

# PETROLEUM

## An Overview of the Industry

A synopsis based on *Petroleum: Sector Report*, a complete review of the economic data describing this industry from the Alaska Economic Database

The petroleum sector is comprised of industries which produce, transport, and process Alaska's crude oil and natural gas. It also includes exploration for new oil and gas fields and investments for developing or enhancing production.

This sector accounted for more than a third of Alaska's gross state product in 1987. The petroleum sector directly employed over 10,000 workers in 1988, second only to fishing among the resource producing industries, and accounted for 5 percent of the state's employment. The same year, it paid over \$600 million, or 10 percent of the state total, in wages and salaries. Average annual wages per employee have consistently been highest in this sector: they are currently about twice as high as the state average.<sup>1</sup>

Although the petroleum sector's share of total wages and salaries is low, it makes other important contributions to the economy. In particular state government has derived about 85 percent of its revenues from petroleum taxes and royalties over the last decade. Most production occurs on land owned by the state from which it collects a royalty. About 25 percent of the royalties are paid into the state Permanent Fund and the rest go into the state general fund.

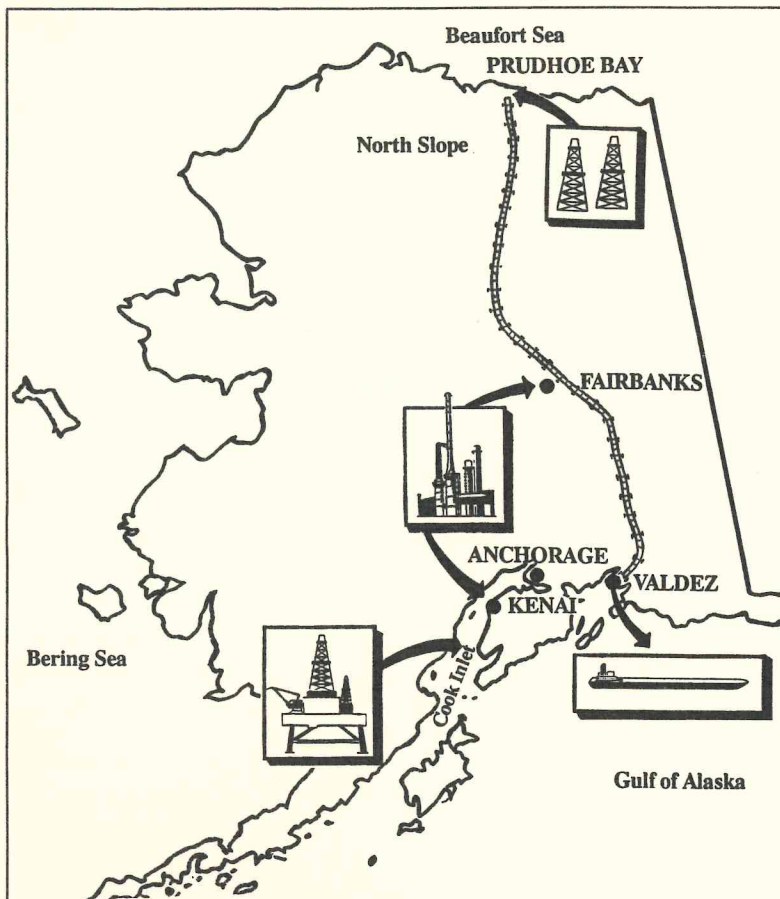
The petroleum sector extracts oil and natural gas on the North Slope and in Cook Inlet. By the end of 1988, 7.7 billion barrels and 4.5 trillion cubic feet of natural gas had been extracted from Alaska's reserves.

The Prudhoe Bay oilfield on the North Slope is by far the largest—it accounts for 20 percent of U.S. oil production and more than 3 percent of world oil production. In 1988, Alaska produced 738 million barrels of crude oil, 98 percent of which came from North Slope fields.

North Slope oil is transported via the trans-Alaska pipeline from Prudhoe Bay to Valdez, where it is loaded on tankers for shipment south. There are also several smaller oil and gas pipelines on the North Slope, in the Interior near Fairbanks and around Cook Inlet. Alaska has six oil refineries which make gasoline, diesel, jet fuel, and kerosene. Chevron and Tesoro refineries are located near Kenai; MAPCO and Petrostar refineries operate outside Fairbanks; and two small ARCO refineries process oil for use on the North Slope. Two facilities on the Kenai Peninsula which process Cook Inlet natural gas are the Phillips-Marathon liquified natural gas (LNG) and Unocal Chemical ammonia-urea plants.

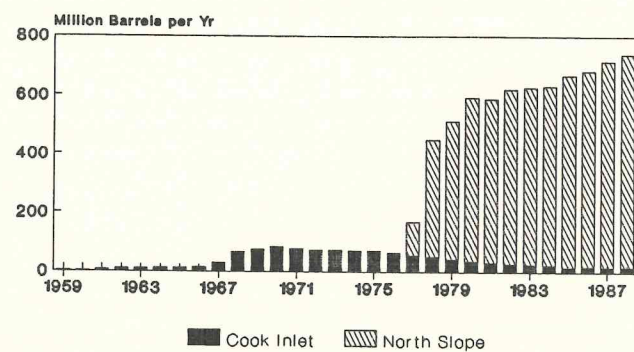
### Production

As shown in Figure 1, oil production began in Cook Inlet in 1959, and peaked in



Further information on the Alaska Economic Database is available from the Division of Business Development of the Alaska Department of Commerce and Economic Development. This database was prepared under the sponsorship of the Alaska Industrial Development and Export Authority and the Alaska Department of Commerce and Economic Development by the Institute of Social and Economic Research, University of Alaska Anchorage. This overview was prepared by Marybeth Holleman of ISER.

**Figure 1. Annual Crude Oil Production Cook Inlet and North Slope Regions 1959-1988**



Source: Alaska Oil and Gas Conservation Commission, Statistical Reports and Bulletin.

1970 at an annual rate of 82 million barrels. Though it has gradually declined, Cook Inlet still produced 16 million barrels in 1988. North Slope fields began producing commercially in 1977, increased quickly to 700 million barrels in 1980, and slowly grew to 722 million barrels in 1988.

North Slope oil is taken mainly from the Sadlerochit field at Prudhoe Bay which, after 12 years of production, has now begun to decline. However, production from the Kuparuk River, Endicott, Lisburne, and Milne Point fields, developed in the 1980s, more than offset Prudhoe Bay's decline in the last three years. Sadlerochit oil production averaged around 1.6 million barrels per day (mmb/d) in 1988, but fell to less than 1.5 mmb/d by February 1989.

Cook Inlet oil production is dominated by the McArthur River field. All the producing Cook Inlet fields have been active for many years and are slowly declining as reserves are depleted. In 1988, Cook Inlet production ranged from 20 thousand barrels per day (mb/d) at McArthur River to 0.5 mb/d at Beaver Creek.

Alaska natural gas production averaged around 1,100 million cubic feet per day (mmcf/d) in 1988. About half this total was production on the North Slope and half was production in the Cook Inlet Region. Only about 516 mmcf/d, half the total, was marketed. Cook Inlet gas represents the major proportion of marketed natural gas production. North Slope gas is used primarily at the lease site for oil production operations, fueling pipeline pump stations, and reinjection.

### Exports

Besides the petroleum processing for Alaska markets discussed earlier, a portion of Cook Inlet oil and some refined oil products such as heavy residual

oil are exported to other countries. In addition, all liquefied natural gas (LNG) and much of the fertilizer produced in Alaska are exported to Japan. The value of all petroleum sector exports fluctuated between \$300 and \$400 million dollars a year in the late 1980s.

### Exploration and Development

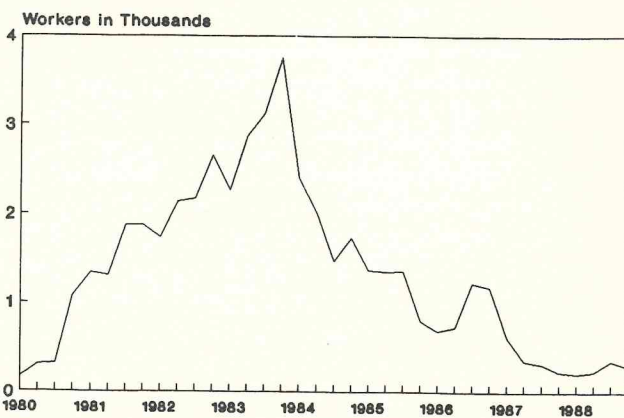
Exploration and development activities have dropped significantly since 1982. This is in part because of dropping oil prices, but also because development at several major North Slope fields has been completed. The primary indicators of exploration activities are the number of geological and geophysical crews operating in the field and the rate of exploratory drilling. For development activities, the primary indicators are the rate of development drilling and the number of people hired to build development facilities.

Exploration activity as measured by field crew months has been extremely variable. From 1958 through 1985, peak exploration activity immediately followed state and federal Outer Continental Shelf (OCS) lease sales. Lower oil prices since 1986 have discouraged exploration activity.

Throughout the 1970s and 1980s, most wells drilled have been development wells. Both exploratory and development drilling permits increased from 1970 to reach a peak in 1985 at over 300 wells, and then dropped to less than one-half that in 1987 and 1988. Exploratory wells averaged 15 to 20 per year, both onshore and offshore. In 1988, oil companies received permits to drill 12 exploratory wells. In contrast, nearly 150 permits were obtained for development wells that same year.

The volatile level of construction employment for drilling wells and constructing production facilities, pipelines, and pumping stations on the North Slope

**Figure 2. Average Monthly Construction Employment, Prudhoe Bay Area, 1980-1988**



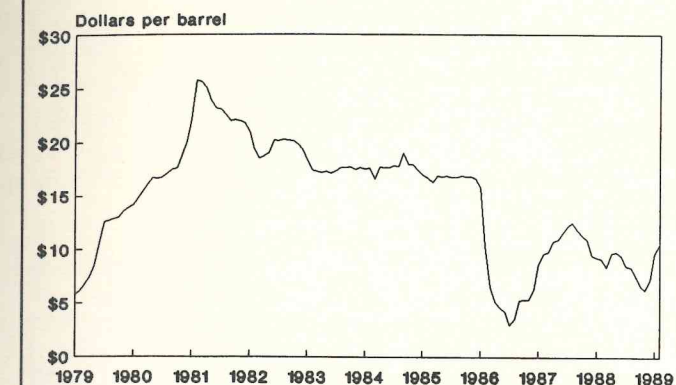
Source: Alaska Department of Labor.

is shown in Figure 2. The work force grew from a few hundred in 1980 to nearly 4,000 in late 1983, as large facilities were installed at Prudhoe Bay and Kuparuk. This number dropped back down to 1980 levels of around 300 workers by early 1988.

### Prices

The price of Alaska's petroleum products is determined in worldwide markets for crude oil and its

**Figure 3. North Slope Wellhead Oil Price January 1979 - February 1989**



\* Weighted average; estimated from severance tax returns. Source: Alaska Dept. of Revenue, Oil and Gas Audit Div.

energy substitutes. Because Alaska contributes just over 3 percent of world oil production, Alaska's production has little influence on world prices. And because the cost of transporting oil by tanker represents only a small fraction of the product's value, oil produced anywhere in the world may compete with Alaska oil.

Figure 3 shows the wellhead price of Alaska North Slope oil from 1979 through early 1989. The wellhead price is the market price minus the transportation cost, consisting of both the tanker cost and the pipeline tariff. For North Slope oil, the pipeline tariff declined from \$6 per barrel early in the 1980s to about \$3 per barrel in the late 1980s when a legal dispute over the tariff was settled.

There have been three distinct periods in Alaska wellhead prices in the past decade. In 1979, the wellhead value of North Slope oil was about \$5 per barrel. It then jumped to \$25 per barrel by 1981, while price controls kept Cook Inlet oil prices down. From 1981 to 1985 prices were stable and high. Then, in 1986, world oil prices crashed, and North Slope prices fell below \$5 per barrel. Prices between 1986 and early 1989 fluctuated between about \$6 and \$12.

On an energy-equivalent basis, world market natural gas prices have been close to oil prices. From 1979 through 1986, wellhead prices for Cook Inlet gas

remained stable at about 70 cents per thousand cubic feet (Mcf) because producers had long-term, fixed-price contracts with utility companies in southcentral Alaska. These contracts have expired and new contracts have been set at higher, more flexible prices. Current Cook Inlet prices in 1989 increased to about \$1.30 per Mcf, slightly higher than world prices.

North Slope natural gas prices do not reflect market conditions because, as noted earlier, the purchasers are also the producers. There is as yet no other market for the reserves in place there.

### Employment

Figure 4 shows petroleum extraction employment. When Alaska production began in 1959, only a few hundred people worked in the petroleum industry. This grew to about 8,000 people by 1982, and has remained near this level even with dropping oil prices. Employment in the processing of oil and natural gas has steadily increased since the mid 1970s to just under 300 workers today.

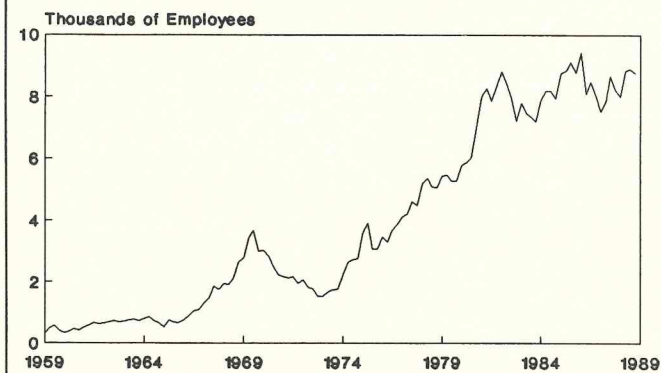
Over 90 percent of Alaska's oil is transported to the Lower 48 states after passing through the trans-Alaska pipeline. Employment in the transportation of oil and gas declined from a peak of about 1,100 workers between 1978 and 1984 to just under 900 employees in the late 1980s. This figure excludes ocean tanker employment levels.

### Wages

Oil field construction wages are an important cost of business for installing production facilities, pipelines, and processing plants. Average earnings of construction workers in the Prudhoe Bay area peaked at about \$7,000 per month in 1983, and then fell 40 percent before stabilizing at roughly \$4,500 per month in 1988.<sup>2</sup>

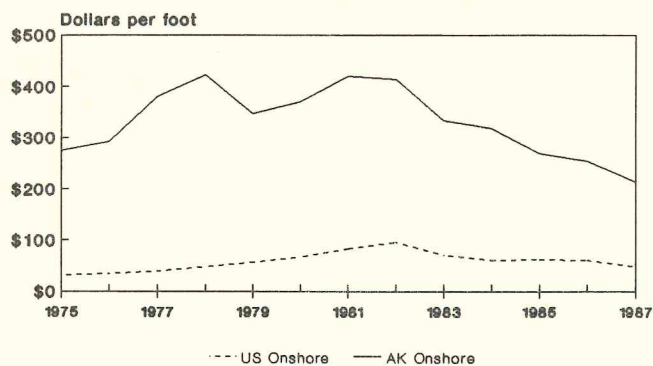
In contrast to construction wages, industry wages have continued a steady rise, from an annual average

**Figure 4. Average Monthly Employment Alaska Oil and Gas Extraction 1959-1989**



Source: Alaska Department of Labor, Statistical Quarterly.

**Figure 5. Estimated Average Drilling Costs, United States and Alaska 1975 - 1987**



Source: Joint Assn. Survey on Drilling Costs. American Petroleum Institute.

of \$20,000 in 1974 to around \$60,000 in the late 1980s. These average annual earnings reflect trends in operating and management costs.

### Costs of Production

Alaska drilling costs reflect the cost of basic exploration and field development investments. As shown in Figure 5, Alaska onshore drilling costs averaged more than \$400 a foot in the early 1980s, but had dropped to just over \$200 a foot by 1987. Even with this sharp drop, Alaska onshore drilling costs remain well above the U.S. average, which was about

\$50 a foot in 1987. Alaska offshore costs, which have usually been closer to the U.S. average, vary widely by location and reflect sporadic activity, so do not serve as a reliable indicator of changes in costs.

The major costs of transportation are pipeline tariffs and tanker rates. The pipeline tariffs are particularly important for North Slope fields, and represent the revenues received by the Alyeska Pipeline Service Company. As discussed earlier, the pipeline tariff dropped by half in the late 1980s.

The primary state tax on the petroleum industry is the production or severance tax. Effective oil severance tax rates range from zero for most Cook Inlet fields to near 15 percent for Prudhoe Bay fields. But because these rates vary widely by field and by producer, an average tax rate can't be calculated. The rate for a particular field is determined by a formula that includes the average production per well as well as total field production. The other major taxes are the petroleum property tax and the special corporate income tax on petroleum.

#### End Notes

1. These numbers do not include indirect contributions evidenced in other sectors, including construction, transportation, wholesale trade, financial services, business services, utilities, and state and local government.
2. These earnings data from the Alaska Department of Labor cannot be adjusted for changes in hours and overtime, so there is considerable variation.

#### INDUSTRY OVERVIEWS

Institute of Social and Economic Research  
 University of Alaska Anchorage  
 E. Lee Gorsuch, Director  
 Anchorage, Alaska 99508

Non-Profit Org.  
 U.S. Postage  
**PAID**  
 Anchorage, Alaska  
 Permit No. 540