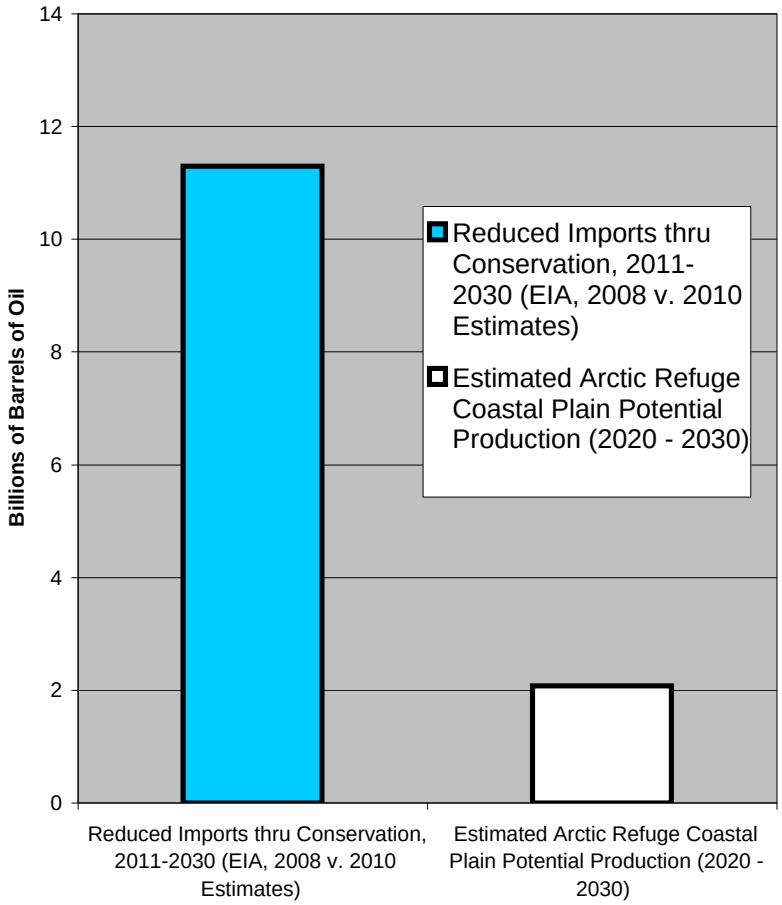
Reduced Oil Imports from Conservation

vs

Potential Arctic Refuge Oil Production, 2011-2030



During the last two years, this nation has quietly booked an 11.3 billion barrel reduction in estimated U.S. oil imports between 2011 and 2030 due to lower oil consumption. This figure, developed by comparing the U.S. Energy Information Administration (EIA) March 2008 Annual Energy Outlook reference case projections to the agency's current outlook (released December 2009), is more than five times greater than the 2.1 billion barrels of oil that EIA estimates might be discovered and produced from the Arctic Refuge Coastal Plain region between 2011 and 2030.

Review of EIA data since 2004 suggests that the anticipated drop in future oil consumption and the corresponding import reduction is far greater than the import savings shown here. This trend, which demonstrates the power of conservation, is associated with the higher oil prices that have become a fixture of the nation's petroleum landscape over the past decade.

A Report to the Northern Alaska Environmental Center (Fairbanks, Alaska) and the Alaska Wilderness League (Washington, DC) – May 15, 2010

-- Prepared by
Richard A. Fineberg
Research Associates, Ester, Alaska 99725 (Rev.)

Reduced Oil Imports from Conservation vs Potential Arctic Refuge Oil Production, 2011 - 2030

Over the last twelve years, elevated oil prices have led to reduced petroleum usage and a dramatic decrease in the nation's long-term oil import requirements.[1] Analysis of U.S. Energy Information Administration (EIA) data – comparison of EIA's 2008 and 2010 *Annual Energy Outlook* data on petroleum imports and review of the agency's 2008 report on Arctic Refuge production potential[2] – reveals significant facts that raise serious questions about the wisdom of exploring for oil on the Arctic National Wildlife Refuge Coastal Plain. In 2008, for example, EIA's reference (base) case scenario called for consumption of approximately 161 billion barrels of liquid fuels between 2011 and 2030 at an estimated average price of $64.79 per barrel in 2010 dollars. By comparison, the 2010 reference case shows consumption of approximately 150 billion barrels of liquid fuel during this period. Imported oil makes up the difference between domestic production and total consumption. When the increase in domestic production – traditional and alternative fuels is subtracted from the total import requirement reduction, the data indicate that in the last two years, lower liquid fuel consumption is responsible for an anticipated 11.3 billion barrel reduction in petroleum imports between 2011 and 2030.[3] Based on the EIA's 2008 analysis, the Arctic Refuge mean resource case would yield production of approximately 2.1 billion barrels of oil between now and 2030.[4]

These figures tell us that for every barrel of oil the Arctic National Wildlife Refuge might produce between now and 2030, in the last two years market-driven conservation

---

[1] For discussion of these trends, see Appendix 1(oil prices) and Appendix 2 (oil imports).

[2] U.S. Energy Information Administration, *Annual Energy Outlook 2010*, Dec. 14, 2009 (reference case [early release]). *Annual Energy Outlook 2008* and *Analysis of Crude Oil Production in the Arctic National Wildlife Refuge,* May 2008 (Report No. SR/OIAF/2008-03).

[3] The reduction in forecast imports is charted in Appendix 2 and quantified in Appendix 4 by subtracting oil supply and demand in the 2010 *Annual Energy Outlook* from the corresponding figures in the 2008 report. The conservation effect (net of increased domestic production, is estimated at 11.3 billion barrels. (A 0.5 billion barrel increase in domestic production for the 2011-2030 period in the current reference case, compared to the 2008 is included in calculation of the reduced import requirement but is excluded from the reckoning of imports reduced by conservation. See Appendix Figure A.4.1.)

[4] See Appendix 3. Because production and consumption trends beyond two decades are increasingly speculative, this analysis is limited to the reasonably foreseeable future and does not consider the highly uncertain petroleum production and conservation effects that might – or might not – apply to an extended forecast.

in response to high oil prices has reduced EIA's forecast of petroleum imports for the period between 2011 and 2030 by more than five barrels.[5] Put otherwise: EIA data show that over the next two decades the conservation gains of the last two years alone, compared to Arctic Refuge drilling, will be 5 times more effective in reducing the nation's petroleum import requirement. This example of the power of conservation is summarized in this report's cover chart; four appendices present supporting information and graphics.

Further analysis of EIA data indicates that the import savings recorded over the last two years are only part of the import reduction trend that began several years ago, reflecting increased oil prices that have prevailed during the last decade. Over the last five years, reductions in petroleum consumption have reduced imports by approximately three to four times the 11.3 billion barrel reduction of the last two years. A rough comparison between EIA 2005 "current futures" and 2010 reference case scenarios suggests that over the last five years the nation's domestic import requirement for the 2011-2030 period has dropped by approximately 39.3 billion barrels.[6] The application of a 10% uncertainty factor to this single-point estimate of reduced imports suggests that the domestic import requirement anticipated for the 2011 – 2030 period has dropped by approximately 35 to 43 billion barrels.[7] This analysis, based on the changes in EIA scenarios between 2005 and 2010, suggests that for every barrel of oil the Arctic Refuge region might produce between 2011 and 2030, import reductions due to conservation during the same period would range from a low of nearly 17 barrels to a high of more than 20.[8] Using the single-point estimate of 39.3 billion barrels in reduced imports between 2011 and 2030, conservation gains over the last five years outweigh the potential of Arctic Refuge drilling by more than 18 to one.[9]

When it is widely recognized that this nation's capital resources are needed for national priorities that include education, health care, infrastructure renewal and

---

[5] The ratio of reduced imports between 2011 and 2030 to Arctic Refuge production is 5 to 1 (11.3 / 2.1 = 5.38).

[6] See Appendix 4 and Figures A.4.2, A.4.3 and A.4.5. (Because rising oil prices in 2004 and 2005 far exceeded those of the EIA's 2005 reference case, to compare EIA's 2005 scenario with later years we use the EIA's "Current Futures" [October 2004] case, which features higher prices than that year's reference case.)

[7] 39.3 – (39.3*0.1) = 35.4; 39.3 + (39.3*01) = 43.2..

[8] 35.4 / 2.1 = 16.9; 43.2 / 2.1 = 20.6.

[9] 39.3 / 2.1 = 18.7.

alternative energy, it is difficult to justify investing a significant portion of these finite resources in Arctic Refuge petroleum development. Apart from the risks inherent in frontier petroleum development, the dramatic reduction in anticipated imports between 2011 and 2030 delineated in this analysis strongly supports the wisdom of continuing on the demonstrably effective conservation path.

List of Appendices and Figures

Appendix 1.

Oil Prices

Since the end of 1998, at the nadir of the lowest real price of oil in North Slope history, oil prices have shown a surprisingly strong upward trend. Annual average prices increased in ten of the last 12 years. Adjusted to real (2010) dollars,[1] the average price of Alaska North Slope crude oil for the last decade (2001 to date) is more than $58 per barrel – well over twice the average price recorded during the preceding decade (1991-2000).

At least for some investors, the inherent uncertain trajectory of future of oil prices still reduces the attractiveness of petroleum development. Nevertheless, price increases to date have reduced the threat that oil production might not generate a profit for industry at the low end of the price spectrum. The December 1998 monthly average of $12.14 per barrel was less one-third of the market price in December 2008, when prices had tumbled to $38.61 from approximately $140.00 per barrel six months earlier. The average oil price in December 2008 average was at least $15.00 per barrel above the estimated North Slope break-even level.

By June 2009, prices had soared again, rising to nearly $70.00 per barrel; for the first four months of 2010, prices have averaged nearly $80.00 per barrel. The U.S. Energy Information Administration (EIA) forecasts 2025 oil prices in 2025 of approximately $112.00 per barrel;[2] the Alaska Dept. of Revenue (historically conservative in its long-term forecast prices), estimates that the West Coast price for Alaska North Slope crude oil in 2019 will be $80.06 per barrel.[3]

(In Figure A.1.1 [borrowed from the Alaska Department of Revenue], the last decade's shift to high oil prices is displayed in nominal dollars. Monthly ANS prices, annual averages and inflation adjustment factors are shown in Figure A.1.2.)

---

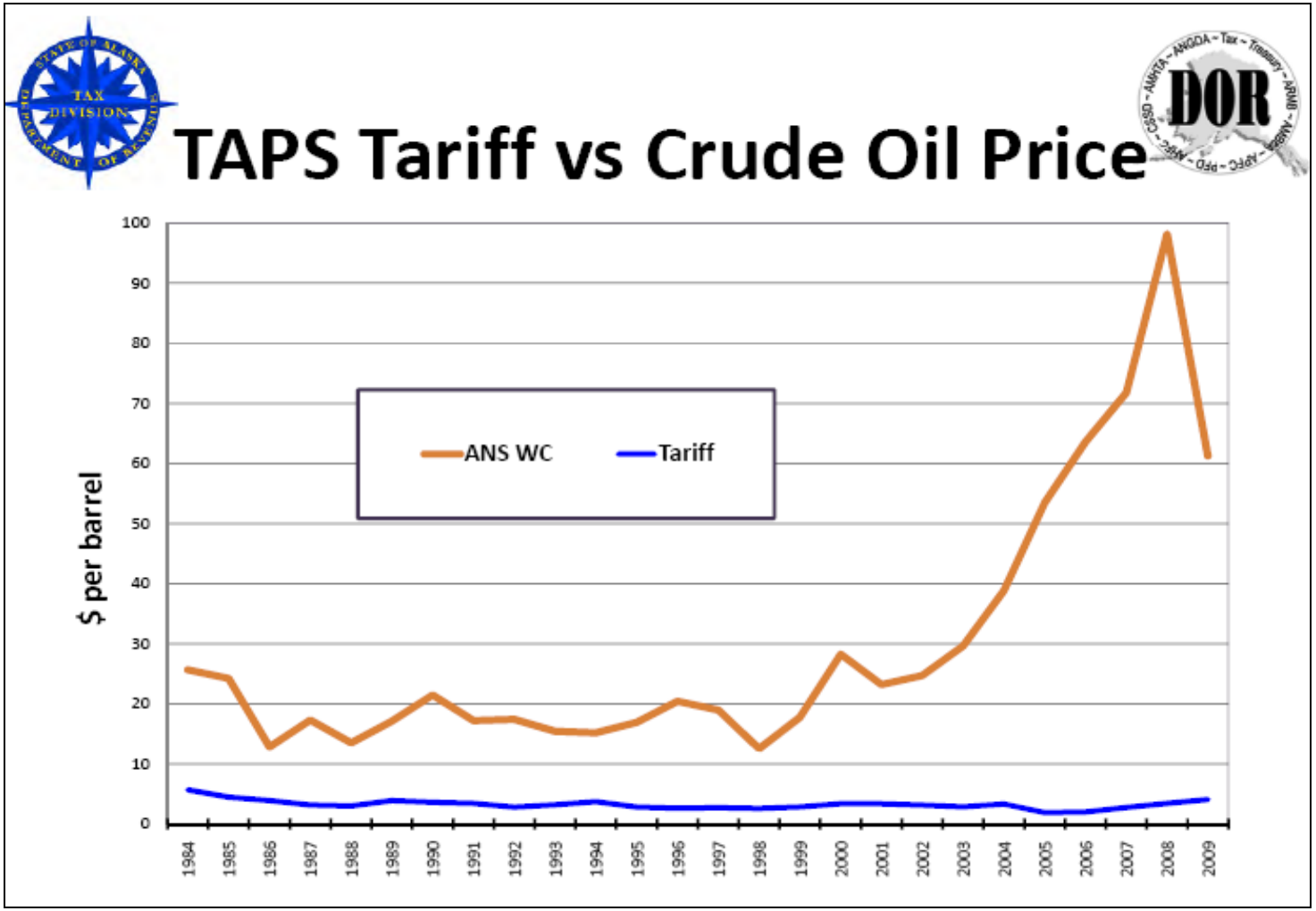
[1] Unless stated otherwise, historical and forecast oil prices have been converted to real (inflation-adjusted 2010) dollars, using the federal gross domestic product (GDP) chained index. (See Figure A.1.2 for Alaska North Slope oil prices since 1988 and the inflation adjustment factors used in this report.)

[2] U.S. Energy Information Administration, *Annual Energy Outlook 2010* (early release), Table A12. EIA anticipates real prices in 2025 of approximately $112.00 per barrel (see Appendix 4, Figure 4.A.1).

[3] Alaska Department of Revenue, "Spring 2010 Forecast," p. 10.

Figure A.1.1 **Alaska North Slope Crude Oil Price v. TAPS Tariff, 1984 – 2009**

(Nominal $ per barrel)



Alaska Department of Revenue, Presentation to Senate Finance Committee, Feb. 16, 2010 (Slide 6).

Figure A.1.2 **Alaska North Slope Crude Oil Price History (1988 - 2010)**

ANS West Coast Price

Year	Price (Nominal $ per barrel)												Calendar Year Avg.		GDP Deflator	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(Nominal)	(Real)	(Chained Price Index)	
1988	14.23	14.03	13.79	15.29	14.86	14.14	13.70	13.63	12.58	11.34	11.36	13.23	**13.52**	**$22.52**		0.6694
1989	15.11	15.99	17.25	19.37	17.64	17.00	16.78	16.04	16.62	17.27	17.49	19.07	**17.14**	**$27.48**		0.6954
1990	20.00	19.30	17.91	14.82	14.38	13.20	15.55	25.99	32.16	31.53	28.79	24.02	**21.47**	**$33.21**		0.7210
1991	20.57	15.74	17.02	17.56	16.67	16.36	17.25	17.18	17.37	18.47	17.57	14.83	**17.22**	**$25.66**		0.7483
1992	14.92	15.30	15.50	16.96	18.03	20.20	19.40	17.97	18.46	18.71	17.46	16.33	**17.44**	**$25.33**		0.7678
1993	15.62	16.78	17.35	18.17	17.47	16.02	14.84	15.42	14.98	15.39	13.07	10.29	**15.45**	**$21.96**		0.7848
1994	11.66	12.59	12.91	14.96	16.47	16.43	16.52	16.66	16.11	16.02	16.71	15.38	**15.20**	**$21.16**		0.8014
1995	16.16	17.14	17.31	18.36	18.43	17.43	16.23	16.72	16.65	15.96	15.88	16.94	**16.93**	**$23.08**		0.8184
1996	17.23	17.78	20.40	22.04	19.65	18.98	19.79	19.90	21.69	22.60	21.50	23.66	**20.44**	**$27.32**		0.8342
1997	23.57	21.03	20.07	18.54	19.41	17.3	17.48	17.98	18.09	19.59	18.33	16.39	**18.98**	**$24.92**		0.8495
1998	14.79	13.39	12.25	12.41	12.31	11.62	12.92	12.49	14.13	13.38	11.47	9.39	**12.55**	**$16.26**	***1991-2000***	0.8603
1999	10.69	10.43	13.07	15.64	15.86	15.82	18.16	20.08	22.96	21.83	23.65	24.54	**17.73**	**$22.68**	***Real Avg.:***	0.8717
2000	25.74	27.65	28.01	23.83	27.15	29.62	27.63	29.40	32.25	31.56	32.74	23.72	**28.28**	**$35.48**	**$24.38**	0.8889
2001	24.37	26.02	24.70	25.55	26.70	25.82	24.60	24.12	23.21	19.45	17.23	16.69	**23.21**	**$28.44**		0.9099
2002	17.52	19.14	22.76	24.99	25.87	24.16	25.82	27.39	28.76	27.53	24.69	28.03	**24.72**	**$29.81**		0.9249
2003	31.91	35.20	32.59	25.59	26.19	29.35	29.17	30.22	27.09	28.55	29.11	30.67	**29.64**	**$35.01**		0.9442
2004	33.10	33.66	35.50	35.43	39.07	36.73	39.44	43.12	42.71	48.56	42.15	36.66	**38.84**	**$44.74**		0.9684
2005	41.12	43.59	50.63	49.75	46.77	53.67	56.67	62.40	63.47	60.37	56.11	57.17	**53.48**	**$59.64**		1.0000
2006	62.85	59.26	60.61	67.74	69.32	69.50	73.10	71.74	62.33	54.27	54.26	58.13	**63.59**	**$68.58**		1.0342
2007	51.52	57.00	59.01	63.92	64.76	69.11	75.93	73.83	79.72	84.77	92.98	88.64	**71.77**	**$75.20**		1.0643
2008	91.16	94.12	105.06	112.37	125.41	133.78	132.87	115.98	101.86	73.65	53.94	37.70	**98.16**	**$100.53**	***2001-2010***	1.0890
2009	39.01	42.78	47.75	46.56	58.23	69.80	64.53	71.52	69.20	74.28	76.52	75.12	**61.28**	**$61.82**	***Real Avg.:***	1.1054
2010	79.34	76.74	79.45	82.23									**79.44**	**$79.44**	**$58.32**	*1.1153*

Notes:

Spot prices are unaudited and do not reflect Production Tax Settlement Values
2010 oil price is four-month average; GDP index for 2010 is estimated.

Sources:

Oil Prices: Alaska Department of Revenue (http://www.tax.alaska.gov/programs/oil/oilprices/ans.aspx)
Gross Domestic Product Index: White House, Budget for Fiscal Year 2011, Historical Tables, “Gross Domestic Product and Deflators,” pp. 210-211.

Appendix 2.

Oil Imports

Over the last six years EIA has charted a dramatic decline in future petroleum imports, as shown in the following charts (*Figure A.2.1*), released by the agency in conjunction with its 2004 and 2010 *Annual Energy Outlook* data. The press release that accompanies the early release of the *2010 Annual Energy Outlook* states that "reliance on imported oil declines significantly over the next 25 years."[1]

The nation's petroleum imports declined for the fourth year in a row in 2009, reversing a long-standing trend of increasing dependence on foreign oil. As shown in *Figure A.2.2*, 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.[2] Consumption and production leveled off in 2005, with imports dropping from a high of 12.5 million bpd in 2005 to 12.0 million bpd in 2007. The trend of increasing imports was broken before the recessionary period of 2008-2009, when net imports dropped to 11.1 million bpd and 9.7 million bpd, respectively.

There is an apparent inverse correlation between oil prices and imports. When oil prices rise, consumption declines, reducing the level of imports needed to fill the gap between domestic production and consumption.[3]

Ignoring these important developments, drilling advocates frequently overstate the nation's dependence on foreign oil. Even well-known oil industry veterans such as wind power advocate T. Boone Pickens get this story wrong.[4]

---

[1] U.S. Energy Information Administration, "EIA Energy Outlook Projects Moderate Growth in U.S. Energy Consumption, Greater Use of Renewables, and Reduced Oil and Natural Gas Imports," Dec. 14, 2009 (press release).

[2] In 1985, total consumption averaged about 15.7 million bpd, of which net imports comprised about 4.3 million bpd; 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 bpd.

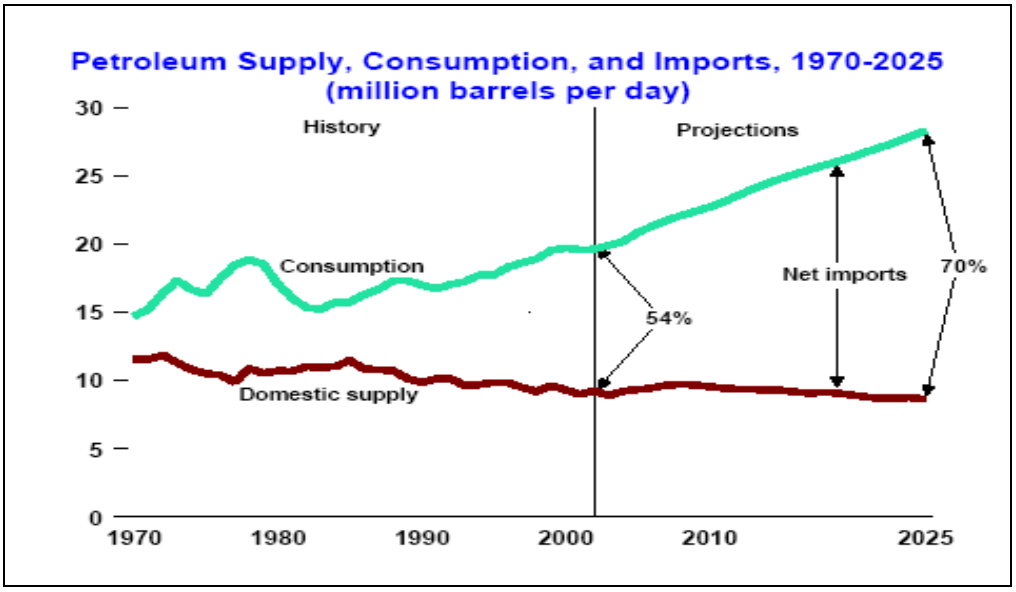
[3] After forecasting increasing long-term oil prices for five consecutive years, the current *Annual Energy Outlook* shows a moderate drop in long-term oil prices; according to EIA Administrator Richard Newell, the price change explains the moderate increase in long-term imports in the 2010 *Annual Energy Outlook* reference case, compared to the 2009 edition.

[4] 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 A.2.1

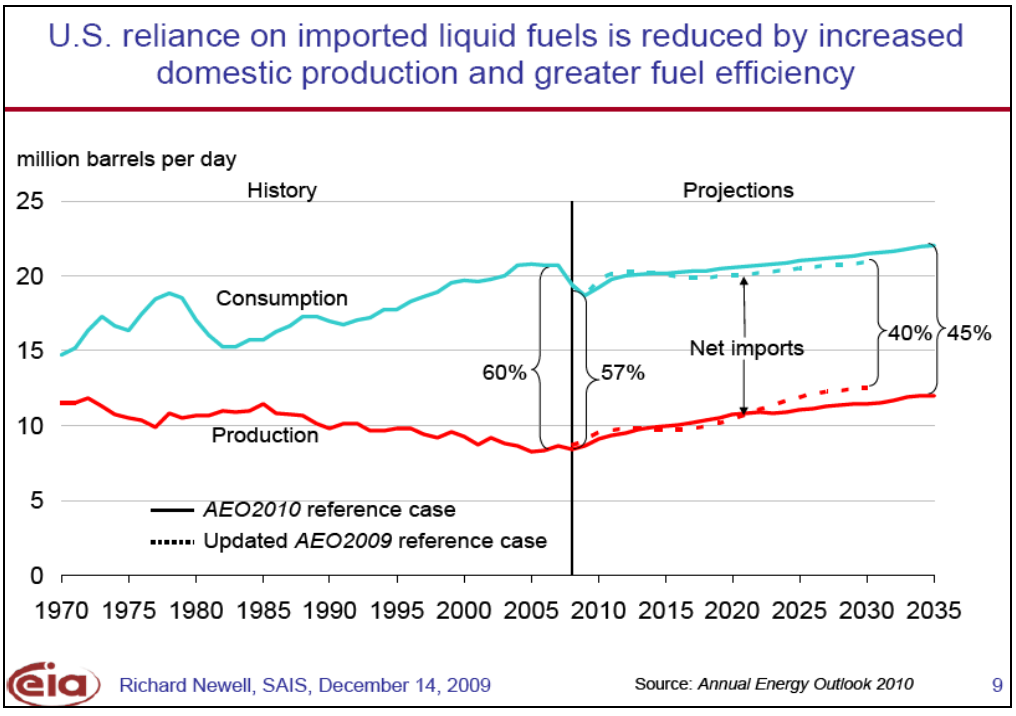
EIA Net Import Projections, 2004 v. 2009

March 2004:



From: U.S. EIA, *Overview of the Annual Energy Outlook 2004*, March 23, 2004.

December 2009:



From: U.S. EIA, *Annual Energy Outlook 2010* (Reference Case), December 14, 2009.

(Research Associates, Ester, Alaska 99725)

Figure A.2.2

U.S. Import Figures, 1973 - 2010

Table 3.3a Petroleum Trade: Overview

	Imports From Persian Gulf[a]	Imports From OPEC[b]	Imports	Exports	Net Imports	Products Supplied	As Share of Products Supplied: Imports From Persian Gulf[a]	As Share of Products Supplied: Imports From OPEC[b]	As Share of Products Supplied: Imports	As Share of Products Supplied: Net Imports	As Share of Total Imports: Imports From Persian Gulf[a]	As Share of Total Imports: Imports From OPEC[b]
	Thousand Barrels per Day						Percent					
1973 Average	848	2,393	6,256	231	6,025	17,308	4.9	17.3	36.1	34.8	13.6	47.8
1975 Average	1,165	3,601	6,056	209	5,846	16,322	7.1	22.1	37.1	35.8	19.2	59.5
1980 Average	1,519	4,300	6,909	544	6,365	17,056	8.9	25.2	40.5	37.3	22.0	62.2
1985 Average	311	1,830	5,067	781	4,286	15,726	2.0	11.6	32.2	27.3	6.1	36.1
1990 Average	1,966	4,296	8,018	857	7,161	16,988	11.6	25.3	47.2	42.2	24.5	53.6
1995 Average	1,573	4,002	8,835	949	7,886	17,725	8.9	22.6	49.8	44.5	17.8	45.3
1996 Average	1,604	4,211	9,478	981	8,498	18,309	8.8	23.0	51.8	46.4	16.9	44.4
1997 Average	1,755	4,569	10,162	1,003	9,158	18,620	9.4	24.5	54.6	49.2	17.3	45.0
1998 Average	2,136	4,905	10,708	945	9,764	18,917	11.3	25.9	56.6	51.6	19.9	45.8
1999 Average	2,464	4,953	10,852	940	9,912	19,519	12.6	25.4	55.6	50.8	22.7	45.6
2000 Average	2,488	5,203	11,459	1,040	10,419	19,701	12.6	26.4	58.2	52.9	21.7	45.4
2001 Average	2,761	5,528	11,871	971	10,900	19,649	14.1	28.1	60.4	55.5	23.3	46.6
2002 Average	2,269	4,605	11,530	984	10,546	19,761	11.5	23.3	58.3	53.4	19.7	39.9
2003 Average	2,501	5,162	12,264	1,027	11,238	20,034	12.5	25.8	61.2	56.1	20.4	42.1
2004 Average	2,493	5,701	13,145	1,048	12,097	20,731	12.0	27.5	63.4	58.4	19.0	43.4
2005 Average	2,334	5,587	13,714	1,165	12,549	20,802	11.2	26.9	65.9	60.3	17.0	40.7
2006 Average	2,211	5,517	13,707	1,317	12,390	20,687	10.7	26.7	66.3	59.9	16.1	40.2
2007 Average	2,163	5,980	13,468	1,433	12,036	20,680	10.5	28.9	65.1	58.2	16.1	44.4
2008 January	2,307	6,415	13,568	1,620	11,949	20,247	11.4	31.7	67.0	59.0	17.0	47.3
February	2,663	5,834	12,660	1,848	10,812	20,029	13.3	29.1	63.2	54.0	21.0	46.1
March	2,516	5,934	12,598	1,807	10,791	19,831	12.7	29.9	63.5	54.4	20.0	47.1
April	2,323	6,262	13,331	1,739	11,593	19,815	11.7	31.6	67.3	58.5	17.4	47.0
May	2,450	5,931	12,902	1,793	11,109	19,798	12.4	30.0	65.2	56.1	19.0	46.0
June	2,363	6,054	13,396	2,146	11,252	19,678	12.0	30.8	68.1	57.2	17.6	45.2
July	2,507	6,125	13,124	2,051	11,073	19,557	12.8	31.3	67.1	56.6	19.1	46.7
August	2,436	6,391	13,118	2,053	11,064	19,272	12.7	33.2	68.1	57.4	18.6	48.7
September	2,086	5,127	11,562	1,323	10,239	17,839	11.7	28.7	64.8	57.4	18.0	44.3
October	2,304	5,875	13,202	1,658	11,545	19,698	11.7	29.8	67.0	58.6	17.5	44.5
November	2,283	5,799	12,881	1,720	11,160	19,052	12.0	30.4	67.6	58.6	17.7	45.0
December	2,208	5,679	12,607	1,856	10,751	19,142	11.5	29.7	65.9	56.2	17.5	45.0
Average	2,370	5,954	12,915	1,802	11,114	19,498	12.2	30.5	66.2	57.0	18.4	46.1
2009 January	2,216	5,676	13,173	1,927	11,246	19,125	11.6	29.7	68.9	58.8	16.8	43.1
February	1,972	4,956	12,190	1,822	10,369	18,706	10.5	26.5	65.2	55.4	16.2	40.7
March	1,823	5,215	12,474	1,838	10,636	18,672	9.8	27.9	66.8	57.0	14.6	41.8
April	1,700	4,754	11,973	1,900	10,073	18,471	9.2	25.7	64.8	54.5	14.2	39.7
May	1,480	4,471	11,596	2,015	9,581	18,176	8.1	24.6	63.8	52.7	12.8	38.6
June	1,586	4,814	11,902	1,963	9,939	18,762	8.5	25.7	63.4	53.0	13.3	40.5
July	1,955	4,623	12,053	2,348	9,704	18,771	10.4	24.6	64.2	51.7	16.2	38.4
August	1,466	4,567	11,243	2,119	9,124	18,732	7.8	24.4	60.0	48.7	13.0	40.6
September	1,718	5,021	11,721	2,105	9,616	18,362	9.4	27.3	63.8	52.4	14.7	42.8
October	1,545	4,581	10,856	2,223	8,633	18,727	8.3	24.5	58.0	46.1	14.2	42.2
November	1,593	4,589	11,080	2,029	9,051	18,550	8.6	24.7	59.7	48.8	14.4	41.4
December	1,378	4,187	10,487	1,996	8,490	19,163	7.2	21.8	54.7	44.3	13.1	39.9
Average	1,701	4,786	11,726	2,026	9,700	18,686	9.1	25.6	62.8	51.9	14.5	40.8
2010 January	R 1,546	R 4,503	R 11,236	R 1,883	R 9,352	R 18,528	R 8.3	R 24.3	R 60.6	R 50.5	R 13.8	R 40.1
February	NA	NA	E 11,532	E 1,707	E 9,825	E 19,356	NA	NA	E 59.6	E 50.8	NA	NA
March	NA	NA	E 11,419	E 1,653	E 9,766	E 19,109	NA	NA	E 59.8	E 51.1	NA	NA
3-Month Average	NA	NA	E 11,391	E 1,749	E 9,642	E 18,986	NA	NA	E 60.0	E 50.8	NA	NA
2009 3-Month Average	2,005	5,293	12,626	1,863	10,763	18,839	10.6	28.1	67.0	57.1	15.9	41.9
2008 3-Month Average	2,492	6,066	12,948	1,756	11,192	20,036	12.4	30.3	64.6	55.9	19.2	46.8

[a] Bahrain, Iran, Iraq, Kuwait, Qatar, Saudi Arabia, United Arab Emirates, and the Neutral Zone (between Kuwait and Saudi Arabia).

[b] See "Organization of the Petroleum Exporting Countries (OPEC)" in Glossary. See Table 3.3c for notes on which countries are included in the data.

R=Revised. E=Estimate. NA=Not available.

Notes: • Readers of this table may be interested in a feature article, "Measuring Dependence on Imported Oil," that was published in the August 1995 *Monthly Energy Review*. See http://www.eia.doe.gov/emeu/mer/pdf/pages/imported_oil.pdf. • Beginning in October 1977, data include Strategic Petroleum Reserve imports. See Table 3.3b. • Annual averages may not equal average of months due to independent rounding. • U.S. geographic coverage is the 50 States and the District of Columbia. U.S. exports include shipments to U.S. territories, and imports include receipts from U.S. territories.

Web Pages: • For all available data beginning in 1973, see http://www.eia.doe.gov/emeu/mer/petro.html. • For related information, see http://www.eia.doe.gov/oil_gas/petroleum/info_glance/petroleum.html.

Sources: • **1973-1975:** Bureau of Mines, Mineral Industry Surveys, *Petroleum Statement, Annual*, annual reports. • **1976-1980:** U.S. Energy Information Administration (EIA), Energy Data Reports, *Petroleum Statement, Annual*, annual reports. • **1981-2008:** EIA, *Petroleum Supply Annual*, annual reports. • **2009 and 2010:** EIA, *Petroleum Supply Monthly*, monthly reports; and, for the current two months, *Weekly Petroleum Status Report* data system and *Monthly Energy Review* data system calculations.

Appendix 3.

Potential Arctic Refuge Production, 2011 – 2030

Arctic Refuge cumulative production through 2030 of 2.1 billion barrels is calculated as the difference between the mean Arctic Refuge resource case production scenario in the EIA's May 2008 report, *Analysis of Crude Oil Production in the Arctic National Wildlife Refuge,* and the *Annual Energy Outlook 2008* reference case scenario (without Arctic Refuge production). [1] The EIA estimates were based on the study of the Arctic Refuge Coastal Plain region by the U.S. Geological Survey, released in 1998.[2]

In its 2008 report, EIA observed that increases in oil prices would not increase Arctic Refuge region production estimates or accelerate production prior to 2030 due to logistical constraints.[3] Based on this assessment, production of the balance of the USGS estimate of oil technically recoverable from the Arctic Refuge Coastal Plain study area – approximately 8.3 billion barrels – could not be accessed and produced until some time after 2030. It should be noted that the remaining 8.3 billion barrels of technically recoverable oil, if induced by high oil prices, would come from approximately two dozen separate, smaller deposits scattered beneath the Coastal Plain study area, which encompasses an area approximately the size of the state of Delaware.[4]

---

[1] U.S. Energy Information Administration, *Analysis of Crude Oil Production in the Arctic National Wildlife Refuge,* May 2008 (Report No. SR/OIAF/2008-03; spreadsheets "Reference" [Datekey d030208f] and "Mean ANWR Resource" [Datekey d031008a]; http://www.eia.doe.gov/oiaf/servicerpt/anwr/index.html). For additional information on Arctic Refuge production scenarios, see Appendix Figures A.4.3 thru A.4.5.

[2] U.S. Geological Survey, *The Oil and Gas Resource Potential of the Arctic National Wildlife Refuge, 1002 Area, Petroleum Assessment, 1998, Including Economic Analysis* (2-disc CD; summarized in USGS Fact Sheet FS-028-01, April 2001 [http://pubs.usgs.gov/fs/fs-0028-01/fs-0028-01.pdf]).

EIA's 2008 Arctic Refuge mean resource case assumed that if Arctic Refuge leasing were authorized in 2008, the seven largest potential fields in the Arctic Refuge Coastal Plain region, as described by the USGS in its 1998 mean resource case, would come on line in alternate years between 2018 and 2030, producing approximately 2.6 billion barrels of oil during the first 12 years of production. Under this scenario, production would have peaked at 0.78 million bpd in the 10th year of production and these seven fields would produce an additional 1.7 billion barrels of oil after 2030. In the absence of Arctic Refuge leasing authorization to date, for the 2010 scenario we have assumed that the EIA's 2008 production profile is delayed by two years, with production beginning in 2020 and peaking in the 10th year of production (2029).

[3] See: *Analysis of Crude Oil Production in the Arctic National Wildlife Refuge*, pp. 3 ("Timing of First Production"), p. 5 ("Field Size Distribution") and pp. 6-8 ("Current Oil Market conditions").

[4] In its assessment of Arctic Refuge production potential, a three-year study completed in 1998, USGS concluded that although a super-giant field like Prudhoe Bay was unlikely to be discovered on the Arctic Refuge Coastal Plain, the region holds a number of smaller fields whose combined mean technically recoverable volumes would total 10.4 billion barrels. See: *The Oil and Gas Resource Potential of the Arctic National Wildlife Refuge, 1002 Area, Petroleum Assessment, 1998, Including Economic Analysis*, *passim*; and Emil D. Attanasi and John H. Schuenemeyer, *Frontier Areas and Resource Assessment: The Case of the1002 Area of the Alaska North Slope*, USGS Open-File Report 02-119, March 2002, p. 10.

Appendix 3.

(For estimates of annual Arctic Refuge production schedules associated with each scenario in this analysis, see Appendix Figures A.4.3 through A.4.5.)

Appendix 4

Reduced Imports through Conservation Since 2005 v. Arctic Refuge Production Potential, 2011 - 2030

To understand the long-term effects of declining petroleum imports shown in Figures A.2.1 and A.2.2, in Figure A.4.1 we compare EIA's 2008 and 2010 *Annual Energy Outlook* reference case estimates for the two decades between now and 2030 by looking at the following elements of the nation's long-term petroleum picture: oil prices (col. [1]), domestic oil production (col. [2]), potential Arctic National Wildlife Refuge production (col. [3]), total U.S. petroleum consumption (col. [4]) and petroleum imports (col. [5]). As shown in Figure A.4.1 (whose domestic production, consumption and import totals represent the sum of the annual figures shown in Figures A.4.3 and A.4.4 for the 2010 and 2008 scenarios, respectively), between 2008 and 2010:

- The estimated price of oil in 2025 in real (2010) dollars has nearly doubled (col. [1]).
- The nation's projected total petroleum import requirement for the 20 years between 2011 and 2030 (shown in col. [5]) decreased by 11.8 billion barrels (from 84.6 billion barrels projected by the EIA in 2008 to approximately 72.8 billion barrels in the current *Annual Energy Outlook*). That's a reduction to total imports of 14% between now and 2030, realized in less than two years.
- Out of the 11.8 billion barrels of reduced imports, 0.5 billion barrels consists of increases in conventional and alternative energy sources that will be added to this nation's liquid energy fuel supply between the 2011 and 2030. (As shown in col. [2], this figure is calculated as the difference between the domestic production totals in the 2008 *Annual Energy Outlook* reference case and the corresponding figure for 2010.)
- The remaining 11.3 billion barrels of reduced domestic consumption (also shown in col. [4]), represents conservation gains since 2008.
- As discussed in Appendix 3 and shown in col. 3 of Figure A.4.3, under EIA's mean resource case, cumulative oil production from the Arctic Refuge between now and 2030 would be approximately 2.1 billion barrels.

As shown in the chart on the cover of this report, the ratio between conservation savings since 2008 and every barrel of oil that drilling in the Arctic Refuge region might yield between now and 2030 is better than 5:1.[1]

[1] 11.3 / 2.1 = 5.38.

Figure A.4.2 also presents the sum of annual figures for domestic production, consumption and imports for 2011 through 2030. This figure compares the 2010 reference case totals (also shown in Figure A.4.1; based on Figure A.4.3) to the results of a scenario derived from EIA's 2005 *Annual Energy Outlook* "Current Futures" case (based on Figure A.4.5). The EIA 2005 NEMS (National Energy Modeling System) model outputs terminated in the year 2025. For this comparison we have extended EIA 2005 scenario production and consumption figures through 2030 by holding domestic production constant and increasing consumption by the average scenario increase for 2016-2020 and 2021-2025. Reflecting the fact that the results of this exercise may not replicate the outputs of EIA's dynamic and highly articulated model, we have assigned a 10% uncertainty factor to the 39.3 billion barrel point estimate of the reduction in the nation's petroleum import requirement between 2005 and 2010, as summarized on page 2 of this report.

Figure A.4.1

Arctic Refuge Production v. Reductions to U.S. Oil Imports between 2011 and 2030

(Based on Annual Energy Outlook 2008 and Annual Energy Outlook 2010 Reference Case Estimates of the U.S. Energy Information Administration)

	(1)	(2)	(3)	(4)	(5)
		/ - Billion Barrels of Oil - /			
Scenario	Avg. Price, Of Oil, 2025 *(2010 $/Bbl.)*	Domestic Production *(excluding Arctic Refuge)*	Potential Arctic Refuge Region Production *(through 2030)*	Total Domestic Consumption *(2011 – 2030)*	Import Requirement *(2011-2030; without [with] Arctic Refuge)*
Annual Energy Outlook 2010 (Early Release, Dec. 14, 2009)	**$112.44**	**77.2**	**2.1**	**150.0**	**72.8** ***[70.7]***
Annual Energy Outlook 2008 (Updated Early Release, Mar. 4, 2008)	**$64.79**	**76.7**	**2.6**	**161.3**	**84.6** ***[82.0]***
Change (AEO 2010 v. AEO 2008)	**$47.65**	**0.5**	**(0.5)**	**(11.3)**	**(11.8)** ***[10.6]***
% Change (*AEO 2010* v. *AEO 2008*)	+73.5%	+0.6%	(19.2%)	(7.0%)	(13.9%) *[12.9%]*

Sources:

Col. (1): From U.S. Energy Information Administration, *Annual Energy Outlook 2008* and *Annual Energy Outlook 2010* (Reference Case; early release, Dec. 14, 2009), Table A12. Prices adjusted to 2010 $ using Gross Domestic Product deflator (White House, *Budget for Fiscal Year 2011, Historical Tables*, "Gross Domestic Product and Deflators," pp. 210-211 [see Appendix A1.1]). 2010: $109.79 (nominal avg. of imported crude and imported low sulfur light crude oils) = $109.47 * 1.1153 / 1.089 = $112.44/bbl.; 2008: $60.08 in 2006$ = $60.08 * 1.1153 / 1.0342) = $64.79/bbl.).

Col. (2), (4): Based on projections in *Annual Energy Outlook 2008* (updated early release) and *Annual Energy Outlook 2010* (early release), Table 11 (see Figures A.4.3 and A.4.4).

Col. (3): Derived from EIA data. Under 2008 and 2010 scenarios, Arctic Refuge production begins in 2018 and 2020, respectively. (see:. Energy Information Administration, *Impacts of Modeled Provisions of H.R. 6 EH: The Energy Policy Act of 2005*, p. 8; and *Analysis of Crude Oil Production in the Arctic National Wildlife Refuge,* May 2008, (*passim*.) and Arctic Refuge "Mean ANWR Resource" scenario.)

Col. (5): without Arctic Refuge = Col. (4) - Col. (2); with Arctic Refuge [shown in brackets] = Col. (4) - (Col. [2] + Col. [3]). *(Rev. 5/15/10)*

Figure A.4.2

Arctic Refuge Production v. Reductions to U.S. Oil Imports between 2011 and 2030

(Based on Annual Energy Outlook 2005 and Annual Energy Outlook 2010
Estimates of the U.S. Energy Information Administration)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
		/ - Billion Barrels of Oil - /			
Scenario	Avg. Price, Of Oil, 2025 *(2010 $/Bbl.)*	Domestic Production *(excluding Arctic Refuge)*	Potential Arctic Refuge Region Production *(through 2030)*	Total Domestic Consumption *(2011 – 2030)*	Import Requirement *(2011-2030; without [with] Arctic Refuge)*
Annual Energy Outlook 2010 (Reference Case)	**$112.44**	**77.2**	**2.1**	**150.0**	**72.8** ***[70.7]***
Annual Energy Outlook 2005 (Current [Oct. '04] Futures Case)	**$41.34**	**69.3**	**3.3**	**189.3**	**120.0** ***[116.7]***
Change (AEO 2010 v. AEO 2005)	**$72.93**	**7.9**	**(1.2)**	**(39.3)**	**(47.2)** ***[46.0]***
% Change (*AEO 2010* v. *AEO 2005*)	+176.4%	+11.3%	(36.4%)	(20.8%)	(39.3%) *[39.4%]*

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 2010* (Reference Case; early release, Dec. 14, 2009), Table A12. Prices adjusted to 2010 $ using Gross Domestic Product deflator (White House, *Budget for Fiscal Year 2011, Historical Tables*, "Gross Domestic Product and Deflators," pp. 210-211 [see Appendix A1.1]). 2010: $109.79 (nominal avg. of imported crude and imported low sulfur light crude oils) = $109.47 * 1.1153 / 1.089 = $112.44/bbl.; 2005: $35.00 in 2003$ = $35.00 * 1.1153 / 0.9442) = $41.34/bbl.).

Col. (2), (4): Based on projections in *Annual Energy Outlook 2005* (Current [Oct. 2004] Futures Case; EIA estimate through 2025, extended to 2030) and *Annual Energy Outlook 2010* (early release), Table 11 (see Figures A.4.3 through A.4.5).

Col. (3): Derived from EIA data. Under 2005 and 2010 scenarios, Arctic Refuge production begins in 2015 and 2020, respectively. (see:. Energy Information Administration, *Impacts of Modeled Provisions of H.R. 6 EH: The Energy Policy Act of 2005*, p. 8; and *Analysis of Crude Oil Production in the Arctic National Wildlife Refuge,* May 2008, (*passim*.) and Arctic Refuge "Mean ANWR Resource" scenario.)

Col. (5): without Arctic Refuge = Col. (4) - Col. (2); with Arctic Refuge [shown in brackets] = Col. (4) - (Col. [2] + Col. [3]). *(Rev. 5/15/10)*

Figure A.4.3

Alaska North Slope Plus Arctic Refuge Production, 2011-2030
(Based on *Annual Energy Outlook 2010)*

(1)	*(2)*	*(3)*	*(4)*	*(5)*
Year	Domestic Supply (without Arctic Refuge Coastal Region)	Arctic Refuge Coastal Plain (2.1 billion of 10.4 billion barrels produced, 2020 thru 2030)	Imports (Estimated Total Consumption less Domestic Supply)	Total Domestic Consumption
	/ - mm bpd - /			
2011	9.39		10.36	19.75
2012	9.47		10.52	19.99
2013	9.75		10.30	20.05
2014	9.87		10.22	20.09
2015	9.97		10.16	20.13
2016	10.03		10.14	20.17
2017	10.18		10.06	20.24
2018	10.34		9.92	20.26
2019	10.55		9.79	20.34
2020	10.71	0.04	9.73	20.44
2021	10.82	0.12	9.70	20.52
2022	10.91	0.25	9.71	20.62
2023	10.85	0.41	9.83	20.68
2024	10.90	0.53	9.85	20.75
2025	11.04	0.61	9.82	20.86
2026	11.16	0.69	9.83	20.99
2027	11.31	0.74	9.79	21.10
2028	11.35	0.77	9.81	21.16
2029	11.41	0.78	9.81	21.22
2030	11.46	0.76	9.90	21.36
Totals 2011 - 2030 *(mm bpd)*	211.47	5.70	199.25	410.72
(billion bbls.)	**77,239.42**	**2,081.93**	**72,776.06**	**150,015.48**

Notes

Col. (2) EIA, *Annual Energy Outlook 2010* , Reference Case, Table 11 (Lines 19 + 35 + 39 + 41 + 43:46).

Col. (3) EIA, *Analysis of Crude Oil Production in the Arctic National Wildlife Refuge* , May 2008 (Mean Resource Scenario [delayed 2 yrs.]).

Col. (4) Col. (5) - Col. (2).

Col. (5) EIA, *Annual Energy Outlook 2010* , Reference Case, Table 11 (Total Primary Supply).

Figure A.4.4

Alaska North Slope Plus Arctic Refuge Production, 2011 - 2030
(Based on *Annual Energy Outlook 2008*)

(1)	*(2)*	*(3)*	*(4)*	*(5)*
Year	Domestic Supply (without Arctic Refuge Coastal Region)	Arctic Refuge Coastal Plain (2.6 billion of 10.4 billion barrels produced, 2018 thru 2030)	Imports (Estimated Total Consumption less Domestic Supply)	Total Domestic Consumption
	/ - mm bpd - /			
2011	9.71		11.52	21.230
2012	9.76		11.65	21.410
2013	9.95		11.56	21.510
2014	10.06		11.55	21.610
2015	10.27		11.47	21.740
2016	10.39		11.47	21.860
2017	10.52		11.41	21.930
2018	10.64	0.04	11.33	21.970
2019	10.65	0.12	11.36	22.010
2020	10.69	0.25	11.35	22.040
2021	10.79	0.41	11.34	22.130
2022	10.92	0.53	11.30	22.220
2023	10.86	0.61	11.39	22.250
2024	10.86	0.69	11.43	22.290
2025	10.81	0.74	11.53	22.340
2026	10.82	0.77	11.59	22.41
2027	10.76	0.78	11.76	22.52
2028	10.62	0.76	12.01	22.63
2029	10.51	0.73	12.21	22.72
2030	10.44	0.71	12.42	22.860
Totals 2011 - 2030	*(mm bpd)* 210.03	7.14	231.65	441.68
	(billion bbls.) **76,713.46**	**2,607.89**	**84,610.16**	**161,323.62**

Notes

Col. (2) EIA, *Annual Energy Outlook 2008* , Reference Case, Table 11 (See Fig. A.4.3).

Col. (3) EIA, *Analysis of Crude Oil Production in the Arctic National Wildlife Refuge* , May 2008 (Mean Resource Scenario).

Col. (4) Col. (5) - Col. (2).

Col. (5) EIA, *Annual Energy Outlook 2008* , Reference Case, Table 11 (Total Primary Supply).

Figure A.4.5

Alaska North Slope Plus Arctic Refuge Production, 2011 - 2030
(Based on *Annual Energy Outlook 2005*)

(1)	*(2)*	*(3)*	*(4)*	*(5)*
Year	Domestic Supply (without Arctic Refuge Coastal Region)	Arctic Refuge Coastal Plain (2.6 billion of 10.4 billion barrels produced, 2018 thru 2030)	Imports (Estimated Total Consumption less Domestic Supply)	Total Domestic Consumption
	/ - mm bpd - /			
2011	9.841		13.03	22.869
2012	9.785		13.40	23.186
2013	9.737		13.77	23.502
2014	9.708		14.13	23.842
2015	9.720	0.038	14.45	24.169
2016	9.655	0.115	14.79	24.444
2017	9.617	0.251	15.16	24.773
2018	9.581	0.408	15.52	25.096
2019	9.534	0.527	15.90	25.434
2020	9.546	0.608	16.21	25.756
2021	9.483	0.701	16.58	26.063
2022	9.332	0.744	17.00	26.330
2023	9.233	0.765	17.39	26.618
2024	9.292	0.783	17.67	26.962
2025	9.277	0.748	18.03	27.303
2026	*9.277*	0.718	*18.38*	*27.66*
2027	*9.277*	0.703	*18.74*	*28.02*
2028	*9.277*	*0.678*	*19.10*	*28.38*
2029	*9.277*	*0.653*	*19.47*	*28.75*
2030	*9.277*	*0.628*	*19.85*	*29.12*
Totals 2011 - 2030	*(mm bpd)* 189.73	9.07	328.55	518.28
	(billion bbls.) **69,297.42**	**3,312.27**	**120,004.08**	**189,301.50**

Notes

Cols. (2) and (5): EIA, *Annual Energy Outlook 2005* (Oct. 2004 Current Futures Case), Table 11, through 2025. 2026 - 2030 estimated from EIA data (Col. [2] held constant; Col. [5] increased at 1.3% per year [approximating EIA estimates for 2016-2020 and 2021-2025]).

Col. (3) EIA production schedule for *Analysis of Crude Oil Production in the Arctic National Wildlife Refuge*, March 2004, delayed 2 years, thru 2027; author's estimates for 2028-2030.

Col. (4) Col. (5) - Col. (2).

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