

Alaska Oil Production in Perspective

By Dr. Charles Logsdon¹

The discovery of the Swanson River oil and gas field on the Kenai Peninsula in 1957 marked the beginning of the oil era in Alaska. Alaska became a state at about the same time. In many ways the maturation and growth of the Alaskan economy mirrors the growth in oil production since that time. Figure 1 illustrates the oil production curve for Alaska compared to State employment since 1958.

By 1962 the Swanson River field was producing nearly 30,000 barrels of oil per day (Table 1). With the discovery of oil offshore in Cook Inlet and the installation of production platforms in the mid 1960s, the Middle Ground shoal field, the Granite Point field, the MacArthur River field, and the Trading Bay field together brought production up to over 200,000 barrels per day. By 1970, Alaska had become a significant oil producer and the oil industry was already contributing over 20% of the revenue coming into the State treasury.

The discovery of the super giant Prudhoe Bay field in 1968 suggested the real potential of Alaska as an oil producer. Over \$900 million was spent in the 1969 state lease sale of the remaining tracts in the Prudhoe area. However, it would take the Arab oil embargo of 1973 to spur congress to pass legislation enabling the construction of the TransAlaska Pipeline System (TAPS) to move oil from Alaska's North Slope to Valdez for shipment to lower 48 markets.

TAPS was completed in June of 1977 at a cost of over \$9 billion, making it the largest privately financed construction project ever undertaken. Oil production from Prudhoe Bay commenced June 20, 1977 and averaged 580,000 barrels per day that year. Production grew until the Maximum Efficient Rate (MER) established by the Alaska Oil and Gas Conservation Commission of 1,500,000 barrels per day was achieved in 1980.

High oil prices in 1980 and the decontrol of domestically produced oil prices spurred development of the giant Kuparuk River oil field 30 miles west of Prudhoe Bay. The completion of the Kuparuk pipeline in 1981 brought this field into production at 80,000 barrels per day. Kuparuk production was developed in three phases. The third phase completed in December 1987 brought production up to 300,000 barrels per day.

The Milne Point field north of Kuparuk came into production in late 1985 at roughly 20,000 barrels per day but was shut-in when the collapse of oil prices made production unprofitable.

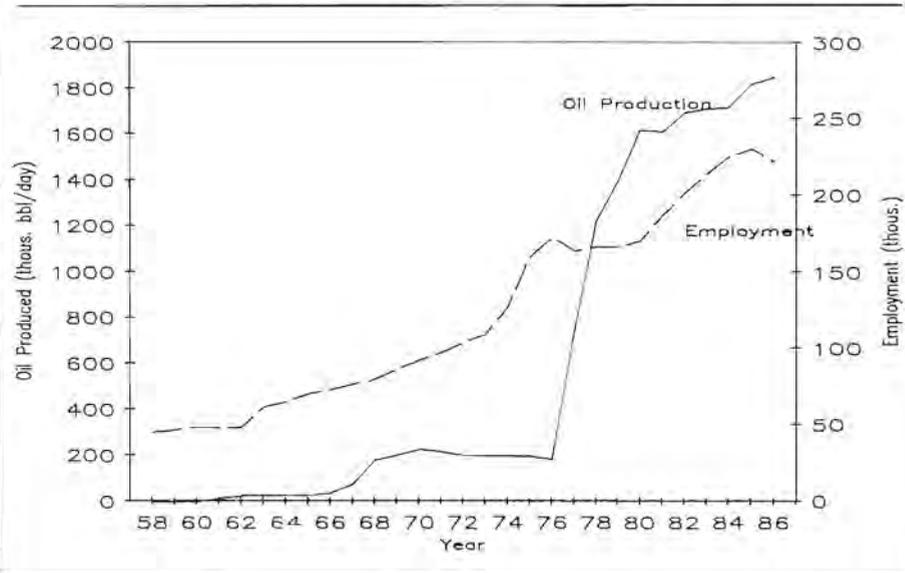
The Lisburne reservoir which underlies Prudhoe was brought into commercial production in 1987 and is currently producing at a rate of 45,000 barrels per day. The Endicott field which just began production has a target production a rate of 100,000 barrels per day.

Barring new discoveries on the Alaska North Slope, oil production in Alaska will probably peak between now and 1990. In the event that no

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Figure 1
Alaska Oil Production & Nonag. Employment 1958-1986



new sources of oil are discovered, it is anticipated that one-half as much oil will be produced in Alaska in the year 2000 as is currently being produced. It might be pointed out that one-half of current production (900,000 barrels per day) is still a significant amount of oil—roughly the current production quota for the OPEC country Kuwait.

If Alaska were a country it would be the world's seventh largest oil producer with 1986 production of 1.855 million barrels per day. Only two countries in OPEC produced more oil than Alaska did in 1986, Saudi Arabia and Iran. The USSR, the lower 48 U.S., the United Kingdom, China, and Mexico were the only non-OPEC countries with more production than Alaska. Alaska accounts for

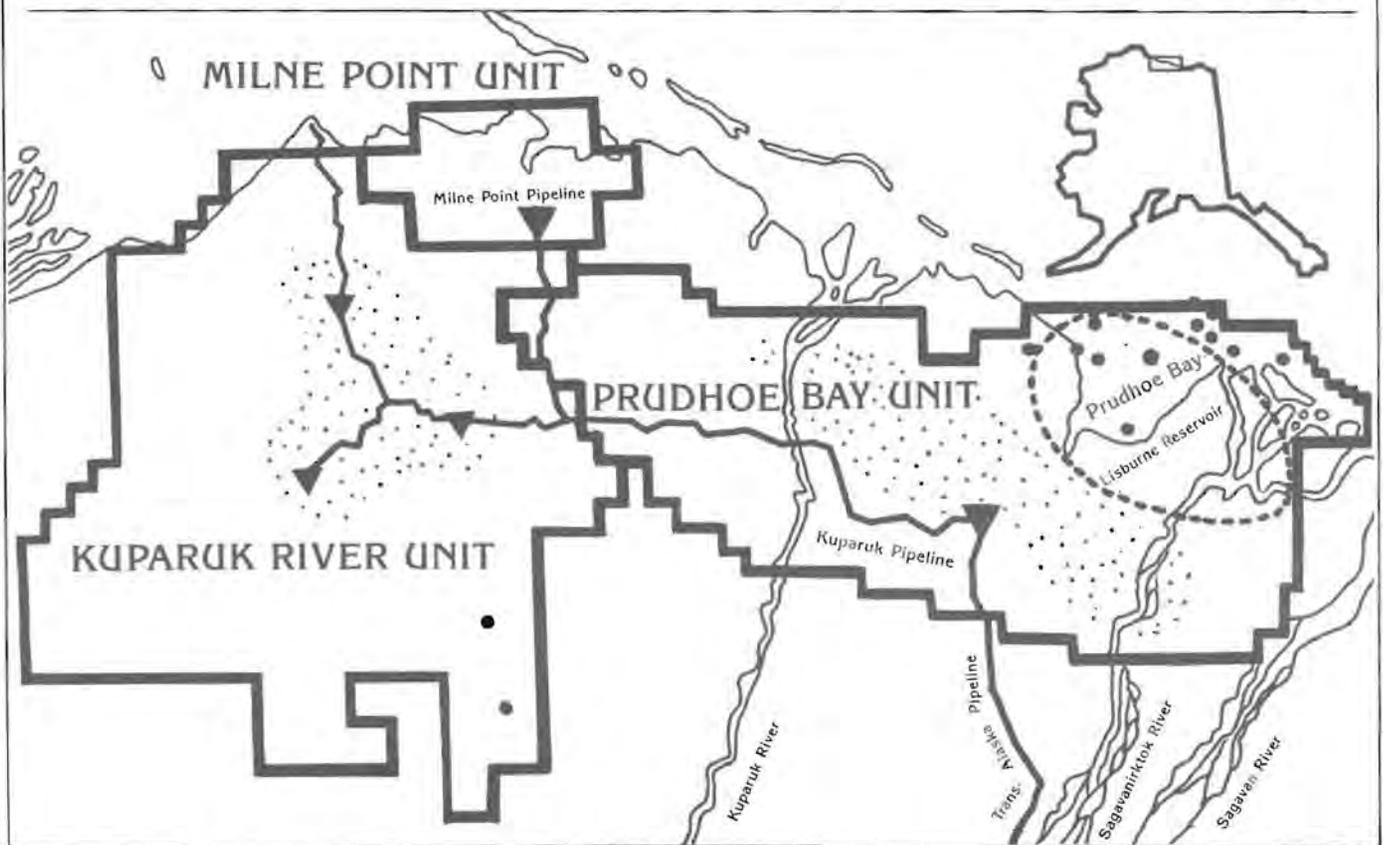
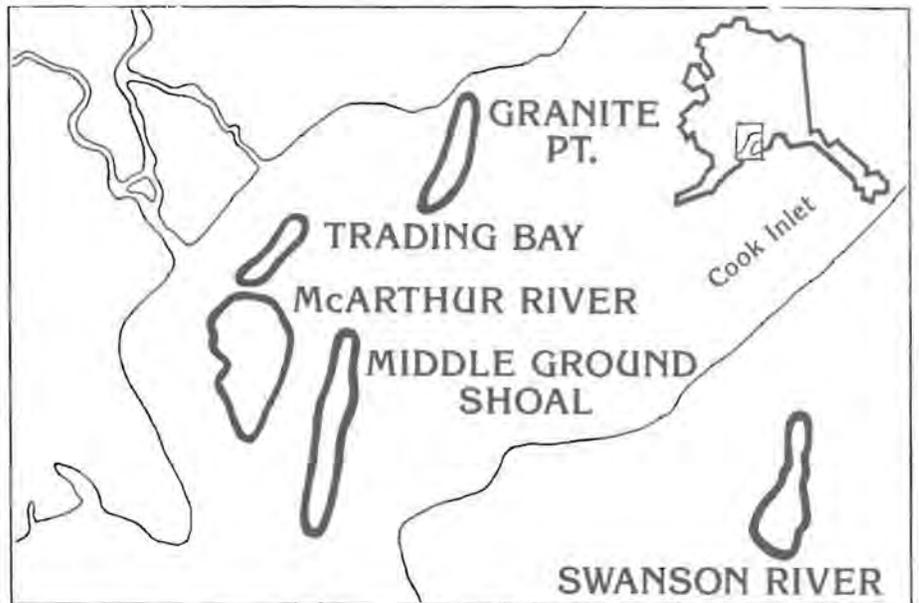
21% of the total oil production in the U.S. and roughly 3% of total world production. Table 2 presents information on world oil production and reserves for 1986.

Alaska accounts for only one percent of total world oil reserves and roughly one-third of total U.S. reserves. The relationship between Alaska reserves and production suggest that Alaska

Alaska Oil and Gas Key Field Locations

- Central Production Facility ▼
- Development Oil Wells •
- Oil and Gas Unit Boundaries —

Source: Historical and Projected Oil and Gas Consumption, Alaska Department of Natural Resources, Division of Oil and Gas, January 1987.



reserves are being depleted at a much faster rate than is the case for most countries.

There are two reasons for this. First the Prudhoe Bay oil field is highly productive. The average well at Prudhoe produces at a rate of 2,800 barrels per day compared to the U.S. average of around 400 barrels per day. Second, most oil production world-wide is controlled by the governments of the producing country. Production rates are controlled to promote the oil price policy of the producing countries and also as an instrument for controlling economic growth. By contrast in the United States private companies determine production rates in response to market forces constrained only by regulations designed to promote maximum production through sound conservation practices.

With respect to production control, all of the OPEC countries produce at less than capacity to support the price structure agreements setup under the cartel production and pricing accords. Even producing at capacity, only four

OPEC countries would have produced more than Alaska did in 1986. These comparisons illustrate in dramatic fashion just how large and productive the Prudhoe Bay oil field is.

The other important implication of the information contained in Table 2 is that of the 8.8 million barrels per day excess capacity which exists in the OPEC countries, Saudi Arabia accounts for 3.6 million barrels per day or 40%. This illustrates dramatically the potential supply side leverage the Saudis have in affecting OPEC pricing policy. This is why the Saudis have found themselves in the role of swing producer to enforce cartel pricing agreements. That is to cut production when over supply in the market weakens price and to increase production to correct shortages or discourage production quota cheating by other cartel members.

Interestingly Iran is the OPEC country with the second largest share of 1986 OPEC excess capacity. This underlines the importance of the need for cooperation between Saudi Arabia and Iran in managing the cartels over-

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Table 1
Alaska Oil Production History Since Statehood
(Barrels Per Day)

Year	Production Event	Cook Inlet	Prudhoe Bay	Kuparek	Milne Point	Lisburne	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	MacArther 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 MER	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			1,713,568
1984		59,769	1,531,287	127,434			1,718,489
1985	Kuparuk Phase 2 Milne Point	47,154	1,556,023	215,888	1,929		1,820,993
1986	Kuparuk Phase 3 + Lisburne	46,611	1,537,752	257,514	12,901	8,500	1,853,278

all production level. OPEC's current success in implementing a return to fixed prices around \$18 per barrel was a direct result of a price and produc-

tion agreement proposed by Iran and endorsed by Saudi Arabia at both the December 1986 and June 1987 OPEC meetings.

Unfortunately, looking at the situation as it occurred in 1986 doesn't tell the whole story because oil is a depletable resource which must be replaced by new discoveries over time if future production is to be maintained. In other words capacity must be expanded and reserves replaced.

In Alaska this means replacing Prudhoe Bay which will begin to decline by 1990. So far new discoveries of oil in Alaska have come nowhere near replacing the 5.5 billion barrels of oil already produced from the Prudhoe field. This is not to say that they can not be replaced since billions and billions of barrels of oil are known to exist in the ground on Alaska's North Slope in reservoirs such as the Ugnu and West Sak not to mention in Prudhoe Bay itself. The key is the cost to produce that oil and under current technology most of this oil cannot be profitably extracted.

In contrast much of OPEC's additional capacity can be extracted from the ground at very low cost. Table 3 presents estimates of the cost of adding to capacity in the OPEC countries.

The information contained in this table has two important implications for Alaska. First, because the cost of developing and producing oil in the OPEC countries are so low relative to world oil prices, there will always be the tendency for the OPEC members to produce in excess of that amount which would keep price at high levels. This implies that it is more likely that prices will continue low, say below \$20.00 per barrel.

Since these cost estimates are for capacity expansions in 1995 the further implication is that the long term prospects for large price increases is small. Prices in the \$20 per barrel range make investment in high cost areas like the West Sak Sands or Ugnu questionable.

Alaska's greatest hope of replacing Prudhoe, if prices remain at current levels over time, is new large discoveries. The geologists tell us that the underground structures capable

Table 2
World Oil Production and Reserves 1986

Country	Production ¹ (thousand bbl/day)	Capacity (thousand bbl/day)	Reserves (billion barrels)
Saudi Arabia	4,865	8,500	166.6
Iran	1,879	3,000	48.8
Iraq	1,688	2,000	47.1
Kuwait	1,238	2,000	91.9
Abu Dhabi	959	1,600	31.0
Dubai	380	450	1.4
Sharjah	65	75	5
Qatar	333	500	3.2
Neutral Zone	361	600	5.2
Mideast OPEC	11,768	18,725	395.7
Venezuela	1,723	2,500	25.0
Nigeria	1,470	1,800	16.0
Libya	1,034	1,500	21.3
Indonesia	1,354	1,700	8.3
Algeria	600	800	8.8
Gabon	163	200	6
Ecuador	277	300	1.7
Total OPEC	18,389	27,525	477.4
USA Lower 48	6,872		17.0
USA-Alaska	1,855		7.6
North Sea	3,573		20.0
Mexico	2,428		54.7
Oman	560		4.0
Other West	7,210		37.5
USSR	12,301		59.0
China	2,568		18.4
Other East	440		1.9
Total World	56,196		697.5

Source: Petroleum Intelligence Weekly and the Oil and Gas Journal.

¹ Excludes natural gas liquids.

Table 3
Cost of Expanding Capacity in the OPEC Countries in 1995
(Development and Operating Cost)

Country	Total Cost (\$/Barrel)
Iraq	\$0.159/bbl
Kuwait	0.334
Qatar	0.353
Saudi Arabia	0.556
Indonesia	0.567
Libya	0.641
Iran	0.671
Algeria	1.527
Abu Dhabi	2.592
Venezuela	3.976
Nigeria	4.982

Source: M.A. Adelman, Massachusetts Institute of Technology, Center of Energy Policy Research.

of holding large accumulations of easily recoverable oil have largely been explored. The major exception are those structures located in the Arctic National Wildlife Reserve (ANWR) and the Outer Continental Shelf (OCS).

The second implication of Table 3 is that reserves may be added much more cheaply elsewhere than in Alaska (barring the discovery of another Prudhoe Bay sized field). This implies that Alaska will continue to suffer cost disadvantages in attracting investment for reserve additions. This raises interesting questions about the behavior of the companies who own the production from Prudhoe Bay. What are these companies doing to replace this asset as it is depleted? Are they reinvesting the profits from Prudhoe Bay back into Alaska? What is the state itself doing to encourage investment in Alaska production?

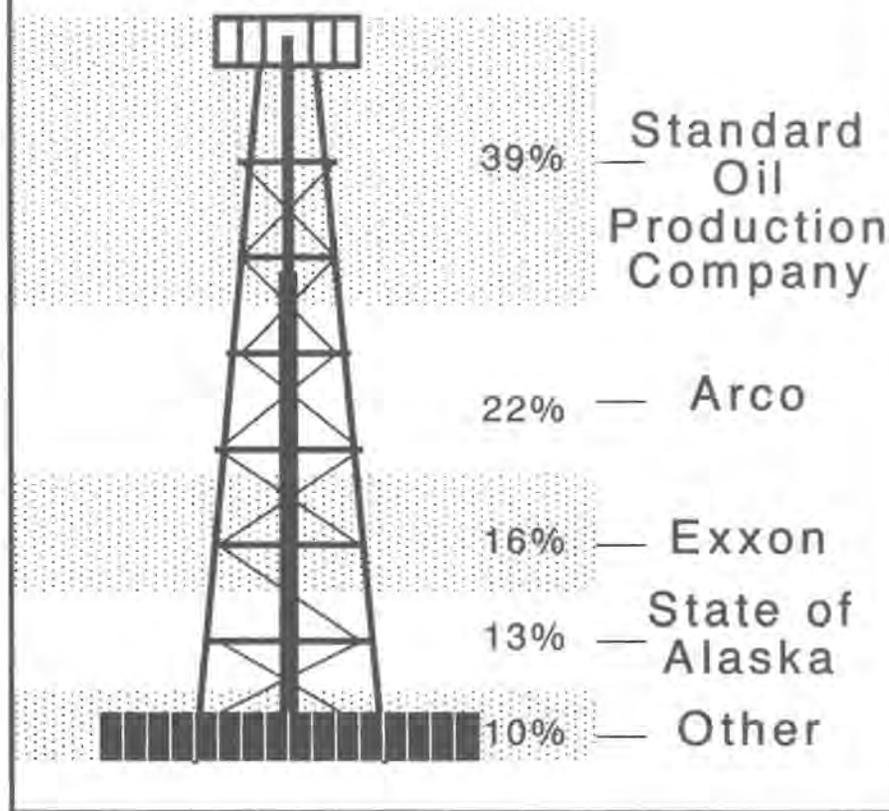
Figure 2 illustrates the ownership of 1986 Alaska North Slope production. The four major owners are Standard Oil Production, ARCO, EXXON, and the State of Alaska through its royalty interest in production. Table 4 summarizes the dependency of each of these three major companies on Alaska for their oil reserves.

Standard Oil Production is now a wholly owned subsidiary of British Petroleum (BP). Alaska oil now represents roughly one-half of the oil reserves of BP. Some of the revenue generated by the prolific Prudhoe Bay field will obviously be used to pay for this major acquisition. Standard will for some time continue to produce the largest amount of oil in Alaska. The company has a significant stake in all the current producing North Slope fields and the Trans-Alaska Pipeline in addition to being the operator of the Endicott field. As a result, Standard Oil Production has developed considerable expertise in Arctic oil production. It is not yet clear, however, what their acquisition by British Petroleum means for further investment in Alaska.

ARCO in press releases and in briefings with securities analysts has made a public commitment to continued investment in development of existing oil reserves in Alaska. The company has restructured to emphasize its position as a West Coast oil

Figure 2

Alaska Oil Production Ownership 1986



refiner/marketer. ARCO is Alaska's largest private employer. It appears that the company will continue to be an aggressive investor in Alaska.

EXXON has in the past drilled and participated in the drilling of numerous exploratory wells in Alaska, most recently in the Norton Sound. Like the other major Alaska producers, EXXON owns a large number of leases on the North Slope known to contain recoverable hydrocarbons and is a participant in all of the cur-

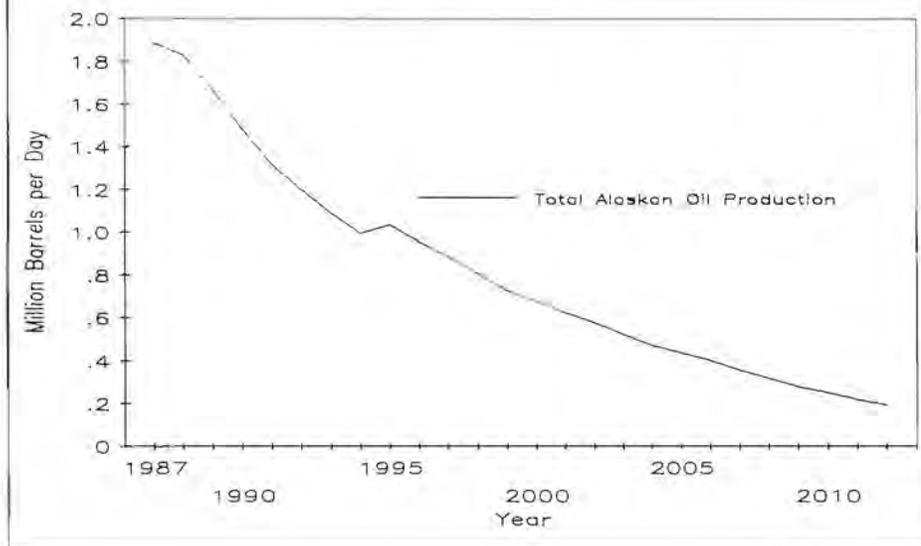
Table 4
Distribution of Major Alaskan Producers Total Production
(1986 Production Thousand Barrels per Day)

	Standard Oil Production	ARCO	EXXON
Alaska	706	307	294
Lower 48	20	189	433
Foreign		75	1,000
Total	726	571	1,761
% Alaska	97%	54%	17%

Source: International Petroleum Finance.

Figure 3

Predicted Oil Production for Alaska 1987–2012



rent producing fields. EXXON in particular has significant gas reserves in both Prudhoe Bay and the Point Thomson Unit. Recently EXXON acquired 100 million barrels of California reserves from Celeron following the industry trend of buying reserves rather than exploring for

them. It remains to be seen to what extent EXXON will use Prudhoe Bay profits to invest in additional Alaskan production.

The State of Alaska attempts to encourage exploration and development of oil in several ways. First, the state has a timely schedule of lease sales. Second, some leases qualify for drilling incentive credits which can essentially underwrite the drilling of an initial exploration well. Third, the state severance tax is subject to the economic limit factor which reduces the tax burden on field which are marginally economic.

Summary

Alaska is relatively new on the oil scene as a major world supplier of crude oil. If Alaska were a country it would rank seventh among oil producing countries. Production of oil will peak soon (Figure 3) with Alaska playing a declining role in world oil markets unless major new fields are discovered. Regardless, Alaska will continue to produce billions of barrels of oil into the Twenty-first century while in the near term playing an important role in world oil markets.