Executive Summary

A NATIONAL TREASURE UNDER THREAT

In the remotest corner of Alaska lies one of America's and the world's greatest treasures — the Arctic National Wildlife Refuge. In 1960, President Eisenhower established the Arctic National Wildlife Range " to protect its unique wildlife, wilderness and recreational values". In 1980, under the Alaska National Interest Lands Conservation Act the original range was renamed and greatly enlarged to incorporate the wintering grounds of the Porcupine Caribou herd.

Canada took similar action to protect the rest of the Porcupine Caribou herd's range by creating the Ivvavik National Park in 1986 and the Vuntut National Park and a contiguous special management area in 1993. This created the first large-scale wilderness reserve for wildlife ranging across international boundaries in the circumpolar arctic. Although all of these areas are managed as separate units, an international agreement signed in 1987 established the International Porcupine Caribou Board to further the protection of the Porcupine Caribou Herd.

The 8 million hectares (18.9 million acres) of the refuge constitutes one of the only places on Earth that protects the complete spectrum of sub-arctic and arctic habitats.

Unfortunately, the most critical part of the Refuge the 607,000 hectares (1.5 million acres) coastal strip of the reserve is not fully protected. Although part of the Refuge, these areas have a dual designation relating to research into both wilderness and mineral values including oil and gas. The value of the Arctic Refuge as a priceless national and international treasure, and the human rights of the Gwich'in Nation should secure the future of this unique landscape. And yet **it is under threat from oil and gas development** that would see the last 5 per cent of this coastal plain opened up to intense and high-risk development such as that in the nearby Prudhoe Bay area.

The drive to open up the Arctic Refuge is fuelled in part by the a popular myth in the USA that Alaska and the Arctic refuge can help to solve the USA's energy crisis. As this report shows the USA will depend mainly upon oil imports for the foreseeable future unless it moves to renewable sources of energy. Even if there was oil under the Arctic refuge at the estimated quantities of 3.2 billion barrels, shown in the US Geographical Survey report of 1999 it would only supply the US market for 180 days at current use levels. If all the arctic oil was to go towards reducing USA imports it would only reduce imports by 4% or less in any given year. Based on these projections WWF believes the case for opening up the Refuge for oil and gas exploration is weak.

The USA could improve its standing within the global environment community in relation to both climate change and wilderness protection by taking a stand in relation to the Arctic Refuge. WWF's message is simple – there should be no oil and gas development in the coastal plain.

A UNIQUE ENVIRONMENT

The Refuge reaches north from boreal forests (taiga) to the tallest peaks in the Brooks Range, which arch towards the ice filled Beaufort Sea. The foothills along the North Slope of the mountains sweep down to the coastal plain, which narrows dramatically to as little as four miles wide. This combination of mountains, plains, lakes, tundra wetlands and river deltas increases its habitat diversity and productivity. The narrow coastal plain provides internationally significant habitat for the Porcupine caribou herd, muskox, wolves, wolverines, brown bears, denning sites for polar bears and staging areas for over 300,000 snow geese and millions of other migratory birds. Over 135 species of birds from four continents have been identified on the Refuge.

In 1965 the US Fish and Wildlife Service summed up its position on the Arctic Refuge as follows;

"The Arctic Refuge coastal plain is unique among the refuges and parks of the United States. Impacts from development would be major, and measures to reduce or remediate those impacts are uncertain. For its biological richness, undisturbed vastness and fragility as arctic Eco system, the coastal plain of the Arctic National Wildlife Refuge is a national treasure, and would be irreparably altered by development."

The importance of this area has already been recognised and respected by the Government of Canada and must be respected by the Government of the USA, the Alaska State Government and the oil and gas industry (Miller, 2000).

You can not place a value on a national treasure; it is priceless and has to be preserved for present and future generations.

THE SACRED LAND OF THE GWICH'IN

For over 20,000 years the Gwich'in (People of the Reindeer) have treated the coastal plain of the Arctic Refuge as sacred lands. In that time they have sustainably managed this delicate environment and the surrounding lands of the Arctic National Wildlife Refuge for the benefit of wildlife as well as their own survival.

The Gwich'in Nation is the most northern American Indian Nation and their territories straddle the Border between Canada and Alaska. The tribe has already been reduced from 150,000 to less than 7,000 as a result of disease and wars. They depend on caribou from the Porcupine herd, the world's largest international caribou herd, for their survival.

The 7,000 Gwich'in live in 14 villages along the migratory route of the Porcupine herd. As a result of climate change and other causes, the Porcupine herd has been reduced in size from 150,000 to less than 130,000.

The Porcupine herd depends upon its calving grounds for its survival. Eighty percent of the time the herd calves in the Arctic Refuge. The Canadian government has already protected the other main calving areas by creating two national parks and a special management area. The

Canadian Government has asked the US Government and the Alaska State Government to permanently protect the coastal plain of the Arctic Refuge so that the caribou and Gwich'in can survive.

The oil companies however are trying to change the status of the Arctic refuge to allow exploitation in the coastal plain of the Refuge. This is strongly opposed by the Gwich'in. Their case is supported by the National Congress of American Indians, which represents 200 tribes.

The Gwich'in Nation's rights under the International Convention 169 for indigenous people are explicit.

Article 7.

They have the right "*to decide their own priorities for development as it affects their lives, beliefs, institutions and spiritual well being and the lands they occupy or otherwise use.*"

Article 12

"The peoples concerned shall be safeguarded against the abuse of their rights and shall be able to take legal proceedings, either individually or through their representative bodies, for the effective protection of their rights."

Part II of the Convention Land

Article 13

"*Governments shall respect the special importance for the cultures and spiritual values of the peoples concerned of their relationship with the lands and territories, which they occupy or otherwise use, and in particular the collective aspects of this relationship*"

"*The use of the term lands in Articles 15 and 16 shall include the concept of territories, which covers the total environment of the areas which the people concerned occupy or otherwise use*."

WWF RECOMMENDATIONS

This report presents a brief overview of the context in which potential oil production from the Arctic National Wildlife Refuge might be judged. The economic analysis has been prepared by Dr. W. Thomas Goerold, Chief Economist, Lookout Mountain Analysis, USA. Topics covered include discussions of the US oil and energy balance, primary uses of petroleum, an examination of the methodology and results of different resource estimates of potential oil in the Refuge, and a discussion of the impacts of some potential alternatives to oil production from the Arctic Refuge.

The decision on whether to develop the coastal plain of the refuge for oil and gas or to permanently protect it in the national wilderness preservation system is left to the Congress and the President of the USA.

WWF is calling on the oil and gas industry to:

- publicly withdraw from interests in oil exploitation in the Arctic Refuge and publicly support permanent protection of the Refuge for its wilderness values. A public commitment of this kind would qualify for a Gift to the Earth through WWF's Global 200 Programme.

WWF is calling on Congress and President Clinton to:

- resist lobbying efforts to open up the coastal plain to oil and gas exploration; and
- declare this area a National Monument which would give it permanent protection under US law.

Challenging the Economic Myths

WHAT IS THE EXPECTED ENERGY BALANCE FOR PETROLEUM IN THE UNITED STATES, AND HOW MIGHT OIL FROM THE ARCTIC NATIONAL WILDLIFE REFUGE ALTER THIS BALANCE?

Since 1970 and into the foreseeable future the Energy Information Administration of the US Department of Energy forecasts that the lands of the United States, the most intensively explored petroleum regions on earth, will continue to yield ever smaller quantities of oil (DOE/EIA, 2000a). Many changes have occurred since the US was the world's largest oil exporter in the mid-twentieth century. The days have long since passed, apparently never to return, when the United Kingdom and other industrialised countries counted on America for large shipments of crude oil. Nowadays, the roles are largely reversed — the United States is now a net importer of crude oil and petroleum products from the United Kingdom as well as from a host of other OPEC and non-OPEC countries. Currently, about one-half of petroleum imports come from OPEC sources.

While US oil production has continued to diminish over time, demand for oil is expected to continue to climb. Largely by projecting current trends, DOE expects that by the year 2020 US annual consumption of oil will amount to about 8.5 billion barrels, while domestic production will total about 2.5 billion barrels. The 6 billion barrel deficit would be comprised of oil imports—amounting to about 70 percent of US consumption by 2020 (DOE/EIA, 2000a).

It is virtually certain that the US will increasingly become an oil-importing nation. There are no credible estimates that, even with a huge contribution of oil production from the Arctic National Wildlife Refuge in Alaska, the US would be able to reverse these fundamental energy truths.

Indeed, even with very significant oil production from the Arctic Refuge, some might be surprised with how little the US energy balance could be altered. The upper line in Figure 1 shows projected US petroleum consumption until 2020. The lower line portrays the slowly declining path of projected domestic oil production. And, the middle "bubble" of the graph shows the impact that oil production from the Arctic Refuge might have on fundamental supply and demand balances. Of course no one knows how much oil might be produced from the Arctic Refuge, if any. But the 3.2 billion barrel amount used in this figure is taken from the fact sheet of the most recent comprehensive study performed by the US Geological Survey (USGS, 1999).

Using this 3.2 billion barrel figure presented in the USGS report as a benchmark, the year 2014 represents the high-water mark of possible import reductions. In that year, imports might be expected to decline from about 69 percent of consumption to about 65 percent of consumption. After 2014 the impact of potential oil production from the Refuge would continually wane.

Put into another context, if 3.2 billion barrels of oil were available immediately, it would represent about 180 days worth of consumption at current rates. More details on impacts from potential petroleum production from the Arctic Refuge are discussed below.

WHERE ARE THE MAJOR USES OF PETROLEUM AND WHAT IS THE GLOBAL WARMING IMPACT OF ITS USE IN THE UNITED STATES?

In 1998, petroleum was the largest single energy source consumed in the United States. About 6.4 billion barrels of petroleum were used in that year, representing almost 40 percent of all national energy consumption (Figure 2, DOE/EIA, 1999). Nationally, motor gasoline comprised about 44 percent of petroleum products consumed, with diesel fuel and jet fuel accounting for another 18 and 9 percent, respectively. The transportation sector accounted for about two-thirds of national petroleum consumption (Figure 3, DOE/EIA, 1999).

Carbon dioxide emissions represent more than 96 percent of human-derived greenhouse gases. Experts contend that greenhouse gases are major contributors to global warming. In 1997, the US DOE estimated that petroleum was responsible for approximately 610 million metric tons of carbon—about 42 percent of all US carbon dioxide emissions. More than three-quarters of the 610 million metric tons of CO_2 emissions was caused by the combustion of petroleum products in the transportation sector (DOE/EIA, 2000).

HOW ARE ESTIMATES MADE ABOUT THE OIL RESOURCE THAT MIGHT BE FOUND IN THE ARCTIC REFUGE?

Because the Arctic Refuge has never been subjected to drilling for oil no one knows with any degree of certainty how much, if any, economically producible amounts of petroleum may underlie the area. To complicate matters, there have been a multitude of estimates over a fifteen-or-more year period that have attempted to quantify the amounts of oil. It is important to note that all of these estimates have been done by applying advanced statistical measurement techniques. These estimates have incorporated indirect measurements of the subsurface of Arctic Refuge rocks and combined them with knowledge about similar rocks outside of Refuge confines.

Arctic Refuge oil estimation methodologies have usually included most of the items discussed below.

(1) The actual region covered by regional oil resource estimates. Several oil projections include not only what is called the “1002 area” (the area described in section 1002 of federal legislation and corresponding to the coastal plain within the Arctic National Wildlife Refuge), but many resource projections also include areas that are outside of the Arctic Refuge (Alaska Native lands and offshore areas out to the 3-mile limit of Alaska State lands).

(2) Oil resource projections typically adhere to similar methodologies.

a) A quantitative assessment is made of the total amount of oil that may underlie the "1002 area" of the Arctic Refuge area, or a larger area including the other land categories described above. This measure, frequently termed "in-place oil" represents geologists' best guess about the total volumes of oil lying in the sub-surface, regardless of whether or not it could ever be pumped to the surface.

b) A fraction of the in-place oil is then deemed to be "technically recoverable." The US Geological Survey definition of technically recoverable oil is the amount of petroleum that may be recoverable using current technology without regard to cost.

c) Some studies calculate a subset of technically recoverable oil that is called "commercially recoverable." Commercially recoverable oil should not be confused with the term economically recoverable oil, described in (d) below. One of the most critical aspects of commercially recoverable oil is that it is assumed that the oil producer knows exactly where the oil pools lie and which ones to target for development drilling. In other words, commercially recoverable oil estimates assume that all exploration activities have already taken place and that the costs of exploration are not factored into any subsequent cost calculations.

   Put into the perspective of the Arctic Refuge, if economically viable amounts of oil exist in the Refuge, and if all of the Refuge had been subjected to exploration drilling, the next step would be to analyse and integrate all of the knowledge gained by drilling to identify the exact location and nature of the oil to be produced. Given the identification of these targets of viable oil, commercially recoverable oil estimates represent the fraction of technically recoverable oil that could be produced at a profit to an oil company with no further exploration efforts.

d) A different category of technically recoverable oil is termed "economically recoverable" oil. The primary difference between this term and commercially recoverable oil is that economically recoverable oil does not assume that exploration drilling has already taken place that has identified the exact targets of oil production.

   Because no exploration drilling has yet taken place in the Refuge, the most meaningful resource estimate for current policy purposes is category (d)—economically recoverable oil. This is the measure that compares the total costs of exploration, development and production of oil and calculates the minimum price needed to recapture these total costs.

   To elaborate, exploration drilling is not a costless activity. For any given oil price the amount of economically recoverable oil in an area will always be less than the amount of commercially recoverable oil. Information gained by exploration drilling is expensive. Commercially recoverable oil estimates assume that one already has all information needed for development and

ignores the costs associated with gaining that information. But, because no one know where, how much, and how deep large pockets of oil may lie in the Refuge, one must first do exploration drilling to answer these questions if oil production is to take place. In order to recoup the cost of exploration drilling, an oil company must fetch a higher price for the oil than if all exploration activities have already been completed.

Moving from category (a)—in-place oil, to category (d)--economically recoverable oil, requires many difficult and specific assumptions regarding both the current and future costs of oil extraction, as well as the likely price that the petroleum might fetch on the market throughout the life of the oil field. Because of these complicating assumptions, the estimation process described above produces no single measure of economically recoverable oil but instead yields a broad range of values presented in the form of probability distributions.

THERE ARE TWO RECENT RESOURCE ESTIMATES FOR POTENTIAL OIL PRODUCTION FROM THE ARCTIC REFUGE, ONE FROM THE US GEOLOGICAL SURVEY (USGS) AND ONE FROM DOE/EIA. WHAT ARE THE DIFFERENCES BETWEEN THESE TWO ESTIMATES?

US Geological Survey (USGS), 1999

Figure 4 presents a summary of some of these estimates that are discussed by the USGS in 1999. The leftmost series of bars in Figure 4 give an estimate of the amount of technically recoverable oil (oil that could be pumped to the surface regardless of cost) for the eastern North Slope region. The eastern North Slope, as used in this context, is defined as the "1002 area" plus adjacent lands owned by Alaska Natives plus areas underlying the Beaufort Sea adjacent to the "1002 area" out to the 3-mile state limit. (Beyond the 3-mile limit offshore lands and associated resources are owned by the federal government).

Statistical techniques employed in this process yield a low (5^{th} percentile), mean (50^{th} percentile), and high (95^{th} percentile) estimate of the total amount of technically recoverable oil that might be found underneath the aggregated eastern North Slope. Resource estimates range from a low of about 6 billion barrels to about 16 billion barrels of technically producible oil, with a mean estimate of about 10 billion barrels (USGS, 1999).

Confining the resource estimates to the lands underlying only the "1002 area" results in a series of estimates corresponding to categories (a) through (d) above. Total amounts of in-place oil underneath the "1002 area" are estimated to range from about 12 to about 32 billion barrels, with a central projection of about 21 billion barrels (shown by the second set of bars). The fraction of total in-place oil which is deemed by the USGS as being technically producible spans values of approximately 4 to 12 billion barrels, with a mean of about 7.7 billion barrels (third set of bars in Figure 4).

Finally, the single point estimate given in the fact sheet of the USGS report for economically recoverable oil is 3.2 billion barrels (rightmost bar in Figure 4) (USGS, 1999). All other things being equal, higher oil prices allow for the use of more costly technologies to be employed in gathering additional petroleum from underground fields. The net result of this relationship is that higher assumed future oil prices lead to higher estimates of economically recoverable oil.

More information about the span of results for economically recoverable oil and the importance of future oil price in these estimates is given below.

Department of Energy/Energy Information Administration (DOE/EIA), 2000

In late May 2000 the DOE/EIA issued a report that provided new and apparently larger estimates of potential oil production from the Arctic Refuge (DOE/EIA, 2000b). The DOE/EIA report reportedly is wholly based on a re-interpretation of the information contained in the US Geological Survey report mentioned above. Even though the DOE/EIA report uses the USGS report as its foundation, the author of the most relevant part of the USGS report states that no DOE/EIA representative talked with him about the proper use of the USGS report or the alternative conclusions presented in the DOE/EIA report.

At first reading, the apparent conclusions of the DOE/EIA report are that there is a significantly greater amount of economically producible oil that was likely to be found in the Refuge than stated in the USGS report. However, a careful reading of the DOE/EIA report shows that it primarily presents a set of production curves based on the technically recoverable and commercially recoverable oil estimates contained in the USGS report. In addition, the DOE/EIA reports lumps together the "1002 area" estimates with the Native lands and offshore State lands estimates.

Caveats contained in the DOE/EIA report state that the effects of oil price and the rate of technology advances (an indirect determinant of costs) were not factored into the report. As a result, the DOE/EIA report does not, and cannot, give estimates of the total size or of the likely annual production of any economically producible oil. Unfortunately, the subtle distinctions between the concepts of technically producible, commercially producible, and economically producible oil contained in the USGS and DOE/EIA reports have sometimes been misconstrued by some members of the media. This lack of understanding has led to some unsupported claims of much larger amounts of economically producible oil in the Refuge than can be justified by the evidence.

In summary, the most meaningful category of Arctic Refuge petroleum estimates is the amount of economically producible oil. The USGS report is the most recent document that estimates the values of economically recoverable oil while considering the effect of price and cost options. The DOE/EIA document presents production curves that do not fully account for all the costs of finding, developing, and producing the oil. As a result, the DOE/EIA report overstates the amount of the petroleum resource likely to be produced from the Arctic Refuge, given our current state of knowledge.

WHAT IS THE IMPORTANCE OF ASSUMPTIONS ABOUT THE FUTURE OIL PRICE WHEN ESTIMATING VALUES FOR ECONOMICALLY PRODUCIBLE OIL? IS THERE A MINIMUM OIL PRICE NEEDED TO ENSURE THAT ECONOMICALLY VIABLE OIL PRODUCTION WOULD TAKE PLACE IN THE ARCTIC REFUGE?

Different methodologies reported in the USGS and DOE/EIA studies have noted the importance of cost and oil price assumptions on oil resource estimates. All other things being held constant, a higher cost or a lower price for exploring and developing the Refuge's potential oil resources

necessarily leads to lower resource estimates. The reason for this relationship is that it is assumed that any oil company that would try to produce oil from the Refuge only up to the point where the cost of production would be less than or equal to the price received for the resource. Put another way, the lower the price fetched for the oil, or the higher the production cost per barrel, the smaller the amount of oil that could be extracted from the Refuge. Conversely, in the event that the expected oil price rises, or that the costs of production decline, the result would be an increase in the volumes of expected economically producible oil.

Authors of the DOE/EIA study did not perform a quantitative study of the oil price and economically producible oil relationships, But, the USGS report presents a series of curves that show the expected value of economically producible oil at a range of oil prices. Because there is an infinite set of future oil prices possible, the USGS simplified the presentation of the price/resource estimate by assuming certain discrete levels of unchanging oil prices throughout the life of any oil production in the Arctic Refuge.

Figure 5 portrays oil price and resource estimates as discussed in the USGS report. At an oil price below approximately $16.35 per barrel (Alaska North Slope (ANS) crude oil delivered to the West Coast of the US), there is not expected to be found any economically recoverable oil. However, if the ANS West Coast price climbs higher, the USGS expected value of economically recoverable oil ranges from about 2.4 billion barrels at $19.62, to as high as 6.3 billion barrels at $32.70 (USGS, 1999).

Currently the average price of West Coast delivered Alaska North Slope crude is at an unusually high level, in the neighborhood of about $23.34 per barrel (State of Alaska, Department of Revenue, Spring 2000). Examining the curve presented in Figure 5, one could estimate that a price of $23.34 implies an estimate of economically recoverable oil of about 4 billion barrels. But, in order to satisfy the 4 billion barrel resource estimate, the price of $23.34 must be maintained throughout the 30- to 60-year-or- more life of any potential oil production from the Arctic Refuge. Note that just one year ago the ANS West Coast price stood at about $13 per barrel.

Figure 6 depicts a forecast of ANS West Coast crude oil prices derived from the Alaska Department of Revenue forecast (State of Alaska, Department of Revenue, Spring 2000). Note the horizontal line at an oil price of $16.35. According to the USGS data the expected value of oil reserves that might be found in the Arctic Refuge is zero if the ANS oil price is below $16.35. At prices higher than $16.35 the USGS expects the Arctic Refuge to yield economically recoverable oil at the rates shown in Figure 5.

The higher the price of delivered Alaska North Slope oil, the greater is the expected amount of economically recoverable oil. After 2004, the State of Alaska assumes that the relevant oil price will drop below the minimum $16.35 needed to support even a minimum-size oil field. So, combining the Alaska Department of Revenue projections of the ANS West Coast oil price with USGS resource estimates shows that the most likely outcome of exploration drilling in the Arctic Refuge would be that no economically recoverable oil would be found in the Arctic Refuge.

IF OIL IS NOT PRODUCED FROM THE ARCTIC REFUGE WHAT OTHER ALTERNATIVES ARE THERE TO SATISFY THE EXPECTED DEMAND FOR PETROLEUM IN THE US?

Two-thirds of all petroleum is consumed in the transportation sector. As a result, policies that impact oil consumption in that sector are most likely to have the greatest impact. Perhaps the most promising alternative to producing petroleum from the Refuge is to re-institute a series of more stringent mandates for automobile and light-truck fuel efficiency. This solution makes sense from both a production aspect and from a pollution-prevention aspect.

Figure 7 is a simplified graph that estimates the impact of mandating a three-percent annual increase in fuel efficiency standards for new automobiles and light trucks starting in 2000. (The graph is not as elaborate and comprehensive as some of the cases presented in the DOE/EIA Annual Energy Outlook 2000, but should be taken as a reasonable approximation of fuel savings, while using many of the most important assumptions used in DOE/EIA analyses). Three percent annual improvement in these standards would result in a 2020 benchmark for automobiles of about 53 miles per gallon, and light trucks of about 39 miles per gallon. Prototype vehicles now exist that could satisfy these standards.

According to the calculations shown in Figure 7, by the year 2020 approximately 19.6 billion fewer barrels of oil would be consumed and imported when compared to oil demands due to fuel efficiency standards in place today. This analysis also implies that the demand for imported oil would actually begin to decrease by 2010 as demand for petroleum decreases due to increased fuel efficiency standards. And, as an added bonus, even if fuel efficiency standards are not increased past the year 2020, fuel savings would continue to accrue into the future as less efficient vehicles are replaced by newer and more efficient vehicles over time.

Compare this 19.6 billion barrel savings with the 3.2 billion barrel production given as an example in the 1999 USGS report.

A further bonus of the oil savings derived from the fuel efficiency standards is the amount of combustion-related pollution and greenhouse gases that would be avoided as compared with consumption of the 3.2 billion barrels from the Arctic Refuge.

DOE/EIA also presents scenarios that contain assumptions of more modest improvements in vehicle fuel efficiency (DOE/EIA, 2000a). The 2000 technology scenario projects fuel needs and greenhouse gas output if the future automobile and light truck fleet continues at present levels. The high technology scenario assumes that the mandated standards for cars would increase to about 39 miles per gallon and light trucks would climb to approximately 29 miles per gallon by the year 2020. A comparison of these two scenarios shows that about 9.2 billion fewer barrels of petroleum would be consumed with the high technology scenario relative to the 2000 scenario. The magnitude of this fuel savings dwarfs the amount of oil that might be extracted from the Refuge. Even so, the 9.2 billion barrel savings understates the actual total savings because it occurs by the year 2020, with the potential for many more years of increased fuel savings to come. Meanwhile the full benefits of oil output that might be expected from the Refuge may not occur until 30 to 60 years after the start of production.

Figure 8 shows the contribution of greenhouse gases that might be expected from the 2000 technology scenario as contrasted with the high technology scenario. While some of these carbon emission reductions are derived from efficiency improvements in aircraft and marine sources, at least two-thirds of the carbon emission reductions are due to increases in the fuel efficiency of cars and light trucks to standards of 39 mpg and 29 mpg, respectively, by the year 2020. The 2000 technology standard presumes that new car and truck efficiencies will be frozen at the current levels of 29 and 21 mpg, respectively.

The difference in carbon emissions between these two cases is about 124 million metric tons of carbon—an amount equal to almost 25 percent of the total carbon emissions from the transportation sector in 2000. The three-percent annual improvement scenario presented earlier in this section would produce proportionately greater reductions in greenhouse gas emissions.

In conclusion, this analysis shows that mandated increases in fuel efficiency for cars and light trucks are superior actions to producing potential oil from the Arctic Refuge for at least two reasons; (1) much more energy could be derived from efficiency improvements as compared with probable Refuge petroleum production, and (2) fuel efficiency improvements make a major contribution towards decreasing carbon emissions. Oil extracted and combusted from the Arctic Refuge would add to carbon emissions, making any attempt to comply with standards set under the Kyoto accord that much harder to meet.

CONCLUSIONS

Approximately 40 percent of the energy consumed in the US is derived from petroleum. About 67 percent of petroleum consumed is used in the transportation sector. As a result, discussion of the impacts of petroleum production, consumption, and imports necessarily focus on the transportation sector. Currently, about one-half of petroleum consumed in the US is imported. Imports from OPEC countries make up about 50 percent of total imports.

Even with a 3.2 billion barrel or greater find in the Arctic Refuge the fundamental truth is that the US will become increasingly dependent on imported oil to meet its projected needs, given current trends and expectations. **If it were immediately available, 3.2 billion barrels of oil represents approximately 180 days worth of use in the US, at current levels of consumption. In reality, Refuge oil production would be spread out over the 30 or more years.** If all Arctic Refuge oil was to go towards reducing imports (even though North Slope oil now is shipped overseas), imports would be reduced by 4 percent or less in any given year.

Many different reports exist that describe and quantify the amount of oil that might be recovered from the Arctic Refuge. The most recent and comprehensive report, done by the US Geological Survey in 1999, explains that the amount of economically recoverable oil is critically dependent on the future oil price. Because oil production in the Refuge could not begin until at least 2010, the oil prices a decade or more from now are the most important numbers to examine. US Geological Survey calculations show that a minimum price of about $16.35 per barrel is needed before any economically producible oil is expected to be found. The relevant oil price for this scenario is not the “global oil price” modeled by the DOE/EIA, but is the price of Alaska North Slope oil delivered to the West Coast (ANS West Coast). Typically, the ANS West Coast price is significantly lower than posted global oil prices.

Any oil price below $16.35 implies that no oil production from the Refuge would be economically feasible. If oil prices during that period are above the $16.35 benchmark, the USGS study implies that an increasing amount of oil might be economically exploited from the Refuge. At prices as high as $32.70 per barrel, the USGS estimates that as much as 6.3 billion barrels of oil might be profitably extracted by oil companies.

Because of the tax significance of any oil production from the Arctic Refuge, the Alaska Department of Revenue produces a forecast of the expected prices of the ANS West Coast oil. According to the Alaska forecast, officials expect that the price of ANS West Coast oil to continually decline from its current level near $23 per barrel, down to about $13.50. Given this forecast, the USGS predicts that no economically producible would likely be found in the Refuge.

Estimates of production from the DOE/EIA need to be used with caution because they are based on the partial costs of oil production. As a result, the production profiles that are shown in the report do not show the expected amounts of economically producible oil. Instead, the oil production profiles shown in this publication all overstate the amount of economically producible oil that might be present in the Arctic Refuge.

Modest or more aggressive increases in the fuel efficiency standards for automobiles and light trucks in the US would produce far more savings in consumption than could ever reasonably expected from oil fields in the Refuge. In addition to saving the Refuge from industrialization, fuel efficiency increases would also contribute significantly to reducing carbon emissions and aid the US in complying with emission reductions mandated by the recent Kyoto accord.

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