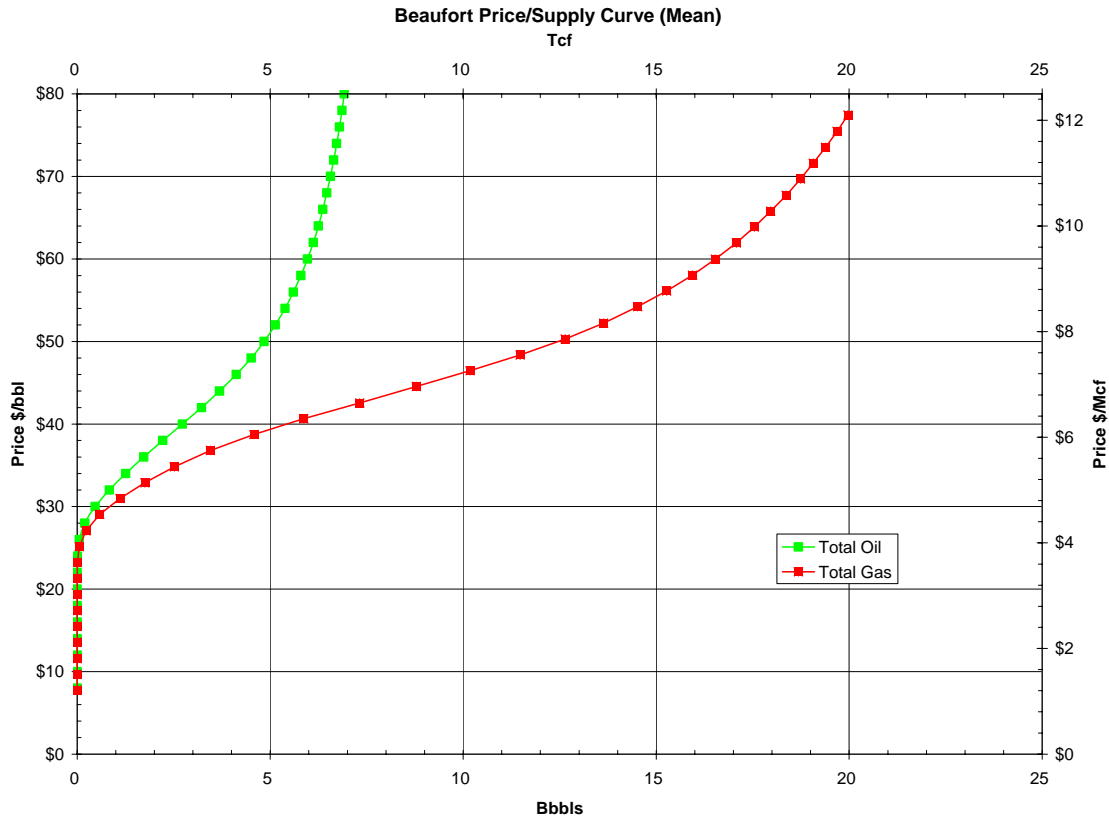
Chukchi Gas Price/Supply Curve (95/Mean/5)



Range of Economic Gas Potential

The potential for commercial gas recovery is very broad, ranging from 3.0 Tcf (95%) to 103.3 Tcf (5%) at a \$9.07 /Mcf price ([Chukchi.xls](#)). The factors leading to this broad range for natural gas resource potential is the same as for oil. However, there are additional economic risks that are not directly included in the analysis. There is a risk that a new North Slope gas pipeline will not be built. Without this pipeline all gas resources in northern Alaska will continue to be stranded. There is a risk that excess capacity in the new pipeline will be delayed for decades. Finally, new offshore gas projects may depend on nearby offshore oil infrastructure, but the oil fields are also undiscovered at present. Although the Chukchi Shelf has a huge natural gas potential, there are many challenges to overcome before these undiscovered gas resources reach market.

Beaufort Shelf Province



Total Oil and Total Gas

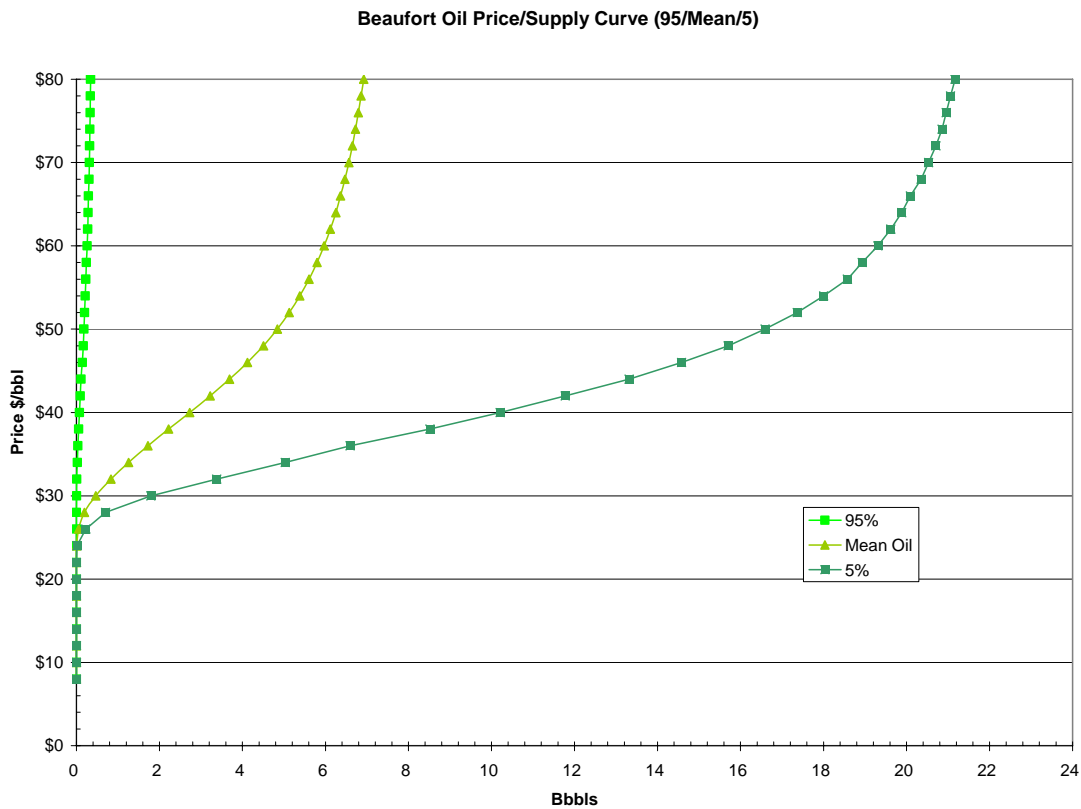
Oil production is carried by the existing TAPS and tanker system to U.S. West Coast markets. Total mean recoverable oil at current price levels (\$60 per barrel) amounts to nearly 6 billion barrels (Bbbl), of which 551 million barrels is condensate recovered with gas production ([Table 2](#)). The mean Undiscovered Technically Recoverable Resource (UTRR) is 8.2 Bbbl, so 73% of the oil endowment would be commercially viable if current price levels continue. However, exploration costs could average \$1/barrel, suggesting that \$6 billion in future industry spending for seismic surveys and drilling would be needed just to locate the commercial-size pools. This is far higher than the industry expenditures to-date (not counting lease bonus bids).

Gas production would rely on a new gas export system originating on the North Slope. At the present time, the most likely project (still not officially proposed) is for a large diameter, high-pressure line carrying gas to the U.S. Midwest. The earliest start-up for this new pipeline is 2015. Excess capacity in the system for new gas supplies (currently unproven) could be delayed for another decade. This means that substantial volumes of gas from the Beaufort Shelf will not reach domestic markets until at least 2025. Total mean recoverable gas at a market price of \$9.07 per thousand cubic feet (Mcf) is 15.9 trillion cubic feet (Tcf). This represents 58% of the mean UTRR gas resource of 27.6 Tcf ([Table 2](#)). Associated-solution gas amounts to 3.1 Tcf (20% of the total economic gas potential) and would be recovered through oil facilities. Shared development strategies with oil production would enhance the viability of new gas projects in this remote, high-cost province.

Beaufort Sea OCS Planning Area, 2006 Assessment, Undiscovered Technically-Recoverable Oil & Gas			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	527	13,142	36,078
Total Gas (Tcfg)	0.649	27.645	72.178
Total Liquids (Mmbo)	412	8,224	23,235
Free Gas** (Tcfg)	0.322	23.792	60.965
Solution Gas (Tcfg)	0.328	3.853	11.213
Oil (Mmbo)	405	7,224	20,625
Condensate (Mmbc)	7	999	2,611
<p>* Risked, Technically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>BOE = total hydrocarbon energy, expressed in barrels-of-oil-equivalent, where 1 barrel of oil = 5,620 cubic feet of natural gas</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

Beaufort Sea OCS Planning Area, 2006 Assessment, Undiscovered Economically-Recoverable Oil (\$60.00) Gas (\$9.07)			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	330	8,804	28,325
Total Gas (Tcfg)	0.404	15.940	50.653
Total Liquids (Mmbo)	0	5,968	19,312
Free Gas** (Tcfg)	0.197	12.845	40.819
Solution Gas (Tcfg)	0.208	3.095	9.834
Oil (Mmbo)	0	5,417	17,525
Condensate (Mmbc)	0	551	1,786
<p>* Risked, Economically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>Oil price in dollars per barrel landed at market, Gas price in dollars per thousand cubic feet landed at market.</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

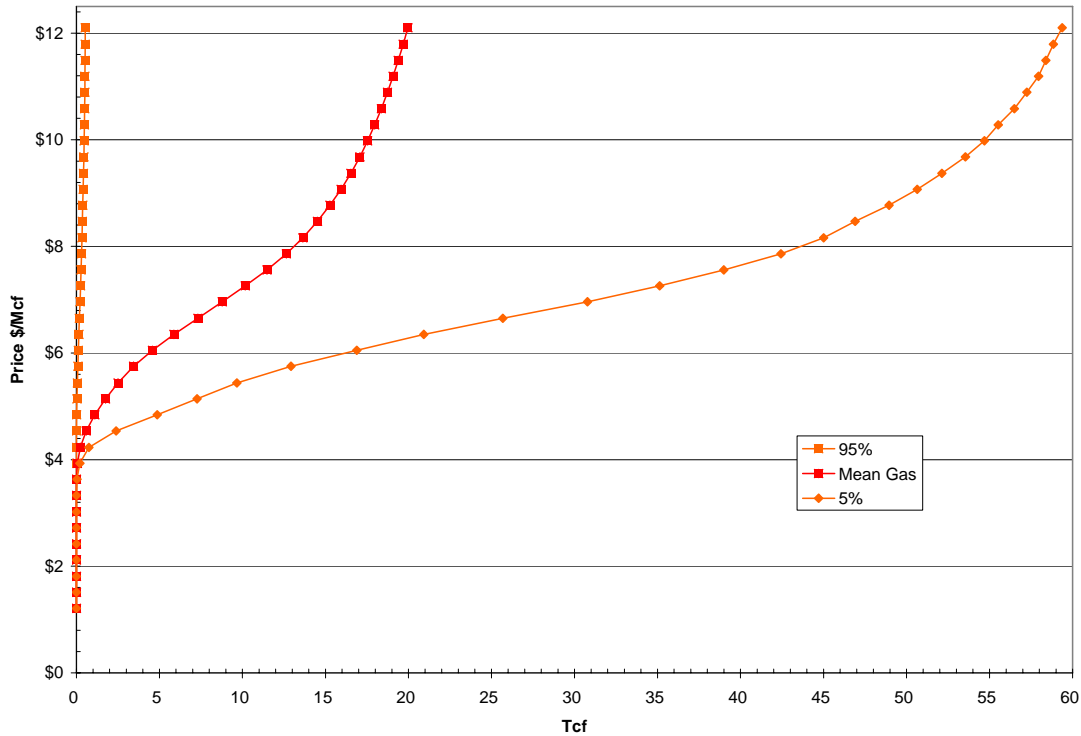
**Table 2:
Comparison of technically recoverable and economically recoverable resources.**



Range of Economic Oil Potential

The potential for commercial oil production is very broad, ranging from 0.258 Bbbl (95%) to 19.3 Bbbl (5%) at a \$60 price ([Beaufort.xls](#)). The uncertainty in resource estimates is related to many factors; including the high number of plays and prospects, the assumed dependency between plays, the proximity to proven plays in adjacent onshore areas, and the early stage of exploration in the offshore province. It is important to recognize the relationship between resource potential and probability. The 5% probability curve suggests that the province has a high up-side potential (19.3 Bbbl at \$60) and this is what attracts companies to explore the area despite difficult operating conditions.

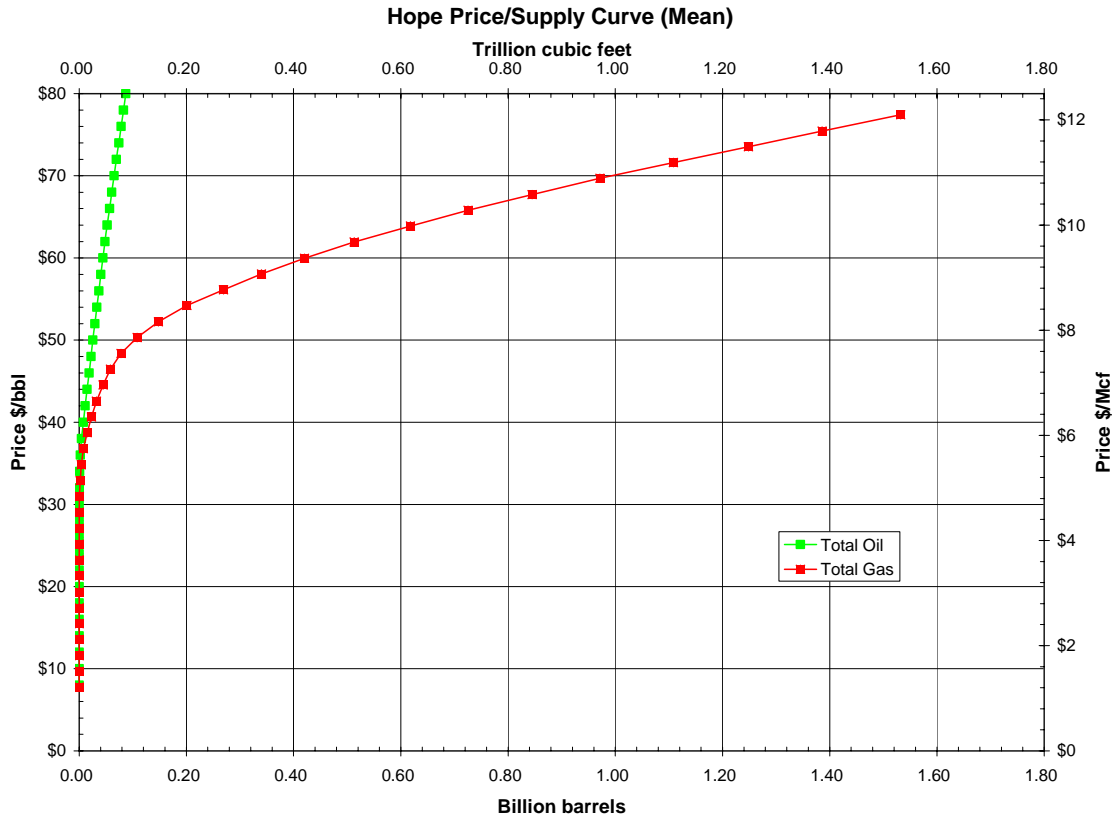
Beaufort Gas Price/Supply Curve (95/Mean/5)



Range of Economic Gas Potential

The potential for commercial gas recovery is very broad, ranging from 0.404 Tcf (95%) to 50.6 Tcf (5%) at a price of \$9.07 /Mcf ([Beaufort.xls](#)). The factors leading to this broad range for natural gas resource potential are the same as for oil. However, there are additional economic risks that are not directly included in the analysis. There is a risk that a new North Slope gas pipeline will not be built. Without this pipeline all gas resources in northern Alaska will continue to be stranded. There is a risk that excess capacity in the new pipeline will be delayed for decades. Finally, new offshore gas projects may depend on nearby offshore oil infrastructure, but these oil pools are also undiscovered at present. Although the Beaufort Shelf could contain a very large natural gas potential, there are difficult challenges to overcome before these unproven resources reach market.

Hope Basin Province



Total Oil and Total Gas

Hope Basin is a gas-prone province and 82% of its mean Undiscovered Technically Recoverable Resource (UTRR) (in BOE) is natural gas (Table 3). The development scenario is designed around gas production and export as liquefied natural gas (LNG). Natural gas liquids (condensate) and small volumes of crude oil could be recovered through gas production facilities. The high costs for LNG export infrastructure must be covered by minimum gas reserves of 5-10 Tcf to support commercial operations in this remote, undeveloped area. To reach this minimum reserve level, we assumed that a centralized facility would be constructed to serve three provinces in the northern North Bering Sea. (*Transportation Scenario for the Economic Resource Assessment*).

Total mean recoverable gas at current price levels of \$9.07 per thousand cubic feet (Mcf) is 0.340 trillion cubic feet (Tcf) which amounts to only 9% of the mean UTRR. (Table 3). Low economic potential can be attributed to relatively small gas pools with high costs for LNG processing and transportation. Largely because of its low petroleum potential and lack of industry interest, the Hope Basin has never been offered for leasing in an OCS lease sale. Future interest in this remote basin may be driven by local demand for gas supplies to support industrial uses (e.g. Red Dog Mine) or villages (e.g. Kotzebue). Other technologies (e.g. Compressed Natural Gas) could be more cost-effective to bring limited gas supplies short distances to markets in Alaska (e.g. Cook Inlet).

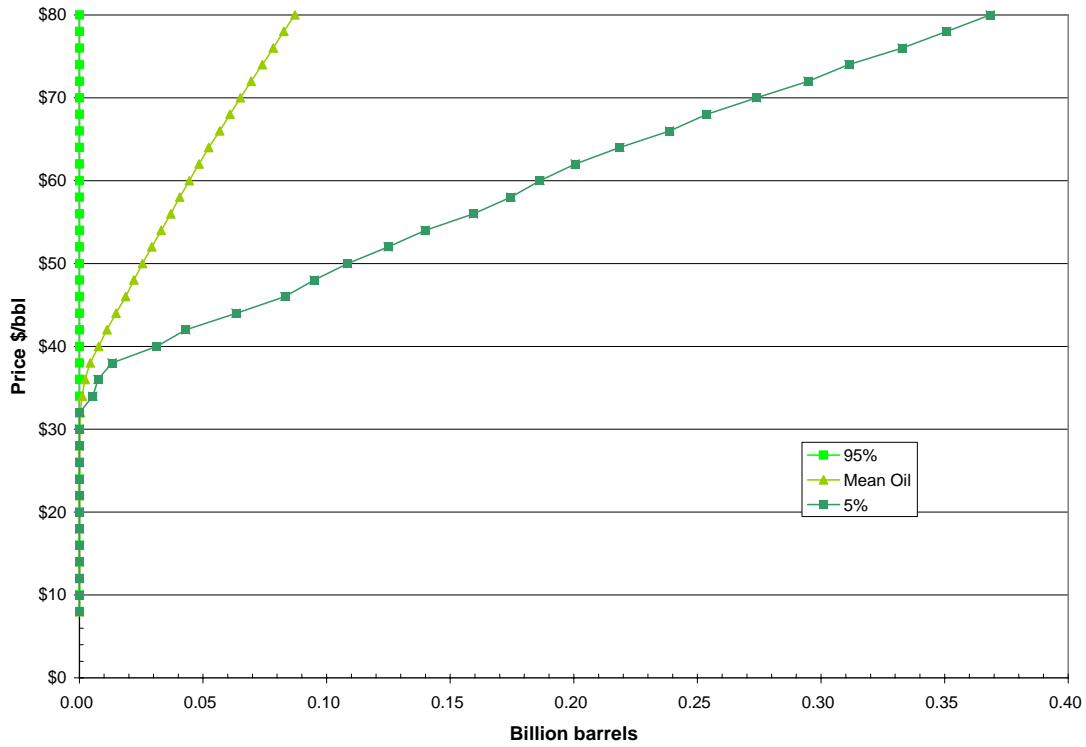
Commercial production of petroleum liquids (gas-condensate and crude oil) would rely on gas production infrastructure, and the liquids could be transported to several market destinations including the Cook Inlet. Total mean recoverable oil at a market price of \$60.00 per barrel is only 44 million barrels (Mmb) (Table 3), most of which is light crude oil.

Hope Basin OCS Province, 2006 Assessment, Undiscovered Technically-Recoverable Oil & Gas			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	0	821	3,268
Total Gas (Tcfg)	0	3.769	14.980
Total Liquids (Mmbo)	0	150	603
Free Gas** (Tcfg)	0	3.721	14.784
Solution Gas (Tcfg)	0	0.048	0.196
Oil (Mmbo)	0	57	231
Condensate (Mmbc)	0	93	371
<p>* Risked, Technically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>BOE = total hydrocarbon energy, expressed in barrels-of-oil-equivalent, where 1 barrel of oil = 5,620 cubic feet of natural gas</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

Hope Basin OCS Province, Undiscovered Economically-Recoverable Oil (\$60.00) Gas (\$9.07)			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	0	105	457
Total Gas (Tcfg)	0	0.340	1.524
Total Liquids (Mmbo)	0	44	186
Free Gas** (Tcfg)	0	0.310	1.400
Solution Gas (Tcfg)	0	0.030	0.124
Oil (Mmbo)	0	36	150
Condensate (Mmbc)	0	8	36
<p>* Risked, Economically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>Oil price in dollars per barrel landed at market, Gas price in dollars per thousand cubic feet landed at market.</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

**Table 3:
Comparison of technically recoverable and economically recoverable resources.**

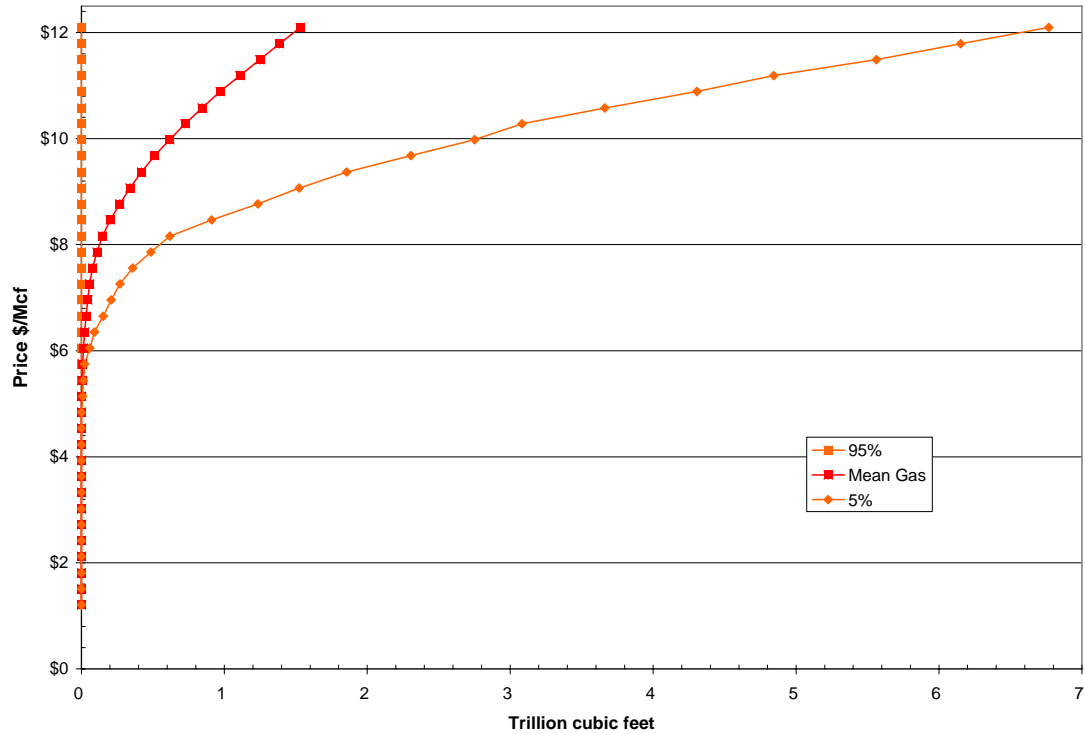
Hope Basin Economic Oil Resources



Range of Economic Oil Potential

The potential for commercial oil production ranges upward to 186 Mmb at a \$60 price and 5% probability level (*Hope.xls*). There is no economic oil at a 95% probability level at prices below \$80/barrel. Although the threshold price (\$30/bbl) for economic oil development is far lower than current prices, oil recovery will depend on the commercial success of gas production in the province.

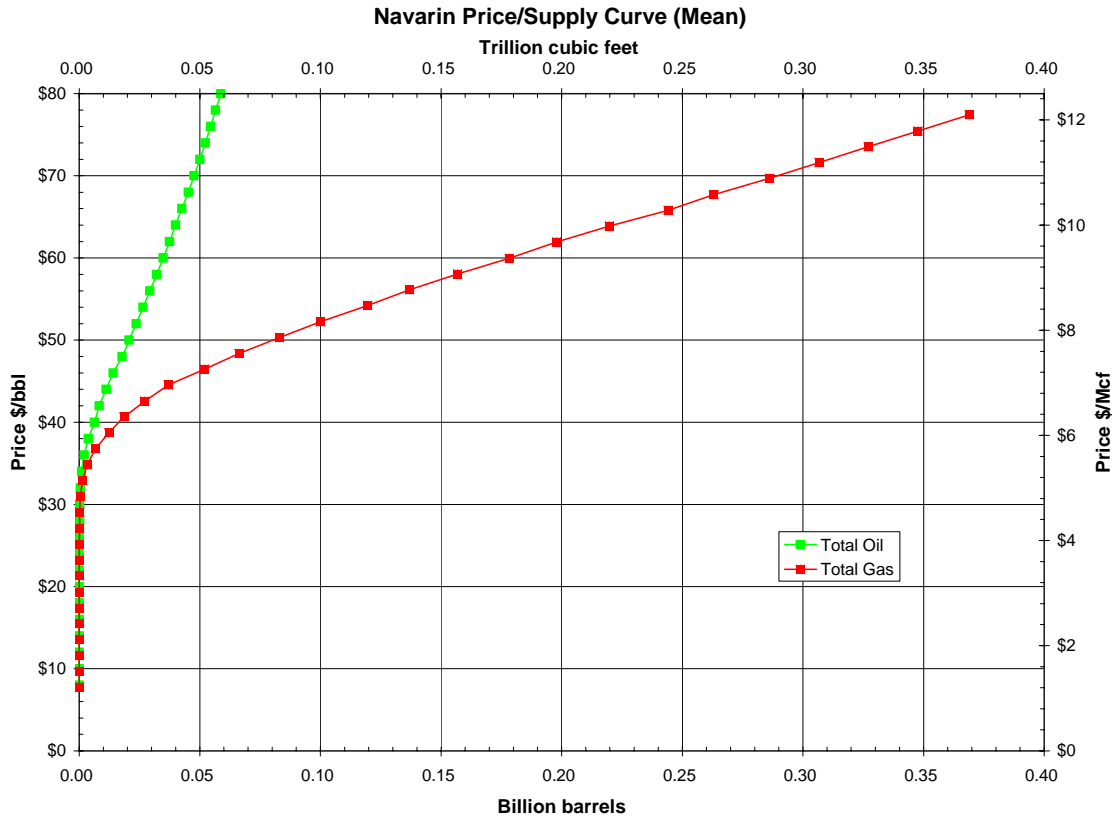
Hope Basin Economic Gas Resources



Range of Economic Gas Potential

The potential for commercial gas recovery is fairly limited, ranging upward to only 1.524 Tcf at the 5% probability level for the \$9.07/Mcf case (corresponding to \$60/bbl oil price) (*Hope.xls*). This is due both to the geology (small gas pools) and very high development and LNG export costs. At the 95% probability level, there are no economically recoverable gas resources at prices below \$12.10/Mcf (equivalent to \$80/barrel oil). This suggests that commercial opportunity is limited in this remote province. In addition, there are economic risks that enough gas reserves will not be discovered in the adjacent provinces (Navarin and Norton) to help support a new LNG export facility constructed on St. Lawrence Island. These risks are not included in the analysis. However, small offshore gas discoveries could play an important role in providing energy or fuel to local users in northwestern Alaska, where transportation costs would be lower. Alternative transportation technologies (e.g. Compressed Natural Gas, or CNG) could be more cost effective than LNG over distances less than 2500 miles to market.

Navarin Basin Province



Navarin Total Oil and Total Gas

Navarin Basin is a remote, high-cost, and resource-poor province. Its potential for oil and gas was downgraded after a series of unsuccessful exploration wells drilled in the mid-1980's. No new geologic analysis has changed perceptions about this province, although large areas and some play concepts have not been thoroughly evaluated. Proportionately, 38% of the mean Undiscovered Technically Recoverable Resource (UTRR) (in BOE) is oil and condensate. The largest resource portion (62%) is comprised of non-associated and solution gas ([Table 4](#)). The engineering simulation involved different transportation strategies for gas and oil. Gas would be converted to LNG at a shared facility constructed on St. Lawrence Island, and oil (with condensates derived from gas production) would be transported by shuttle tankers from an offshore storage and loading facility to transshipment terminals in Alaska ([Transportation Scenario for the Economic Resource Assessment](#)). Combining production infrastructure in shared, centralized facilities would improve the chances that commercial development would occur.

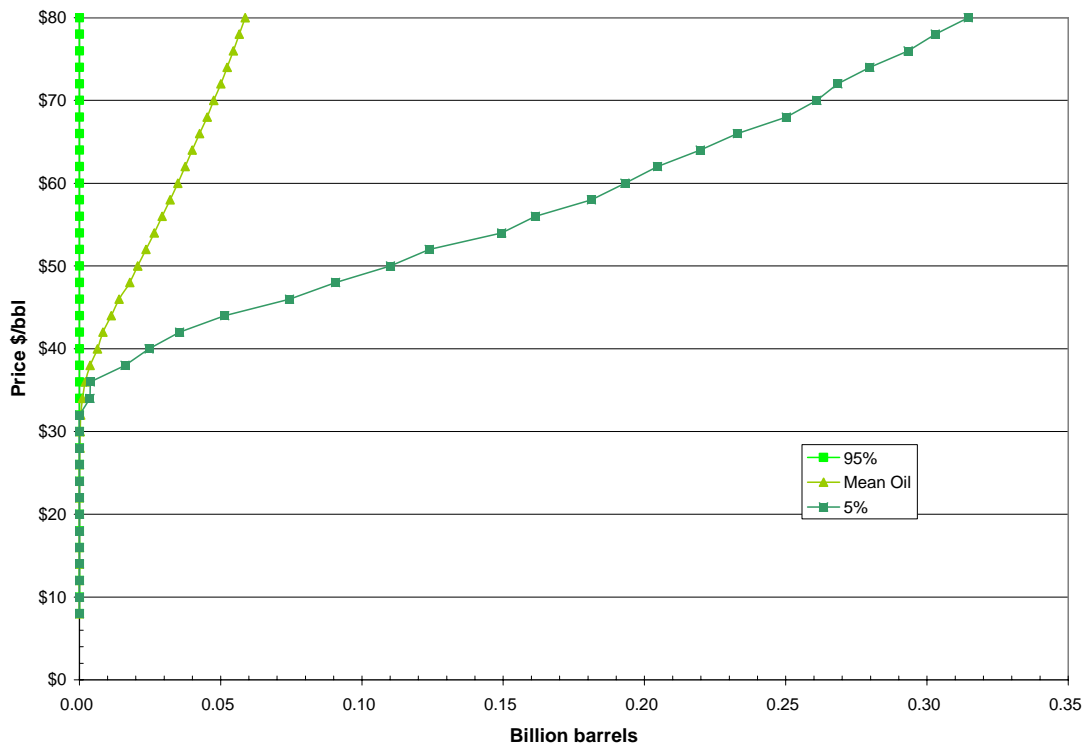
Total mean recoverable gas at current price levels of \$9.07 per thousand cubic feet (Mcf) amounts to 0.157 trillion cubic feet (Tcf) or 13% of the mean UTRR for gas ([Table 4](#)). Liquid hydrocarbons recoverable at a price of \$60/barrel amount to 35 Mmb. New technologies, higher prices, and additional exploration effort could change the perception of low resource potential for this province.

Navarin Basin OCS Planning Area, 2006 Assessment, Undiscovered Technically-Recoverable Oil & Gas			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	0	350	1,654
Total Gas (Tcfg)	0	1.218	5.802
Total Liquids (Mmbo)	0	133	621
Free Gas** (Tcfg)	0	1.181	5.636
Solution Gas (Tcfg)	0	0.037	0.166
Oil (Mmbo)	0	86	395
Condensate (Mmbc)	0	48	226
<p>* Risked, Technically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>BOE = total hydrocarbon energy, expressed in barrels-of-oil-equivalent, where 1 barrel of oil = 5,620 cubic feet of natural gas</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

Navarin Basin, 2006 Assessment Undiscovered Economically-Recoverable Oil (\$60.00) Gas (\$9.07)			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	0	63	331
Total Gas (Tcfg)	0	0.157	0.776
Total Liquids (Mmbo)	0	35	193
Free Gas** (Tcfg)	0	0.145	0.713
Solution Gas (Tcfg)	0	0.012	0.063
Oil (Mmbo)	0	29	162
Condensate (Mmbc)	0	6	31
<p>* Risked, Economically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>Oil price in dollars per barrel landed at market, Gas price in dollars per thousand cubic feet landed at market.</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

Table 4:
Comparison of technically recoverable and economically recoverable resources.

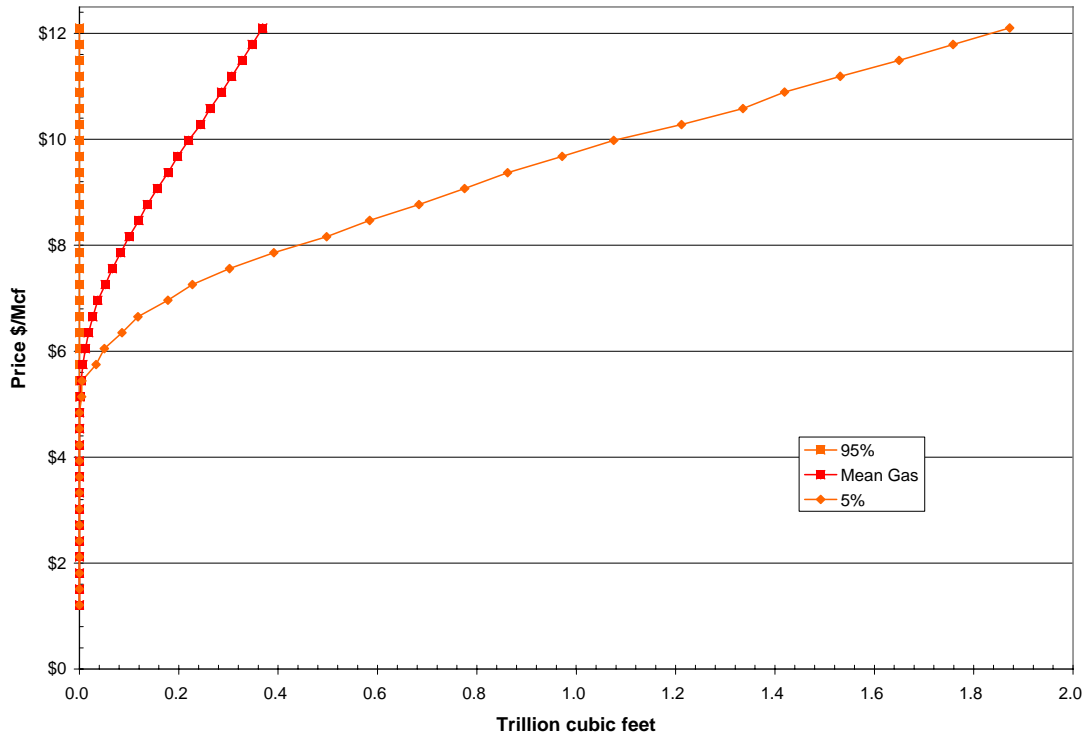
Navarin Economic Oil Potential



Range of Economic Oil Potential

The potential for commercial oil production ranges upward to 193 Mmb at a \$60 price and 5% probability level (*Navarin.xls*). There is no economic oil at the 95% probability level at prices below \$80/barrel. Commercial oil recovery will depend on the future discoveries of large gas pools and infrastructure shared with neighboring provinces (Norton and Hope Basin).

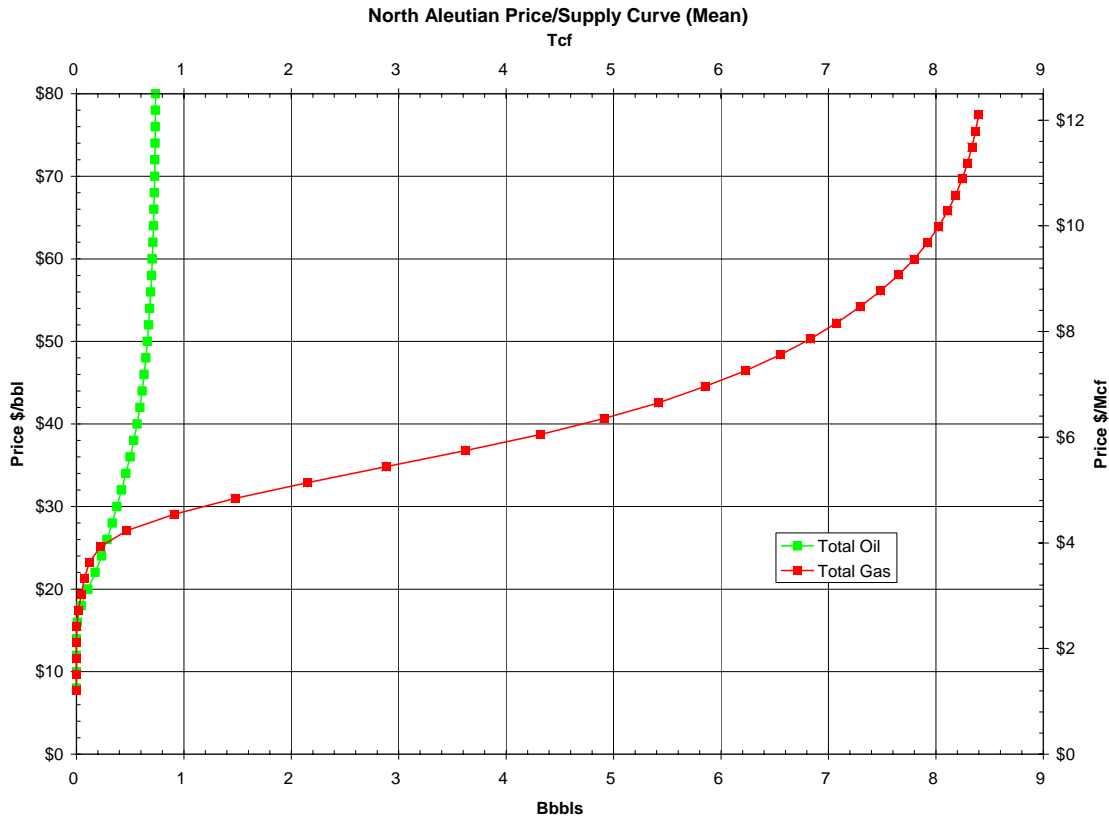
Navarin Economic Gas Potential



Range of Economic Gas Potential

The potential for commercial gas recovery is very limited, ranging upward to only 0.713 Tcf at the 5% probability level for current prices of \$9.07/Mcf (*Navarin.xls*). This is due both to the poor geology and very high development and LNG export costs. At the 95% probability level, there are no economically recoverable gas resources at prices below \$12.10/Mcf (equivalent to \$80/barrel oil). This suggests that commercial success is unlikely. In addition, there are economic risks that enough gas reserves will be discovered in the adjacent provinces (Hope and Norton) to help support a new LNG export facility constructed on St. Lawrence Island. These risks are not included in the analysis. New technologies to transport gas from remote offshore platforms could provide an economic opportunity if the high-side resource potential is discovered in a few close pools. However, no additional leasing is considered at this time.

North Aleutian Basin Province



Total Oil and Total Gas

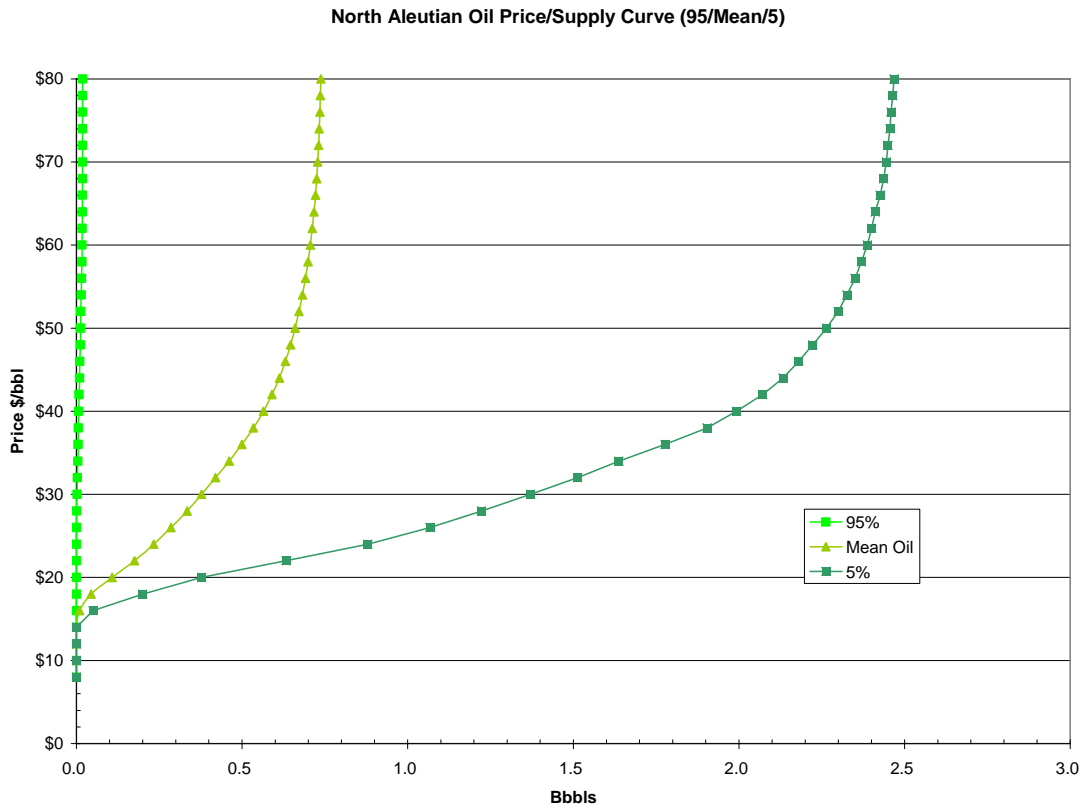
This province is viewed as a gas-prone basin, so the development scenario is designed around gas production and export. Natural gas liquids (condensate) and small volumes of crude oil could be recovered through gas production infrastructure. Because of distance to market, the most feasible plan would be to convert natural gas to liquefied form (LNG) and then transport it by sea to large markets on the U.S. West Coast. At the present time, there is no petroleum-related infrastructure in this province and no LNG receiving terminals on the West Coast, although there are many proposals for terminals. The economic model assumes that third-party consortiums would build the necessary facilities and ships to carry production from future projects in the North Aleutian Basin province. Additional discussion is provided in [Transportation Scenario for the Economic Resource Assessment](#).

Total mean recoverable gas at current price levels of \$9.07 per thousand cubic feet (Mcf) amounts to 7.7 trillion cubic feet (Tcf), of which only 3% is solution gas recovered with oil production ([Table 5](#)). The mean Undiscovered Technically Recoverable Resource (UTRR) for gas is 8.6 Tcf, and 89% of this gas endowment would be commercially viable if current price levels continue. However, the high costs for a LNG processing facility, marine terminal, and LNG carriers must be backed by proven gas reserves in the 5-10 Tcf range. Although this minimum requirement is met by the expected (mean) volume at current prices, lower prices would be disastrous to future operations. This represents a commercial risk not accounted for in our economic analysis. Only 1 lease sale has occurred, only one offshore well has been drilled in the basin, and leasing is currently closed by Executive Order. The North Aleutian Basin is the most prospective of all provinces in southern offshore Alaska, and its development could become the hub for other provinces in the Bering Sea and Pacific Margin.

North Aleutian Basin OCS Planning Area, Undiscovered Technically-Recoverable Oil & Gas			
Assessment Results as of 2006			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	91	2,287	6,647
Total Gas (Tcfg)	0.404	8.622	23.278
Total Liquids (Mmbo)	19	753	2,505
Free Gas (Tcfg)	0.401	8.393	22.487
Solution Gas (Tcfg)	0.003	0.229	0.791
Oil (Mmbo)	9	545	1,948
Condensate (Mmbc)	10	208	556
<p>* Risked, Technically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>BOE = total hydrocarbon energy, expressed in barrels-of-oil-equivalent, where 1 barrel of oil = 5,620 cubic feet of natural gas</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

North Aleutian Basin OCS Planning Area, Undiscovered Economically-Recoverable Oil (\$60.00) Gas (\$9.07)			
Assessment Results as of 2006			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	73	2,068	6,145
Total Gas (Tcfg)	0.317	7.653	21.117
Total Liquids (Mmbo)	17	706	2,388
Free Gas** (Tcfg)	0.314	7.434	20.354
Solution Gas (Tcfg)	0.003	0.219	0.763
Oil (Mmbo)	9	521	1,882
Condensate (Mmbc)	8	185	506
<p>* Risked, Economically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>Oil price in dollars per barrel landed at market, Gas price in dollars per thousand cubic feet landed at market.</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

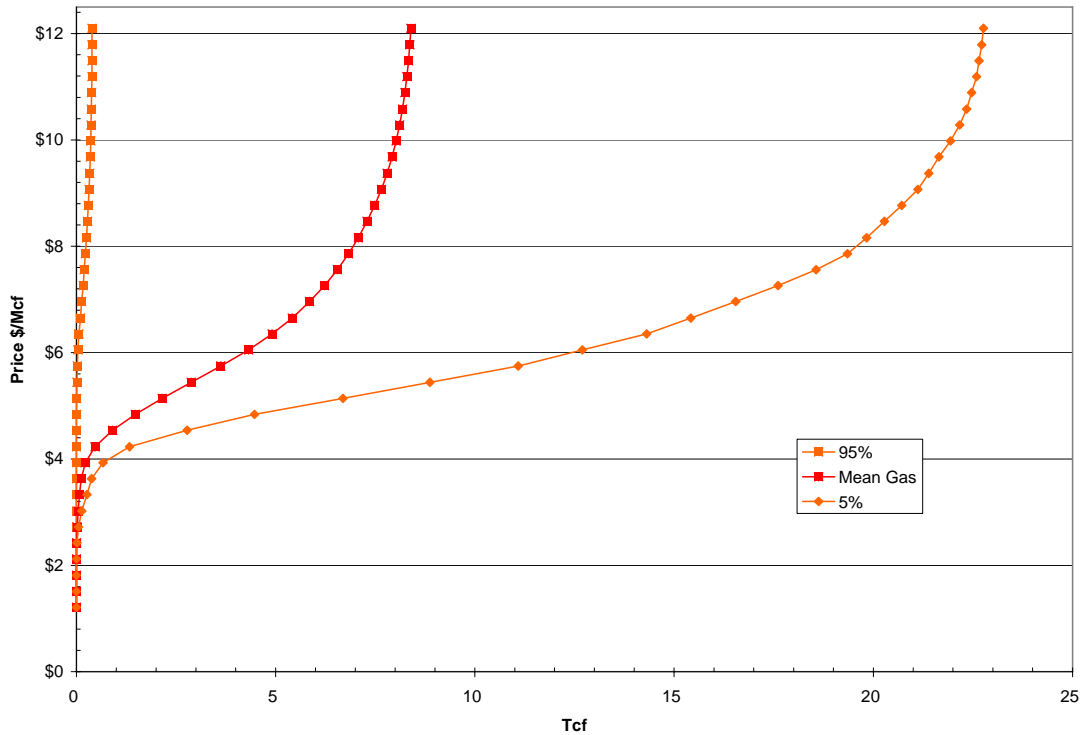
**Table 5:
Comparison of technically recoverable and economically recoverable resources.**



Range of Economic Oil Potential

The potential for commercial oil production ranges from 17 Mmb (95%) to 2.4 Bbbl (5%) at a \$60 price ([NAB.xls](#)). Recovery of the full economic oil potential will largely depend on the commercial successes associated with natural gas exploration in the province.

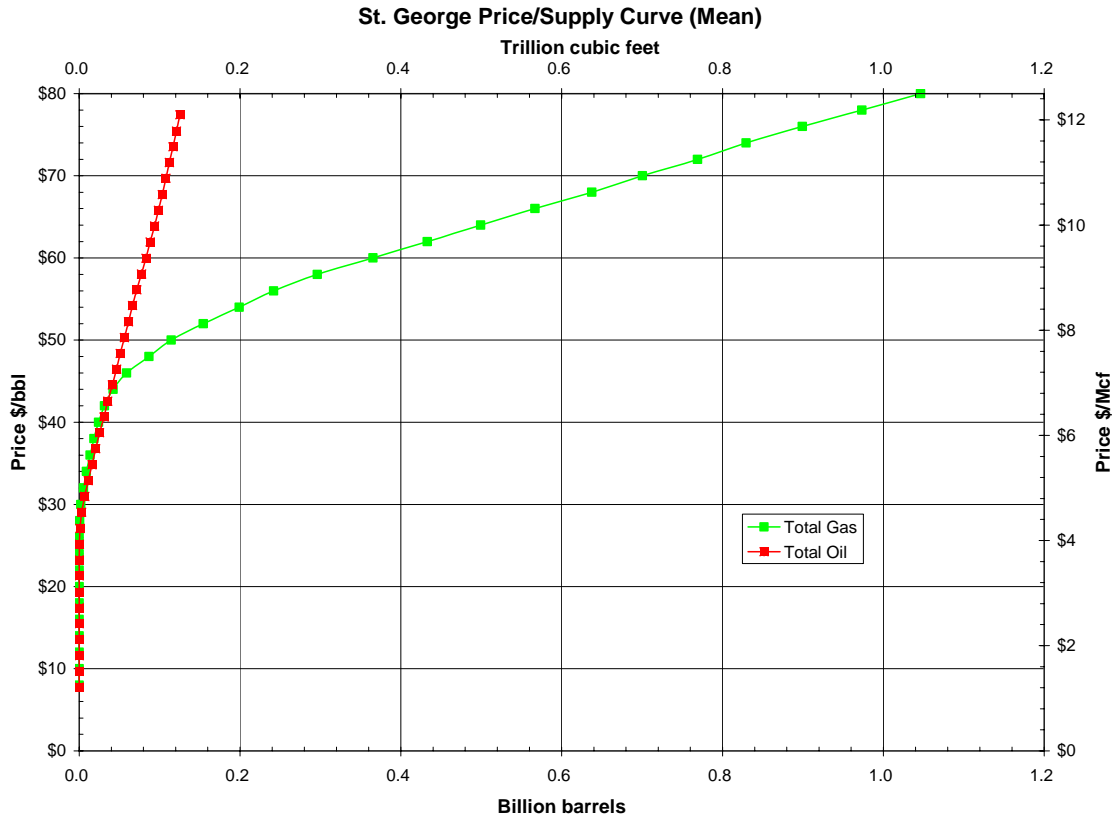
North Aleutian Gas Price/Supply Curve (95/Mean/5)



Range of Economic Gas Potential

The potential for commercial gas recovery is very broad, ranging from 0.3 Tcf (95%) to 21.1 Tcf (5%) at a \$9.07 /Mcf price ([NAB.xls](#)). This is largely because exploration is at an early stage and many of the geologic characteristics are uncertain. The commercial risks associated with discovering and developing the minimum reserves to support new LNG export infrastructure (discussed above) are not included in the results. Also, the time delay between leasing and delivery to market could be at least a decade, so gas resources in this province represent potential long-term (not immediate) supplies. However, future development in this province could be the key to unlocking the gas resource potential in several other basins in southwestern Alaska. The province has a high-side potential of over 2 Bbbl (BOE) and logistical factors are far less severe than other Alaska OCS provinces. Outside of the Beaufort and Chukchi provinces, the North Aleutian Basin is the most attractive, untested province in the Alaska OCS.

St. George Basin Province



Total Oil and Total Gas

St. George Basin is a gas-prone province where approximately 70% of the total Undiscovered Technically Recoverable Resource (UTRR) (in BOE) is natural gas. The economic scenario is designed for gas production and export as LNG through shared facilities constructed on the Alaska Peninsula (*Transportation Scenario for the Economic Resource Assessment*). The model assumes that third-party consortiums would build the new facility and charter the ships to carry LNG to markets on the U.S. West Coast. Hydrocarbon liquids (crude oil and condensate) would be loaded on to shuttle tankers bound for destinations in Alaska (Cook Inlet or Valdez) or the U.S. West Coast. The necessary LNG infrastructure does not exist today, and high construction and operating costs must be supported by minimum gas reserves of 5-10 Tcf. To reach this minimum reserve volume, we assume that the new LNG operation would serve several provinces, but be primarily supported by gas production from the North Aleutian Basin.

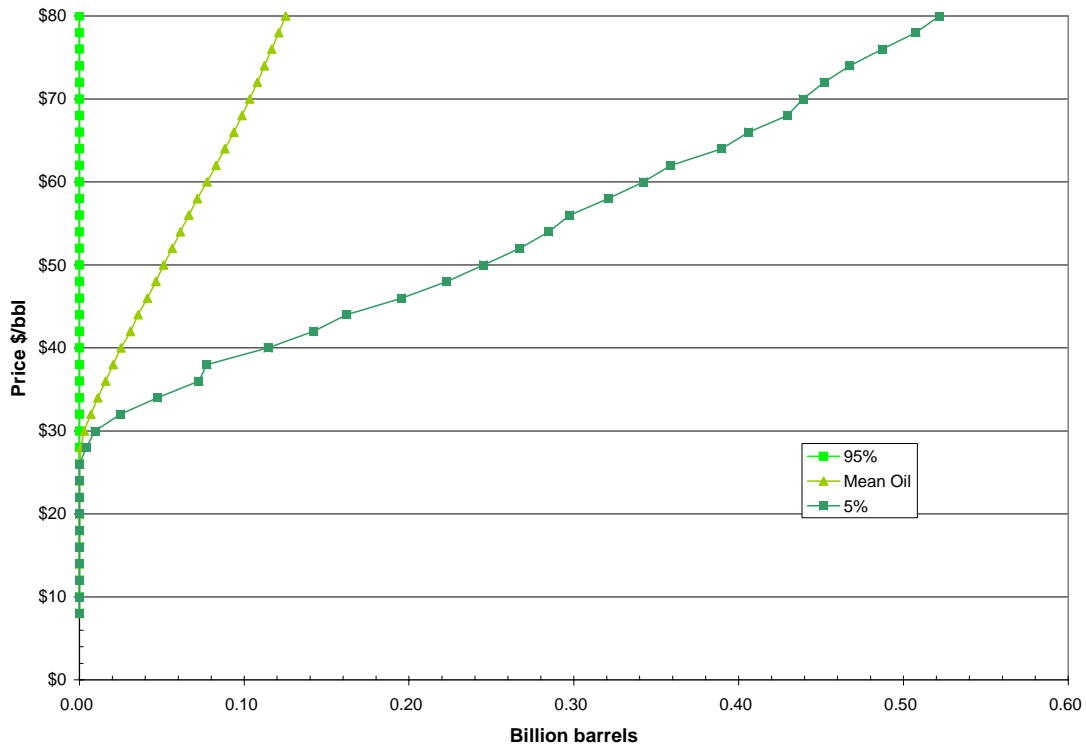
The total mean recoverable gas resource at current price levels of \$9.07 per thousand cubic feet (Mcf) is 0.365 trillion cubic feet (Tcf), amounting to 13% of the total UTRR of 2.798 Tcf for gas (*Table 6*). Petroleum liquid production (condensate and crude oil) would rely on gas production infrastructure.

St. George Basin OCS Planning Area, 2006 Assessment, Undiscovered Technically-Recoverable Oil & Gas			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	0	712	2,772
Total Gas (Tcfg)	0	2.798	11.145
Total Liquids (Mmbo)	0	214	789
Free Gas** (Tcfg)	0	2.756	11.002
Solution Gas (Tcfg)	0	0.042	0.143
Oil (Mmbo)	0	109	390
Condensate (Mmbc)	0	105	400
<p>* Risked, Technically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>BOE = total hydrocarbon energy, expressed in barrels-of-oil-equivalent, where 1 barrel of oil = 5,620 cubic feet of natural gas</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

St. George Basin, 2006 Assessment Undiscovered Economically-Recoverable Oil (\$60.00) Gas (\$9.07)			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	0	142	722
Total Gas (Tcfg)	0	0.365	2.135
Total Liquids (Mmbo)	0	77	342
Free Gas** (Tcfg)	0	0.341	2.034
Solution Gas (Tcfg)	0	0.024	0.101
Oil (Mmbo)	0	66	279
Condensate (Mmbc)	0	11	63
<p>* Risked, Economically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>Oil price in dollars per barrel landed at market, Gas price in dollars per thousand cubic feet landed at market.</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

**Table 6:
Comparison of technically recoverable and economically recoverable resources.**

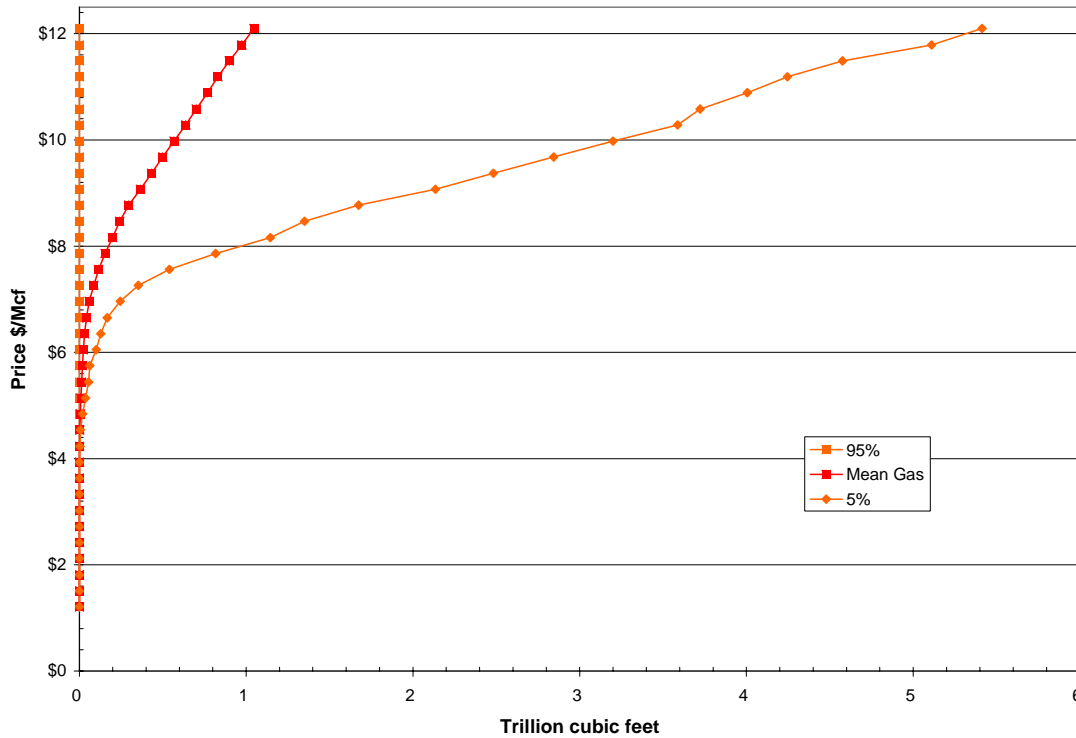
St. George Basin Economic Oil Potential



Range of Economic Oil Potential

The potential for commercial oil production ranges upward to 342 Mmb at a \$60 price and 5% probability level (*St. George.xls*), approximately 86% (279 Mmb) of which is crude oil. One OCS sale was held in the province (Sale 70 in 1983), followed by 10 exploration wells with no discoveries. Although the St. George Basin has been downgraded for its oil potential, there is a slight chance that large crude oil pools occur in the province, as the previous exploration wells primarily tested obvious structural traps. Stratigraphic traps might be identified by more modern seismic technology (3-D surveys). Perhaps the best opportunity exists for gas production. If new LNG infrastructure is constructed to serve operations in the North Aleutian province, industry interest might be rekindled in this neighboring province. Small oil pools could become commercial if they share gas production infrastructure.

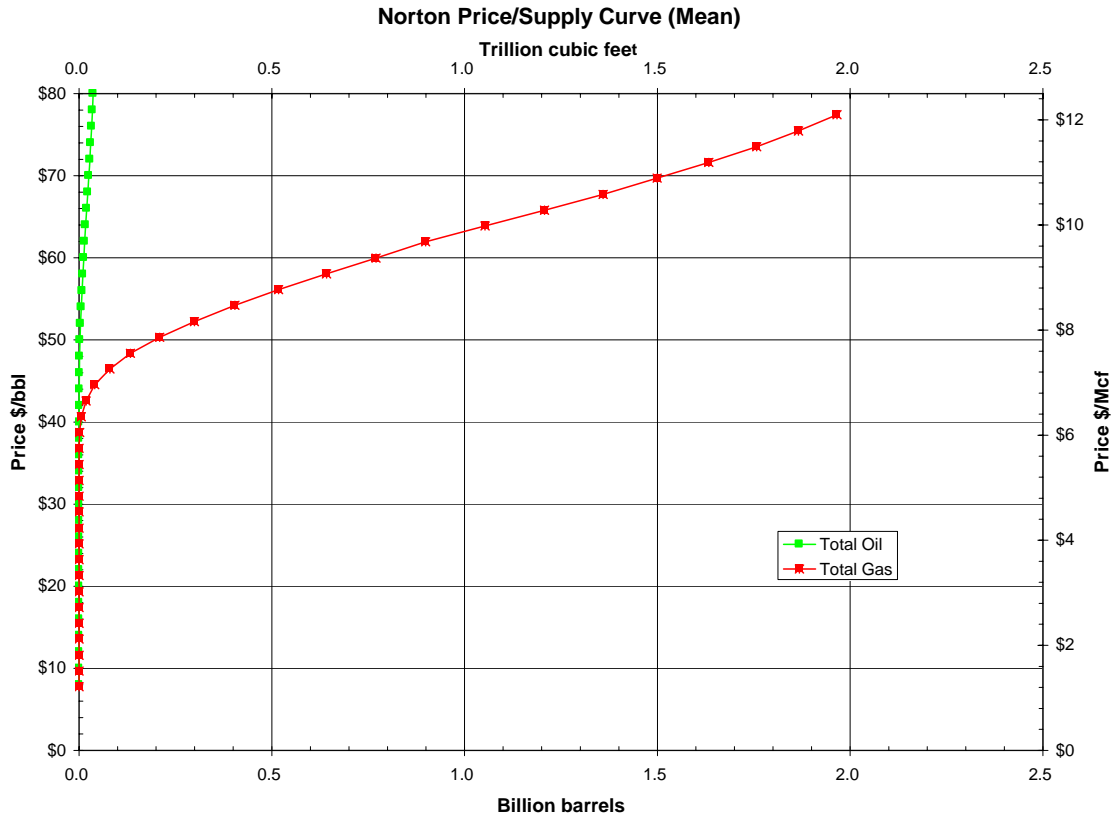
St. George Basin Economic Gas Potential



Range of Economic Gas Potential

The potential for economic gas recovery ranges upward to 2.135 Tcf at a \$9.07 /Mcf price (*Table 6*). At the 95% probability level there are no economically recoverable gas resources at prices below \$12.10/Mcf (equivalent to \$80/barrel oil) (*St. George.xls*). This indicates that commercial development is improbable in this remote province. Although threshold prices are \$3.93/Mcf (mean), gas reserves large enough (minimum 5 Tcf) to support new LNG infrastructure require very optimistic prices (approaching \$12/Mcf) and low probability levels (5%). In other words, there is a 1-in-20 chance that if prices are sustained at 50% above current levels, then the geologic endowment of St. George Basin could support a standalone LNG export operation. A more likely scenario is that large gas discoveries in the North Aleutian Basin would backstop a new LNG export facility shared by neighboring provinces such as the St. George Basin.

Norton Basin Province



Total Oil and Total Gas

Norton Basin is a gas-prone province with 91% of its mean Undiscovered Technically Recoverable Resource (UTRR) (in BOE) as natural gas (Table 7). No crude oil is expected in the province and all hydrocarbon liquid is condensate. The development scenario models gas export as liquefied natural gas (LNG). The high costs for LNG export infrastructure must be covered by minimum gas reserves of 5-10 Tcf to support commercial operations in this remote, undeveloped area. To reach the minimum reserve level, we assumed that a centralized facility would serve three provinces in the northern North Bering Sea (Hope Basin, Navarin, and Norton) (*Transportation Scenario for the Economic Resource Assessment*).

Total mean recoverable gas at current price levels of \$9.07 per thousand cubic feet (Mcf) amounts to 0.642 trillion cubic feet (Tcf) which is 21% of the mean UTRR for gas (Table 7). This low economic potential can be attributed to relatively small gas pools with high development and costs associated with LNG transportation. Future interest in this province may be driven by local demand for gas supplies to support industrial uses and consumers in the Nome area. Other technologies (e.g. Compressed Natural Gas) could be more cost-effective to bring limited gas supplies short distances to markets in Alaska (e.g. Cook Inlet).

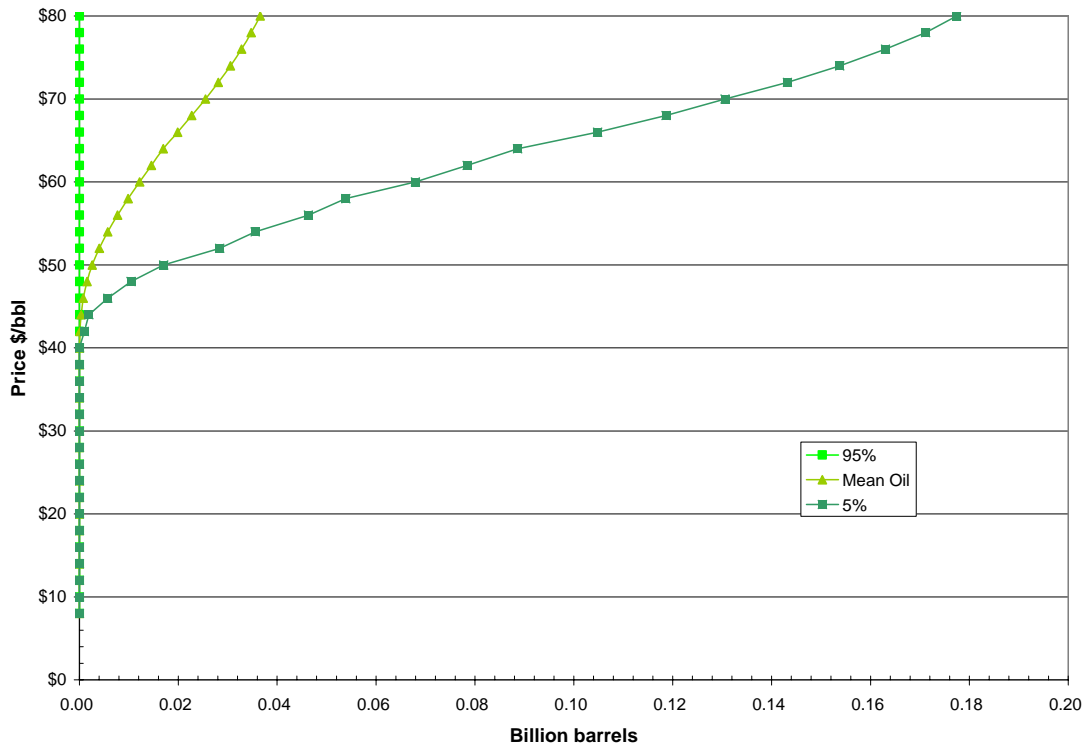
Petroleum liquids production (gas-condensate and crude oil) would be recovered through gas production infrastructure, and petroleum liquids could be transported to several market destinations including the Cook Inlet. Total mean recoverable oil at a market price of \$60.00 per barrel is only 12 million barrels (Mmb) (Table 7), all of which is gas-condensate.

Norton Basin OCS Planning Area, 2006 Assessment, Undiscovered Technically-Recoverable Oil & Gas			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	0	601	2,606
Total Gas (Tcfg)	0	3.058	13.273
Total Liquids (Mmbo)	0	56	244
Free Gas** (Tcfg)	0	3.058	13.273
Solution Gas (Tcfg)	0	0	0
Oil (Mmbo)	0	0	0
Condensate (Mmbc)	0	56	244
<p>* Risked, Technically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>BOE = total hydrocarbon energy, expressed in barrels-of-oil-equivalent, where 1 barrel of oil = 5,620 cubic feet of natural gas</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

Norton Basin, 2006 Assessment Undiscovered Economically-Recoverable Oil (\$60.00) Gas (\$9.07)			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	0	126	713
Total Gas (Tcfg)	0	0.642	3.623
Total Liquids (Mmbo)	0	12	68
Free Gas** (Tcfg)	0	0.642	3.623
Solution Gas (Tcfg)	0	0	0
Oil (Mmbo)	0	0	0
Condensate (Mmbc)	0	12	68
<p>* Risked, Economically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>Oil price in dollars per barrel landed at market, Gas price in dollars per thousand cubic feet landed at market.</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

Table 7:
Comparison of technically recoverable and economically recoverable resources.

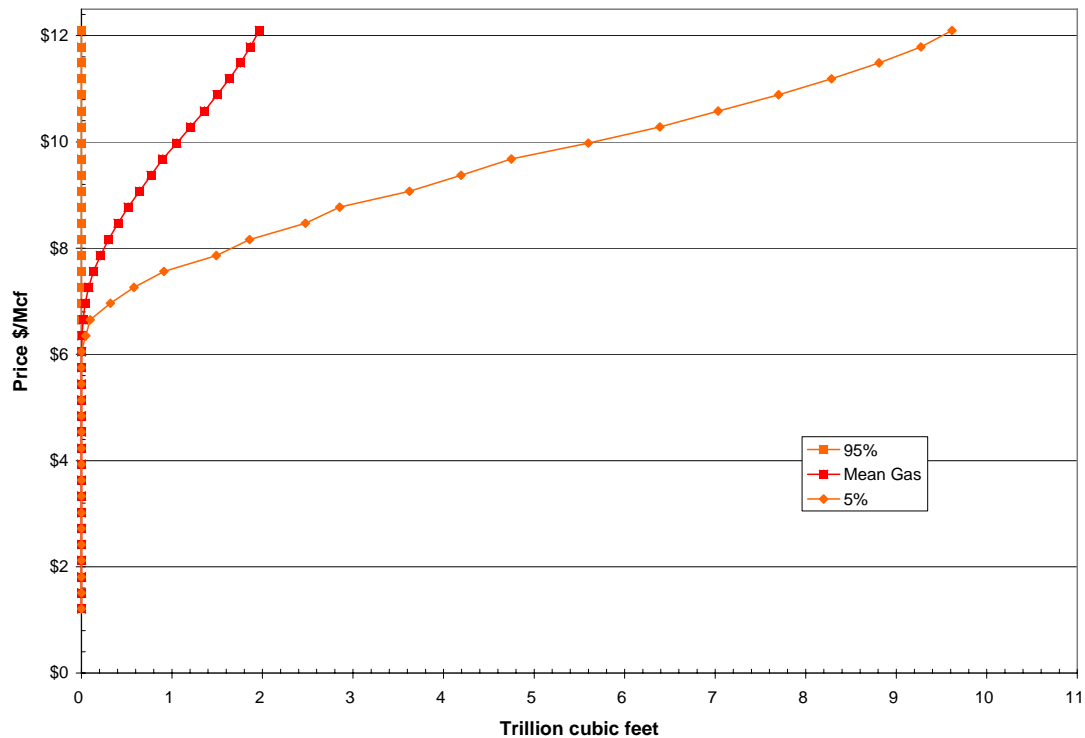
Norton Basin Economic Oil Potential



Range of Economic Oil Potential

The potential for commercial oil production ranges upward to only 12 Mmb at a \$60 price and 5% probability level (*Norton.xls*). There are no economically recoverable resources at a 95% probability level for any price below \$80/barrel. Because condensate is only recovered through gas production facilities, economic recovery of petroleum liquid is entirely dependent on the commercial successes associated with natural gas in the province.

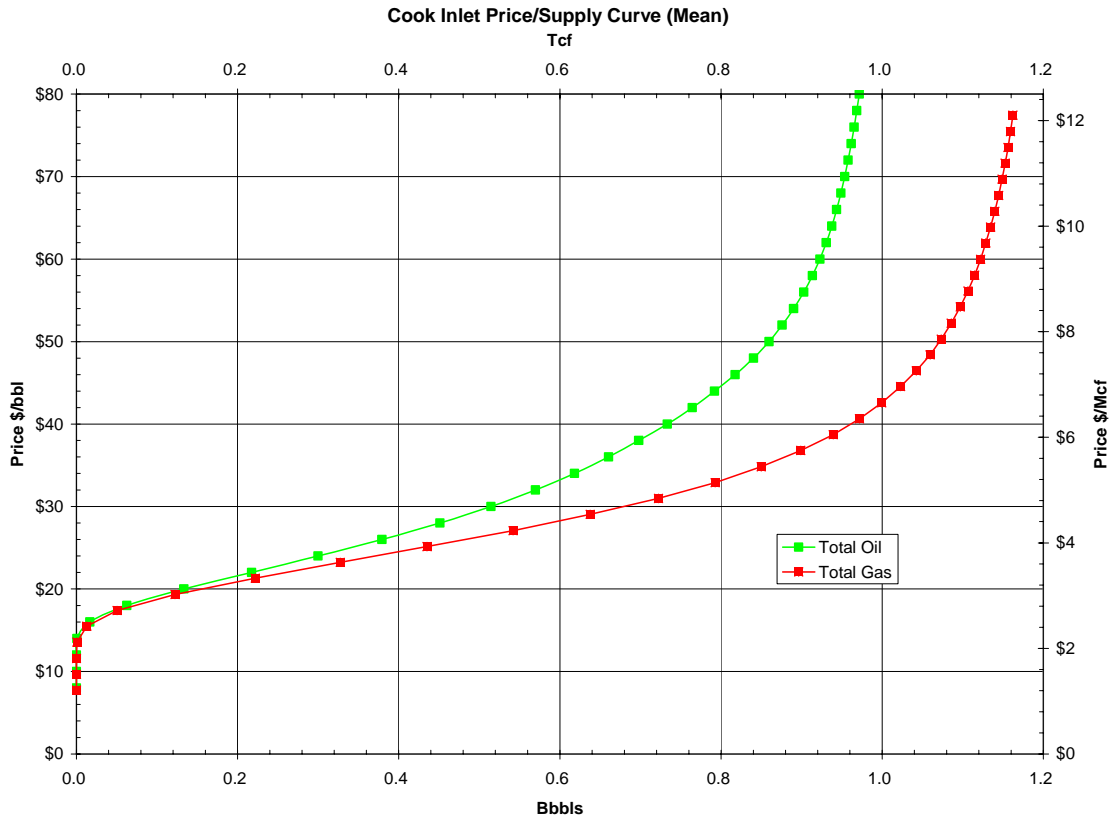
Norton Basin Economic Gas Potential



Range of Economic Gas Potential

The potential for commercial gas recovery at current prices (assume \$9.07/Mcf, equivalent to \$60/bbl oil prices) ranges upward to 3.623 Tcf at the 5% probability level (*Norton.xls*). This is due both to the geology (small gas pools) and very high development and LNG export costs. At the 95% probability level, there are no economically recoverable gas resources at prices below \$12.10/Mcf (equivalent to \$80/barrel oil). This suggests that the chances for commercial success are relatively low in this remote province. In addition, there are economic risks that enough gas reserves will not be discovered in the adjacent provinces (Navarin and Hope) to jointly support a new LNG export facility constructed on St. Lawrence Island. These risks are not included in the analysis. However, small offshore gas discoveries could play an important role in providing energy or fuel to users in northwestern Alaska, where transportation costs would be lower. Alternative transportation technologies (e.g. Compressed Natural Gas, or CNG) could be more cost effective than LNG over distances less than 2500 miles to market.

Cook Inlet Province



Total Oil and Total Gas

Offshore oil and natural gas production in the Cook Inlet (State portion) has occurred since the late 1960's and continues today. Oil is gathered by pipelines to the Tesoro refinery in Nikiski where it is processed mainly into fuels. However, oil has been imported from Valdez to make up for declining local production. Gas is gathered by pipelines to industrial and utility users. Cook Inlet gas fields are also in decline, with shortages in the market expected within 5-10 years. Because of future local demands, the economic model assumes that all new production from the Federal portion of the Cook Inlet would be used within Alaska. The scenarios for all other provinces assume that oil and gas would be exported to outside markets.

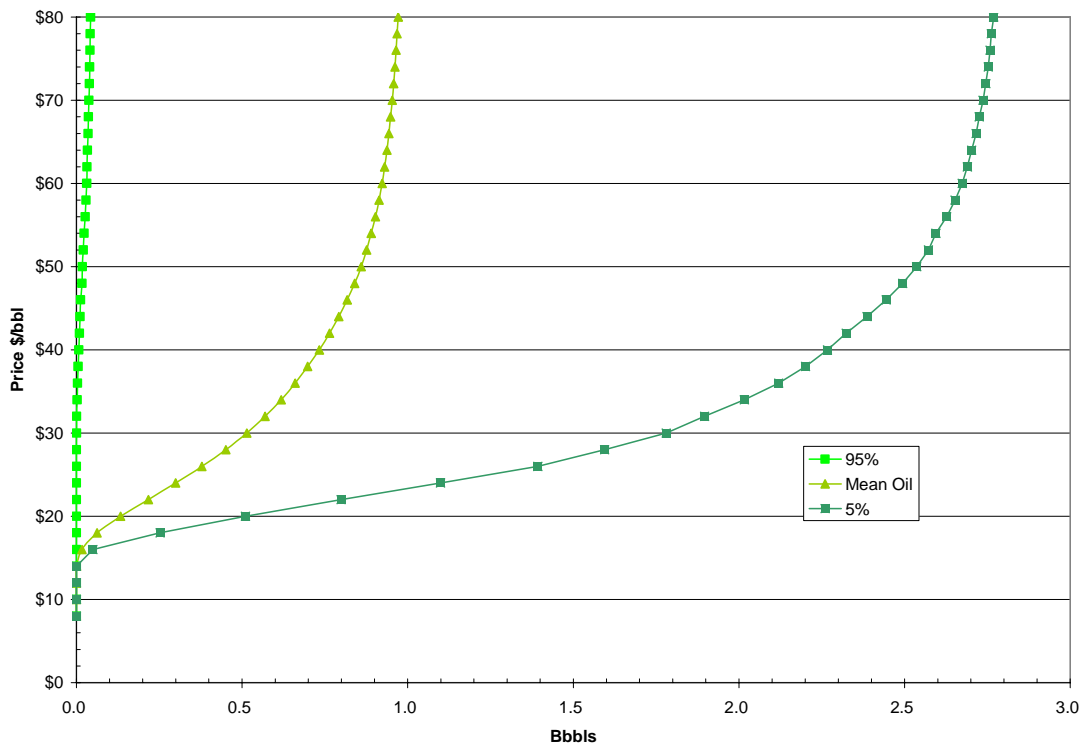
Oil and natural gas are co-developed in the model, although future offshore exploration is likely to first focus on oil prospects. Total mean recoverable oil at current price levels (\$60 per barrel) amounts to 923 million barrels (Mmb), which represents 91% of the mean Undiscovered Technically Recoverable Resource (UTRR) of 1,012 Mmb ([Table 8](#)). Total mean recoverable gas at a corresponding market price of \$9.07 per thousand cubic feet (Mcf) is 1.1 trillion cubic feet (Tcf), which represents 92% of the mean UTRR gas resource of 1.2 Tcf. Associated-solution gas amounts to nearly 0.3 Tcf (31% of the total economic gas potential) and would be recovered through oil production facilities. Economic development in the Cook Inlet is viable at lower prices than other Alaska OCS provinces because of less difficult conditions and shorter distances to market. Threshold prices for minimum economic viability are \$14/barrel and \$2.12/Mcf ([Cook Inlet.xls](#)). However, exploration drilling that followed the first OCS lease sales in the late 1970's did not discover commercial pools in the most attractive prospects. New exploration concepts and 3-D seismic data will be needed to identify future drilling targets.

Cook Inlet (Federal) OCS Planning Area, 2006 Assessment, Undiscovered Technically-Recoverable Oil & Gas			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	61	1,225	3,469
Total Gas (Tcfg)	0.027	1.201	3.478
Total Liquids (Mmbo)	57	1,012	2,850
Free Gas** (Tcfg)	0.005	0.824	2.416
Solution Gas (Tcfg)	0.021	0.378	1.063
Oil (Mmbo)	56	1,009	2,841
Condensate (Mmbc)	0	3	9
<p>* Risked, Technically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>BOE = total hydrocarbon energy, expressed in barrels-of-oil-equivalent, where 1 barrel of oil = 5,620 cubic feet of natural gas</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

Cook Inlet (Federal) OCS Planning Area, Undiscovered Economically-Recoverable Oil & Gas Oil (\$60) Gas (\$9.07)			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	34	1,121	3,261
Total Gas (Tcfg)	0.013	1.115	3.303
Total Liquids (Mmbo)	31	923	2,674
Free Gas** (Tcfg)	0.002	0.770	2.304
Solution Gas (Tcfg)	0.011	0.345	0.999
Oil (Mmbo)	31	920	2,666
Condensate (Mmbc)	0	3	8
<p>* Risked, Economically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>Oil price in dollars per barrel landed at market, Gas price in dollars per thousand cubic feet landed at market.</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

**Table 8:
Comparison of technically recoverable and economically recoverable resources.**

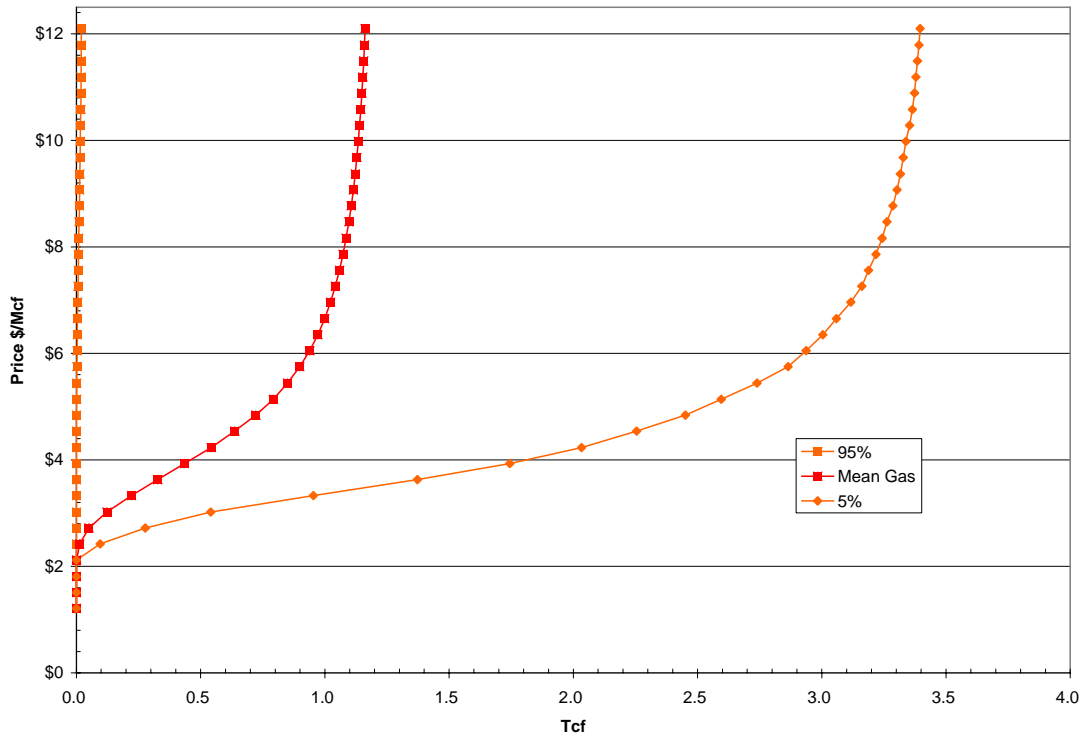
Cook Inlet Oil Price/Supply Curve (95/Mean/5)



Range of Economic Oil Potential

The potential for commercial oil production ranges from 31 Mmb (95%) to 2,674 Mmb (5%) at a \$60 price ([Cook Inlet.xls](#)). The uncertainty in resource estimates in this moderately tested province is related to several factors; including the assumed dependency between plays, the analogies to proven plays in adjacent areas, and the uncertainties in stratigraphic play concepts. It is important to recognize the relationship between resource potential and probability, as well as the level of exploration needed to fully evaluate the province. The mean probability curve suggests that the province has a potential of 923 Mmb that could occur in several large fields. However, at the present time there is no drilling rig available to test new prospects. Environmental restrictions to drilling and seismic activities also discourage industry exploration despite attractive development economics.

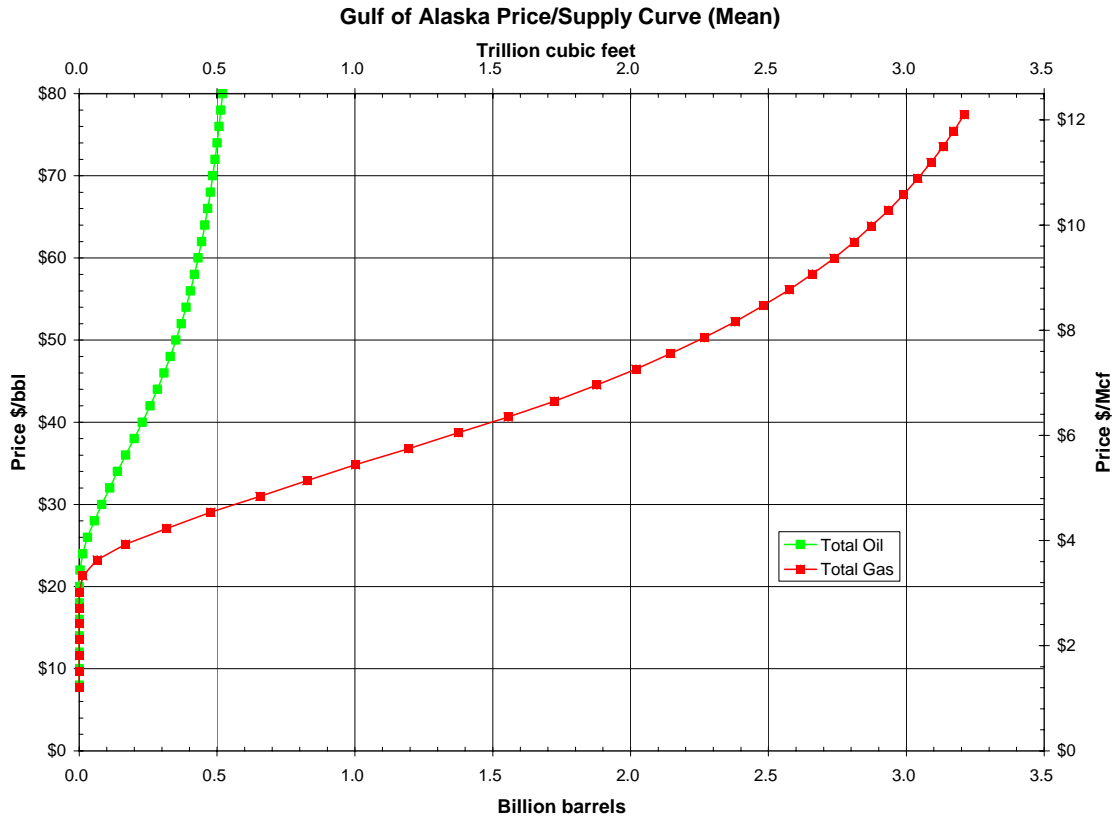
Cook Inlet Gas Price/Supply Curve (95/Mean/5)



Range of Economic Gas Potential

The potential for commercial gas recovery ranges from 13 Bcf (95%) to 3.3 Tcf (5%) at a \$9.07 /Mcf price ([Cook Inlet.xls](#)). The factors leading to this broad range for natural gas resource potential is the same as for oil. In all likelihood, new offshore oil facilities will be used to recover both associated-solution gas and small gas pools reachable from the platform. Gas production could be delayed somewhat, as it would be first used to enhance oil recovery. However, temporarily stored gas (re-injected) would be available for supplies to the local market. Without new oil and gas production, these commodities will be imported in increasing amounts. This would translate to higher prices to consumers and increased environmental risks (tanker spills).

Gulf of Alaska Province



Total Oil and Total Gas

The Gulf of Alaska province is modeled for the production of both oil and gas. Crude oil and condensate represent 43% of the mean Undiscovered Technically Recoverable Resource (UTRR) in BOE ([Table 9](#)) and could be produced through infrastructure scaled to the volume of future discoveries. Oil and condensate could be separated on platforms and transported to Valdez by shuttle tankers. From Valdez this oil would be carried on the established tanker route to the U.S. West Coast. Natural gas represents 57% of the BOE-equivalent endowment but it would require costly new LNG facilities supported by minimum proven gas reserves of at least 5 Tcf. The gas reserve requirement is overlooked in the economic model which assumes that third-party consortiums would build new LNG facilities and the ships to carry it to markets on the U.S. West Coast. Additional discussion of the transportation model is given in [Transportation Scenario for the Economic Resource Assessment](#).

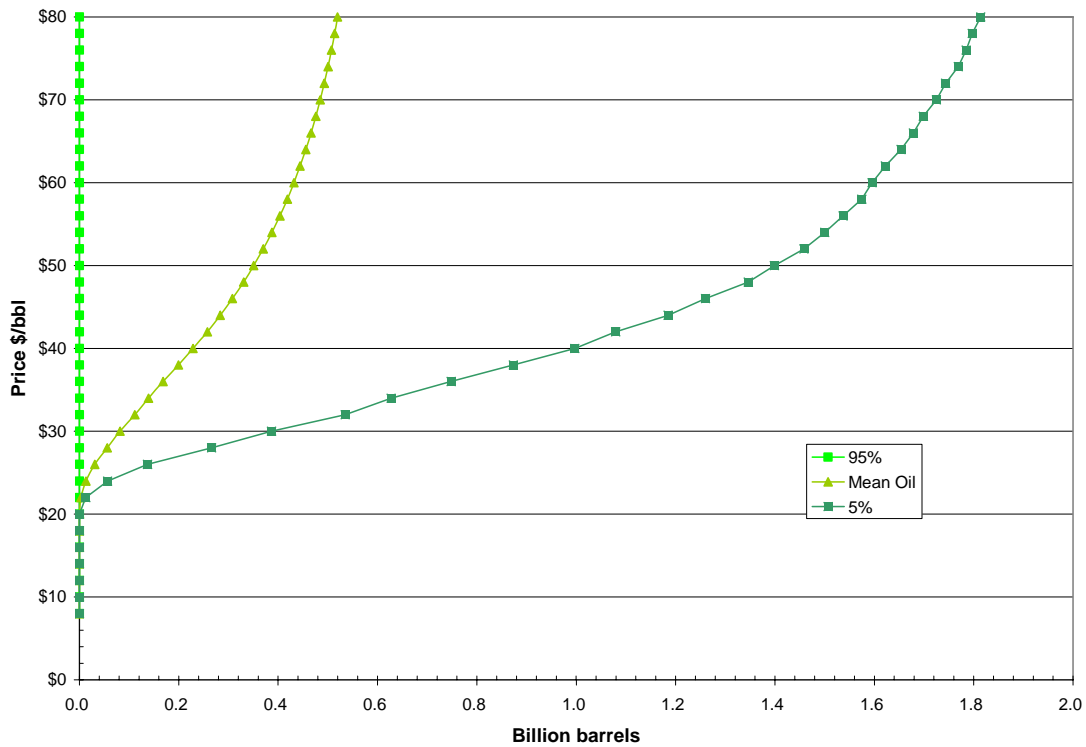
Total mean economically recoverable gas at current price levels of \$9.07 per thousand cubic feet (Mcf) amounts to 2.659 trillion cubic feet (Tcf), which is 57% of the UTRR of 4.650 Tcf ([Table 9](#)). A small fraction (12%) of the total economic gas is solution gas recovered with oil production. As discussed above, the mean economic gas volume recoverable at current prices is probably insufficient to support a new LNG export operation for this province. Other technologies (e.g. Compressed Natural Gas, or CNG) could be more cost-effective to bring small volumes of gas over shorter distances to markets in Alaska (e.g. Cook Inlet). However, alternative transportation technologies were not tested in this assessment. Mean economic oil recoverable oil at \$60/barrel is 432 Mmb, of which 72% is non-associated crude oil. A significant portion of recoverable liquids (122 Mmb) is condensate recovered with gas production.

Gulf of Alaska OCS Planning Area, 2006 Assessment, Undiscovered Technically-Recoverable Oil & Gas			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	0	1,454	4,887
Total Gas (Tcfg)	0.000	4.650	16.003
Total Liquids (Mmbo)	0	627	2,040
Free Gas** (Tcfg)	0	4.167	14.442
Solution Gas (Tcfg)	0	0.483	1.560
Oil (Mmbo)	0	449	1,440
Condensate (Mmbc)	0	178	600
<p>* Risked, Technically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>BOE = total hydrocarbon energy, expressed in barrels-of-oil-equivalent, where 1 barrel of oil = 5,620 cubic feet of natural gas</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

Gulf of Alaska OCS Planning Area, Undiscovered Economically-Recoverable Oil (\$60.00) Gas (\$9.07)			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	0	905	3,374
Total Gas (Tcfg)	0.000	2.659	9.996
Total Liquids (Mmbo)	0	432	1,596
Free Gas** (Tcfg)	0	2.327	8.764
Solution Gas (Tcfg)	0	0.332	1.232
Oil (Mmbo)	0	310	1,142
Condensate (Mmbc)	0	122	454
<p>* Risked, Economically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>Oil price in dollars per barrel landed at market, Gas price in dollars per thousand cubic feet landed at market.</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

**Table 9:
Comparison of technically recoverable and economically recoverable resources.**

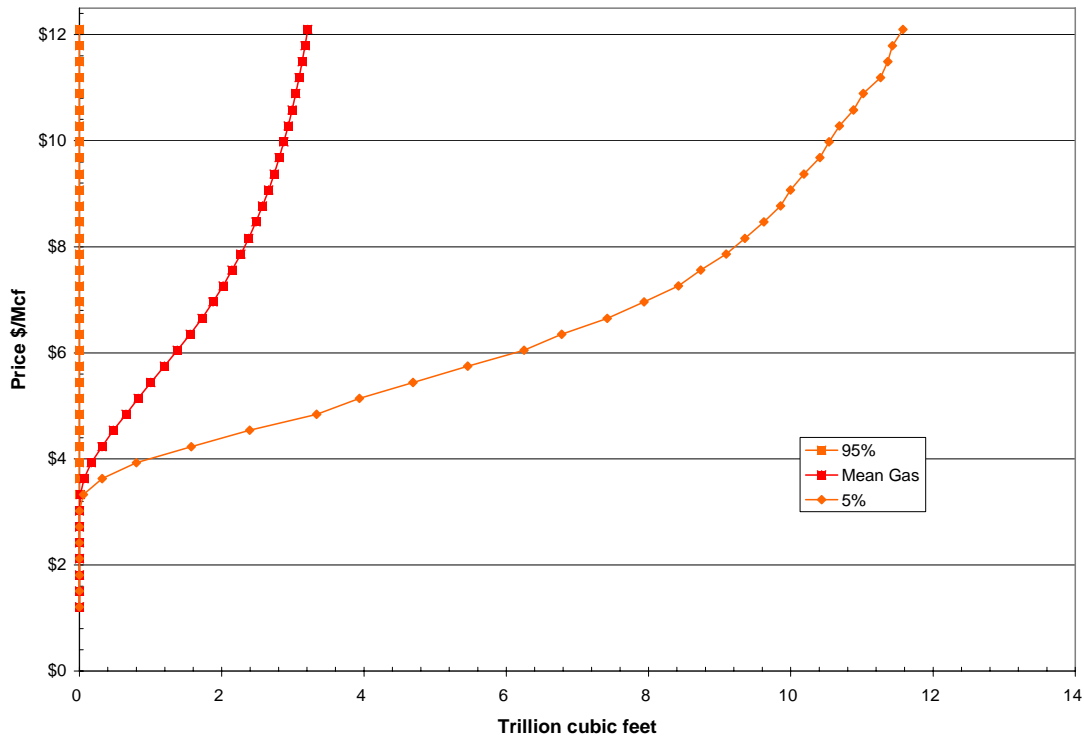
Gulf of Alaska Economic Oil Potential



Range of Economic Oil Potential

The potential for commercial oil production ranges from 0 (95%) to 1,596 Mmb (5%) for the \$60 price case (*Gulf of Alaska.xls*). The broad range in resource estimates can be attributed to several factors; including the uncertainties in untested play concepts and the assumed dependency between plays. If optimistic play concepts prove to be true, then the shared attributes of plays will translate to a high resource potential. The converse is also true, where dry holes in key plays will largely condemn the large portions of the province. Between 1976 and 1982, four OCS lease sales were conducted in various parts of the Gulf of Alaska province. Fourteen offshore wells and 25 onshore wells on the narrow coastal plain were drilled to test numerous prospects, but no commercial-sized pools were discovered. The southeast part of the offshore province is lightly explored and holds the highest undiscovered petroleum potential. However, at the present time there are no drilling rigs in Alaska to test offshore prospects and future OCS sales are not scheduled in this planning area.

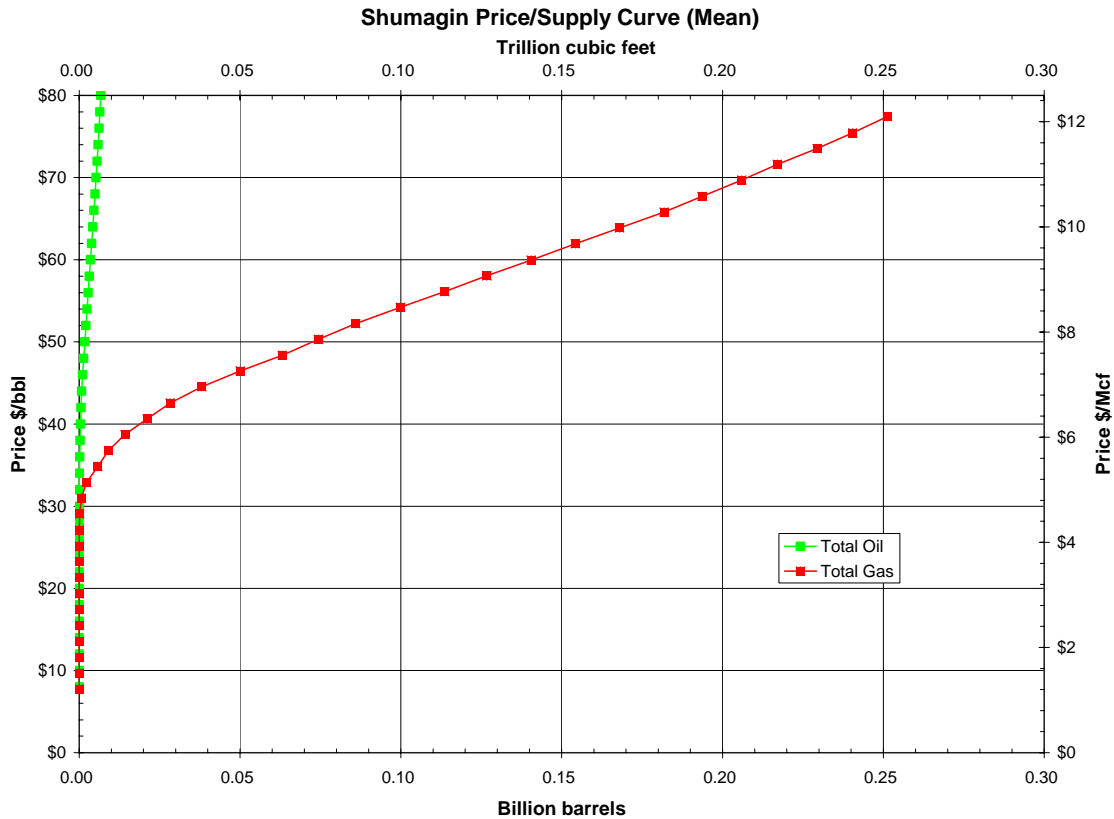
Gulf of Alaska Economic Gas Potential



Range of Economic Gas Potential

The potential for commercial gas recovery ranges from 0 (95%) to 9.996 Tcf (5%) at a \$9.07 /Mcf price ([Gulf of Alaska.xls](#)). The factors leading to this broad range for natural gas resource potential are the same as for oil. If commercial discoveries are made, new production infrastructure is likely to be built near Yakutat, and these facilities would handle both oil and gas. The development synergies between oil and gas would improve the viability of both operations. If the optimistic (5% probability) gas resource volume is discovered, a full-scale LNG operation would be possible. For perspective, this volume of gas would be slightly greater than the total gas reserves discovered in the Cook Inlet region (8.7 Tcf). Otherwise, discoveries totaling the mean economic case would be insufficient to justify a full-scale LNG export operation. As an alternative strategy, if a gas pipeline was constructed to a new LNG facility in Valdez, gas production from the Gulf of Alaska province could be pipelined to this facility for processing and export. This would eliminate the need to identify large proven gas reserves in the province and individual gas fields could become viable at lower market prices. As a second strategy, new transportation technologies (e.g. Compressed Natural Gas, or CNG) could be more cost effective than LNG over distances less than 2500 miles to market and thus could deliver gas to Alaska markets. Future industry interest in this province is likely to be driven by the opportunity for gas production supported by alternative strategies to transport natural gas to market.

Shumagin Province



Total Oil and Total Gas

Shumagin is a gas-prone province with 87% of its mean Undiscovered Technically Recoverable Resource (UTRR) (in BOE) as natural gas (Table 10). Non-associated crude oil pools are not expected in the province and all petroleum liquid is gas-condensate. The engineering model assumes that gas will be exported as liquefied natural gas (LNG) through a shared facility. However, this infrastructure does not exist today and the high costs for construction and operation must be supported by minimum gas reserves of 5-10 Tcf. To reach the minimum reserve volume, we assume that a facility on the Alaska Peninsula would be largely supported by gas production from the North Aleutian Basin but will serve other provinces in the southern North Bering Sea. (*Transportation Scenario for the Economic Resource Assessment*).

Total mean recoverable gas at current price levels of \$9.07 per thousand cubic feet (Mcf) amounts to 0.127 trillion cubic feet (Tcf) which is 26% of the mean UTRR of 0.490 Tcf (Table 10). Low economic potential can be attributed to relatively small gas pools combined with high costs for development and LNG operations. Other technologies (e.g. Compressed Natural Gas) could be more cost-effective to bring small volumes of gas resources from isolated offshore platforms to markets in Alaska (e.g. Cook Inlet).

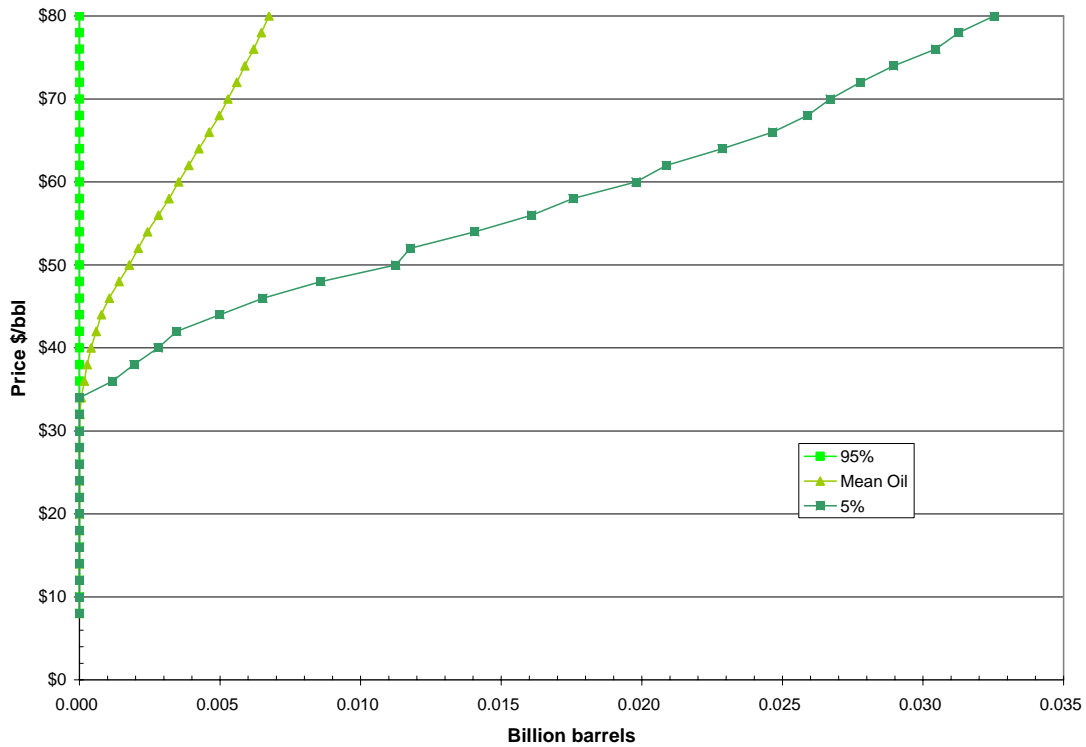
Petroleum liquids (gas-condensate) would be recovered through gas production infrastructure and then transported by shuttle tankers to the Cook Inlet or other market destinations. Total mean economically recoverable liquid at a market price of \$60.00 per barrel is only 4 million barrels (Mmb) (Table 10).

Shumagin OCS Planning Area, 2006 Assessment, Undiscovered Technically-Recoverable Oil & Gas			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	0	100	416
Total Gas (Tcfg)	0	0.490	2.040
Total Liquids (Mmbo)	0	13	53
Free Gas** (Tcfg)	0	0.490	2.040
Solution Gas (Tcfg)	0	0	0
Oil (Mmbo)	0	0	0
Condensate (Mmbc)	0	13	53
<p>* Risked, Technically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>BOE = total hydrocarbon energy, expressed in barrels-of-oil-equivalent, where 1 barrel of oil = 5,620 cubic feet of natural gas</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

Shumagin OCS Province, 2006 Assessment Undiscovered Economically-Recoverable Oil (\$60.00) Gas (\$9.07)			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	0	26	145
Total Gas (Tcfg)	0	0.127	0.703
Total Liquids (Mmbo)	0	4	20
Free Gas** (Tcfg)	0	0.127	0.703
Solution Gas (Tcfg)	0	0	0
Oil (Mmbo)	0	0	0
Condensate (Mmbc)	0	4	20
<p>* Risked, Economically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>Oil price in dollars per barrel landed at market, Gas price in dollars per thousand cubic feet landed at market.</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

Table 10:
Comparison of technically recoverable and economically recoverable resources.

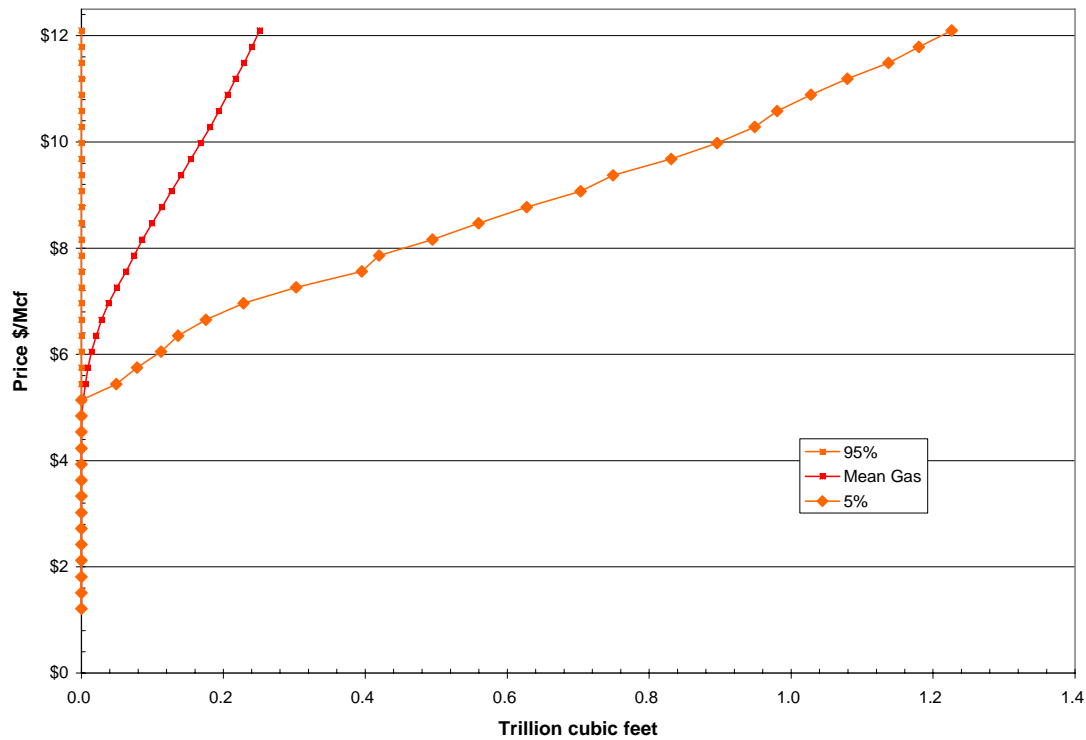
Shumagin Economic Oil Potential



Range of Economic Oil Potential

The potential for commercial oil production ranges upward to only 12 Mmb at a \$60 price and 5% probability level (*Shumagin.xls*). All of this “oil” is actually condensate associated with natural gas. There are no non-associated crude oil pools expected in this province. Economic recovery of gas-condensate depends entirely on the discoveries of natural gas and commercial success for gas in the North Aleutian province. Gas production from the North Aleutian province could support new LNG infrastructure which, in turn, would serve other provinces in the area. Although petroleum liquids would be part of the value of gas production, they would not be economic as standalone products.

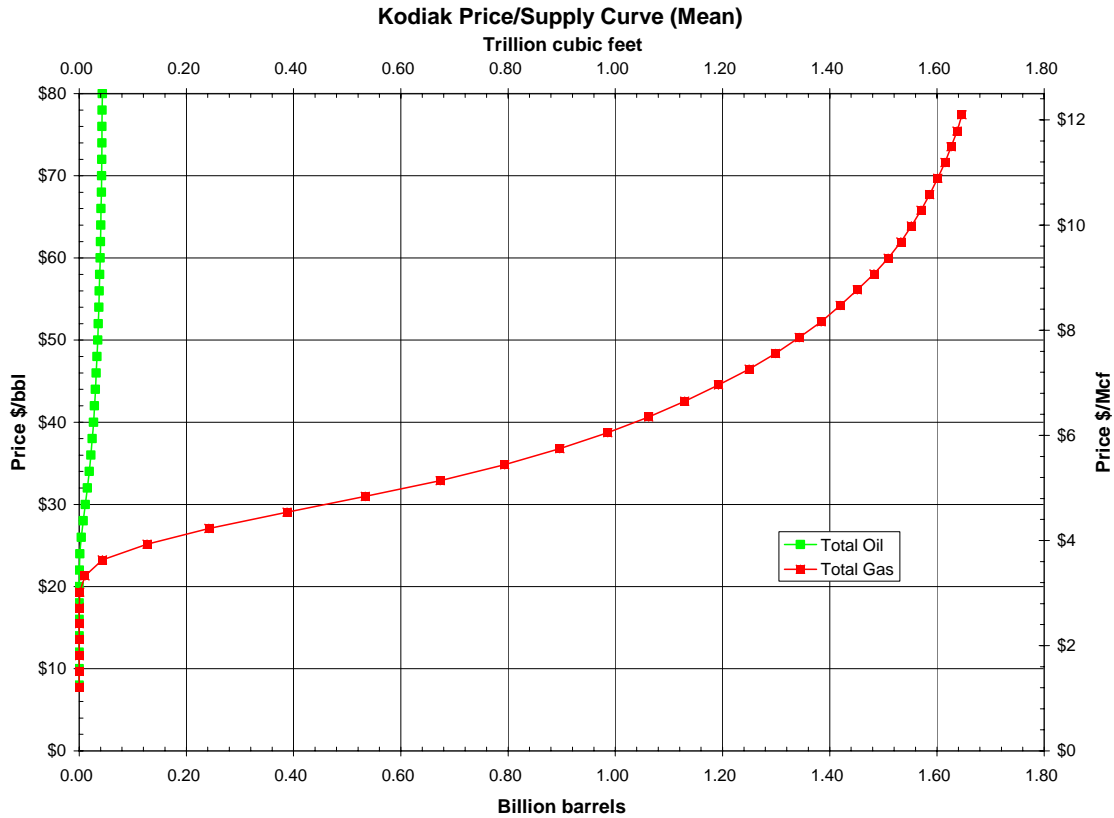
Shumagin Gas Potential



Range of Economic Gas Potential

The potential for commercial gas recovery ranges upward to only 0.703 Tcf at the 5% probability level in the current price case of \$9.07/Mcf (*Shumagin.xls*). In all likelihood, this entire endowment would have to be discovered in a single pool (or several pools close-by) to warrant costly development in this offshore area. At the 95% probability level there are no economically recoverable gas resources at prices below \$12.10/Mcf (equivalent to \$80/barrel oil). In addition, there are economic risks that enough gas reserves will not be discovered in the adjacent provinces (primarily the North Aleutian Basin) to support a new LNG export facility. Without this nearby LNG infrastructure or new technologies to move the gas to market, the natural gas resources in the Shumagin province will be stranded. This province has never been offered for OCS leasing and is not scheduled for future leasing programs.

Kodiak Province



Total Oil and Total Gas

Kodiak is a gas-prone province with 87% of its mean Undiscovered Technically Recoverable Resource (UTRR) (in BOE) as natural gas (Table 11). No crude oil pools are expected in the province and all petroleum liquid is condensate. The development scenario includes gathering to a central platform and transporting gas through a high-pressure subsea pipeline to Cook Inlet markets. (*Transportation Scenario for the Economic Resource Assessment*). Gas liquids are entrained in the high-pressure pipeline and then separated at onshore facilities. Utilizing relatively close, existing facilities lowers the overall cost of producing gas from this offshore province.

Total mean economically recoverable gas at current price levels of \$9.07 per thousand cubic feet (Mcf) amounts to 1.482 trillion cubic feet (Tcf) which is 81% of the mean UTRR for gas (Table 11). For perspective, approximately 8.7 Tcf of natural gas has been discovered in the Cook Inlet region (including onshore and offshore State lands) and 7.1 Tcf has been produced through 2005. New gas supplies from the Kodiak province would be a substantial addition to remaining reserves in this area. Other technologies (e.g. Compressed Natural Gas) could also be cost-effective in transporting gas production over short distances to markets throughout southern Alaska, but this new technology has not yet been used commercially.

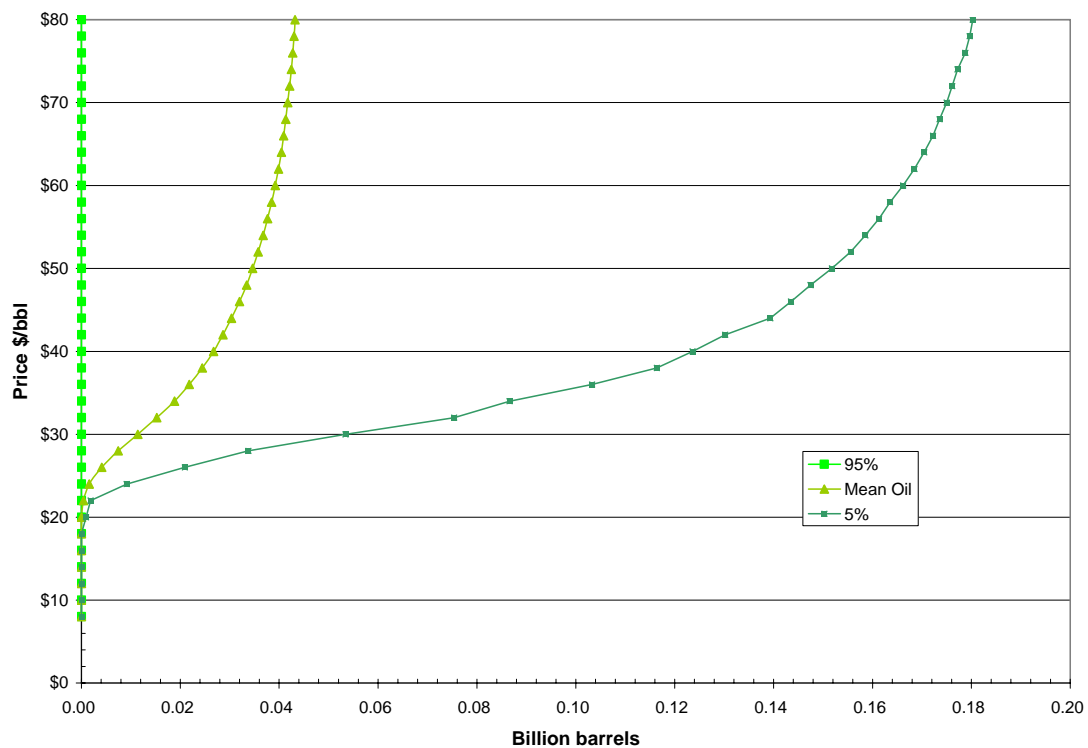
Petroleum liquids production (gas-condensate) would be recovered with gas production and sold to the local market. Total mean recoverable liquid (condensate) at a market price of \$60.00 per barrel is 39 million barrels (Mmb) (Table 11).

Kodiak OCS Planning Area, 2006 Assessment, Undiscovered Technically-Recoverable Oil & Gas			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	0	375	1,551
Total Gas (Tcfg)	0	1.840	7.618
Total Liquids (Mmbo)	0	48	196
Free Gas** (Tcfg)	0	1.840	7.618
Solution Gas (Tcfg)	0	0	0
Oil (Mmbo)	0	0	0
Condensate (Mmbc)	0	48	196
<p>* Risked, Technically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>BOE = total hydrocarbon energy, expressed in barrels-of-oil-equivalent, where 1 barrel of oil = 5,620 cubic feet of natural gas</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

Kodiak OCS Planning Area, 2006 Assessment Undiscovered Economically-Recoverable Oil (\$60.00) Gas (\$9.07)			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	0	303	1,308
Total Gas (Tcfg)	0	1.482	6.415
Total Liquids (Mmbo)	0	39	166
Free Gas** (Tcfg)	0	1.482	6.415
Solution Gas (Tcfg)	0	0	0
Oil (Mmbo)	0	0	0
Condensate (Mmbc)	0	39	166
<p>* Risked, Economically-Recoverable</p> <p>** Free Gas Includes Gas Cap and Non-Associated Gas</p> <p>F95 = 95% chance that resources will equal or exceed the given quantity</p> <p>F05 = 5% chance that resources will equal or exceed the given quantity</p> <p>Oil price in dollars per barrel landed at market, Gas price in dollars per thousand cubic feet landed at market.</p> <p>Mmb = millions of barrels</p> <p>Tcf = trillions of cubic feet</p>			

**Table 11:
Comparison of technically recoverable and economically recoverable resources.**

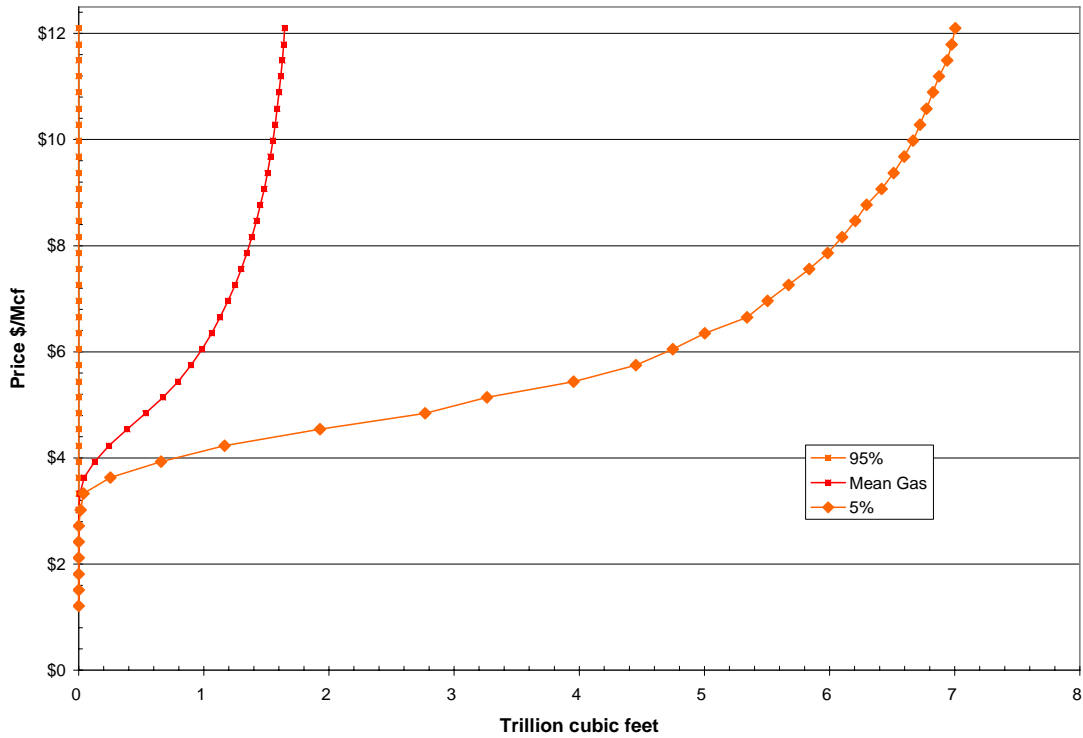
Kodiak Economic Oil Potential



Range of Economic Oil Potential

Liquid hydrocarbon (condensate) production ranges upward to 166 Mmb at a \$60 price and 5% probability level (*Kodiak.xls*). This represents a large supplemental value to gas production (166 Mmb at \$60/bbl is \$9.96 billion in gross value) with small recovery costs. However, condensate recovery will depend entirely on the commercial success for natural gas projects in this province.

Kodiak Economic Gas Potential



Range of Economic Gas Potential

The potential for commercial gas recovery ranges upward to 6.415 Tcf at the 5% probability level ([Kodiak.xls](#)) for the \$9.07/Mcf case (corresponding to \$80/bbl oil price). At the 95% probability level, there are no economically recoverable gas resources at prices below \$12.10/Mcf (equivalent to \$80/barrel oil). This suggests there is a relatively low chance that commercial-size gas pools occur in the area. However, as proven gas reserves in the Cook Inlet region continue to drop and the local market expands, new gas supplies will have to be identified. Given that the accessible portions of the Cook Inlet region are mature with respect to exploration, it is very likely that gas imports will be needed for industrial and consumer users within the next decade. Options for natural gas from the untested OCS provinces near the Cook Inlet should not be ignored, particularly in view of the up-side gas potential of the Kodiak province.