Testimony of W. Thomas Goerold, Ph.D., of Lookout Mountain Analysis Golden, Colorado to the Senate Energy and Natural Resources Committee, on the topic of oil resources in the 1002 Area of the Arctic National Wildlife Refuge, April 5, 2000.

Mr. Chairman, members of the Committee, my name is Tom Goerold, and I have been asked by the Alaska Wilderness League to investigate the petroleum potential of the 1002 Area of the Arctic National Wildlife Refuge and its possible impacts on the national energy balance. I have earned an M.S degree in Geology and a Ph.D. in Mineral Economics from Penn State University. In addition, I worked for the U.S. Synthetic Fuels Corporation as both a Policy Analyst and a Financial Analyst during the early 1980s. I have been working on and following Arctic National Wildlife issues since the mid-1980s. Arctic Refuge oil potential has been a topic that I have scrutinized closely, and I have presented testimony and published papers that deal with this issue. This combination of education and experience has given me a broad perspective on both Arctic Refuge issues and also on national energy issues.

I would like to focus on just two issues in this testimony, (1) examining the multiple estimates of oil potential in the Refuge and pulling out the most likely and most useful petroleum estimates for the policy debate, and (2) placing these estimates of oil potential in the Refuge in a national energy context.

Figure 1 is a bar graph that shows the latest U.S. Geological Survey estimates of the amounts of oil that may be found in the Arctic Refuge 1002 region, as well as a larger region surrounding the 1002 area.

The leftmost group of bars represents the USGS estimate of the minimum, average, and maximum likely amounts of oil in-place that may underlie the Arctic Refuge 1002 area, nearby Native Lands, and the State Lands beneath the Beaufort Sea from the shoreline out to the 3-mile limit that separates State Lands from Federal Lands further offshore. The USGS team that performed the resource assessment said that their best guess is that there is a minimum of about 15.6 billion barrels, an average (or expected value) of 27.8 billion barrels, and a maximum of approximately 42.3 billion barrels.

Of course oil in-place, is not oil that can be put in the pipeline for the trip to Valdez. Only a fraction of oil in-place can actually be pumped to the surface. The USGS estimated that the minimum amount of oil in the entire eastern North Slope region that technology could

pump to the surface is 5.7 billion barrels, an average amount of 10.4 billion barrels, and a maximum amount of about 16 billion barrels. These estimates represent the limits of technology—i.e., the above estimates are the maximum amount of oil that could be pried loose from the underground formations of the 1002 area, Native Lands, and the near-offshore area, regardless of cost.

But, I expect that this committee is most interested in the Federal lands of the 1002 area for this hearing, not the Native Lands and the State Lands offshore. USGS projections of in-place oil underlying the 1002 area are much lower after excluding the Native and State Lands--a minimum of 11.6 billion barrels, an average of 20.7 billion barrels, and a maximum of 31.5 billion barrels.

Zeroing in on the fraction of oil under the Federal 1002 area that could be pumped to the surface, the USGS estimates a minimum amount of 4.3 billion barrels, an average of 7.7 billion barrels, and a maximum of 11.8 billion barrels. Once again, these resource estimates represent the quantity of oil that could be pumped to the surface if one had an unlimited budget.

More realistically, the USGS also estimates the amount of oil that could be produced from the 1002 area if the operator was forced to operate under a budget. The USGS says that the expected value of economically producible oil from the Arctic Refuge is about 3.2 billion barrels. This estimate takes into account the costs of producing the oil as well as the expected price that it would fetch on the market.

The latter estimate by the USGS forces the agency to project the level of oil prices that may occur in the distant future—the period in which Arctic Refuge oil might be produced. According to the agency, the delivered price of Alaska North Slope crude oil is expected to be about $15 (early 1996 dollars). After adjusting for inflation, this $15 price creeps up to almost $17 when expressed in current year-2000 dollars ($16.94).

As part of their assessment the USGS says that if the price of delivered North Slope crude oil falls below that price of $16.94, then the expected value of economically producible oil underlying the 1002 area drops to zero. Conversely, if the relevant crude price rises above the $16.94 benchmark, their estimate of economically producible oil in the Refuge grows.

Figure 2 shows the Alaska Department of Revenue's forecast of the benchmark price of Alaska North Slope crude delivered to the West Coast. Note that this price (after adjustment for inflation) has been declining over time. The solid horizontal line on Figure 2 represents the USGS-derived price of $16.94 that is required for any economically producible oil. In the past, this benchmark price was achieved and surpassed, but the Alaska Department of Revenue projections show that they expect this price to decline below the benchmark $16.94 level from the year 2002 up to the end of their forecast in 2010. The implication of Figure 2 is that, if official Alaska Department of Revenue forecasts occur, the USGS states that the most likely scenario is that economic quantities of oil would not be found in the Arctic National Wildlife Refuge.

The preceding part of my testimony focuses on Arctic Refuge oil resource estimates and probabilities. From here on, I will examine the impacts on national energy security, if 3.2 billion barrels of oil could be economically extracted from the Refuge. This section is intended to investigate the impacts that oil from the Refuge could have on oil imports, gasoline and other petroleum product prices in the Northeast and the rest of the United States.

Figure 3 represents a possible production profile of a potential 3.2 billion-barrel find in the Refuge. If a lease sale were held tomorrow, the first production that could conceivably be wrested from the Arctic Refuge would likely occur no earlier than 2007. This graph illustrates a likely production path of oil that may be seen if 3.2 producible barrels are found. The top line represents the Energy Information Agency's (EIA) estimate of the amount of petroleum that this country is likely to consume through 2020. The first line above the horizontal axis represents the amount of petroleum that the U.S. will likely produce during the period. Given the consumption requirements of this country shown by the top line and the petroleum production estimate in the lower area, the remainder of the graph—represented by the shaded area between the consumption and production lines is the amount that the U.S. would have to import to meet its needs.

Additional oil production from the Arctic Refuge is shown by the small bubble starting in the year 2007. My assumption is that Arctic Refuge oil production substitutes for imported oil. Of course there is no guarantee that all of the benefits of any Arctic Refuge would remain in this country. With the ban on exported oil lifted, oil companies may again find it more profitable to ship American oil to overseas markets.

While petroleum output from the Refuge is discernable on the graph, the amount that might be produced does not have a significant or lasting impact on reducing petroleum imports into this country. At its greatest magnitude in 2011, a 3.2 billion-barrel find in the Arctic Refuge might reduce imported oil from 68 percent of consumption to about 64 percent. Of course this four-percent decrease only occurs for one year and steadily decreases over time. By the year 2020, estimates show that the difference in the amount of imported oil that would be displaced by Arctic Refuge production shrinks to about one percent and declines in subsequent years.

Relatively high gasoline prices seen in recent days may prompt some to look towards oil production from the Refuge for potential relief. But, again examination of the national energy picture shows that the relatively small quantities of oil relative to the huge energy needs of the country means that any oil found there could not possibly be enough to have any appreciable effect on the world oil price.

The inescapable facts of the matter are that, the vast majority of world oil reserves lie outside this country. And, suprisingly, the owners of those oil reserves are not all members of OPEC. In fact, research shows that, in recent times, the volume and value of non-OPEC imports into this country are actually as large or larger than oil imports from OPEC members. This is a consequence of drilling activity caused by higher oil prices.

Contrary to many energy economist's estimates, the success rate of finding oil in countries such as Great Britain and other non-OPEC countries has been quite good. As a result, these non-OPEC countries have been able to claim larger shares of imports to this country. This occurrence has had the effect of blunting the potential market power of the OPEC cartel.

Figure 4 gives a historical look at crude oil prices. Contrary to many people's beliefs, crude oil prices in this country have shown a declining trend since the late 1970s. In fact, prior to the recent run-up in prices (and the apparent decline that we are now experiencing), the inflation-adjusted price of crude oil was actually about what it was prior to the first energy crisis of 1973. Not many commodities have shown this trend of declining real prices.

The strongest crude oil price increase shown on Figure 4, one that occurred throughout the 1970s, actually happened at the same time the largest part of the massive 9-billion barrel Prudhoe Bay oil field on Alaska's North Slope hit the market. This price increase happened despite the large increase in oil production—a production increase that was much larger than the 3.2 billion barrels of hypothetical oil from the Refuge. Clearly, history shows us that domestic oil production has not be able to influence the price of oil. That fact was true in the 1970s, and, if anything, it is truer today. Not only will an Arctic Refuge find have no impact on gasoline prices, but it also would not have any impact on heating oil prices, or on virtually any other petroleum product prices anywhere.

Thank you for your time, and I will be glad to take any questions.

Addendum discussing three additional graphs not discussed during oral testimony

The next figure that will be discussed has the heading "Net Petroleum Imports by Source". This figure shows a red line, denoting non-OPEC imports to the U.S., and a blue line, representing OPEC petroleum imports into this country. The most prominent feature of the graph is the pronounced spike in OPEC imports occurring in 1980. At this point in time, the United States imports over 6 billion barrels per day of petroleum from OPEC countries. At this same time, the U.S. only imported about 2.5 billion barrels per day of petroleum production from non-OPEC countries. The ratio of petroleum imports has changed significantly since 1980. Projected numbers for the year 2000 show that the total amount of petroleum imports will likely by about what it was in 1980—approximately 8.5 billion barrels per day. But, the OPEC share of those imports will have dropped from about 70 percent to less than 50 percent. Thus, petroleum importers in the U.S. today are much less dependent on OPEC sources now than they were in the earlier days of OPEC. This fact is a result of the greater-than-expected increase in oil production from non-OPEC countries with the higher oil prices.

Another enclosed figure has the heading "Value of Crude Oil Imports". This graph has similar information to impart to the previous figure. Instead of tracking barrels of oil, this graph tracks the actual dollar-value of crude oil imports (adjusted for inflation). Note on this graph as on the previous one, the obvious peak in oil imports during 1980, culmination in a value of more than $100 billion (1992 dollars). But, notice the very steep decline from the 1980 peak, bottoming out at a value of approximately $30 million. The $30 million represents this nation's bill for crude oil at a time of very low oil prices seen during 1986. Another notable feature of this graph is the very stable bill for imported crude oil during the 1990s—staying between about $38 and $50 billion in every year. Notice the contrast of that pattern with the earlier years where the imported oil bill yo-yoed from $5 billion to more than $100 billion during the 1970s. It is clear that the repeated oil crises have had at least one favorable impact on this country—it now uses less energy per capita than before and generally pays less for it than during the earlier oil price events.

The final enclosed figure has the heading "Federal Land Share of National Petroleum Production". This graph shows the percentage of petroleum production derived from federal lands, as a share of total petroleum production. In spite of some organizations' insistence that actions such as park and wilderness designations have had a chilling effect on national petroleum production from federal lands, it is clear from this graph that the opposite effect is true. Since 1990 the share of petroleum production from federal lands has increased by more than forty percent—to almost 30 percent of total national petroleum production. This result seems to contradict those who say that federal land withdrawals are a significant reason for declining petroleum production in this country.

Figure 1

Recent USGS Oil Resources Estimates of the Eastern North Slope of Alaska

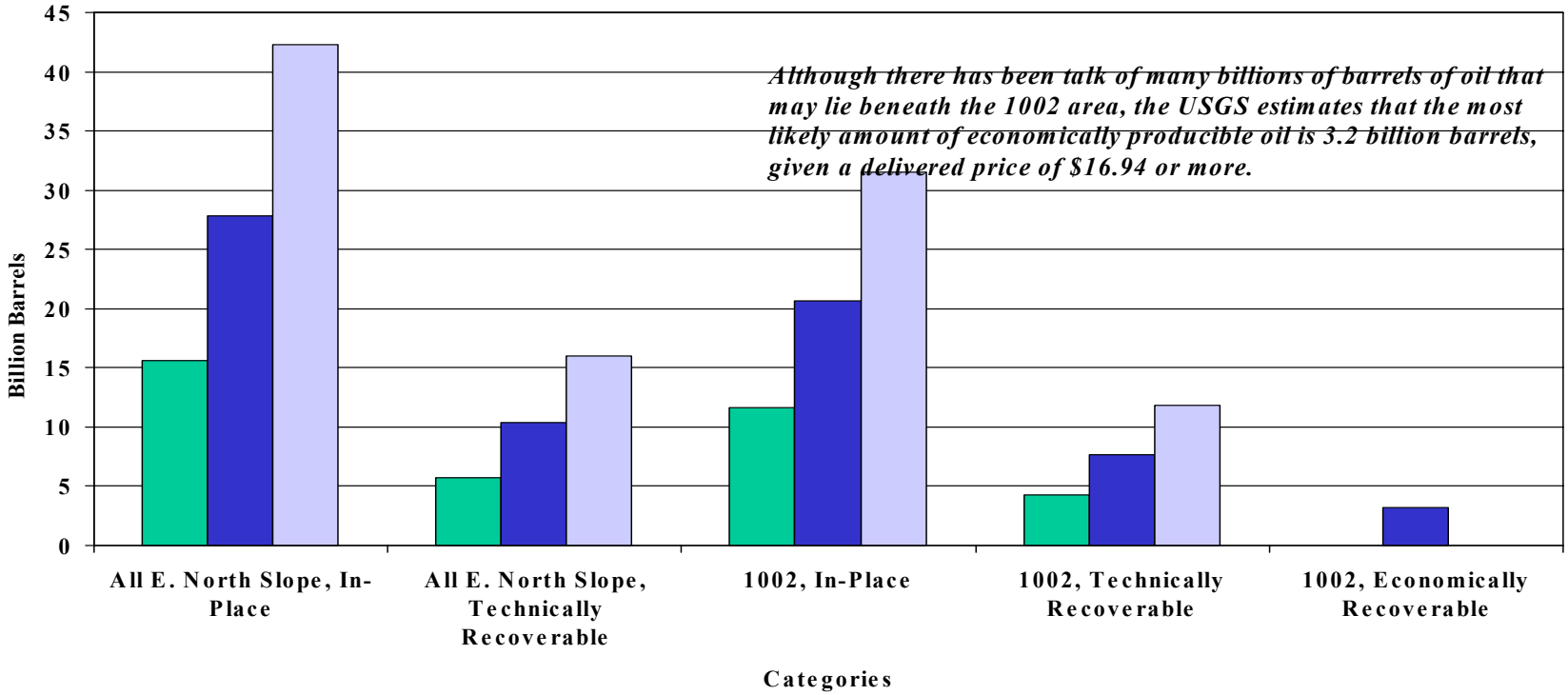
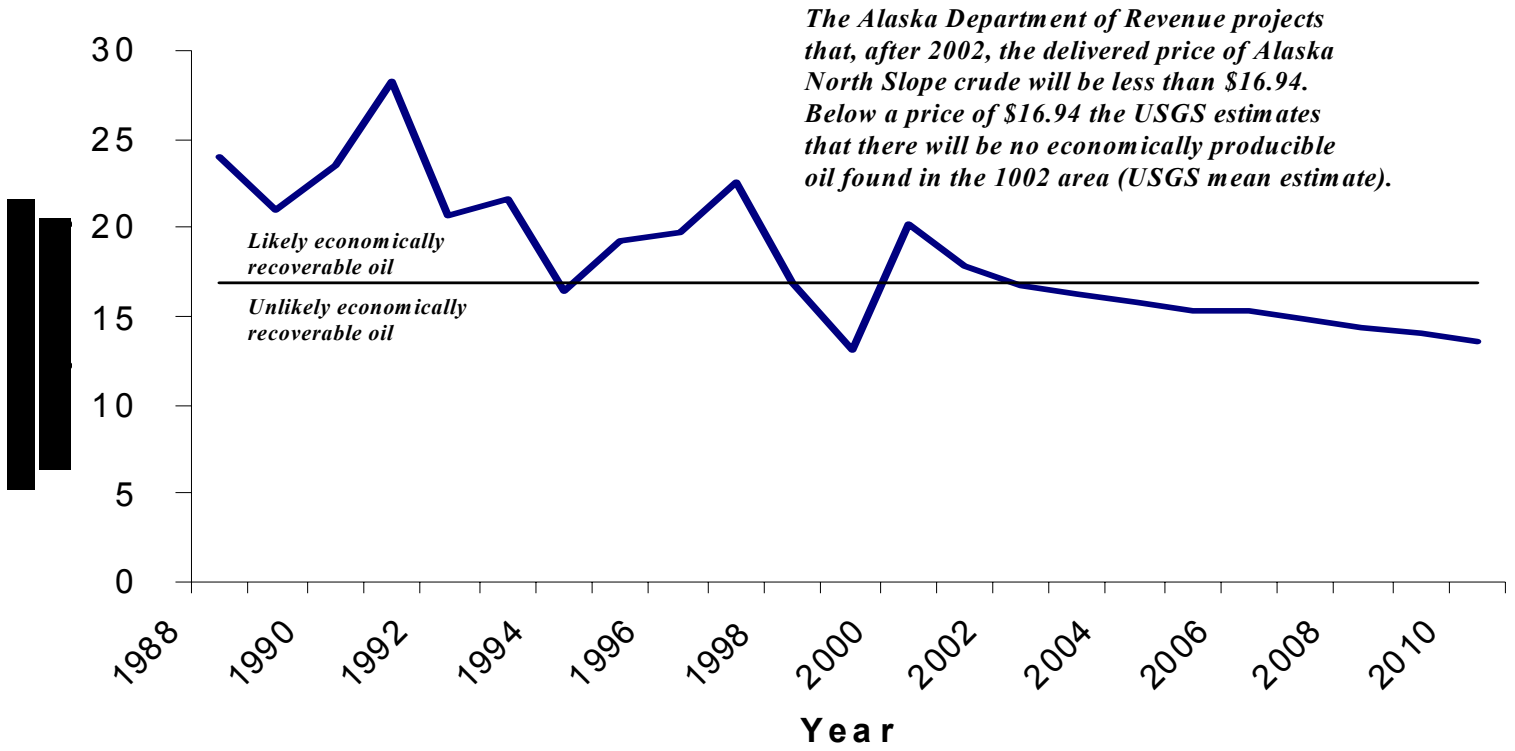


Figure 2

Alaska Dept. of Revenue Oil Price Historical and Projections

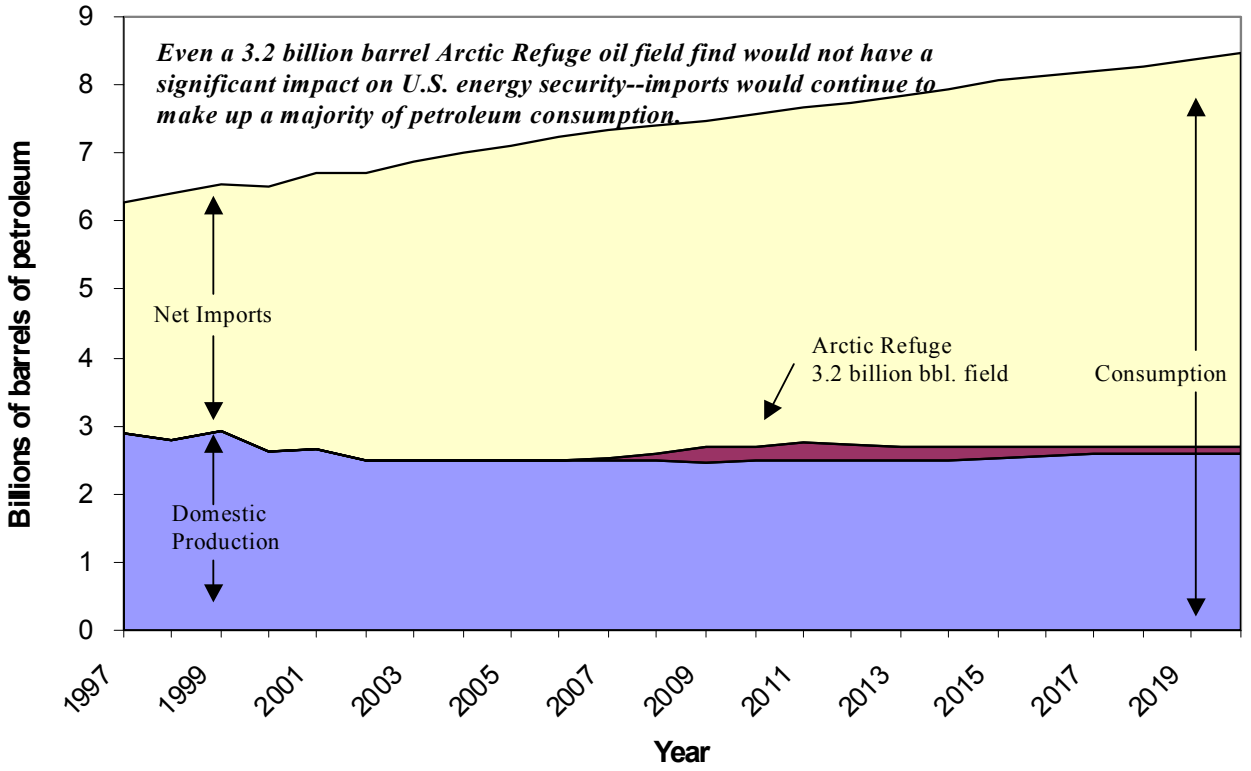


Sources: USGS, 1999, The Oil and Gas Resource Potential of the Arctic National Wildlife Refuge 1002 Area, Alaska, and State of Alaska Fall 1999 Revenue Sources Book, p. 18, as obtained from their website.

Produced by Lookout Mountain Analysis for the Alaska Wilderness League, April 2000.

Figure 3

Arctic Refuge Energy Security

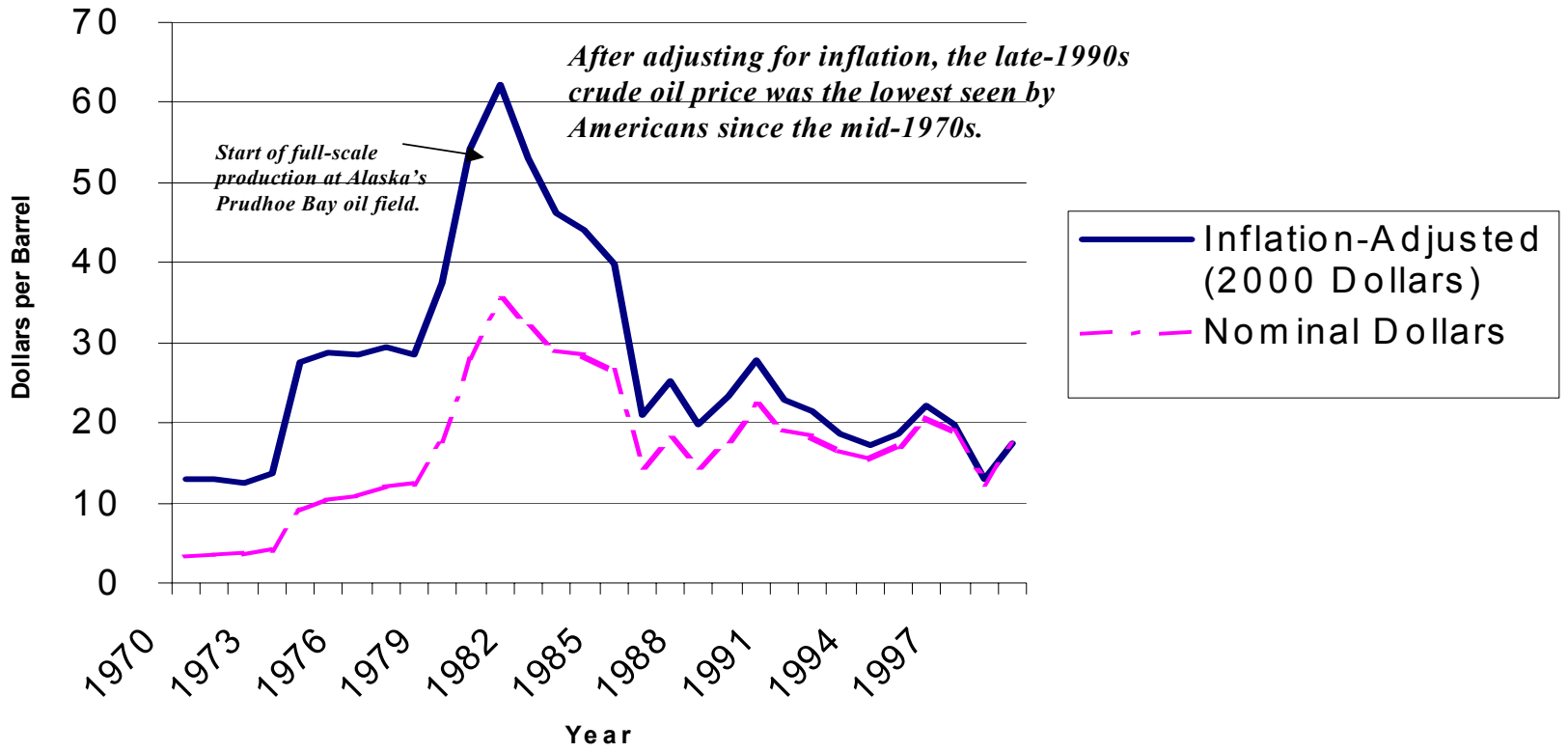


Sources: U.S. DOE, EIA, 2000, *Annual Energy Outlook 2000*, (historical and projected consumption, domestic production, and net imports), EIA, 1987, *Potential Oil Production from the Coastal Plain of the Arctic National Wildlife Refuge,* (annual production profiles, lease/exploration/development/production timing, and oil field decline curves).

Produced by Lookout Mountain Analysis for the Alaska Wilderness League, April 2000.

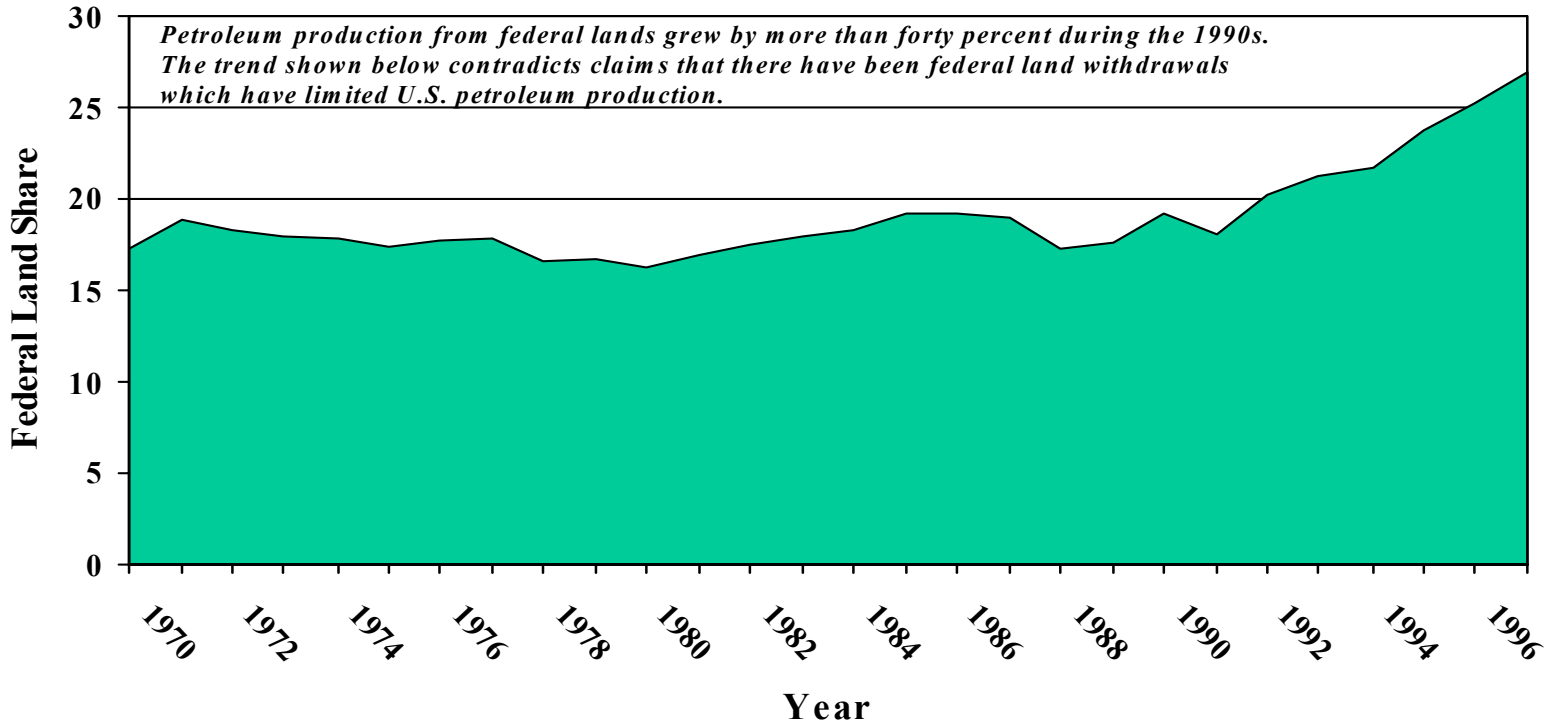
Figure 4

Refiner's Acquisition Cost of Crude Oil (Composite)



Source, Energy Information Administration, 2000, Online Energy Statistics.

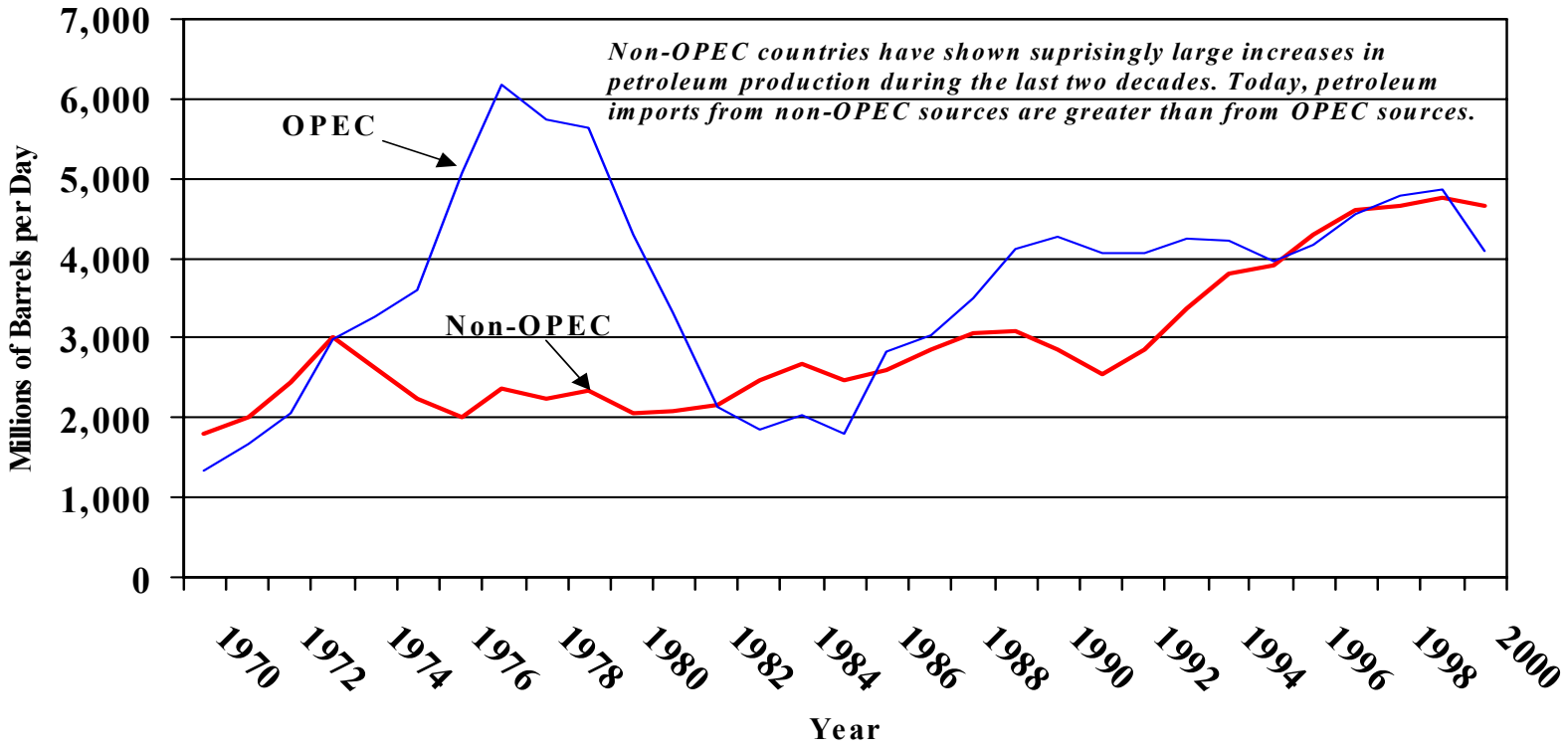
Federal Land Share of National Petroleum Production



Source: Energy Information Administration, 2000, Online Energy Statistics.

Produced by Lookout Mountain Analysis for the Alaska Wilderness League, April 2000.

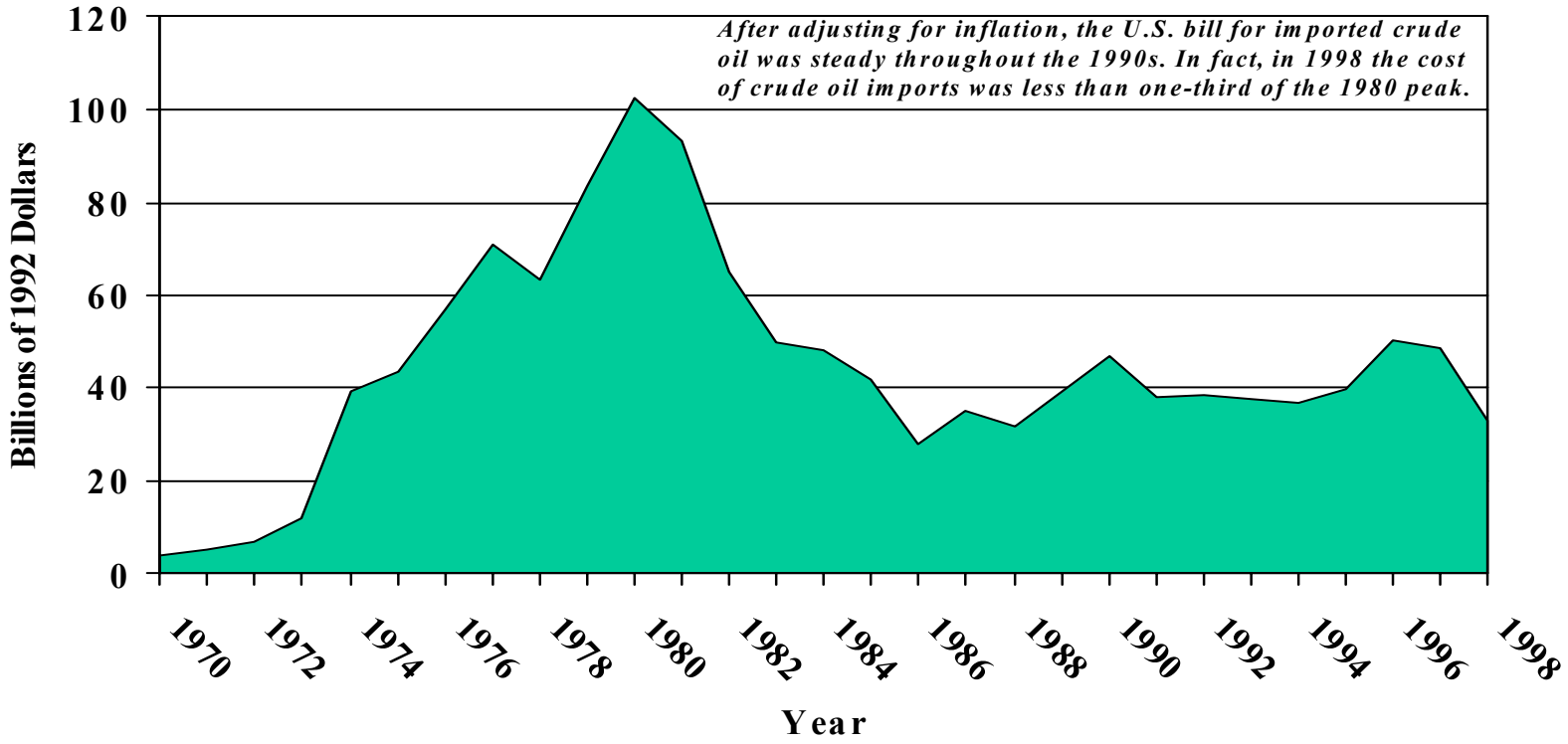
Net Petroleum Imports by Source



Source: Energy Information Administration, 2000, Online Energy Statistics.

Produced by Lookout Mountain Analysis for the Alaska Wilderness League, April 2000.

Value of Crude Oil Imports



Source: Energy Information Administration, 2000, Online Energy Statistics.

Produced by Lookout Mountain Analysis for the Alaska Wilderness League, April 2000