

Arctic National Wildlife Refuge: A Refuge for America?

Christine E. Fogliasso, J.D.
University Professor
Pittsburg State University
Department of Management and Marketing
1701 South Broadway
Pittsburg, KS 66762
Telephone: 620-235-6010
E-mail: chrisfog@pittstate.edu

Margie Washburn, MBA Candidate
Pittsburg State University
1701 South Broadway
Pittsburg, KS 66762

ABSTRACT

There are strong supporters on both sides of the issue of whether or not America should drill in the Arctic National Wildlife Refuge. The primary concerns about doing so include the protection of the environment and wildlife, and the fact that there might not be enough oil in the ground to satiate America's need. However supporters of the initiative argue that the amount of oil is unclear, and that only drilling will reveal how much is actually harbored in the refuge. Also, when compared to similar drilling regions in Alaska, any effect on wildlife would be minimal. In fact, some analysts actually indicate that the wildlife has significantly prospered during past times of drilling. So the question becomes: Does America drill for oil, "savage" the land, and not receive any significant amount of oil to fuel its massive consumption? Or is America sitting on an untapped goldmine?

PURPOSE

According to the U.S. Energy Information Administration (EIA), the United States consumes almost seven billion barrels of oil per year (almost 19 million barrels per day). This statistic has grown significantly over time and continues to increase. Although there are initiatives to reduce America's dependence on gasoline, it is still the primary energy solution. The United States is the leader in oil consumption; however it is third in oil production (EIA). Therefore, to make up the difference the U.S. is currently importing over half its oil supplies

from a variety of different countries all over the world. While most experts recognize a need for the U.S. to reduce its dependency on foreign oil, the country is still importing over half its energy supply. This puts the United States in an economic chokehold. The country is dependent on the oil imported from a variety of countries for America to heat homes, power vehicles, and fuel its citizens' daily lives. Critics of the current import situation argue that the country should completely eliminate its need for imported oil. However the process of converting oil use to alternative sources (such as water, electric or hydrogen) would take years (or even decades) to complete. Since there is an obvious need to reduce U.S. foreign oil dependency, some suggest the country should look in its own backyard for answers to solve this problem.

ARCTIC NATIONAL WILDLIFE REFUGE

Located above the Arctic Circle and 1,300 miles below the North Pole, in a northeastern corner of a sparsely populated section of Alaska, there is an area of over 19 million acres of land named the Arctic National Wildlife Refuge (ANWR). Inside of the 19 million acres there is a section of land named the "10-02 Area" or the "Coastal Plains" that has been set aside for oil and gas exploration. The 10-02 Area encompasses million acres, at the topmost section of ANWR (which is roughly the size of Delaware). However there is no real exploration activity occurring there, even though it has been set aside for that specific purpose. Even if there were oil and gas exploration activities going on in the 10-02 area, only 2,000 acres of the allotted 1.5 million would be accessible to oil corporations. The area cannot be explored without the approval of Congress and that specific debate has not yet yielded an outcome (Arctic Power). There are wildlife and environmental concerns with drilling in the Arctic. However the main reason for the lack of drilling is that environmental protection groups argue there is not enough oil located in ANWR to significantly reduce America's dependency on foreign oil. The idea of ravaging one of the last few shorelines of the Arctic does not sit well with many people.

THE HISTORY

In 1960 President Dwight Eisenhower designated 3.2 million hectares of land that a group of scientists deemed appropriate and necessary to preserve a vast ecosystem of plants and animals. They called this the Arctic National Wildlife Range. In the early 1970's Congress enacted the Alaska Native Claims Settlement Act to "resolve all Native aboriginal land claims against the United States" (Almanac). This act essentially paid the native residents for the land, and in the process set up village corporations. Ten years later Congress passed the Alaska National Interest Land Conservation Act (ANILCA) and another 4 million hectares of land was added to comprise the region now known as the Arctic National Wildlife Refuge (Cohn). There have been debates over the land ever since its creation, and even fifty years ago state officials were concerned that this would effectively lock up the land, and make drilling and excavation of

natural resources extremely difficult (Cohn). Since Eisenhower's designation of the land there have been many presidents who have looked at ANWR as a drilling possibility (see Figure 1)

THE CLIMATE AND WILDLIFE

Like much of Northern Alaska, the 10-02 Area is "unbearably cold and dark" (Arctic Power). Temperatures range from 40° Fahrenheit in the summer months to well below zero in the winter months. There are sections of the year where the sun does not rise at all, leaving the uninviting area dark and cold. However, in the summer time, there is continuous daylight, showing miles of vast empty tundra (Arctic Power).

There is a wide array of wildlife including hundreds of different birds that migrate to the area every year to raise their young, molt, or just continue on the migration process. There is also the impressive Porcupine Caribou herd, which travels through the region during their migration pattern. As the winter cycle comes to a close, the herd starts to migrate north into the upper region of ANWR, which is where they stay until the fall season comes and pushes them back to the south where the climate is not as harsh (Arctic Power). These caribou are an important source of food for natives who live a subsistence life style and live off the land. These animals are a staple of many natives' diet, and without those animal many residents would be forced to search for other sources of meat (which might not be as easily hunted or found) or else rely on expensive grocery services. Numerous other animals are also in the region, such as musk oxen, bears (grizzly and polar), wolves and moose. However most of the animals are not regularly found in the Coastal Plains area, with food resources being sparse and the climate conditions being too harsh (Arctic Power).

ANWR ESTIMATED OIL RESERVE

There are many different estimates regarding how much oil is contained in the Coastal Plains region of ANWR. In 1987 geologists believed that there could be as little as 500 million barrels located onshore (Arctic Power). But the actual amount of oil located in the reserve is unclear, as only drilling will tell how much is actually there. At the current time there is only one oil well on the Coastal Plains, and it is owned by the Kaktovic Inupiat Corporation (Arctic Power).

The EIA has done a study to estimate crude oil production on the reserve. After factoring in a production timeline, market oil conditions, field size and timing of continuous development, The EIA concluded:

"...In the mean oil resource case, the total volume of technically recoverable crude oil projected to be found within the coastal plain area is 10.4 billion barrels, compared to 5.7 billion barrels for the 95-percent probability estimate, and 16.0 billion barrels for the 5-percent probability estimate. Because the USGS 5-percent and 95-percent probability oil resource estimates are asymmetric around the mean estimate, the

expected field size distribution and, in turn, the distribution of projected oil production are also asymmetric with respect to the mean estimate's field sizes and projected production. In the mean oil resource case, the largest projected field in ANWR is nearly 1.4 billion barrels" (U.S. Energy Information Administration, 2008, 1)

This means there are potentially 1.4 billion barrels of oil located in the Coastal Plains area of the reserve (see Figure 2). This would make an enormous impact on United States domestic production of natural resources. However, another source has strikingly different numbers about the amount of potential oil. The Almanac of Policy Issues states:

"...In 1998 by the U. S. Geological Survey (USGS), found that there is an excellent chance (95%) that at least 11.6 billion barrels of oil are present on federal lands in the 1002 area. There also is a small chance (5%) that 31.5 billion barrels or more are present. USGS estimates there is an excellent chance (95%) that 4.3 billion barrels or more are technically recoverable (costs not considered); and there is a small chance (5%) that 11.8 billion barrels or more are technically recoverable." (Almanac of Policy Issues, 2005, 1)

These figures are even higher than the numbers previously quoted. So which is correct? Again, without drilling, it is difficult (if not impossible) to be certain. The EIA estimates that it would take ten years to put the plan into production, based on an eight to twelve year guideline. According to the EIA's time line, if Congress were to approve drilling in the Arctic, the first two to three years would all be bureaucratic red tape. That initial time period would consist of obtaining leases at auctions for companies to drill, completing the required paperwork and collection of data. The next two to three years would be filled with exploratory drilling, in order to collect more "geophysical data". After four to six years have passed, the companies and the government would then start on a production plan (but only if an oil reservoir is discovered). The last three to four years would consist of the construction and transportation of materials to the Coastal Plains region and setup of the wells. Even if Congress approved drilling today, production would not start until 2019 at the earliest.

ARGUMENTS IN FAVOR OF DRILLING

If Congress allowed the opening of 10-02 to drilling, it could create thousands of employment opportunities. Jobs would be created in every aspect of the process. This pattern has been seen in the North Slope area, where thousands of people are needed to keep the industry going. A similar situation is also seen with the oil boom in North Dakota. People have flocked to the area, hoping to obtain a job working in the oil fields. These hopeful job seekers have lived in tents, campers, and vehicles in order to find employment. The oil business in that area is

Insights to a Changing World (Volume 2012 Issue 1)
Franklin Publishing Company www.franklinpublishing.net

stimulating the economy. Oil workers are paid a good wage, and those workers are in turn spending more, which generates income throughout the community. In North Dakota home prices have skyrocketed because of the shortage of housing available to all the recent migrants. This leads to more work in home development, creating even more jobs and additional revenue. New businesses are also sprouting up because there is more need for them. However, unlike the situation in North Dakota where people can “camp out” around the potential oil field site, the Coastal Plain would be uninhabitable, therefore increasing the need for homes and businesses around Anchorage and Fairbanks. There would also be a need to improve transportation to the area, which currently can only be accessed by plane or boat. Either way, more industries profit, because employees have to get there in order to work.

In recessionary periods like the present, it makes sense to stimulate the economy by bringing more jobs to America and more dollars back into the taxpayer’s pocket. In addition, drilling in Alaska would also help reduce dependence on foreign oil. If there are at least 1.4 billion barrels in the reserve (20% of current U.S. annual consumption), it would reduce the need for imported oil by 20%. That number is significant and would be an important step in helping solve the problem of America being so dependent on imported oil.

ARGUMENTS AGAINST DRILLING

Although arguments can be made in favor of initiating the exploration process of ANWR, arguments can certainly be made against doing so, as well. According to the EIA, Alaskan oilfields have always been more expensive to develop, and they have shown that in five years the cost of doing so has increased even more. The following paragraph shows the tremendous price difference between drilling in Alaska and drilling elsewhere:

“For example, the American Petroleum Institute’s (API) *Joint Association Survey of Drilling Costs* (JAS) reports, that for the 10,000 to 12,499-foot well-depth interval, the average cost of drilling a domestic onshore oil well increased from \$111 per foot-drilled in 2000 to \$294 per foot-drilled in 2005, a 165-percent cost increase. For the same well-depth interval, Alaska onshore oil well drilling costs increased from \$283 per foot-drilled in 2000 to \$1,880 per foot-drilled in 2005, a 564-percent cost increase...” (U.S. Energy Information Administration, 2008, 1)

In order for companies to start the excavation process, it is obvious they will need enormous amounts of capital. Also, the debate over ANWR has continued for so long that many large companies who may have been interested at some point are no longer looking at ANWR as a possibility, and are instead focusing on other regions.

Many critics of the proposed drilling see one especially significant problem: the destruction of one of the last untouched ecosystems in our country. At ANWR’s fiftieth birthday

(hosted by the US Fish and Wildlife Service) Roger Kaye, a wilderness activist said, “ANWR represents a wildlife sanctuary within an intact ecological system that is big enough to allow ecological and evolutionary processes to be preserved,” and “ANWR is like a time machine that can transport you back thousands of years to a previous time. It’s a world apart, a place where the outside world can be put aside. It evokes a sense of our primeval past” (Cohn). Certainly he is accurate in his description of the area’s beauty. It is untouched except for the handful of visitors who make their way up there each year, and the individual native communities established in the area.

The final major criticism of opening ANWR is the unknown amount of oil. Critics point out that if the coastline is destroyed with oil wells and machinery, and then it turns out that the amount of oil promised is not there, the initiative will not have been a wise one. Even if the projected amount of oil does exist and can be extracted from the ground, they argue it will not be enough to actually sustain American’s needs nor substantially lessen the amount of crude oil that must be imported each year.

COUNTERING THE NEGATIVES

According to the Census Bureau there are over three hundred million people living in the United States, and the question arises: how many of them have heard about ANWR, know where it is located, or what environmental treasures it holds? According to Arctic Power, it seems that there were only 1000-1500 visitors to this “magical place” in 1997. A more recent number (2010) shows that 1600-3000 people visit each year (Cohn). Even if those numbers regarding visitors in 2010 are correct, that would still only be .001% of the population. Most Americans would not know the difference between the Coastal Plains (where there would potentially be drilling) and the other 17.5 million acres of ANWR. Fifteen years ago President Bill Clinton vetoed an initiative to open ANWR because the land was “pristine” and [the] scenic coastal plain is the biological heart of the refuge and would be ruined by energy development (Carlisle).” In an article for Human Events, John Carlisle explains the difference between President Clinton’s “biological heart of the refuge” and the truth:

“To begin with, this supposedly pristine area is already home to a village of Inupiat Native Americans, complete with an airstrip, power lines and an oil well... The coastal plain also contains a military early warning radar site. Second, the coastal plain is not the most scenic part of ANWR. Environmentalists often show pictures of the Brooks Range and other scenic parts of ANWR to convey the impression that the coastal plain is similarly scenic. But the coastal plain is a flat, treeless, nearly featureless plain that extends from the ocean to the Brooks Range. The Brooks Range is scenic hills and mountains that would not be affected by drilling.” (John Carlisle, 2001, 1)

Insights to a Changing World (Volume 2012 Issue 1)
Franklin Publishing Company www.franklinpublishing.net

If the public was accurately informed about the situation of the Coastal Plains, would that affect how it views the situation? In the Midwest and in the Plains regions of America it not unusual to look out the backdoor and see oil wells and pump jacks. Environmentalists also don't want to tamper with the ecosystem, which is certainly understandable and laudable. However are many examples of animals prospering under similar drilling processes and circumstances. It is also important to remember that ANWR is comprised of 19 million acres, which is similar in size to South Carolina. The area where drilling would commence is only 1.5 million acres, around the size of Delaware. Therefore 17.5 million acres are going virtually untouched, because most equipment will have to be hauled around on barges through the sea, instead of over the land, because it is impassable.

Other arguments against drilling are also a subject of current discussion. Drilling is definitely an extremely expensive venture, and there really isn't any way to get around the cost. It will take large oil corporations to finance the project. However the argument that the U.S. shouldn't drill because whatever oil is extracted won't "solve" the problem is less meritorious. Again, there might be more oil there than anyone could have expected, or there could be less. It will obviously not solve the energy crisis, but it would definitely allow the country more time to seek additional solutions.

EXPECTATIONS REGARDING WILDLIFE

With concern about global warming on the rise, environmental experts fear that the ice caps, so crucial for polar bears to find sustenance, are melting and therefore forcing the massive mammals farther into the mainland (Cohn). They are also concerned that during the drilling process the porcupine caribou herd, which includes over 100,000 individual caribou, will have their migration pattern interrupted. Every spring the herd migrates back to the 10-02 area to have their offspring and environmentalists worry that if drilling starts in the area, the animals will be detracted from the area, causing a drop in births.

However when compared to similar regions, like Prudhoe Bay, where drilling is excessive and has been for decades, wildlife studies have shown that the population has not declined. The Central Arctic caribou herd that passes through the Prudhoe Bay region has grown from 3,000 in 1970 to almost 23,000 in 1995, which is a 666% increase (Carlisle). Also, there would only be certain times of the year that drilling would be possible in ANWR. Drilling would only be possible in the winter months, when the ground is completely frozen and oil field workers can make ice airways (for planes), ice platforms, temporary roads and pathways (Carlisle). The Porcupine Caribou herd is only in the region in the summer months to feed off of the tundra and give birth to their offspring, so the drillers would not actually be in the area while

the caribou are there. The workers would also make pipelines to the refineries elevated so it is easier for migratory animals to pass over them without being thwarted on their journey.

NATIVE PERSPECTIVE

Some native peoples currently live in ANWR, including one particular tribe being located on the Coastal Plains. At the very tip of the state there is a native village called Kaktovik. Its history dates back to the 1920's when a fur trader decided to make the village a permanent set up (Arctic Power). The Kaktovik people are descendants from the Inupiat Indians, who were mostly nomadic (Arctic Power). The Inupiat lived off the land by hunting land and sea mammals, fishing, and scavenging for wild plants and berries. They were relocated several times by the United States government for military strategic purposes (with most of them leaving the area, dwindling the population down to around 50 at one point). However in 1964 they received title to their native land, and were offered jobs within the local government and a school system (Arctic Power). Kaktovik now has a population hovering around 200 people, with people living in a way that is consistent with their ancestors, mixed with changes brought to them by western culture.

According to Arctic Power:

“The residents of Kaktovik, the only people living on the Coastal Plain of ANWR, support oil and gas development in their 'back yard'. Alaska's indigenous people have benefited greatly from North Slope production. In addition to providing a tax base for the local government, oil development has provided jobs, funding for water and sewer systems and schools. Native and village corporations with oil field-related subsidiaries are working on the North Slope, and the local government has a voice in permitting and environmental regulation (Arctic Power, 2011, 1).”

These individuals live in the proposed drilling area. They are exposed to the harsh winters, the extremely cool summers and live without many of the “conveniences” that people in a modern culture are accustomed to having. They see all the potential benefits of drilling, and they have seen all the benefits that the villagers in the Prudhoe Bay region reaped from drilling activities. In addition, many corporations native to the area also support drilling initiatives. These include City of Kaktovic, Kaktovik Inupiat Corporation, North Slope Borough, Arctic Slope Regional Corp., Doyon Regional Corporation and Alaskan Federation of Natives (Arctic Power).

In addition to the local natives endorsing drilling in ANWR, indications show that many other residents of Alaska do, as well. A survey by the Dittman Research Corporation found that 78% of Alaskans support drilling in ANWR (Arctic Power). People who took the survey were

asked “What is your opinion, do you feel oil and gas exploration should or should not be allowed in that area?” (Arctic Power) (see Figure 3). The results are explained in an excerpt from the Dittman Research Corporation offered by Arctic Power:

“Further polls nationally have shown that once basics facts about ANWR exploration are explained to respondents, such as the fact that the only area under consideration for development is the 10-02 Area of ANWR and of this legislation limits the footprint size to 2000 acres, that nearly half of those who originally answered ‘opposed’ change their minds. The results for Alaskans are very clear and have been for decades. That Alaskans understand exploration can be done properly and with care for the environment. Furthermore the issue in Alaska is fairly non-partisan with Democrats and Republicans supporting the issue equally. Nearly every year the Alaska State Legislature passes a resolution supporting ANWR exploration. The votes have always been nearly unanimous with only 1 or 2 legislators dissenting.” (Arctic Power, 2008, 1)

These results show that the majority of people who live in the state, both native and non-native, support the initiative for exploratory drilling. They are aware of the process and the potential problems that could arise, and are nevertheless in favor of it. If their experiences and input were shared more openly with the rest of the country, that would provide valuable information to help U.S. citizenry see a potential solution to a very real energy crisis.

POTENTIAL PROBLEMS

The very mention of the phrase “oil spill” sparks (very justifiable) outrage from the public. Oil spills can be small, as in a couple of gallons, to catastrophic as in a few million barrels. It is common news that in the summer of 2010, there was a massive, destructive oil spill in the Gulf of Mexico. The spill destroyed jobs and industries, and killed animals and people. It was a devastating event that captured the attention of the entire nation. British Petroleum caused the spill, accepted responsibility, and has focused efforts on making offshore drilling safer for employees, communities and the environment. The initiative proposed for ANWR would lease the lands to responsible oil corporations, so not just any corporation could come in and set up a production site. Drilling corporations would also be subjected to strict legislative guidelines for drilling. According to the Almanac of Policy Issues:

“H. R. 4 (§ 6507(a)) requires the Secretary to administer the leasing program so as to "result in no significant adverse effect on fish and wildlife, their habitat, subsistence resources, and the environment, ... including ... requiring the application of the best commercially available technology" H. R. 4 (§ 6503(a)(2)) also requires that this

program be done "in a manner that ensures the receipt of fair market value by the public for the mineral resources to be leased." (Almanac of Policy Issues, 2002, 1)

Companies are going to be required to have the "best commercially available technology" and will most definitely be regulated by the government. Also, the drilling process has changed tremendously from the 1970's to the present, with advances in technology. John Carlisle explains the benefits of new technology:

"Because of advances in oil drilling technology, the petroleum industry can recover oil using even less land than was required for Prudhoe Bay, which was developed using 1960s-era technology. In the 1970s, production wells were spaced 100 feet or more apart. But thanks to new directional drilling techniques and drilling equipment, wells can now be placed 25, 15 or in some cases even just 10 feet apart. An oil field that would have covered 65 acres in 1977 will cover less than nine acres today. If Prudhoe Bay had been developed using this new technology, oil equipment and roads would cover 1,526 acres, a reduction in land area of more than 60%" (John Carlisle, 2001, 1).

With the new technology, drillers could use "ice pads" instead of the gravel pads that are found in the Prudhoe Bay site. These ice pads will eventually melt, and leave less of a footprint on the environment. This means that, with new innovations, the construction of the new wells might not even need all of the 2,000 acres that are allotted to the development of the exploration area. This would satisfy environmentalists by preserving some of the proposed area from excavation.

SOLUTIONS

The optimal resolution to the issue might be a combination of pro-drilling and environmentalist ideas. It seems the best solution available at this time would be to drill in ANWR creating hundreds (or even thousands) of new jobs for Americans. It would provide a much-needed stimulus to the United States economy, and also help the country reduce some of its dependency on foreign oil.

However since it is apparent that drilling in ANWR cannot continue forever, it is important to continue to search for additional solutions to energy problems, as well. Potential areas to consider exploring include water, solar, and electricity, as well as alternative fuels such as biodiesel, ethanol, hydrogen and methanol. Most U.S. companies are already taking initiatives to make their companies more sustainable and reduce their carbon footprint. For example, a number of transportation companies are switching to hybrid vehicles and creating new routes for deliveries in order to find the most efficient route to preserve resources. Some businesses have initiated various types of "work from home" programs to reduce employees' commutes. Other

companies are actively soliciting employee input and ideas about how to best “go green.” Corporations and individuals alike need to keep their consumption use in mind when considering the world’s limited resources.

CONCLUSION

So is ANWR a refuge for America? Most assuredly, ANWR will not completely reduce the country’s dependency on foreign oil, nor will it probably dramatically lower gas prices. It would, however, help maintain domestic production while creating new jobs and opportunities for Americans. The reasons not to drill are acknowledged, but appear to be outweighed by the reasons in support of doing so. There is no guarantee that ANWR is sitting above a gold mine that can be tapped. However, even with the estimates that are available, it is a fairly widely accepted fact that a significant amount of oil could be extracted from the land over a period of time. The environment should not be disturbed with regulations from the government in place and with new technology that leaves less of a human trace. The chances of wildlife being affected are also low to minimal. Compared with the Prudhoe Bay site, the caribou population has increased tremendously. Drilling activities should not unduly disturb the caribou in ANWR, considering that migration and production schedules are at opposite times. Also, the native citizens of the area seem to be in favor of drilling, as they see significant opportunities for the advancement of their people and their individual economies. So, should America drill in ANWR? With all the research and statistics that are now available, the better question might be, “Why haven’t we started drilling yet?”

REFERENCES

- Anonymous, (2008), “Negligible ANWR,” article, Pittsburgh Post-Gazette.
- Arctic Power, (2005-2011), “anwr.org” (accessed September 30, 2011), [available at <http://www.anwr.org/>].
- Baldwin, Pamela., Corn, M. Lynne, (2002), “Almanac of Policy Issues,” (accessed September 30, 2011), [available at http://www.policyalmanac.org/environment/archive/crs_anwr.shtml].

- Carlisle, John, (2001), “Green Opposition to Opening ANWR Simply Unfounded,” article, Human Events, Vol. 57, Issue 5,.
- Cohn, Jeffrey P. (2011), “50th Anniversary for ANWR,” article, Bioscience, Vol. 61, Issue 6.
- Krauthammer, Charles, (2007), “Energy Independence?: A serious plan requires Taxes, ANWR and Nukes,” editorial, The Washington Post.
- United States Energy Information Administration (EIA), (2011), “Analysis of Crude Oil Production in the Arctic National Wildlife Refuge,” report # SR-OIAF/2008-03

Figure 1

This map of ANWR shows the difference between ANWR and the Coastal Plain region. This image is property of the Alaska Department of Natural Resources.

Figure 2

Table 1. Oil Field Sizes and Their Date of Initial Production for the Three ANWR Resource Cases
(million barrels)

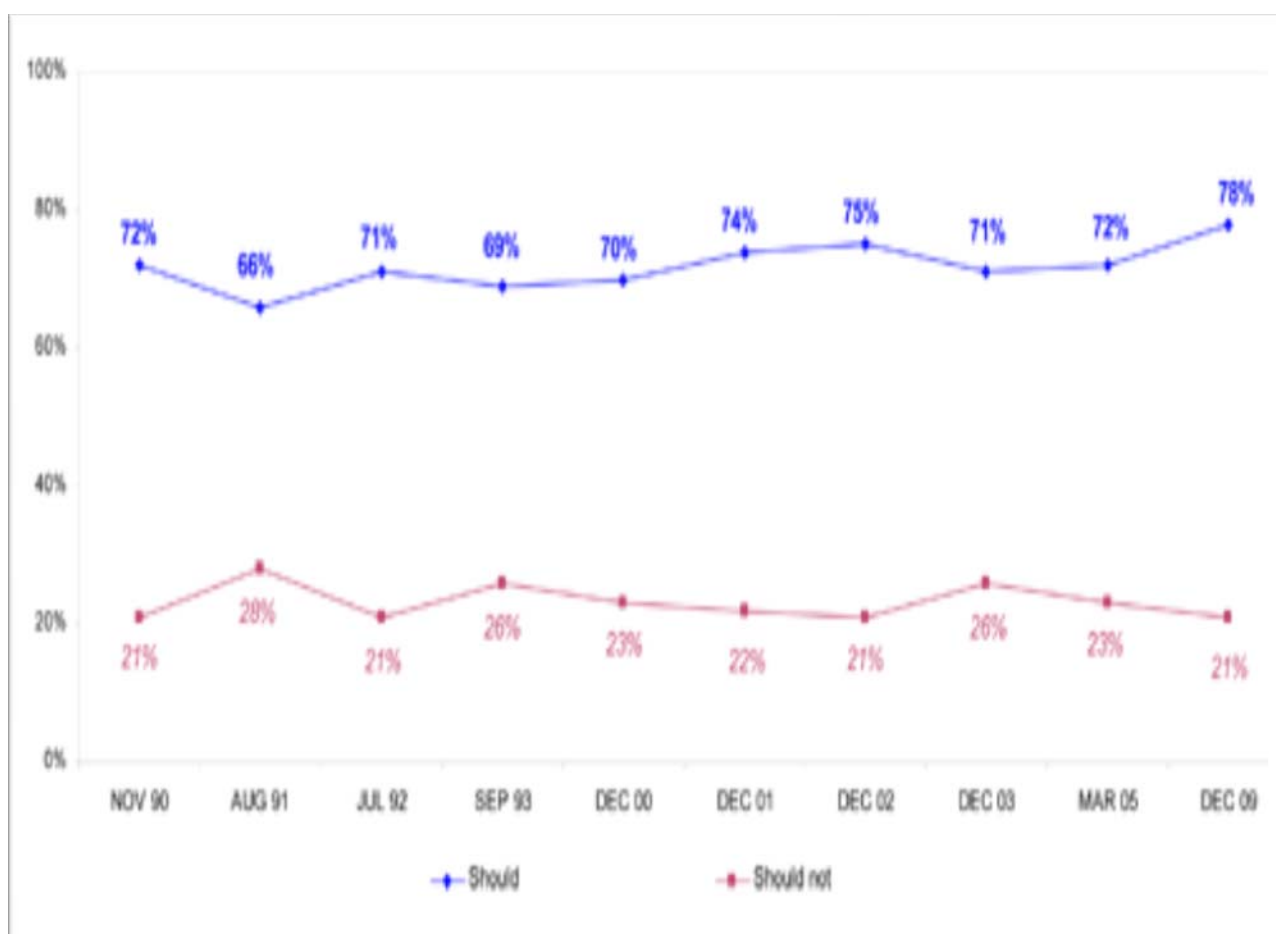
Year In Which Field Begins Production	Mean Oil Resource Case	Low Oil Resource Case	High Oil Resource Case
2018	1,370	700	2,000
2020	700	700	1,340
2022	700	340	1,340
2024	360	340	700
2026	360	340	700
2028	360	340	700
2030	360	180	700
Total	4,210	2,940	7,480

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

This chart shows the process of production with various production schedules based on various estimates of oil.

This chart is property of the United States Energy Information Administration.

Figure 3



This chart shows the results of the survey mentioned in the text over a period of time.

This Chart is the property of Arctic Power

Copyright of Insights to a Changing World Journal is the property of Franklin Publishing Company and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.