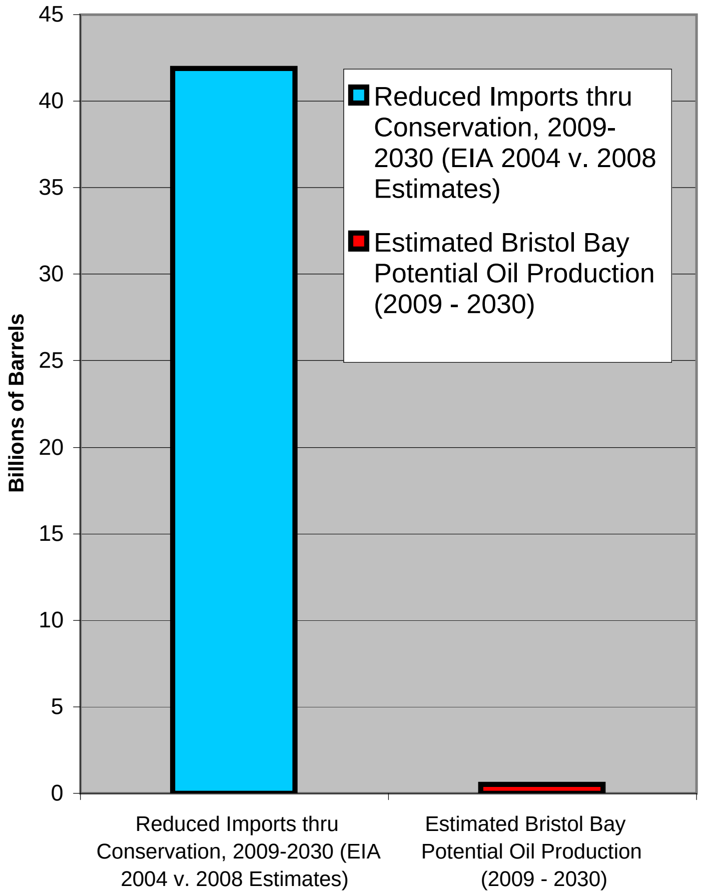
Economic Perspectives on Oil and Gas Drilling in the North Aleutian Basin



(See Figure 6, p. 17.)

Recent EIA Data Show Dramatic Decline in Actual and Forecast Oil Imports; Conservation Gains Far Outweigh North Aleutian Basin (Bristol Bay) Oil Production Potential

A Report to the World Wildlife Fund

by

Richard A. Fineberg
Principal Investigator, Research Associates
P.O. Box 416
Ester, Alaska 99725

February 12, 2009

Executive Summary

➔ The information presented in Section I. of this report suggests that exploration for undiscovered North Aleutian Basin natural gas is not likely to contribute materially to the resolution of this nation's energy problems.

➔ As shown in Section II., reductions in oil demand and imports realized through conservation in recent years far outweigh the potential of drilling for oil in the North Aleutian Basin. The 111:1 ratio between conservation gains since 2004 and estimated potential North Aleutian Basin production between 2009 and 2030 demonstrates that exploring in Bristol Bay represents a dramatically less efficient energy path.

➔ The data presented in this report support the following broader economic considerations, which have relevance to the North Aleutian Basin:

- **In addition to delivering far greater petroleum savings than drilling in remote provinces, conservation measures offer the significant public policy benefits of not exacerbating climate change or incurring other pollution-related costs associated with the use of fossil fuels.**

- **Oil consumption and price patterns over the last three decades demonstrate the folly of relying on market forces to determine energy policy: Despite the fact that the economic and strategic dangers of dependence on imported petroleum were well recognized more than three decades ago, the United States continued to pursue a course of energy inefficiency and increasing dependence on imported oil for another two decades. The manner in which consumption rose as prices fell in the final months of 2008 further demonstrates that it would be a mistake to assume that market forces will deliver reduced**

petroleum consumption in the absence of government policy mandates. Instead of contributing to the restructuring the nation's energy delivery system, drilling in the North Aleutian Basin would tie up capital on a status-quo reliance on oil and gas.

- **The chronic volatility and uncertainty of long-term oil prices creates a feast or famine dilemma that undermines rational economic planning. The possibility of low prices inhibits investment in the technology and the infrastructure necessary to sustain development, while the prospect of high long-term oil prices induces development but strains the system, pushing up costs. North Aleutian Basin drilling would be prone to inefficient use of capital resources due to either: (a)) project failure or delay if oil prices remain low; or (b) requirements for additional capital to cover cost overruns and project delays frequently associated with high oil prices.**

- **To provide meaningful economic analysis, assessment of economically recoverable volumes of estimated discovered technically recoverable oil should take into account the escalating field costs experienced in recent years, which adversely effect the economics of prospective development.**

Table of Contents

Table of Contents (Continued)

I. Prospects for a Bristol Bay (North Aleutian Basin) Natural Gas Discovery

According to MMS, "the North Aleutian Basin OCS Planning Area is primarily a gas province" that contains a mean estimate of 8.622 trillion cubic feet (TCF) of technically recoverable natural gas.[1] This estimated volume of undiscoverede natural gas equates to approximately 1.5 billion barrels of oil equivalent.[2] By comparison, MMS estimates that the North Aleutian Basin contains approximately 0.75 billion barrels of technically recoverable oil – approximately half the amount of prospective natural gas.[3]

When oil prices increased dramatically during the decade between 1998 and 2008, the increase in natural gas prices was more modest.[4] The overall increase in energy prices induced the development of high-priced unconventional natural gas prospects in the Lower-48, but the resulting supply excess curbed the increase and then exerted downward pressure on natural gas prices. By early 2009, onshore domestic natural gas production gains, sparked by the upward trend in energy prices, had collided head-on with the decline in demand resulting from the sharp downfall of domestic and global economies, causing an unprecedented mismatch between the over-supply of domestic natural gas and market needs. "To rebalance the market," one veteran industry analyst noted, "production will need to be reduced steeply." Moreover, he noted, the short-

[1] U.S. Department of the Interior (Minerals Management Service, Alaska OCS Region), *North Aleutian Basin OCS Planning Area: Assessment of Undiscovered Technically Recoverable Oil and Gas – As of 2006*, February 2006, pp. 2-3 (*http://www.mms.gov/alaska/re/reports/rereport.htm*).

[2] MMS estimates that one barrel of oil equivalent (BOE) equals 5,620 cubic feet of natural gas.

[3] *North Aleutian Basin OCS Planning Area: Assessment of Undiscovered Technically Recoverable Oil and Gas – As of 2006*, pp. 2-3.

[4] During the summer of 2008, crude oil (refinery acquisition cost) prices peaked at roughly 3.5 times 2004 the 2004 average price, while the natural gas (city gate wholesale) was slightly less than twice the 2004 average (U.S. Energy Information Administration, Monthly Energy Review, January 2009, Tables 9.1 and 9.11). By year-end, oil had collapsed to 2004 levels, while natural gas prices were approaching 2004 levels. (See: EIA, *This Week in Petroleum*, Data Table 2*, Natural Gas Monthly*, January 2009, Table 3, and *Natural Gas Weekly Update*, Overview for the week ending Feb. 4, 2009.

term oversupply situation is liable to turn into a long-term natural gas crisis exacerbated by three factors – emerging shale gas plays, energy efficiency legislation and a surge into the U.S. natural gas market of liquefied natural gas (LNG), ending years of promise without delivery.[5]

Bristol Bay natural gas development faces another set of handicaps. Natural gas is less efficient (and therefore more expensive) than oil to transport and store. For this reason, as a general rule natural gas prices tend to exhibit greater regional variations and greater volatility than oil. These characteristics make it more difficult to finance and arrange large-scale natural gas projects than an oil development that would produce a similar amount of energy.

Even if general economic conditions were right for northern natural gas exploration and development, to enter production after discovery Bristol Bay natural gas would have to leap another major hurdle: distance to market. Consider the case of the large volumes of discovered natural gas on Alaska's North Slope. Despite Prudhoe Bay's economy of scale and the development of an oil transportation route to market during the 1970's, the economics of transporting Prudhoe Bay natural gas to market have yet to be worked out. Bristol Bay's undiscovered gas is estimated to be about one-fourth the size of the undeveloped natural gas resource discovered with the supergiant oil field at Prudhoe Bay four decades ago. Bristol Bay's estimated undiscovered natural gas deposits are approximately equal in size to another discovered North Slope resource – the Pt. Thomson field on the Arctic Ocean coast at the western edge of the Arctic National Wildlife Refuge. Like the larger Prudhoe Bay gas resource, Pt. Thomson gas has yet to be developed.[6]

---

[5] For discussion of these trends and their implications for natural gas exploration and development, see Andy Weissman, "Profound Change Sweeps Gas Market," *The American Oil & Gas Reporter*, January 2009, pp. 57-60.

[6] The Pt. Thomson discovery also has the benefit of an estimated 300 million barrels of natural gas condensate; that discovered liquid hydrocarbon resource has yet to make it across the 40 miles between Pt. Thomson and the eastern edge of the Prudhoe Bay complex.and the established production network.

The game plan of XTO Energy Inc. – an independent natural gas producer that will continue to expand its Lower-48 natural gas production in 2009 in the face of this grim economic situation[7] – provides another indication of the importance of understanding the transportation hurdle. In one shale development in Louisiana, XTO reports that its activity is restricted by a lack of pipeline access. XTO is also involved in shale gas development in Pennsylvania's Marcellus Shale. There, XTO is planning its initial drilling locations in close proximity to pipelines to ensure ready access to market. As XTO CEO Keith Hutton puts it, development drilling "is not just a science project. We are drilling these wells to be producers."[8]

MMS suggests that Bristol Bay gas could be put to regional use, but even in this scenario the pipeline economics do not appear to be promising. According to MMS:

> **Locally, the proposed "Pebble" gold mine (estimated gas demand of 66 Mmcfg/day to feed a 200 Mw power plant) north of Iliamna Lake may form a potential future market for North Aleutian basin gas resources. However, the Pebble project site is located approximately 400 miles northwest of the key prospects in the central part of the North Aleutian basin and the estimated gas demand may be too small to support a pipeline of this length.[9]**

In sum: Although North Aleutian Basin discovery prospects favor natural gas, the chances of putting a Bristol Bay natural gas find into production do not appear promising.

---

[7] XTO anticipates record cash flows in 2009, based in part on an aggressive hedging program that guarantees relatively high prices for its oil and gas, regardless of depressed prices. XTO CEO Keith Hutton expects his company to increase production by 18% in 2009, following increases of 29% in 2008 and 19% in 2007. (See: vGregory DL Morris, "XTO Energy: Fueled By Acquisitions, XTO Energy Turns Corner to Organic Growth Strategy," *The American Oil & Gas Reporter*, January 2009, pp. 70-81.)

[8] "XTO Energy: Fueled By Acquisitions, XTO Energy Turns Corner to Organic Growth Strategy," p. 79.

[9] *North Aleutian Basin OCS Planning Area: Assessment of Undiscovered Technically Recoverable Oil and Gas – As of 2006*, February 2006, p. 4.

Alaskan Arctic and offshore petroleum development efforts are typically directed toward finding and developing oil prospects rather than natural gas. Moreover, drilling advocates frequently tout reduced dependence on imported oil as a principal reason for proposing exploration and development in remote northern regions. As discussed above, remote natural gas development faces inherent handicaps that significantly reduce the chances of developing Bristol Bay natural gas. In light of these considerations, the data and charts presented in the following section focus on oil rather than natural gas. This approach will facilitate comparisons between the North Aleutian Basin, other northern petroleum provinces and national petroleum demands.

II. Oil Price, Consumption and Import Data

A. Introduction

This section discusses seven figures that focus on current economic analyses to place the likely volume of potential oil and gas production from the Bristol Bay federal offshore tracts under consideration for leasing (the North Aleutian Basin OCS Planning Area) in their appropriate national energy context. Key documents for this report are the December 2008 early release of the U.S. Energy Information Administration (EIA) 2009 *Annual Energy Outlook* [10] and the U.S. Minerals Management Service's 2006 analysis of Bristol Bay oil and gas potential.[11] The later report was completed in 2005 and relies on data and information available in January 2003.[12] The MMS economic analysis therefore predates the dramatic increase in oil prices between 2005 and mid-2008 and the subsequent precipitous and unexpected collapse in oil prices. By the end of 2008, as the global economy lurched into a severe recession oil had lost roughly three-quarters of its record high trading value six months earlier.[13] Global and national debate on energy and climate change policy combine with the extremely volatile oil prices of 2008 to underscore the importance of updating data relevant to Bristol Bay's petroleum potential.

[10] U.S. Energy Information Administration, *Annual Energy Outlook* 2009, Dec. 17, 2009 (Report # DOE/EIA-0383[2009] Early Release).

[11] U.S.Minerals Management Service, *North Aleutian Basin OCS Planning Area: Asessment of Undiscovered Technically-Recoverable Oil and Gas – As of 2006,* February 2006.

[12] *North Aleutian Basin OCS Planning Area: Asessment of Undiscovered Technically-Recoverable Oil and Gas – As of 2006*, p. 2.

[13] In December 1998, oil sold for an average of $11.32 per barrel (2009 $) on the U.S. spot oil market. Over the next ten years, the spot oil price rose to record high levels, averaging $134.82 during the four weeks preceding its peak in July 2008. The spot oil price immediately tumbled from that peak to an average of $37.51 per barrel during the last four weeks of 2008. (From: U.S. Energy Information Administration, "Weekly United States Spot Price FOB Weighted by Estimated Import Volume [Dollars per Barrel]," http://tonto.eia.doe.gov/dnav/pet/hist/wtotusaw.htm. Note: Unless indicated otherwise, oil prices in this report are shown in real [2009] dollars [see Appendix 2 for conversion factors].)

B. Seven Figures

About Figure 1. *(U.S. Petroleum Production and Net Imports, 1985 – 2008)*

The nation's petroleum imports declined for the third year in a row in 2008, reversing a long-standing trend of increasing dependence on foreign oil. During the 21 years between 1985 and 2005, net imports increased by an average of 5.5% per year to fill the gap between increasing domestic consumption and generally declining domestic production.[14] As shown in this figure, consumption and production leveled off in 2005, with imports dropping from a high of 12.5 million bpd in 2005 to a current level of approximately 11.1 million bpd in 2008 (a reduction of about 11%).[15] Import rates declined at a record pace in 2008, comprising 57.2% of this nation's total petroleum supply. Ignoring these important developments, drilling advocates frequently overstate the nation's dependence on foreign oil.[16] Even respected oil industry veterans such as wind power advocate T. Boone Pickens get it wrong.[17]

---

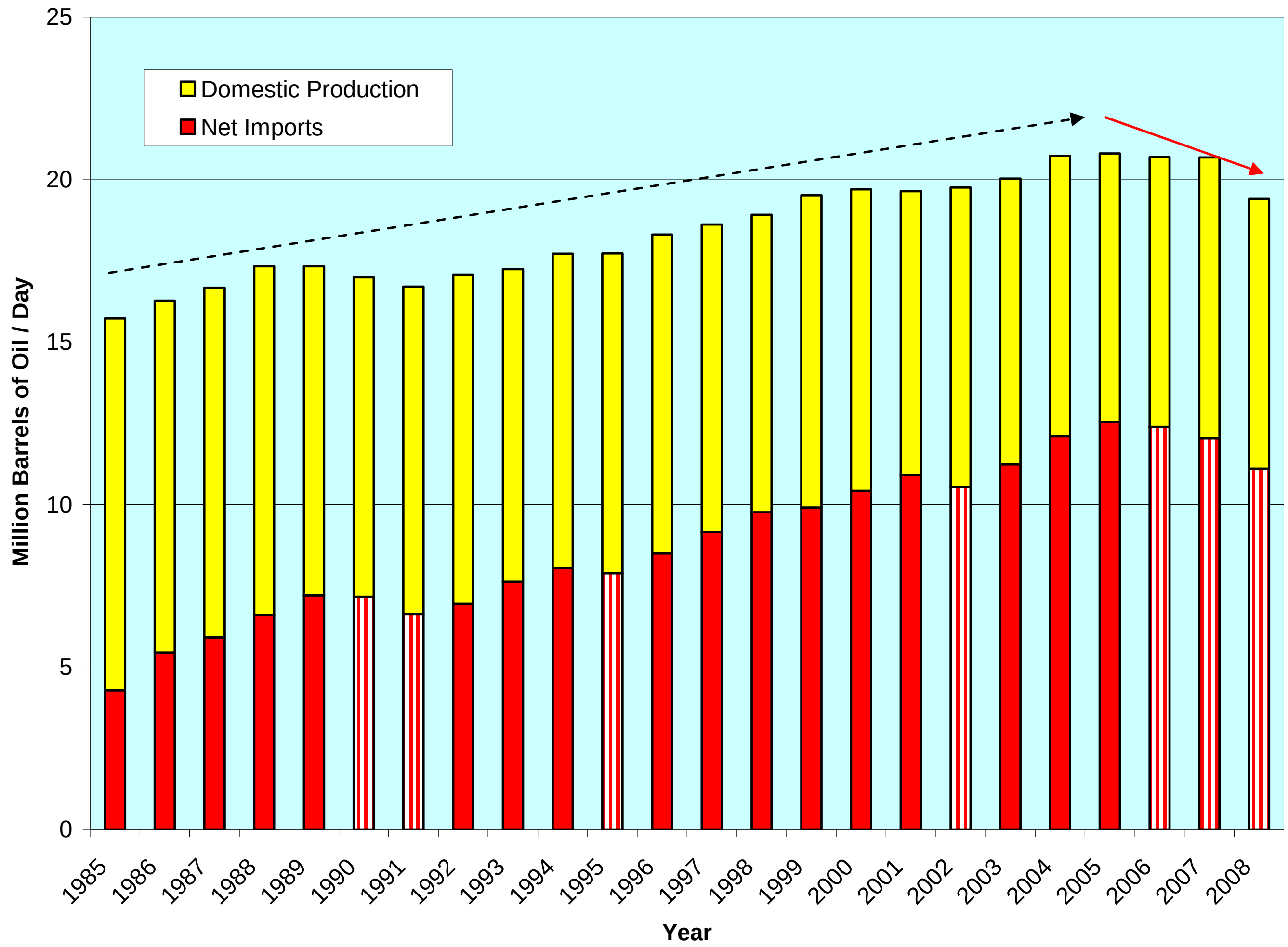
[14] In 1985, total consumption averaged about 15 million bpd, of which net imports comprised about 4.2 million; both figures were significantly lower than the corresponding figures for 1980. But by 1985, the nation's abandonment of adherence to CAFÉ (corporate automotive fuel efficiency) standards was beginning to make itself felt, as imports and total consumption began to increase again. By 2005, total domestic consumption topped 20 million bpd and imports exceeded 12 million.

[15] EIA data presented here covers the first 11 months of 2008. (U.S. Energy Information Administration, *Monthly Energy Review*, December 2008, p. 37 [Table 3.1, Petroleum Overview].)

[16] For example, on May 1, 2008, then-U.S. Senator Ted Stevens, speaking on the Senate floor, said, "Mr. President, we import more than 12.5 million barrels a day of petroleum – over 60 percent of our energy needs. As a matter of fact, I think it's higher than that now in the last two or three days." Three weeks later, Senator Stevens told his colleagues, "we import today 67 percent of our oil." (Senator Ted Stevens, "Senator Stevens Highlights Inconsistencies in Anti-Drilling Stance" and "Senator Stevens Calls for Oil and Gas Development in Alaska" [press releases on Senate floor statements], May 1 and May 23, 2008 [accessed in June 2008 at the former senator's web site, now defunct]).

[17] In his national campaign to promote wind power, veteran oilman T. Boone Pickens frequently states that U.S. oil imports comprise more than 70% of the nation's total petroleum supply. (See, for example, the video of excerpts from Pickens' presentation at Rice University, displayed on the home page of the Pickens plan web site, which opens with Pickens telling students, "We have the problem of the imports that are now up to 70%" [accessed Jan. 12, 2009 at *http://www.pickensplan.com/index.php*]).

Figure 1. **U.S. Petroleum Production and Net Imports, 1985 - 2008**



Declining Imports: Between 1985 and 2005, petroleum net imports (the best measure of dependency on foreign oil; shown in red) increased at an average rate of more than 5.5% per year, increasing 17 times and decreasing only 4 times in 21 years (shown with red & white vertical stripes). Since 2005, this trend has reversed; Total domestic consumption and imports have decreased for three consecutive years.

Sources: *U.S. Energy Information Administration,* Annual Energy Outlook Retrospective Review, *2006, Tables 5 and 7 (1985-2005) and* Monthly Energy Review, *Dec. 2008, Table 3.1 (2006 – 2008).*
(See discussion in text.)

Research Associates, Ester, Alaska 99725 / January 2009

About Figure 2. *(Oil Prices v. U.S. Petroleum Consumption, 2008)*

In 2008 oil prices averaged nearly $100 per barrel on an annualized basis. However, in terms of oil prices the year was divided into two distinct and remarkable parts. During the first half of 2008, oil prices skyrocketed and consumption declined significantly. But after oil prices crashed during the last half of the year, the consumption trend reversed, as shown in Figure 2.

History demonstrates that the imbalance between supply and demand creates an erratic price pendulum that swings, with disconcerting irregularity, back and forth over time.[18] The factors creating oil price pendulum swings are not equal in intensity or duration. Moreover, global factors may either strengthen or offset domestic trends. As various factors come together, their effects do not occur with regularity or predictability.[19] What was most unusual about 2008 was the extremes to which the price of oil soared and the suddenness of its subsequent collapse. While most observers now believe oil prices are on a long-term upward trend (reversing the prevailing view a decade ago), it is not known when oil prices will rebound, how high oil prices will go, or how long it will take for higher oil prices to induce further reductions in consumption.[20]

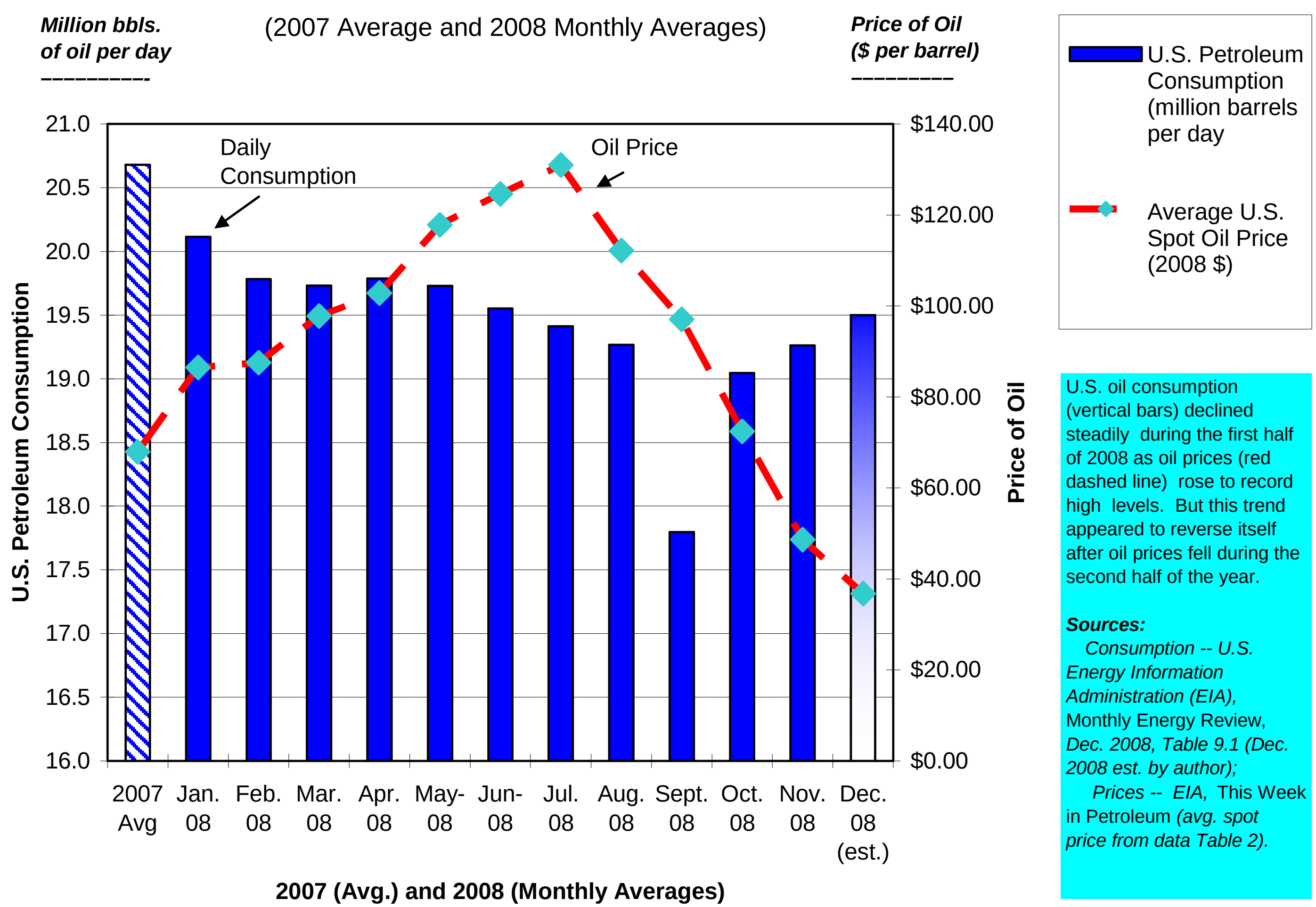
---

[18] In 1975, after the first of the two oil price run-ups of that decade, Anthony Sampson offered this comment in the opening chapter of his seminal study of the oil industry: "I found myself marveling that the West should ever have become dependent on such an unreliable commodity. . . . the black stuff had always seemed to be spurting up in the most impossible places, one moment in excessive quantities, the next moment threatening a terrifying shortage, as if to exasperate its millions of dependents." Anthony Sampson, *The Seven Sisters: The Great Oil Companies and the World They Shaped* (Bantam Books [Viking Press], 1975), p. 3.

[19] For example, during the decade between 1999 and 2008, as oil prices rose, United States consumption continued to rise for the first seven years, leveled off (with slight decline) for two years, followed by the more precipitous decline in 2008, as shown in Figure 1.

[20] See, for example, John Porretto, "Don't get accustomed to cheap oil: Cutbacks in exploration now will help fuel price increase when demand heats up again; some see oil topping $150 per barrel," *Petroleum News*, Jan. 11, 2009, p. 10 ("The oil industry is scaling back on exploration and production because some projects don't make economic sense when energy prices are low. . . . No one knows for sure, but some analysts say the spike could happen as soon as next year, perhaps in 2011 or 2012").

Figure 2. **Oil Prices v. U.S. Petroleum Consumption, 2008**

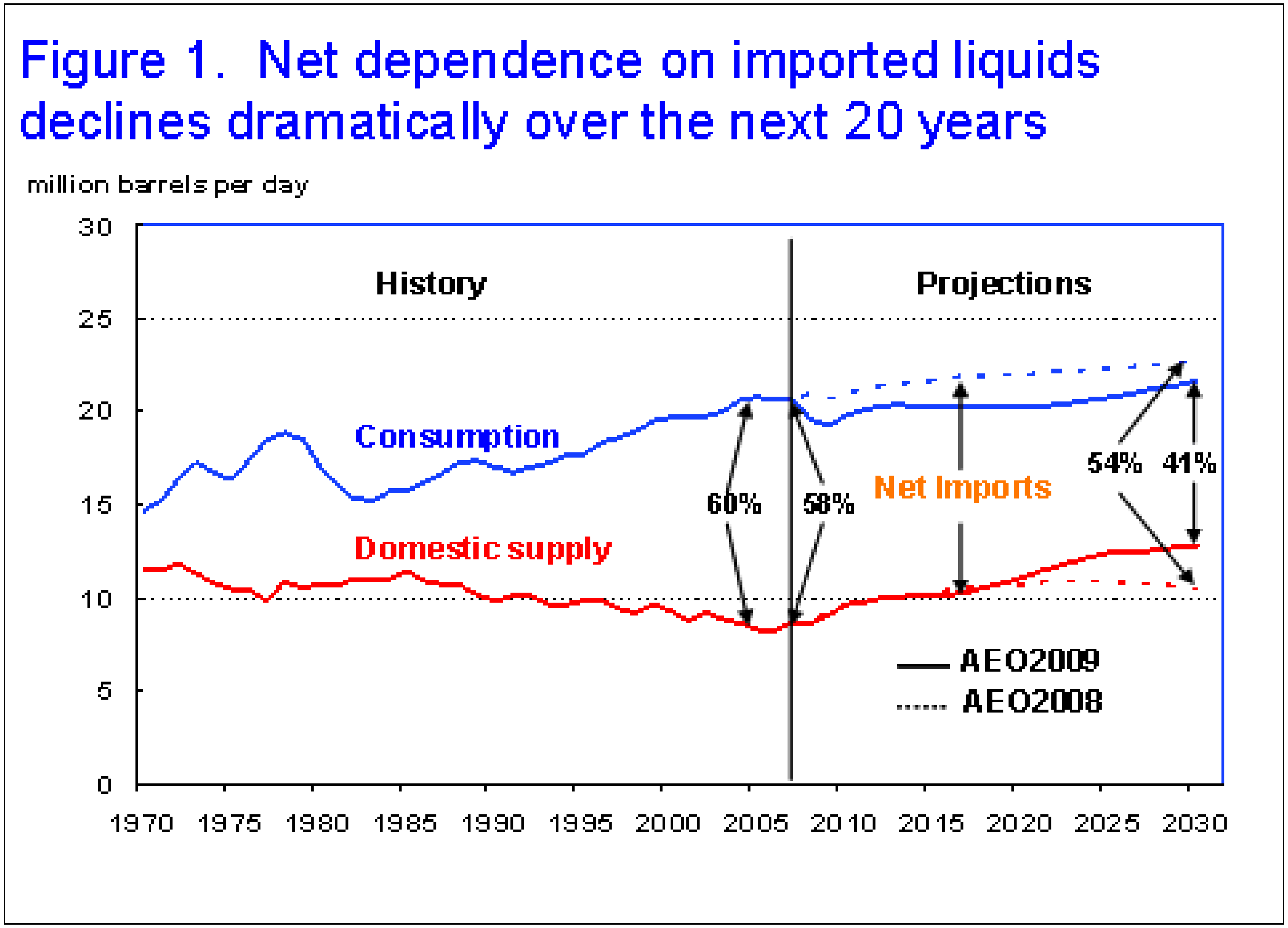


<u>About Figure 3. *(Petroleum Imports – Looking Forward)*</u>

As shown in Figure 3, EIA's current reference or base case long-term scenario anticipates future imports will decline significantly, resulting in far greater petroleum savings than the import reduction already delivered in 2008. EIA now estimates that imports will constitute 41% of the nation's total petroleum requirement in 2030, significantly below the current import level of approximately 57%. The energy agency's current estimate of declining future imports (Figure 3) was prominently displayed as the first chart accompanying the early release of *Annual Energy Outlook 2009*.[21]

[21] U.S. Energy Information Administration, "New EIA Energy Outlook Projects Flat Oil Consumption to 2030, Slower Growth in Energy Use and Carbon Dioxide Emissions, and Reduced Import Dependence," Dec. 17, 2008 (press release and press release Figure 1, accessed Jan. 2, 2009 at *http://www.eia.doe.gov/neic/press/press312.html*).

Figure 3. **Petroleum Imports – Looking Forward**



U.S. Energy Information Administration, "New EIA Energy Outlook Projects Flat Oil Consumption to 2030, Slower Growth in Energy Use and Carbon Dioxide Emissions, and Reduced Import Dependence," Dec. 17, 2008 (press release and press release Figure 1, accessed Jan. 2, 2009 at *http://www.eia.doe.gov/neic/press/press312.html*).

<u>About Figure 4. (*Rising Future Oil Price Forecasts between 2004 and 2009 v. Declining Imports as Percentage of U.S. Petroleum Consumption*)</u>

EIA's current import estimate for 2030 reflects a reduction of more than 40% from the agency's corresponding estimate five years ago. Figure 4 shows the steady decline in EIA's estimate of future imports since 2004,[22] as well as the estimated oil price for 2025 associated with each annual forecast.

The steady increase in estimated future oil prices between 2004 and 2008 and the corresponding decrease in imports lend additional support to the proposition (discussed with Figure 2, above) that when oil prices rise, consumption declines, reducing the level of imports needed to fill the gap between domestic production and consumption.[23]

[22] A series of past EIA charts delineating this trend is attached to this report as Appendix 1.

[23] As noted in the discussion of Figure 2, above, the real-world effects of this general rule do not play out with the precision of a metronome.

Figure 4.

Rising Future Oil Price Forecasts between 2004 and 2009 v. Declining Imports as Percentage of U.S. Petroleum Consumption

(Data from EIA, *Annual Energy Outlook*, various years)

(1)	*(2)*	*(3)*	
U.S. Energy Information Administration *Annual Energy Outlook (AEO)*	Average Oil Price, 2025 *(2009 $ / Bbl.)*	Imported Oil as Percentage of Total U.S. Consumption / - - - - - - *Year* - - - - - - / *(2025)*	*(2030)*
AEO 2004 (Reference Case)	**$32.35**	***70%***	
AEO 2005 (Current [Oct. '04] Futures Case)	**$41.11**	***68%***	
AEO 2006 (Reference Case)	**$61.90**		***62%***
AEO 2007 (Reference Case)	**$65.57**		**61%**
AEO 2008 (Reference Case)	**$69.08**		**54%**
AEO 2009 (Reference Case)	**$126.74**		**41%**

Sources:

Col. (2): From U.S. Energy Information Administration, *Annual Energy Outlook,* 2004 through 2009 (*AEO*), Table A1, except 2005 (Table D1). Prices adjusted to 2009 $ using Gross Domestic Product deflator (U.S. Energy Information Administration, *Annual Energy Outlook 2009*, Table 20, "Macroeconomic Indicators," [EIA Early Release, 12/17/08]; see Appendix B for estimating factors calculated as follows:

AEO 2004 = $27.00 (2002 $/bbl.) * 125.00 / 104.32 = $32.35
AEO 2005 = $35.00 (2003 $) * 125.00 / 106.43 = $41.1
AEO 2006 = $54.08 (2004 $) * 125.00 / 109.2 = $61.90
AEO 2007 = $59.12 (2005 $) * 125.00 / 112.7 = $65.57
AEO 2008 = $64.49 (2006 $) * 125.00 / 116.7 = $69.08
AEO 2009 = $121.47 (2007 $) * 125.00 / 119.8 = $126.74

Col. (3): See Figure 5 and Appendix 1.

About Figure 5. *(Reductions to Estimated U.S. Oil Imports between 2009 and 2030 v. Potential Production from the North Aleutian Basin (Bristol Bay); 2004 v. 2008)*

To understand the long-term effects of declining petroleum imports shown in Figures 2, 3 and 4, we now compare EIA's 2004 and 2008 reference case estimates for the 2009 – 2030 period by looking at the following categories: domestic oil production (col. [2]), potential Bristol Bay oil production (col. [3]), total petroleum consumption (col. [4]) and petroleum imports (col. [5]).[24] As shown in Figure 5, between 2004 and 2008:

- **The nation's projected total petroleum import requirement for the 22 years between 2009 and 2030 decreased by 55 billion barrels (from 129 billion barrels projected by the EIA at the end of 2004 to a current estimate of approximately 74 billion barrels – a reduction of 43% in total imports.**
- **Out of the 55.3 billion barrels of reduced imports, 41.9 billion barrels (75.8%) can be attributable to reduced consumption.**
- **The remaining 13.4 billion barrels of reduced imports consists of increased conventional petroleum sources and alternative energy additions to this nation's liquid energy fuel supply total.**
- **In contrast, under EIA's mean resource case, between now and 2030 potential oil production from the North Aleutian Basin would be less than 0.75 billion barrels.[25]**

To place these numbers in broad perspective, at current consumption rates this nation is using approximately seven billion barrels of oil per year.[26]

---

[24] Totals compiled from the U.S. Energy Information Administration, *Annual Energy Outlook 2005* (Current [Oct. 2004] Futures Case, circa Dec. 2004), Table 11; and *Annual Energy Outlook 2009* (Reference Case; early release, Dec. 17, 2008), Table 11.

[25] *North Aleutian Basin OCS Planning Area: Assessment of Undiscovered Technically Recoverable Oil and Gas – As of 2006*, February 2006, pp. 2-3. (We estimate that much of this oil, if discovered, would be produced after 2030 [see Figure 6 of this report for additional discussion].)

[26] U.S. consumption of 20 million bpd equals approximately 7.3 billion barrels of oil per year (20 x 365 = 7,300).

Figure 5.

Reductions to Estimated U.S. Oil Imports between 2009 and 2030 v. Potential Oil Production from the North Aleutian Basin: 2004 v. 2008

(Based on Estimates from U.S. MMS and EIA Data, 2004 and 2008)

Scenario	(1) Avg. Price, Of Oil, 2025 *(2009 $/Bbl.)*	(2) Domestic Production *(excluding Bristol Bay)*	(3) Potential North Aleutian Basin **Oil** Production *(2019 – 2030)*	(4) Total Domestic Consumption *(2009 – 2030)*	(5) Import Requirement *(2009-2030; with [without] Bristol Bay)*
		/ - - - - Billion Barrels of Oil - - - - /			
Annual Energy Outlook 2009 (Reference Case)	**$126.74**	**89.7**	**<0.75**	**163.6**	**71.4** ***[72.15]***
Annual Energy Outlook 2005 (Current [Oct. '04] Futures Case)	**$41.11**	**76.3**	**<0.75**	**205.5**	**126.7** ***[127.45]***
Change (AEO 2009 v. AEO 2005)	**$85.63**	**13.4**	**0.00**	**(41.9)**	**(55.3)** ***[55.3]***
% Change (*AEO 2009* v. *AEO 2005*)	+208.3%	+17.6%	(0.00%)	(20.4%)	(43.6%) *[43.4%]*

Sources:

Col. (1): From U.S. Energy Information Administration, *Annual Energy Outlook 2005* (Current [Oct. 2004] Futures Case; circa Dec. 2004) and *Annual Energy Outlook 2009* (Reference Case; early release, Dec. 17, 2008), Table A1. Prices adjusted to 2009 $ using Gross Domestic Product deflator (U.S. Energy Information Administration, *Annual Energy Outlook 2009*, Table 20, "Macroeconomic Indicators," [2009: $121.86 * 125.00 / 119.93 = $126.74/bbl.; 2005: $35.00 * 125.00/106.43 = $41.11/bbl.]).

Col. (2), (4): Based on projections through 2030 in *Annual Energy Outlook 2005* (Current [Oct. 2004] Futures Case) and *Annual Energy Outlook 2009* (early release), Table 11.

Col. (3): U.S. Department of the Interior (Minerals Management Service, Alaska OCS Region), *North Aleutian Basin OCS Planning Area: Assessment of Undiscovered Technically Recoverable Oil and Gas – As of 2006*, February 2006, pp. 2-3. This figure represents the MMS estimate of mean volume of technically recoverable oil estimated to lie beneath Bristol Bay; much of this oil, if discovered, would be produced after 2030 (see Figure 6 of this report for additional discussion).

Col. (5): With Bristol Bay = Col. (4) - (Col. [2] + Col. [3]); without Bristol Bay (in brackets) = Col. (4) - Col. (2).

About Figure 6. *(Bristol Bay Production Potential, 2009 – 2030, v. Reduced Importsthrough Conservation Since 2004)*

MMS estimates that the mean volume of technically recoverable oil in the North Aleutian Basin (Bristol Bay) at 753 million barrels.[27] The quantity of oil that is economically recoverable is a fraction of that volume that is price-dependent. We estimate that if oil prices rebound to levels high enough to induce full recovery of technically recoverable volumes, no more than half of Bristol Bay's economically recoverable oil – approximately 377 million barrels would be produced by 2030.[28]

- **For the 2009 – 2030 period, Bristol Bay's likely oil production would constitute approximately two-tenths of one percent of the nation's total domestic petroleum requirement.[29]**
- **In comparison to mean estimated Bristol Bay production between now and 2030, since 2004 conservation has reduced this nation's total import requirement for the same period by 41.9 billion barrels. To put these figures in perspective: The ratio between conservation savings since 2004 and the amount of oil that drilling in Bristol Bay might yield between now and 2030 is more than 100 to one.[30]**

---

[27] By comparison, MMS estimates that in the five percentile case (representing a one-in-twenty chance), the North Aleutian Basin may hold more than 2.29 billion barrels of technically recoverable oil; at the other end of the scale, in the 95 percentile case (represnting a 19-in-20 chance), the North Aleutian Basin holds 91 million (0.091 billion) barrels of technically recoverable oil (*North Aleutian Basin OCS Planning Area: Assessment of Undiscovered Technically Recoverable Oil and Gas – As of 2006*, February 2006, pp. 2-3).

[28] In analyzing the production potential of remote Alaska petroleum provinces, economic analysts typically estimate a 10-year lead time between leasing and first production and a 40-year production horizon. (See, for example: Minerals Management Service, Alaska OCS Region, *Outer Continental Shelf Oil and Gas Leasing Program 2007-2012: Final Environmental Impact Statement*, April 2007, Summary, p. i; and *Beaufort and Chukchi Sea Planning Areas Oil and Gas Lease Sales 209, 212, 217, and 221: Draft Environmental Impact Statement*, November 2008, Appendix B [Exploration and Development Scenarios], *passim*.) The U.S. Energy Information Administration estimates that even at high oil prices between 2009 and 2030 the Arctic National Wildlife Refuge would produce less than one-quarter of the mean technically recoverable volume of crude oil. (See: U.S. Energy Information Administration, *Analysis of Crude Oil Production in the Arctic National Wildlife Refuge*, May 2008, pp. 3 ["Timing of First Production"] and pp. 6-8 ["Current Oil Market conditions"].)

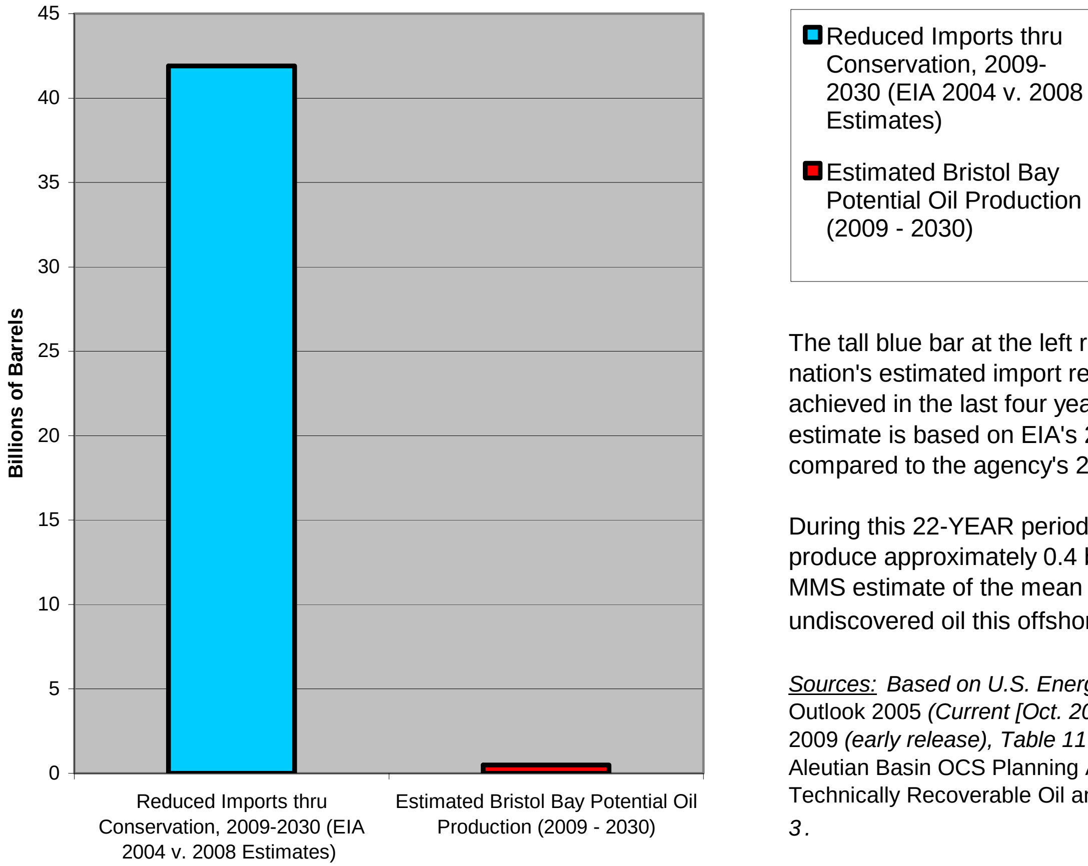
[29] 0.377 billion barrels / 163.6 billion barrels = 0.0023 (see Figure 5 and footnote 19, above).

[30] 0.377 billion barrels * 111.14 = 41.9 billion barrels (see Figure 5 and footnote 19, above).

Figure 6.

Reduced Imports through Conservation Since 2004 v. Bristol Bay Potential Oil Production, 2009 - 2030

(Estimates based on U.S. Energy Information Administration and Minerals Management Service Reports)



The tall blue bar at the left represents the dramatic reduction to this nation's estimated import requirement between now and 2030 achieved in the last four years by decreased oil consumption This estimate is based on EIA's 2009 projections through 2030, compared to the agency's 2005 estimates.

During this 22-YEAR period, we estimate that Bristol Bay can produce approximately 0.4 billion barrels -- approximately half of the MMS estimate of the mean technically recoverable volume of undiscovered oil this offshore region is thought to hold.

Sources: *Based on U.S. Energy Information Administration,* Annual Energy Outlook 2005 *(Current [Oct. 2004] Futures Case),* Annual Energy Outlook 2009 *(early release), Table 11 and U.S. Minerals Management Service,* Aleutian Basin OCS Planning Area: Assessment of Undiscovered Technically Recoverable Oil and Gas – As of 2006, *February 2006, pp. 2-3*.

Research Associates, Ester, Alaska 99725 / February 2009

About Figure 7. (*Volatile Oil Prices and Rising Alaska North Slope Field Costs between 2005 and 2009)*

Two factors reduce the odds that economic conditions will support the high costs of finding and then developing Bristol Bay oil and gas:

➔ Uncertain Oil Prices: Although the oil price spike during the first half of 2008 delivered another year of significant oil price increase on an annualized basis, by year's end oil prices had plummeted. Both EIA and the Alaska Dept. of Revenue higher oil prices in 2009,[31] but speedy recovery from the global recession, which has reduced the demand, is by no means certain. How long oil prices will remain at current (low) levels – or how high they will go when they rebound – is unknown. The uncertain trajectory of future of oil prices reduces the attractiveness of high-priced oil and gas development projects for many investors.[32]

➔ Increasing Field Costs: A second damper on prospective development is increasing field costs. Reversing a long-term trend of declining field costs, since 2005 costs of oil field operations have increased significantly as contractors strain to provide the needed equipment, materials and personnel.[33] Because field costs vary by region, Figure 7 focuses on Alaska Revenue Dept. North Slope cost estimates. As shown in columns (3) and (4), the current forecast shows field costs for 2008 doubling compared to 2005 estimates, with field costs for 2009 anticipated to increase significantly once again.

[31] EIA's 2009 forecast price is $63.53 in 2009 dollars. (*Annual Energy Outlook 2009*, Early Release, Table 12 "Petroleum Product Prices;" imported light sweet crude = $60.89 [2007 $]; for conversion factors, see Appendix 2.)

[32] For discussion of the effects of price volatility on current oil development activities, see, for example: John Porretto, "Don't get accustomed to cheap oil;" Gary Park, "Open season for oil gurus," *Petroleum News*, Nov. 23, 2008, p. 1; and Gary Park, "Poised to Pounce," *Petroleum News*, Nov. 23, 2008, p. 14.

[33] See, for example: Gary Park, "Shell puts sands in limbo: Once on track for a million bpd, supermajor is slowing research and expansion plans in favor of cost cutting and higher profits," *Petroleum News*, Dec. 7, 2008, p. 5; and Eric Lidji, "Increasing costs cloud view of prices: As oil prices fall to levels not seen since mid-2000s, costs are becoming more important for assessing the near term in Alaska," *Petroleum News*, December 28, 2008, p. 6.

Figure 7.

Volatile Oil Prices and Rising Alaska North Slope Field Costs between 2005 and 2009

(Alaska Department of Revenue Estimates for Alaska North Slope Crude Oil)

(1)	*(2)*	*(3)*	*(4)*	*(5)*
Calendar Year	Average ANS Oil Price *(2009 $ / Bbl.*)*	/ - - - - - - - - - Estimated Field Costs - - - - - - - - - / *(2009 $ / Bbl.*)*		
		Fall 2005 Estimate	/ - - - Fall 2008 Estimate - - - /	*(% Increase over prior year)*
2004	$44.46	- - - -	- - - -	- - - -
2005	$59.32	- - - -	- - - -	- - - -
2006	$68.11	- - - -	$11.55	- - - -
2007	$74.95	/ - - - $7.31	$12.72	*10.1%*
2008	$99.86	/ - - -	$15.00 **	*17.9%*
Dec. 1, 2008 - Jan. 13. 2009	***$36.61***	- - - -	- - - -	- - - -
2009 (ADOR forecast)	$76.72	- - - -	$18.01 **	*20.1%*

Sources:

Col. (2): 2004 – November 2008: from monthly average spot price from Alaska Dept. of Revenue, "ANS West Coast Price;" and Dec. 1, 2008 – Jan. 12, 2009: from daily spot prices, Alaska Dept. of Revenue, "ANS West Coast Price (accessed Jan. 12, 2009 at http://www.tax.alaska.gov/programs/oil/index.aspx?10026).
2009 forecast – From Alaska Dept. of Revenue, *Fall 2008 Revenue Sources Book*, p. 10 (http://www.tax.alaska.gov/programs/documentviewer/viewer.aspx?1530f).

Col. (3): Fall 2005 estimate for state fiscal year 2008 from Alaska Dept. of Revenue, "The Cost Story," Oct. 21, 2007, slides 4 and 7 (property taxes subtracted from ADOR estimates).

Cols. (4), (5): Fall 2008 calendar year estimate for CY 2008 from Alaska Dept. of Revenue data. (2006 and 2007: Field cost estimates provided by Dept. of Revenue, September 2007. 2008 and 2009: See Alaska Dept. of Revenue, *Revenue Sources Book*, Fall 2008, p. 10 [fiscal year forecast prices], p. 49 ["Opex" and "Capex" field cost estimates], p. 54 [production], pp. 54 and 57 [property tax estimates, subtracted from ADOR field costs]).

* All figures adjusted to 2009 $ using EIA Gross Domestic Product Deflator; for adjustment factors see Appendix 2.

** See Appendix 2 for note on conversion from state fiscal year to calendar year.

III. What Petroleum Price, Consumption and Import Data Tell Us

(Figure 1.) ➔ **Annual petroleum consumption and import totals, on a generally increasing trend between 1985 and 2005, leveled off in 2006 and began declining.**

- **Between 1985 and 2005, imports increased by an average of 5.5% per year. Since 2005, this trend has reversed; import totals declined slightly in 2006 and 2007 and by approximately 7.7% in 2008, to reach a current level of 57.2% of the nation's total petroleum requirement.**
- **2008 marks the first time in more than two decades that imports have declined for three years in a row.**

(Figure 2.) ➔ **Monthly oil price and consumption data during 2008 suggests that the price of oil is a significant factor in determining oil consumption patterns.**

- **During the first half of 2008, petroleum consumption fell significantly as oil prices skyrocketed. But after oil prices crashed during the last half of the year, the consumption trend reversed.**

(Figure 3.) ➔ **EIA's current reference or base case long-term scenario anticipates that oil imports between 2009 and 2030 will decline by significantly greater volumes than the import reductions realized in 2008.**

- **EIA now estimates that in 2030 imports will constitute 41% of the nation's total petroleum requirement, compared to current import levels of approximately 57%.**

(Figure 4.) ➔ **Review of EIA estimated future oil price and import data since 2004 shows increasing future oil prices and decreasing import levels.**

- **The steady increase in estimated future oil prices between 2004 and 2008 and the corresponding decrease in imports associated with that price increase lends additional support to the proposition that when oil prices rise, consumption declines, reducing the level of imports needed to fill the gap between domestic production and consumption. (However, as noted in the discussion of Figure 2, the real-world effects of this general rule do not play out with the precision of a metronome.)**

(Figure 5.) ➔ **EIA data indicate that since 2004 conservation has resulted in an anticipated import reduction of 41.9 billion barrels between now and 2030.**

- **Compared to the corresponding figures for 2004, this figure represents a 43% reduction in the nation's total import requirement for the 22-year period between 2009 and 2030.**

(Figure 6.) ➔ **By comparison, we estimate that during the period between 2009 and 2030 the North Aleutian Basin can be expected to produce approximately 0.4 billion barrels of oil.**

- **For every barrel of oil drillers might discover and produce from the North Aleutian Basin between 2009 and 2030, over the last four years conservation has delivered more than 100 barrels of oil savings.**

(Figure 7.) ➔ **Two factors – uncertain oil prices and increasing field costs – reduce the odds that economic conditions will support the high costs of finding and then developing the oil and gas in the North Aleutian Basin.**

IV. Conclusions

➔ 1. The information presented in Section I. suggests that exploration for undiscovered North Aleutian Basin natural gas is not likely to contribute materially to the resolution of this nation's energy problems.

➔ 2. As shown in Section II., reductions in oil demand and imports realized through conservation in recent years far outweigh the potential of drilling for oil in the North Aleutian Basin. The 111:1 ratio between conservation gains since 2004 and estimated potential North Aleutian Basin production between 2009 and 2030 demonstrates that exploring in Bristol Bay represents a dramatically less efficient energy path.

➔ 3. In addition to delivering far greater petroleum savings than drilling in remote provinces, conservation measures offer the significant public policy benefits of not exacerbating climate change or incurring other pollution-related costs associated with the use of fossil fuels.

➔ 4. Oil consumption and price patterns over the last three decades demonstrate the folly of relying on market forces to determine energy policy: Despite the fact that the economic and strategic dangers of dependence on imported petroleum were well recognized more than three decades ago, the United States continued to pursue a course of energy inefficiency and increasing dependence on imported oil for another two decades. The manner in which consumption rose as prices fell in the final months of 2008 further demonstrates that it would be a mistake to assume that market forces will deliver reduced petroleum consumption in the absence of government policy mandates. Instead of contributing to the restructuring the nation's energy delivery system, drilling in the North Aleutian Basin would tie up capital on a status-quo reliance on oil and gas.

➔ 5. The chronic volatility and uncertainty of long-term oil prices creates a feast or famine dilemma that undermines rational economic planning. The possibility of low prices inhibits investment in the technology and the infrastructure necessary to sustain development, while the prospect of high long-term oil prices induces development but strains the system, pushing up costs. North Aleutian Basin drilling would be prone to inefficient use of capital resources due to either: (a)) project failure or delay if oil prices remain low; or (b) requirements for additional capital to cover cost overruns and project delays frequently associated with high oil prices.

➔ 6. To provide meaningful economic analysis, assessment of economically recoverable volumes of estimated discovered technically recoverable oil should take into account the escalating field costs experienced in recent years, which adversely effect the economics of prospective development.

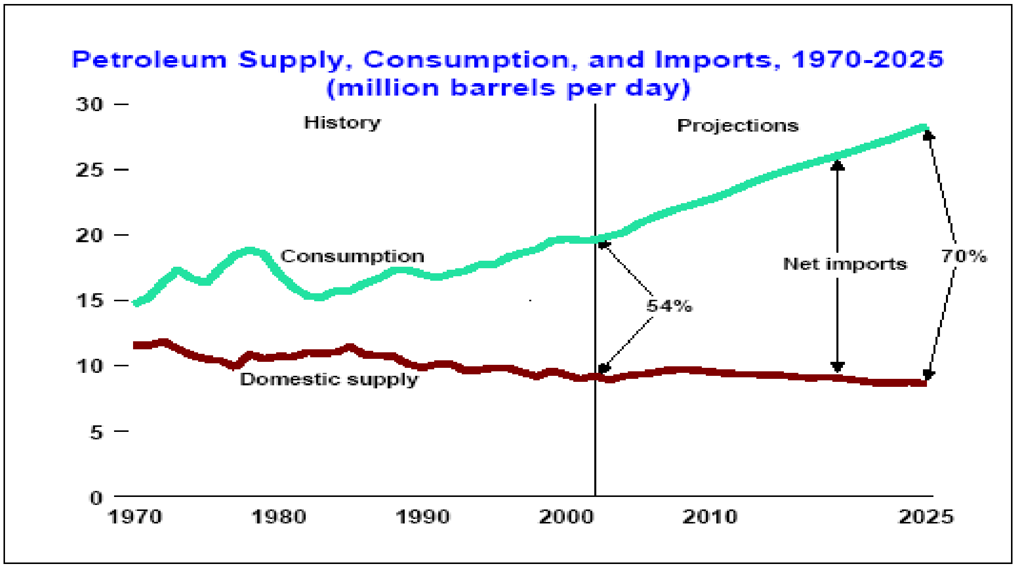
Appendices

1. **Selected EIA Net Import Projections, 2004 – 2008**

2. **Worksheet: Inflation and Fiscal Year to Calendar Year Conversions**

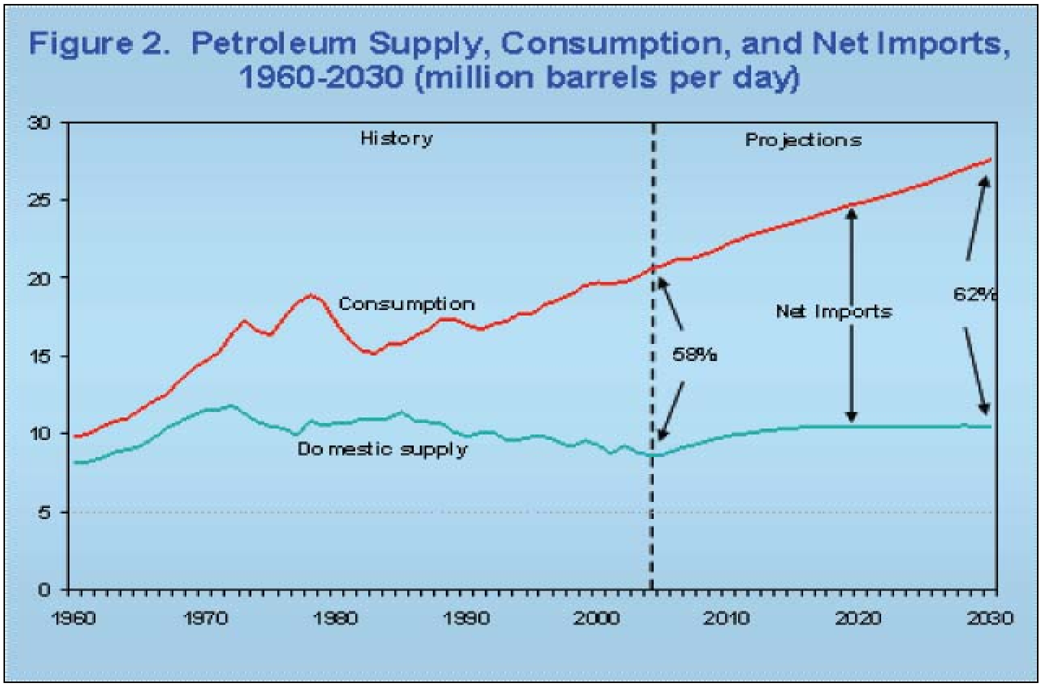
EIA Net Import Projections, 2004 - 2008

2004:



From: U.S. EIA, *Overview of the Annual Energy Outlook 2004*, March 23, 2004.
(Note: Early versions of this report incorrectly sourced this chart to *"Annual Energy Outlook 2007,* March 23, 2004.")

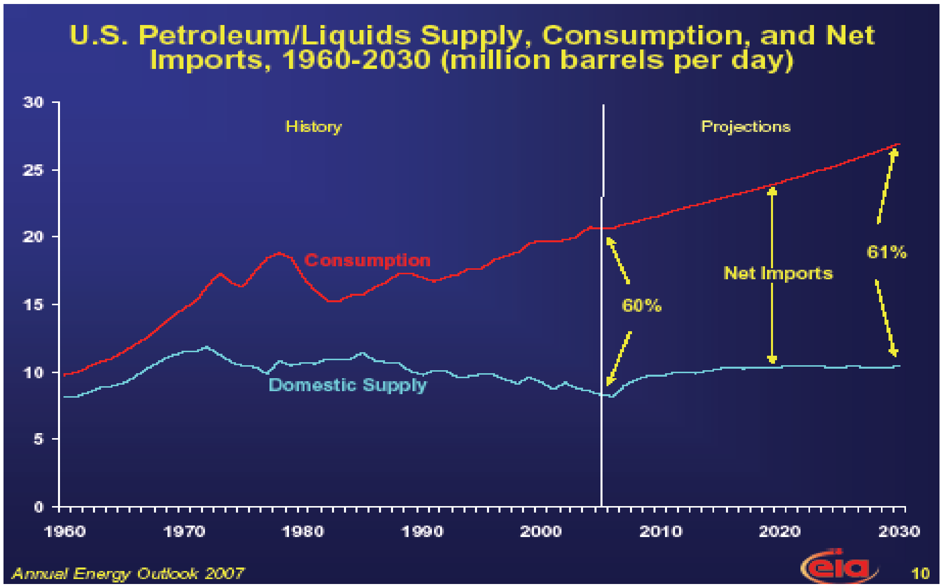
2006:



From, U.S. EIA, *"Annual Energy Outlook 2006* (Administrator's Presentation)," December 2005.

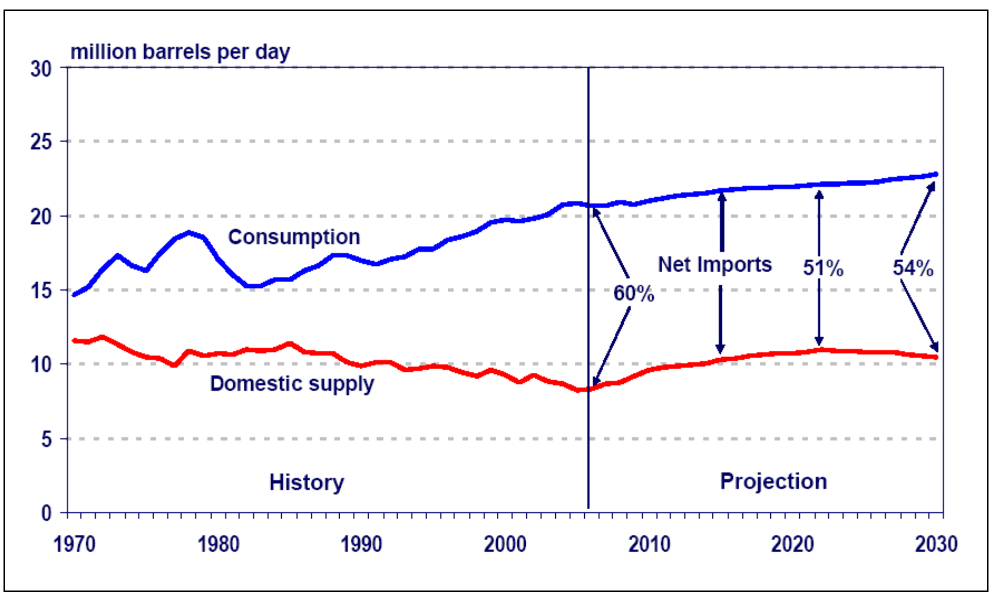
EIA Net Import Projections, 2004 - 2008

2007:



From U.S. EIA, *Annual Energy Outlook 2007*, Advanced Release presentation (posted Dec. 5, 2006).

2008: IMPORT SHARE OF NET LIQUIDS USE DECLINES FROM ITS CURRENT LEVEL.



The EIA's 2008 projection of future oil imports was presented as Figure 9 in EIA Administrator Guy Caruso's March 4, 2008 testimony to the U.S. Senate Energy and Natural Resources Committee,

Appendix 2 **Worksheet: Inflation and Fiscal Year to Calendar Year Conversion**

(Sheet 1 of 1)

(1)	(2)	(3)	(4)	(5)
Year	***CPI-U (Index)***	***Inflation (%)***	***GDP Implicit Price Deflator (FFY Index)***	***Inflation (%)***
1976	56.9000		40.6300	
1977	60.6000	6.5%	42.3300	4.2%
1978	65.2000	7.6%	45.1800	6.7%
1979	72.6000	11.3%	48.8200	8.1%
1980	82.4000	13.5%	53.1000	8.8%
1981	90.9000	10.3%	58.3000	9.8%
1982	96.5000	6.2%	62.2900	6.8%
1983	99.6000	3.2%	65.0400	4.4%
1984	103.9000	4.3%	67.4400	3.7%
1985	107.6000	3.6%	69.9300	3.7%
1986	109.6000	1.9%	71.2500	1.9%
1987	113.6000	3.6%	73.1100	2.6%
1988	118.3000	4.1%	75.4100	3.1%
1989	124.0000	4.8%	78.3400	3.9%
1990	130.7000	5.4%	81.2500	3.7%
1991	136.2000	4.2%	84.3000	3.8%
1992	140.3000	3.0%	86.4200	2.5%
1993	144.5000	3.0%	88.3800	2.3%
1994	148.2000	2.6%	90.2800	2.1%
1995	152.4000	2.8%	92.1800	2.1%
1996	**156.9000**	**3.0%**	**93.9500**	**1.9%**
1997	160.5000	2.3%	95.5900	1.7%
1998	163.0000	1.6%	96.7500	1.2%
1999	166.6000	2.2%	98.0200	1.3%
2000	**172.2000**	3.4%	**100.0000**	2.0%
2001	177.1000	2.8%	102.3600	2.4%
2002	179.9000	1.6%	104.3200	1.9%
2003	184.0000	2.3%	106.4300	2.0%
2004	188.9000	2.7%	109.2000	2.6%
2005	**195.3000**	3.4%	**112.7000**	3.2%
2006	201.6000	3.2%	116.7000	3.5%
2007	207.3420	2.8%	119.8000	2.7%
2008	***216.0000***	**4.2%**	***122.7000***	**2.4%**
2009	*215.0000*	-0.5%	*125.0000*	*1.9%*
2010	**219.0000**	1.9%	***126.2000***	*1.0%*
2011	*224.0000*	2.3%	*127.8000*	*1.3%*
2012	*230.0000*	2.7%	*130.0000*	*1.7%*
2013	*236.0000*	2.6%	*132.7000*	*2.1%*
2014	*242.0000*	2.5%	*135.6000*	*2.2%*
2015	**249.0000**	2.9%	***138.6000***	*2.2%*
2016	*256.0000*	2.8%	*141.8000*	*2.3%*
2017	*262.0000*	2.3%	*144.9000*	*2.2%*
2018	*269.0000*	2.7%	*148.2000*	*2.3%*
2019	*276.0000*	2.6%	*151.5000*	*2.2%*
2020	**283.0000**	2.5%	***154.7000***	*2.1%*
2021	*288.0000*	1.8%	*157.4000*	*1.7%*
2022	*294.0000*	2.1%	*159.7000*	*1.5%*
2023	*299.0000*	1.7%	*161.8000*	*1.3%*
2024	*304.0000*	1.7%	*163.6000*	*1.1%*
2025	**308.0000**	1.3%	***165.3000***	*1.0%*
2026	*312.0000*	1.3%	*166.9000*	*1.0%*
2027	*317.0000*	1.6%	*168.6000*	*1.0%*
2028	*321.0000*	1.3%	*170.3000*	*1.0%*
2029	*326.0000*	1.6%	*171.9000*	*0.9%*
2030	**331.0000**	1.5%	***173.7000***	*1.0%*

Converting Nominal Dollars ("Money of the Day") to Real (2009) Dollars

Unless otherwise indicated, to minimize distortion of economic data, dollar values in this report have been converted to real (inflation-adjusted 2009) dollars by using the GDP deflator (column [4], at left), as shown in the following example (from Introduction footnote 2).

(a)	*(b)*	*(c)*	*(d)*	*(e)*
Year	**Nominal Value**	**GDP Deflator**	**Real (2009) $**	**How Calculated**
1998	*$8.76*	*96.75*	$11.32	= (8.76) * 125.00 / 96.75

The formula can be reversed to obtain nominal dollars by using the following formula:

$11.32 * 96.75 / 125.00 = $8.76

Inflation Indices:

Col.	*Source (or basis for calculation)*
(2)	**1976-2007:** U.S. Dept. of Labor, Bureau of Labor Statistics, "Consumer Price Index – All Urban Consumers – (CPI-U)" (ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt [accessed Jan. 7, 2009]). **2008-2030:** From U.S. Dept. of Energy, Energy Information Administration, *Annual Energy Outlook 2009* , Table 20, "Macroeconomic Indicators " (Report #:DOE/EIA-0383[2009] early release), 12/17/08.
(3)	**1976-2030:** (Current year Index / Previous year index) -1.00
(4)	**1976-2005:** *Budget for Fiscal Year 2009, Historical Tables* , "Gross Domestic Product and Deflators," pp. 194-195 (released 2/4/08). **2006-2030: "**GDP Chain-type Price Index (2000 = 1.000)" from U.S. Dept. of Energy, Energy Information Administration, *Annual Energy Outlook 2009* , Table 20, "Macroeconomic Indicators " (Report #:DOE/EIA-0383[2009] early release), 12/17/08.
(5)	1976-2030: (Current year Index - Previous year index) / (previous year index) * 100.

Converting State Fiscal Year Data to CalendarYear

The Alaska Department of Revenue typically displays its data on a state fiscal year basis (July 1 to June 30). For comparison to calendar-year data used in most economic reports, if monthly state data are unavailable fiscal year totals have been converted to calendar-year basis by combining data for the preceding state fiscal year with the current state fiscal year on a 7:5 basis.

Richard A. Fineberg is an independent, Alaska-based analyst who has reported on economic and environmental issues associated with Alaska petroleum development for more than three decades. In addition to the numerous reports he has prepared for non-government organizations (available on-line at http://www.finebergresearch.com), he has served as a senior advisor to the governor of Alaska on oil and gas policy, and as an occasional consultant to various state and federal agencies, including the U.S. Internal Revenue Service, the Alaska Department of Revenue and the Regulatory Commission of Alaska.

Please address questions or comments on this report to:

Richard A. Fineberg
P.O. Box 416
Ester, Alaska 99725, USA

Tel.: (907) 479-7778
E-mail: fineberg@alaska.net