An Overview of Alaska's Oil Industry

by John Boucher, Brian Rae & James Wilson

In the last 30 years Alaska's oil & gas industry evolved from a minor player in the state's economy to one of the most important industries. By some measures, the oil and gas industry is today the most prominent one in the state.

This article is a broad view of Alaska's oil and gas industry. It will briefly examine its development and will look at Alaska's current position in the world oil market. Further, employment characteristics and trends in the industry will be examined. Finally, this article will air recent oil industry developments and how these developments may affect the industry in Alaska.

30 years ago Alaska was a minor player in the oil industry.

1957-1968: Infancy on the Kenai Peninsula

The Swanson River field, discovered in 1957 on the Kenai Peninsula, was the initial site of commercial production of Alaska oil and gas. Four offshore fields came online in the early 60s which brought Alaska's crude oil production to more than 200,000 barrels per day. (See Table 1.) By 1968, Alaska was a significant oil producer, and the industry was contributing more than 20% of the total revenue to the state's treasury.

1968-80: Prudhoe Bay Transforms Alaska into Oil Giant

In 1968, a super giant oil field was discovered at Prudhoe Bay. In 1969, $900 million in bids for Prudhoe oil tracts signalled the beginning of the black gold rush.

The remaining obstacle was finding a way to get Prudhoe Bay oil to market. A pipeline was proposed. Although many roadblocks materialized, the Arab oil embargo of 1973 spurred Congress into passing legislation enabling pipeline construction to begin.

Construction of the Trans-Alaska Pipeline System (TAPS) began in 1974 and was completed in 1977 at a cost of over $9 billion. In June 1977, the first barrel of North Slope crude flowed from the Trans-Alaska pipeline, and Alaska stepped into the big leagues of oil producers. By 1980 more than 1.5 million barrels of oil a day were flowing to Valdez.

1980-Present: Supplemental Development on the North Slope

The '80s in Alaska's oil industry have been characterized by wild fluctuations in oil prices and development of supplemental projects on Alaska's North Slope. High oil prices early in the decade spurred development of the Kuparuk River oil field which increased North Slope production by 300,000 barrels per day. Milne Point, Lisburne and Endicott fields added more than 150,000 barrels per day to that total. In 1986 and early 1987, the Milne Point field was temporarily shut down due to low oil prices.

Alaska produces 25% of all U.S. oil.

Alaska a Major U.S. player, a Minor Player in the Global Game

In 1988, Alaska produced more than 2 million barrels of oil a day. That represented more than 25% of the U.S.' production and about 3.5% of the total world production. Alaska ranked 9th last year in world oil production. Three Organization of Petroleum Exporting Countries (OPEC) produced at a higher rate than Alaska — Saudi Arabia, Iran, and Iraq. Five nonmembers of OPEC out produced Alaska — the USSR, the rest of the U.S., Great Britain, China, and Mexico. Even if all OPEC countries had produced at capacity in 1988 Alaska would have come in at 11th in total oil production. (See Table 2.)

The relationship between OPEC members' actual production and their potential production capacity has been the single biggest factor in the world oil market since 1973. Producing at less than capacity, OPEC has driven up the price for oil and facilitated oil development that was otherwise too costly or politically sensitive to consider.

Alaskan Oil: Subject to the Whims of the World Market

OPEC's potential to dictate world oil supply is important because it puts into perspective Alaska's current position in the world oil market. The

Table 1

Alaska Oil Production History since Statehood
(Barrels per Day)

Year	Production Event	Cook Inlet	Prudhoe Bay	Kuparuk	Milne Point	Lisburne	Endicott	TOTAL
1958	Swanson River	98						98
1959		511						511
1960		1,529						1,529
1961		17,333						17,333
1962		28,107						28,107
1963		29,425						29,425
1964	Middle Ground Shoals	30,285						30,285
1965		30,497						30,497
1966	Granite Point	39,355						39,355
1967	MacArthur River	79,215						79,215
1968	Trading Bay	181,103						181,103
1969		203,597						203,597
1970		229,080						229,080
1971		215,849						215,849
1972		201,540						201,540
1973		200,382						200,382
1974		197,796						197,796
1975		197,184						197,184
1976		183,586						183,586
1977	TAPS Opens	160,364	580,000					740,364
1978		137,559	1,089,000					1,226,559
1979		117,778	1,283,000					1,400,778
1980	Prudhoe at Maximum Efficienct Rate	98,851	1,522,000					1,620,851
1981	Kuparuk Start-up	86,411	1,522,000	2,990				1,611,401
1982		75,151	1,532,241	88,622				1,696,014
1983	Prudhoe Waterflood	67,947	1,536,413	109,207				1,713,567
1984		59,769	1,531,287	127,434				1,718,490
1985	Kuparuk Phase 2 Milne Point	47,154	1,556,023	215,888	1,929			1,820,994
1986	Kuparuk Phase 3 & Lisburne	46,611	1,537,752	257,514	12,901	8,500		1,863,278
1987	Endicott Starts Up Lisburne Full Development Central Gas Facility Online	40,000	1,590,000	280,000		40,000	20,000	1,970,000
1988	North Slope Production Peak?	40,000	1,590,000	300,000		40,000	100,000	2,070,000

Source: Alaska Department of Natural Resources, Division of Oil & Gas.

Table 2

World Oil Production and Reserves 1988
(Ranked by 1988 Production)

Country	1988 Production (thousands bbl./day)	1988 Capacity (thousands bbl./day)	Jan. 1, 1989 Oil Reserves (billion barrels)	1988 Production as a Percent of Total 1989 Reserves
Saudi Arabia	4,708	8,750	170.0	1.0%
Iraq	2,679	2,800	100.0	1.0
Iran	2,208	3,000	92.9	0.9
Kuwait	1,254	2,500	*91.9	0.5
Abu Dhabi	1,013	N/A	92.2	0.4
Dubai	355	N/A	4.0	3.2
Qater	349	600	3.2	4.0
Neutral Zone	316	N/A	5.2	2.2
Shar jah	65	N/A	1.5	1.6
Middle East OPEC	12,947	N/A	560.9	0.8
Venezuela	1,658	2,150	58.0	1.0
Nigeria	1,358	1,700	16.0	3.1
Libya	1,012	1,600	22.0	1.7
Indonesia	1,138	1,350	8.3	5.0
Algeria	667	700	8.4	2.9
Gabon	175	200	0.7	9.1
Ecuador	310	310	1.4	8.1
Total OPEC	19,265	N/A	675.7	1.0
USSR	12,477	N/A	58.5	7.8
Other Noncommunist	9,220	N/A	79.6	6.2
USA - Excluding Alaska	6,096	N/A	19.7	11.3
North Sea	3,445	N/A	15.6	8.1
China	2,690	N/A	23.6	4.2
Mexico	2,527	N/A	54.1	1.7
USA - ALASKA	2,070	N/A	6.8	11.1
Oman	597	N/A	4.1	5.3
Other Communist	422	N/A	1.8	8.6
Total NonOPEC	39,544	N/A	263.8	5.5
Total World	57,703	N/A	907.4	2.3

* Includes Neutral Zone capacity.

Source: Oil and Gas Journal, December 26, 1988 and Petroleum Intelligence Weekly, July 25, 1988
N/A: Not Available or Applicable.

OPEC countries, in particular Saudi Arabia, have tremendous potential to influence the world supply of oil. If all OPEC countries were to produce at full capacity they would drive down oil prices. One potential result of this scenario is the closure of oil fields which cannot produce as cheaply. As a comparatively small producer, Alaska just goes along for the ride when

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Occupational Staffing Patterns In Alaska's Oil Industry

Oil is More Than a Hard Hat Industry

Many people, if asked to describe their image of an oil and gas industry employee, might describe a roustabout working on an oil rig. Others would picture a corporate executive sitting behind a large desk. Still others might first think of a mariner employed on a supertanker. All would be right.

Since 1986 oil and gas firms operating in Alaska have been required to submit information to the Department of Labor describing the occupation and work location of all their employees. Analysis of this information provides some interesting — and not too surprising — insights into the industry.The left hand columns of the table below break out employment in the oil and gas industry by various occupational groups.

1 in 8 A Mechanic or Repairer, But Not In Every Region

Nearly one in every eight oil and gas employees (12.3%) in Alaska is a mechanic or repairer. As expected, these skills aren't demanded equally throughout the state. The four right hand columns of the table below point out the geographically uneven distribution for the different occupations; nearly 70% of mechanics and repairers work in the Northern region, 13.4% in Gulf Coast, and only 8.7% in the Anchorage/MatSu region.

While the Northern region claims the highest percentage of the industry's mechanics, Anchorage/MatSu is home for most of the office staff and those working in related technical trades. Over 20% of the industry's employees are either executives, administrators, or office staff. Two–thirds of the executives, administrators and corporate officers work in the Anchorage/MatSu area, as do one–half of the industry's clerical and administrative support workers. The area also claims most of the scientists, mathematicians and technicians.

The Gulf Coast region has only one–half the number of workers as Anchorage/MatSu and a third of the number as the Northern region. Yet it employs a significant share of workers in certain occupations. One–third of all welders and solderers are located in the Gulf Coast region. And nearly four in every ten material handlers, helpers and general laborers work in the region.

Extraction Workers Located in Northern & Gulf Coast Regions

The majority of workers in the extractive occupations (oil well drillers, explosives handlers, and mine machine operators, for example) are located in the Northern and Gulf Coast regions. The Northern region claims slightly less than one–half of all oil and gas industry employees; but nearly two–thirds of those employed in extractive occupations. Likewise, the Gulf Coast region is host to only 15% of all oil and gas jobs, but the area has 25% of the extractive jobs.

Overall, regional occupational breakouts portray an industry that has different occupational needs in different regions. Most administrative and scientific employees work in areas where support services are most accessible. Those occupations which are responsible for production work close to the resource.

Oil & Gas Industry Occupational Patterns

Oil & Gas Industry Occupational Breakdown for Alaska			Oil & Gas Industry Occupational Breakout By Region			
Rank	Pct. of Total	Occupation	Northern	Anch. Mat/Su	Gulf Coast	Balance of State
1	12.3%	Mechanics & Repairers	69.5%	8.7%	13.4%	8.4%
2	10.9	Admin. Support & Clerical	35.1	54.1	7.1	3.7
3	10.5	Officers Administrators & Execs	26.3	65.7	4.6	3.3
4	9.7	Handlers, Helpers & Laborers	46.2	4.8	38.6	10.4
5	8.0	Material Moving Occupations	63.1	6.9	22.9	7.1
6	7.7	Extractive Occupations	63.7	5.5	25.5	5.3
7	7.7	Engineers, Surveyors & Architects	36.5	56.7	3.7	3.1
8	6.5	Plant & System Operators	56.1	25.4	18.4	0.2
9	6.3	Construction Trades	59.0	9.7	21.7	9.7
10	4.9	Natural Scientists & Mathematicians	10.5	87.9	1.2	0.4
11	4.5	Technicians	40.0	53.4	6.1	0.5
12	2.4	Welders & Solderers	59.4	6.2	33.0	1.4
	8.7	All Other	49.2	30.8	16.1	3.9
	100.0	Total	47.7	31.5	15.8	5.0

Source: Alaska Department of Labor, Resident Hire Files

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countries or events act to manipulate prices. The results for the Alaskan economy can be bountiful, as evidenced by the boom in the early 1980s. Or they can be traumatic, as was the case when oil prices crashed in 1986.

Trends: Employment Small, Productivity High

Alaska's oil industry (defined as those companies producing or performing oil and gas field services) employed about 9,000 people in 1988. This was little more than 4% of the state's total wage and salary employment. If the definition of industry activity were to be extended to include pipelines, refineries, and wholesale and retail sales of petroleum products, the employment number stretches to 11,000.

This is a relatively small number compared to the oil industry in other U.S. oil producing states, especially when the amount of oil produced is figured into the equation. By comparison, Texas' oil industry employs over 171,000 people; nearly 120,000 more are employed in related activities. Texas employs these greater numbers despite the fact that the amount of oil produced there amounts to only slightly more than that produced in Alaska. Table 3 compares the barrels produced per employee ratios for the major oil producing states.

Prudhoe = High Productivity

No, Alaskan oil industry workers are not that much more productive than those in other states. Circumstances surrounding the industry in this state are different than in any other state. Prudhoe Bay is the nation's only producing super giant oil field, and its sheer size and productivity per well lends itself to a smaller work force. The average Alaska oil well produced more than 588,000 barrels of crude oil in 1988; in Texas that figure was slightly more than 3,900 barrels. The average production per oil well translates into fewer producing wells in Alaska (1,216 in 1987 compared to Texas' 198,163). One consequence of this is that fewer people are needed to support the smaller number of Alaska rigs.

While fewer oil wells partly explains why direct oil industry employment in Alaska is smaller, it doesn't explain why indirect employment is smaller. The industry's indirect activities, such as pipelines, refineries, and wholesale and retail distribution of petroleum products, are a size smaller in Alaska because this state has a much smaller, more fragmented market for petroleum products than exists in Texas or elsewhere in the nation.

High Productivity + Large Oil Companies = Smaller Employment Fluctuations

One effect of the relatively low amount of labor needed to produce a barrel of oil from Prudhoe is that it has made Alaska oil industry employment less sensitive to changes in oil prices than in other oil producing states. Figure 1 compares annual changes in employment in the oil industry during the past seven years in the five largest oil producing states. In general, during the last seven years employment changes on the down side have been less severe in Alaska than in other oil producing states. On the other hand, when conditions have been favorable for employment growth, Alaska has been among the growth leaders.

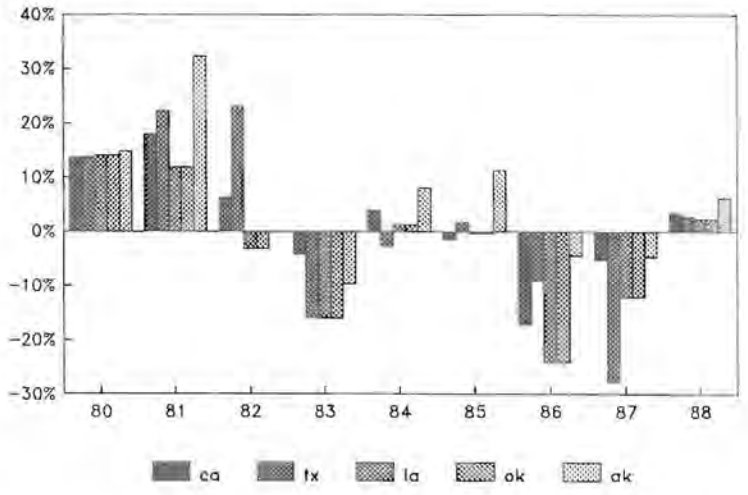
Another factor which cannot be ignored when examining employment trends is the relative size and strength of the players in Alaska's oil industry. Alaska's oil industry is dominated by a few well capitalized, well positioned oil companies. In other states, smaller independent oil companies play a much larger role in the industry. The companies involved in Alaska's oil industry are better positioned to ride out price fluctuations than smaller companies, and one result of this is more stable employment in Alaska.

When Employment Changes Occur: Oil Field Services are Affected First

Alaska's oil industry breaks down into two basic sectors: firms engaged in the general operation of oil field properties, and firms providing services to companies operating oil properties. The former category, oil producers, is where traditional oil company employment is counted — Atlantic Richfield Inc. (ARCO), British Petroleum Exploration, and Exxon, for example. An example of firms in the latter category, oil field services, are VECO Inc. and Alaska United Drilling. In general, employment has been somewhat evenly divided between these two categories. (See Table 4.)

Figure 1

Changes in Oil Industry Employment in the Five Largest Oil Producing States 1980-1988



Source: U.S. Department of Labor, Bureau of Labor Statistics.

While the distribution of total employment has been in the 40-60 percent range for each of the categories, employment patterns in the two sectors are different. Table 4 examines the oil field services component of the industry in greater detail. It is evident that since 1980 the most volatile part of oil industry employment appears in firms providing services to traditional oil companies, especially those firms providing exploration services. The fluctuations in exploration employment generally parallel the fluctuations in world oil prices. When prices are high, more fields become feasible and exploration employment booms. On the other hand, when prices fall exploration is curtailed and firms drilling and exploring for new finds are the first to be cut back.

More than Just a Hard Hat Industry

While the image of an oil industry worker is a rig attendant wearing a hard hat, the industry covers a broad range of occupations. Geologists, clerical staff, construction workers, and mathematicians are all part of the industry picture. (See sidebar on page 8.) So although the oil industry has a blue collar image, it is still host to plenty of white collar jobs.

A large number of the blue collar employees work in the oil field services segment of the industry. The difference in the type of work conducted by blue collar and white collar workers is made evident in the occupational injury and illness statistics. The oil field services industry is a far more hazardous place to work than is the traditional oil company. (See sidebar on injury and illness statistics page 12.)

Oil Spill Clouds Industry's Immediate Future

Ever since the discovery of Prudhoe Bay, speculation has been that Alaska's economic future would be intimately tied to the oil industry. Events occurring between 1969 and the present have reinforced that impression. The last eight months, though, have cast doubt as to what the industry's role will be in the 1990s and beyond. The Exxon Valdez oil spill set off a number of reactions, including a tax increase on the industry in the form of repeal of the Economic Limit Factor (ELF), legislation mandating more extensive clean-up capabilities and a re-evaluation of the development of oil reserves in the Arctic National Wildlife Refuge (ANWR).

Despite the events that have transpired since the spill, several facts lead one to believe that the oil industry will continue to be a prominent player in Alaska's economy well into the next century. First, Alaska's market position, while it may erode gradually, should continue to be good. Prudhoe Bay is the largest, most efficient oil producing field in the United States. And regardless of inevitable declines in production, Prudhoe will be a significant oil producer into the next century. Second, ANWR represents what the U.S. Department of Energy has characterized as one of the largest potential oil reserves in the U.S. These facts, coupled with projections that the U.S. will be importing more than 60% of its oil by the year 2000, increase the likelihood of the development of ANWR.

Table 3

Thousands of Barrels Produced Per Employee [1]/

	1986	1987
Alaska	80.6	88.8
Louisiana	8.4	9.4
Oklahoma	3.0	3.1
Texas	4.3	4.5
Wyoming	11.0	13.0
TOTAL	7.0	7.7

1/ Employee count includes only those in oil and gas extraction firms, not indirect employment such as oil and gas refineries.

Source: Petroleum Independent, September 1988.

Table 4

Alaska Oil Industry Employment

Industry	1980	1981	1982	1983	1984	1985	1986	1987	1988
Total Oil & Gas	6,154	8,116	8,085	7,443	8,040	8,869	8,509	8,064	8,619
Producers	3,312	3,156	3,549	4,057	4,515	4,748	4,639	4,460	4,568
Oil Field Services	2,842	4,960	4,536	3,386	3,525	4,121	3,870	3,604	4,051
Drilling	991	1,493	1,245	815	841	1,174	1,171	846	893
Exploration (Seismic)	751	1,447	1,615	930	710	673	340	298	294
Other Oil Field Services	1,100	2,020	1,676	1,641	1,974	2,274	2,359	2,460	2,864
Oil Industry Indicators									
Number of oil rigs operating	14	23	22	14	14	20	13	8	n/a
Exploration (crew months)	37	82	129	58	79	48	16	5	n/a
Production (millions of barrels)	591.6	587.3	618.9	625.5	630.4	666.2	681.3	716.0	738.1

Source: Employment, Alaska Department of Labor, ES-202 data; Oil Industry Indicators, Petroleum Independent, September 1988 except 1988 production from Oil & Gas Conservation Commission.
N/A: Not available.

Finally, add in the near certainty of continued supplemental development of fields in the Prudhoe area, and the oil industry's future looks bright in Alaska. And this doesn't even figure in the potential of tapping Alaska's tremendous North Slope natural gas resource.

This is not to say that the oil industry's future — especially when it comes to new development — is guaranteed. Like any resource or potential resource, Alaska's oil industry must remain competitive with other oil producers, as well as with substitute energy forms. Development of ANWR oil reserves, for example, while likely, is not a certainty.

The mere presence of oil and gas reserves doesn't translate into oil industry investment or employment. While there are significant developable oil & gas reserves in Alaska, political and market conditions must be favorable for major expansion to occur.

It's a matter of debate whether a compelling case can be made for ANWR development in light of the Valdez oil spill. There is less debate, though, that the specter of rising dependance on imported oil will carry a great deal of weight in future decisions. Another factor that weighs in the equation is that the most likely alternative to ANWR — increased consumption of imported oil — will do nothing to decrease oil tanker traffic. Most imported oil is shipped by ocean going tankers; not developing ANWR would likely redirect traffic to and from Alaska, but it wouldn't necessarily reduce overall oil tanker traffic.

Other than the development of ANWR or the proposed gasline, there are potential development sites on the North Slope which should provide incremental increases to Alaskan oil production. Development of these fields is likely to be gradual, however. And they are not likely to replace lost production at Prudhoe that will occur between now and the time when they come into production.

Summary

The oil and gas industry has developed into one of the state's most prominent industries in the last 30 years. Production from the Prudhoe Bay super giant oil field has made Alaska a major U.S. producer and a significant, but lesser player in the world oil market. Employment in Alaska's oil industry is much less than other oil producing states in large part due to the production per well at Prudhoe. Alaska's oil industry has two employment components — a relatively stable producing sector and a more volatile oil field services sector. Employment in oil field

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Worker Injuries and Illnesses in Alaska's Oil & Gas Industry

Oil & Gas Not One of Alaska's High Injury Industries

Worker injury data shows that 5% of the private sector OSHA recordable injuries and illnesses are attributed to workers employed in the oil & gas industry. Of the 8,069 private sector time loss cases reported to the Alaska Division of Workers' Compensation for 1987, 423 were workers employed by oil & gas companies.

Although some might think of oil & gas as an injury prone industry, this is not born out by OSHA statistics. Oil & gas has a low incidence of worker injuries and illnesses compared to many of Alaska's private industries — lower than manufacturing, construction, and transportation. In fact, during the period 1985 to 1987, the OSHA recordable case rate for oil & gas has been lower than the rate for retail trade.

Work injury and illness rates are stated in terms of the estimated number of cases per 100 "workers", where one worker is equal to 2,000 hours worked. This allows a common standard for comparing all Alaska industries despite differing work hour patterns.

From 1982 to 1986 oil & gas experienced a five–year series of steadily dropping rates for OSHA recordable injury and illness cases. The 1986 rate was the lowest ever recorded for the industry (8.2 cases per 100 workers)1/. In 1987, the OSHA case rate increased to 9.0 cases per 100 workers, ending the five year trend of dropping rates.

Oil Field Services Work More Hazardous Than Production Work

The oil and gas industry has two components, production and field services (which includes drilling and exploration). The 1987 employment composition was 55% production and 45% services. The two components have vastly different rates of injury.

The incidence rate for OSHA recordable injuries and illnesses in the production component is relatively low. The 1987 rate was 3.5 cases per 100 workers, lower than most other industries. In comparison, the rate of OSHA cases in the field services component for 1987 was 15.2 cases per 100 workers. This is higher than the total private sector rate of 10.9 and only slightly lower than the incidence rate for Alaska's construction industry (17.1). The oil field services industry had its lowest recorded OSHA case rates in 1986–1987.

The time loss case rate is a measure of the more serious injury and illness cases — those cases requiring the employee to be absent from work. The lost workday case rate for oil & gas was stable during 1986–1987, following a general trend of declining rates in the prior few years. The lost workday case rate in oil and gas field services was stable from 1986 to 1987, holding at its record low of 6.8 cases per 100 workers.

Falls & Fractures are Common Injuries

A brief portrait of worker injury characteristics has been developed from time loss cases filed with the Alaska Division of Workers Compensation. Oil & gas has a lower portion of back injuries than most other industries. Injury data for 1987 show that injuries to the lower extremities accounted for 96 of the 423 time loss cases, a greater proportion than the average for all industries. Falls also account for a greater portion of accidents in oil & gas than in other industries. Oil & gas typically has a higher percentage of fracture injuries than other industries.

1/ Many employees in the oil and gas industry work long hours (as compared to the standard 40-hour week). The incidence rate, based on hours worked, can not be used to derive the number of injuries as a proportion of the annual average employment.

services is much more sensitive to price changes than production employment. While the oil industry provides a lot of blue collar employment for Alaskans, it also has a good percentage of white collar jobs.

The Exxon Valdez oil spill has raised some questions as to the future of the oil industry in the state. More stringent legislation and a more scrutinizing public are just two results of the spill. The potential future of the industry in Alaska looks to be bright with the possibility of expansion at ANWR, a potential gas pipeline, and continuing production and development in the Prudhoe area. Future development, however, is contingent on two factors: the ability of Alaska's oil industry to remain competitive in the world oil market, and the political climate surrounding development of Alaska's remote, pristine areas.