

01/16/13
WHO'S KEEPING
THE LIGHTS
ON? PROBLEMS
AND SOLUTIONS
(PART 1)

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THE LIGHTS ON- PROBLEMS AND SOLUTIONS (PART
1)</SUBJECT><COMM>SRES28</COMM></TARGET>

ALASKA STATE LEGISLATURE

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Senate Resources Committee

AGENDA

January 16, 2013
Butrovich Room 205
3:30 p.m. – 5:00 p.m.

First in a Series:

Who's Keeping the Lights & Heat On? Problems & Solutions

3:30 p.m. – 4:15 p.m.

Petrotechnical Resources Alaska
Cook Inlet Natural Gas Supply Update
Peter J. Stokes, P.E.

4:15 p.m. – 5:00 p.m.

Dr. Antony Scott, Senior Economist and Policy Analyst
University of Alaska Fairbanks

Testimony: By Invitation

Antony Scott's Overview

Current

- Senior Commercial Analyst at University of Alaska Fairbanks

Past

- Commercial Analyst, Section Manager at Division of Oil and Gas, Department of Natural Resources, Division of Oil and Gas
- Commercial Analyst at State of Alaska, Department of Natural Resources, Division of Oil and Gas
- Chief Economist at Regulatory Commission of Alaska

Education

- University of Wisconsin-Madison
- University of California, Berkeley
- University of California, Berkeley

[see all](#)

Senior Commercial Analyst

University of Alaska Fairbanks

February 2012 – Present (1 year) Anchorage, Alaska

My position is currently attached to the Center for Research Services where I provide commercial, economic, and policy analysis support to the University's research mission. Core focus is on energy policy and interactions between social and ecological systems.

Commercial Analyst, Section Manager

Division of Oil and Gas, Department of Natural Resources, Division of Oil and Gas

December 2006 – February 2012 (5 years 3 months) Anchorage, Alaska

Managed the Division's Commercial Section, which strives to maximize the State's economic return on over \$2 billion in annual oil and gas royalty. Directed agency staff and outside expert consultant research, managed multimillion-dollar research budgets, engaged in negotiations with industry, provided policy advice to Administration officials, and testimony to state Legislature on oil and gas legislative initiatives. Supported all commercial aspects of state royalty, including: negotiating reopeners under various Royalty Settlement Agreements for valuing oil; developing hydrocarbon lease sale terms; assessing and advising on appropriate transportation deductions

for royalty valuation; supporting Unit decisions; assessing oil and gas development incentives associated with hydrocarbon production tax initiatives. Technical lead on state gasline efforts, including: Alaska Gasline Inducement Act (AGIA) and AGIA Request for Applications drafting; evaluating AGIA License applications; directing analysis underlying and drafting Finding in Support of AGIA License award; developing AGIA regulations for gas royalty valuation; directing research to monitor License compliance and project risk.

Commercial Analyst

State of Alaska, Department of Natural Resources, Division of Oil and Gas

December 2002 – December 2006 (4 years 1 month) Anchorage, Alaska

Applied core expertise in tariff matters to oil and gas pipeline issues affecting state royalty values and the competitive landscape for exploration and development. Lead DNR technical support for Stranded Gas Act negotiations with both Producer and TransCanada/MidAmerican groups.

Chief Economist

Regulatory Commission of Alaska

July 2000 – December 2002 (2 years 6 months) Anchorage, Alaska

Reviewed and interpreted litigation testimony for Commissioners and Commission staff. Developed decision memoranda and recommendations on economic regulation of oil and gas pipelines, electric utilities, and local telecommunication services. Helped draft Commission decisions, including the landmark decision on Trans Alaska Pipeline System tariffs. Performed economic research on cost, price, and market structure trends.

|Chancellor

Mark Myers

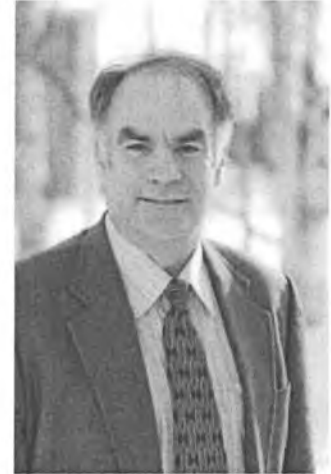
Vice Chancellor for Research

Mark Myers began working as the vice chancellor for research in January 2011.

A UAF alumnus, Myers previously worked as the Alaska Gasline Inducement Act coordinator for the State of Alaska. Before that, he was the director of the U.S. Geological Survey.

Myers holds bachelor's and master's degrees from the University of Wisconsin-Madison and a doctorate in geology from UAF. His career as a geologist and policymaker spans more than three decades, and includes work as a geologist for ARCO Alaska and the State of Alaska. From 2001 to 2005, he served as director of the state Division of Oil and Gas. Prior to his geology career, Myers served in the Air National Guard and Air Force Reserve as a pilot and intelligence officer.

As vice chancellor for research, Myers oversees administration of UAF's \$123-million-per-year research enterprise and supervises the university's research institutes.



Jenn Baker - 1 March 2011, Tuesday 14:34

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SUMMARY OF THE 2006 SOUTHCENTRAL ENERGY FORUM

SPONSORED BY ALASKA OIL AND GAS CONSERVATION COMMISSION

Anchorage • Sept. 20-21, 2006

Prepared by Peter Larsen, Pamela Cravez, and Scott Goldsmith
 Institute of Social and Economic Research, University of Alaska Anchorage

WHY WAS THERE AN ENERGY FORUM?

Nearly 70% of Alaskans rely on relatively inexpensive natural gas from Cook Inlet. That gas heats homes and businesses, generates electricity, and fuels industrial processes.

Cook Inlet gas benefits the state economy not only because it provides inexpensive energy for homes and businesses but also because industrial uses of the gas create jobs and add to the local tax base. More than half the gas currently being produced is either processed and exported as liquefied natural gas (LNG) or used to create fertilizer for export.

But growing demand has depleted 80% of the known Cook Inlet gas reserves. Many Alaskans are concerned about where Southcentral Alaska will get affordable energy in the future.

There are big unknowns. Will the Cook Inlet producers look for more gas? When will a natural gas pipeline from the North Slope be built, and will there be a spur line to bring gas to Southcentral? What will future industrial demand be? Will alternative energy sources help offset demand for gas?

In September 2006, the Alaska Oil and Gas Conservation Commission brought community leaders, gas producers, large consumers, geologists, engineers, economists, and the general public together at a two-day forum in Anchorage to talk about the problem and propose solutions for meeting the region's future energy needs.

The commission asked the Institute of Social and Economic Research (ISER) at the University of Alaska Anchorage to summarize forum proceedings. The information presented here is not a product of ISER research. It is a summary of statements, opinions, and projections of those attending the forum.

WHY IS THIS GAS "INEXPENSIVE"?

"Inexpensive" natural gas from Cook Inlet means relative to prices of gas in the rest of the country and to prices of other energy sources in Alaska. The price residential customers pay for Cook Inlet gas has more than doubled since 1996—but it remains 30% to 50% below prices in other states, according to ENSTAR Natural Gas Company. It's also far cheaper than the diesel Alaskans without access to natural gas rely on.



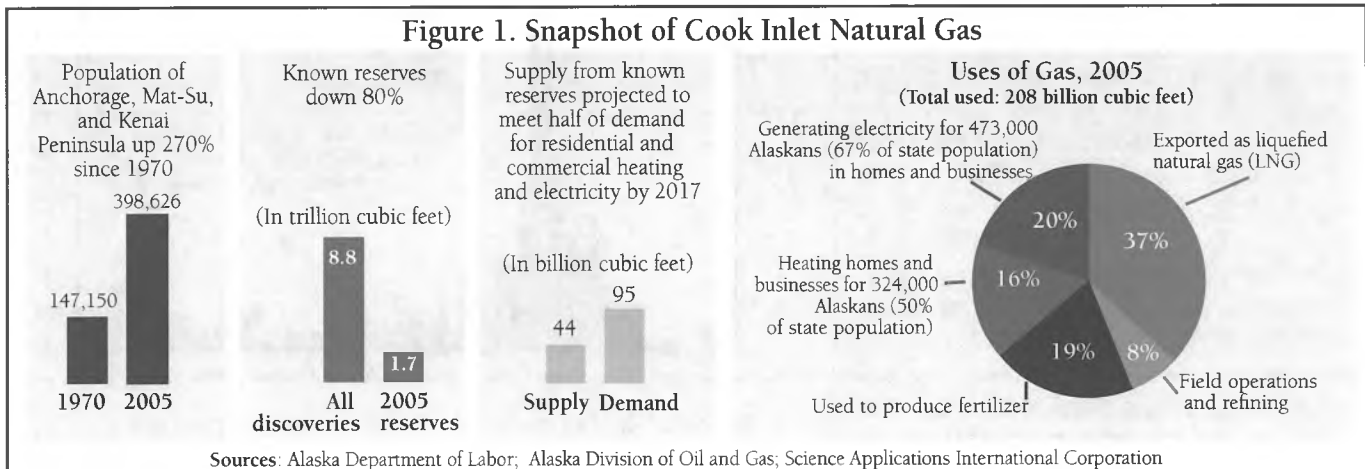
The price of Cook Inlet gas has historically been low because oil companies incidentally found trillions of cubic feet in the 1950s and 1960s, while they were looking for oil. The absence of a ready market for that gas provided Alaskans with a much less expensive energy source, compared with oil, and it made some industrial development possible.

WHO ARE CONSUMERS AND HOW DO THEY USE GAS?

Most of the consumers are in Anchorage and the Kenai Peninsula and Mat-Su boroughs—where more than 60% of all Alaskans live (see map). That regional population has almost tripled since 1970. Communities along the railbelt north to Fairbanks also use electricity generated by Cook Inlet gas, and some gas is super-chilled to a liquid form so it can be trucked to Fairbanks.

The biggest current uses of Cook Inlet gas are industrial—37% is liquefied and exported and another 19% is used to produce fertilizer for export. Heating homes and businesses in Southcentral Alaska takes about 16% of production, and another 20% is used to generate electricity throughout Southcentral and into the Interior. The remaining 8% is used for oil and gas field operations and refining oil.

Figure 1. Snapshot of Cook Inlet Natural Gas



HOW DOES COOK INLET GAS GET TO CONSUMERS?

Current gas producers in Cook Inlet include Chevron, Marathon Oil, Conoco Phillips, and others. Most, but not all, the gas for heating goes through ENSTAR Natural Gas Company, a major public utility in Alaska and a subsidiary of Semco Energy, headquartered in Michigan. The producers themselves also market a small amount of gas directly to consumers.

ENSTAR is regulated by the Regulatory Commission of Alaska (RCA). ENSTAR and the producers negotiate, with RCA oversight, future prices and conditions for gas delivery from the producing fields to the consumer. The RCA must approve rates ENSTAR proposes to charge consumers.

ENSTAR supplies gas to about 325,000 commercial and residential users and also delivers gas to electric utilities. It has about 3,000 miles of distribution and transmission mains.

Municipal Light and Power and Chugach Electric Association are electric utilities also regulated by the RCA. They generate electricity almost entirely with gas. Together they serve about 473,000 residential and commercial customers from Southcentral into the Interior, either directly or through sales to other electric utilities.

WHY WORRY?

With the reserves declining, it's become harder to deliver gas to consumers as they need it, on a daily basis. Assuming no new investments in exploration or development, that problem is expected to worsen, especially in the winter. Consultants to the U.S. Department of Energy and others have projected the future demand for and supply of Cook Inlet gas.

The assumptions used in individual studies vary somewhat, but they all show the same general result: that the demand for Cook Inlet gas will soon exceed the current supply, even if industrial uses drop sharply.

Projections by Science Applications International Corporation (Figure 2), a consultant to the U.S. Department of Energy, are based on specific assumptions that other analysts may disagree with. Those include:

- Assumption: that the Agrium fertilizer plant will cease operating in the near future. Agrium hasn't run at full capacity since 2001, and it recently announced it will shut down during peak use winter months. Agrium has identified high gas prices as the main reason for the cutbacks—but high prices are related to short supply. (Agrium is, however, investigating alternatives to gas; see page 7.)
- Assumption: that the federal Office of Fossil Energy in the U.S. Department of Energy will not renew the export license for the LNG facility, which expires in 2009. To have the license renewed, the operator has to show that exporting LNG will not jeopardize local gas supplies.
- Assumptions: that a spur pipeline to carry North Slope natural gas to the Southcentral region will be built by 2015 and that most of the future demand will be residential and commercial, including the proposed Pebble mine in southwest Alaska.
- Assumption: that some industrial uses might be feasible, but that the cost of North Slope natural gas will make the current methane-intensive industrial uses (like producing fertilizer) uneconomic.

The projected decline in gas supply is essentially based on known reserves. Economists would argue that as supply shrinks, prices rise—and that rising prices would ultimately cause the producers to look for more gas. (But in the largely regulated Cook Inlet market, that might not happen).

IS THERE MORE UNDISCOVERED GAS?

In the 1950s and 1960s, oil companies drilled as many as 30 wells a year in Cook Inlet (Figure 3). They were looking for oil—and found oil as well as trillions of cubic feet of natural gas. Those gas reserves, large enough to last for many years, left no need to look for more.

Then, in the late 1960s, world-class oil reserves were discovered at Prudhoe Bay, on the North Slope, and the petroleum industry's focus shifted away from Cook Inlet. The last commercial gas discovery in Cook Inlet was in 1979 and the last major oil discovery in 1991.

Net gas production—that is, production beyond what the producers re-injected to increase oil recovery—peaked in 1996 at 223 billion cubic feet. By 2005, net production had dropped to 208 billion cubic feet.

Many geologists think Cook Inlet basin is under-explored, compared with other gas exploration regions. Speakers at the forum said analysis of the distribution of field sizes in the basin suggests there may be large undiscovered fields remaining.

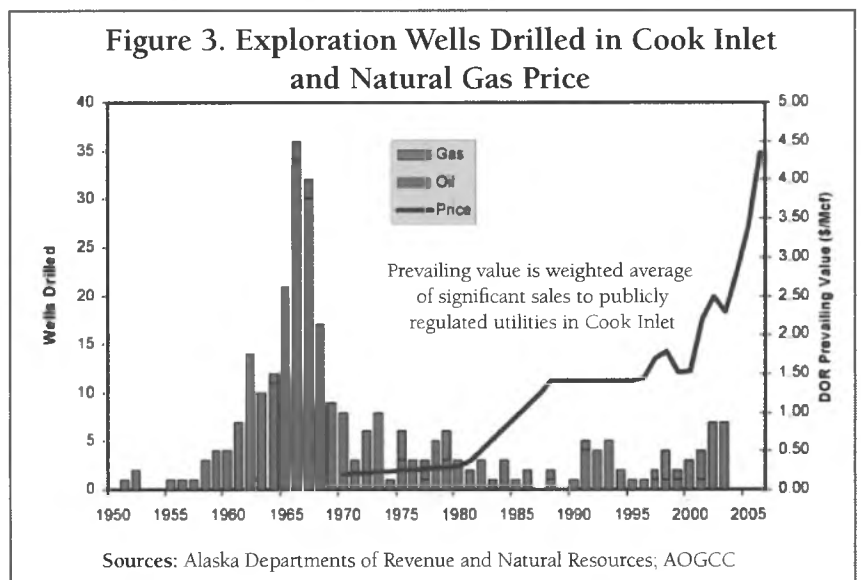
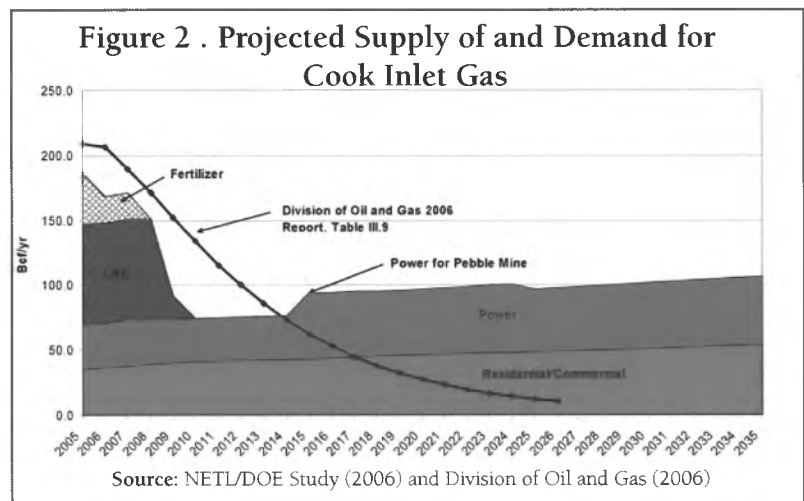
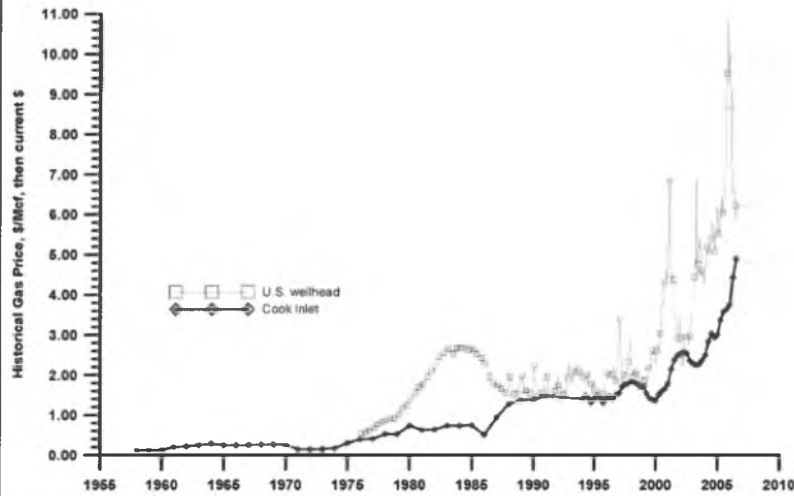


Figure 4. U.S. and Cook Inlet Natural Gas Price
(Wellhead Price per Thousand Cubic Feet, In Current Dollars)



Source: Alaska Department of Revenue and EIA

But no one is certain how much gas may be left in the basin, because few exploratory gas wells have been drilled there since the 1970s. Data from the Alaska Department of Revenue show that the bulk of the 240 exploration wells drilled in Cook Inlet since 1955 have been for oil. Only in the last five years has there been any focus on locating more natural gas—and that increased exploration coincides with rising gas prices (Figure 3).

The Alaska Department of Natural Resources estimates that 8.8 trillion cubic feet of gas have been found in Cook Inlet basin to date, with 7.1 already produced and 1.7 remaining. The U.S. Department of Energy estimates potential undiscovered natural gas reserves at between 13 and 17 trillion cubic feet. Other estimates are lower, with no analysis conclusively showing where new fields may be located. Whatever the remaining reserves, the level of future exploration will depend on gas prices.

HOW HAVE PRICES CHANGED?

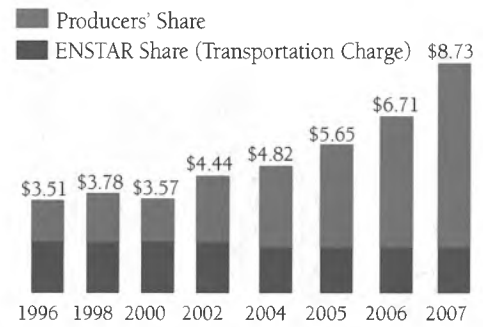
As the supply dwindles, the price of Cook Inlet gas has increased rapidly—although not as rapidly as elsewhere in the nation (Figure 4).

The price residential customers pay for Cook Inlet gas roughly doubled between 1996 and 2006, and it will increase another 30% in 2007 (Figure 5).

But that price includes both what the oil companies get for producing the gas and what ENSTAR charges for transporting it to customers.

ENSTAR is a regulated utility, and it reports charging about the same (per thousand cubic feet) to transport gas today as in 1996. Virtually all the recent increase in the price to residential customers has gone to the producers.

Figure 5. Residential Natural Gas Price
(Per Thousand Cubic Feet)



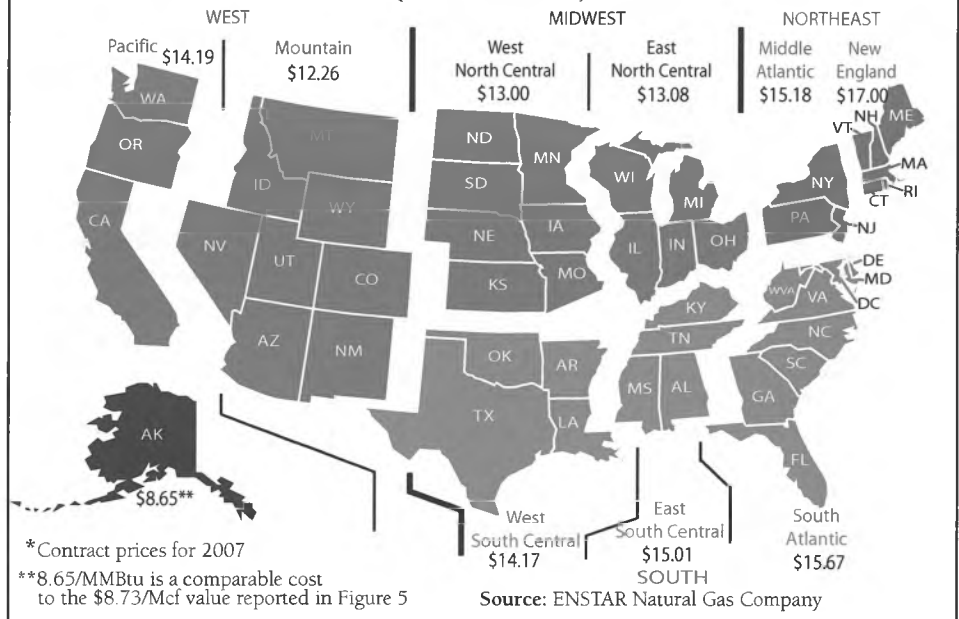
Source: ENSTAR Natural Gas Company

ENSTAR also reports that despite sharp increases in what Alaskans pay for natural gas, they still pay about 30% to 50% less than other Americans.

Figure 6 compares 2007 contract prices for residential customers nationwide. In 2007 Alaskans will pay \$8.65 per million Btus (British thermal unit, a standard energy measurement). Customers in the mountain states and the north-central states will pay \$12 to \$13. The highest natural gas prices will be in the mid-Atlantic, south-Atlantic, and New England states, where prices are expected to be nearly double the Alaska price.

Natural gas is also much less expensive than alternative ways of heating homes and businesses in Alaska. Figure 7, provided by ENSTAR, shows that natural gas for heating is about one-quarter to one-half the price of diesel, propane, or electricity, as measured by energy content.

Figure 6. Prices of Natural Gas for Residential Customers, 2007*
(Per Million Btu)



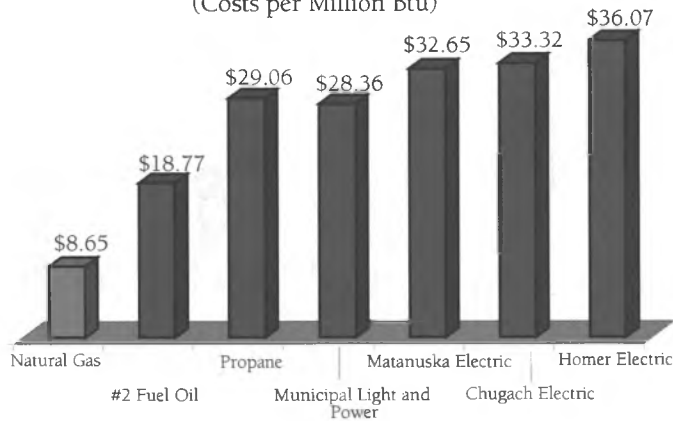
*Contract prices for 2007

**\$8.65/MMBtu is a comparable cost to the \$8.73/Mcf value reported in Figure 5

Source: ENSTAR Natural Gas Company

Figure 7. Comparing Current Costs of Home Heating Sources for Southcentral Alaska

(Costs per Million Btu)



Source: ENSTAR Natural Gas Company

As for the electric utilities using Cook Inlet gas, Municipal Light and Power is not actively seeking new gas contracts now—because it owns part of a Cook Inlet gas field estimated to meet its demand for the next 10 to 15 years. Chugach Electric Association has sufficient gas under contract to meet demand only until 2011.

WHERE IS THE PRICE HEADED?

As Figure 8 shows, the Alaska Division of Oil and Gas forecasts that the price of Cook Inlet gas will increase until 2008 and then drop, staying in the range of \$6 per thousand cubic feet through 2016. (This forecast takes into account the recent ruling by the RCA.)

Figure 9 shows the division’s estimates of the potential range of future demand from residential and commercial consumers, at higher or lower gas prices. The higher the price, the less consumption increases.

WHAT DETERMINES PRICE?

The price residential customers pay for Cook Inlet gas is actually the average of various prices in several contracts ENSTAR currently has with the producers. The contracts were all negotiated separately, and each has its own terms that can influence price.

In some contracts, for instance, the gas price is linked to oil prices. In two of the most recent contracts, Cook Inlet gas prices are linked to gas prices at what is known as the Henry Hub. That hub is in Louisiana, near where gas supplies from the Gulf of Mexico arrive. It is the pricing point for natural gas futures contracts traded on the New York Mercantile Exchange.

Increasingly, gas contracts in the U.S. are being set in relation to the Henry Hub benchmark price, with transportation and other charges added to that base to determine local prices.

Some analysts believe linking Cook Inlet prices to that hub will stimulate exploration, by raising those prices closer to the U.S. average.

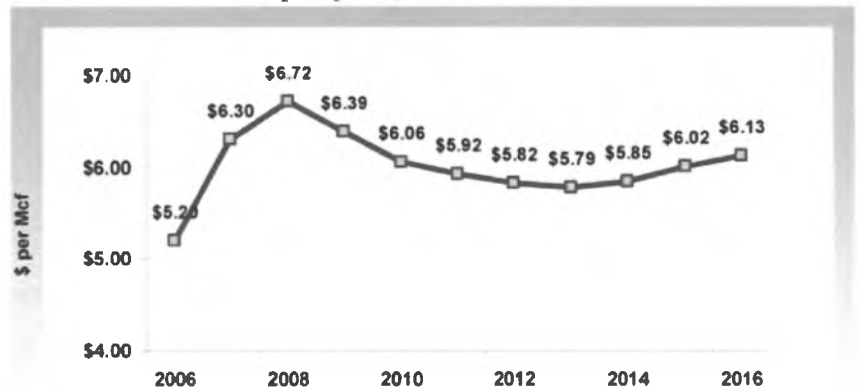
However, application of Henry Hub prices to Cook Inlet gas has been controversial, and the RCA recently rejected a proposed new contract between ENSTAR and Marathon Oil Company, benchmarking a portion of ENSTAR’s future purchases of Cook Inlet gas to that hub.

The RCA found that “responsibility for paying gas prices that encourage new gas exploration and production should not rest exclusively with gas ratepayers.”

ENSTAR is now in the process of renegotiating that contract with Marathon, which—if successful—would give it enough gas to meet its projected requirements through 2017. Today the utility has enough gas contracted only through 2008.

Figure 8. Projected Price of Natural Gas

(Price per Thousand Cubic Feet)

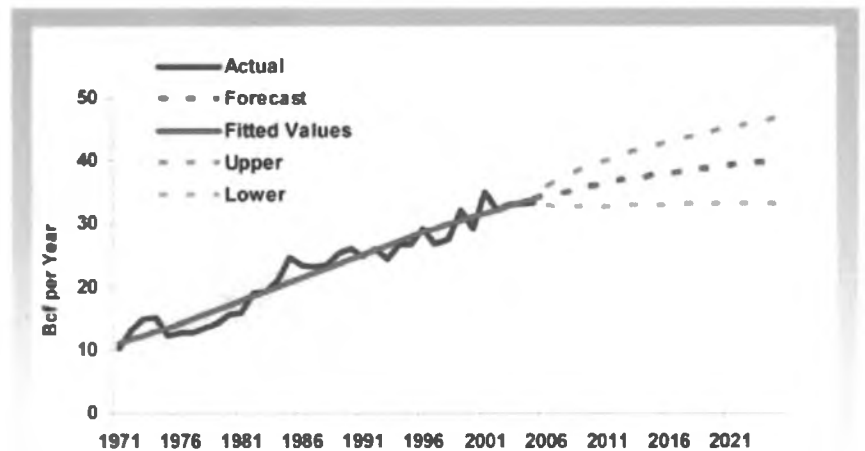


Estimates based on DOE oil and gas price forecasts and four ENSTAR gas supply contracts: Marathon-APL4; Beluga; Moquawkie; Unocal

Source: Alaska Division of Oil and Gas

Figure 9. Projected Residential And Commercial Demand for Cook Inlet Gas

(In Billions of Cubic Feet per Year)



Source: Alaska Division of Oil and Gas

These forecasts are based on the best current information—but it is difficult to predict future costs of natural gas, because all public gas and electric utility contracts are subject to approval by the RCA.

WHAT IS THE CURRENT SITUATION?

The Alaska Division of Oil and Gas reports that with gas reserves shrinking, increased residential and commercial consumption in the winter has occasionally outstripped the system's capacity to deliver. Figure 10 shows the sharp winter increases in demand for Cook Inlet gas. Spokesmen for the division say that if no new reserves are added, the number of days when peak demand exceeds the system's capacity will increase as time goes on.

Current industrial users—the Agrium and LNG plants and oil and gas field operations—consume almost two-thirds of the gas produced in Cook Inlet. (See Figure 1). Industry representatives at the forum said that industrial demand for gas is driven by export markets and depends on the availability of cheap gas to use in industrial processes.

The fertilizer plant has not run at full capacity since 2001. With the price of gas rising and supplies uncertain, Agrium reported at the forum that it is now making only year-to-year contracts for Cook Inlet natural gas. It is looking for long-term solutions—like coal gasification—to replace Cook Inlet gas.

The other big industrial user is the LNG plant at Nikiski, which currently uses more than a third of the gas produced. However, the plant needs approval from the federal Office of Fossil Energy to export LNG, and its current export license will expire in early 2009. (As of late 2006, no application to renew had been filed.)

To renew the license, the company needs to show that it is in the public interest to extend the contract and that exporting LNG would not jeopardize gas supplies for local consumers. Demonstrating that will become increasingly difficult as the supply of Cook Inlet gas declines.

However, representatives of the producers said at the forum that the loss of these big industrial users would reduce their incentive to explore and, consequently, hurt long-term stability of the supply of Cook Inlet gas

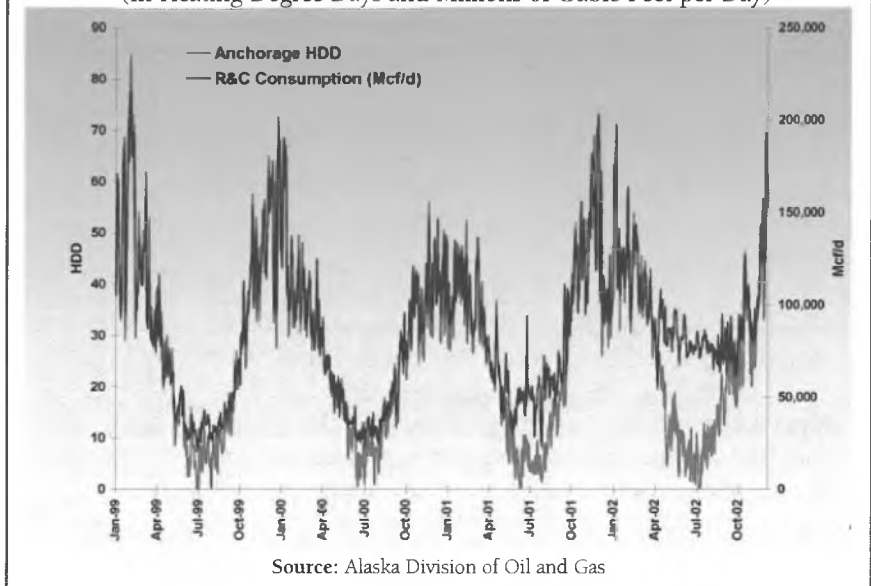
WHAT ARE SHORT-TERM SOLUTIONS?

One short-term way of meeting peak utility demand is temporarily storing gas. Since 2001, producers in Cook Inlet have stored their own gas underground in depleted reservoirs, to help meet utility demand.

To date the federal Bureau of Land Management has approved three gas storage agreements with Chevron at the Swanson River field; two of those are currently storing and delivering gas. The Alaska Department of Natural Resources and the Alaska Oil and Gas Conservation Commission have approved

Figure 10. Seasonal Residential and Commercial Demand for Cook Inlet Gas, 1999-2002

(In Heating Degree Days and Millions of Cubic Feet per Day)



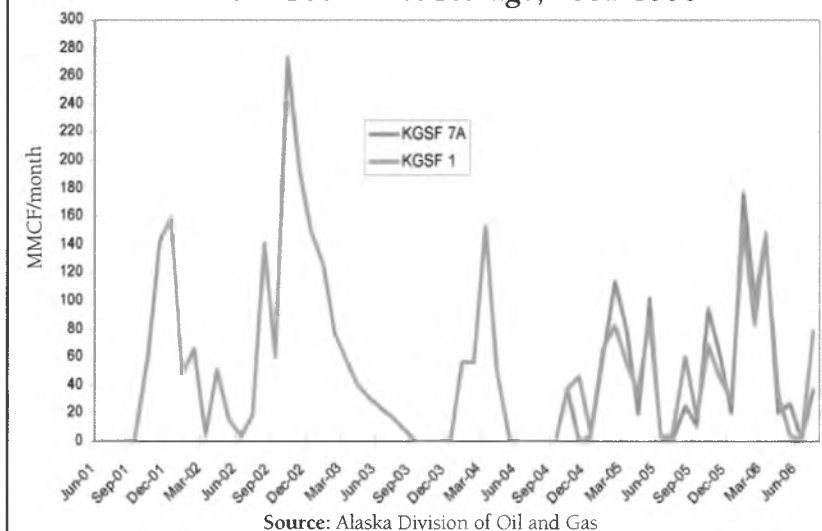
two gas storage leases for active facilities at Chevron's Pretty Creek field and Marathon's Kenai field.

Figure 11 shows how draw-downs for utility demand from the storage facilities at the Swanson River field vary with the season, spiking in the winter.

Another way of easing short-term supply problems is interruptible contracts (allowing producers to curtail sales when demand is high). Agrium's fertilizer plant uses them to accommodate winter shutdowns. Also, as long as the LNG plant is operating, it can continue its historical role of providing "swing" gas that can be diverted to consumers when needed.

But industry speakers said at the forum that in the long run better solutions are needed—encouraging more exploration in Cook Inlet; bringing gas in from elsewhere (North Slope gas or imported LNG); or examining the feasibility of alternatives to natural gas—ranging from coal to tidal power.

Figure 11. Seasonal Draw-Downs for Utility Demand from Cook Inlet Storage, 2001-2006



WHY ISN'T THERE MORE EXPLORATION?

There is some ongoing exploration in Cook Inlet basin. A number of both established and new companies are looking for oil and gas in the basin, according to petroleum industry presenters at the forum. Chevron, Marathon Oil, Aurora Gas, Forest Oil, and Conoco Phillips are among the Cook Inlet producers exploring for oil or gas.

Chevron reported in late 2006 that it has found about 150 billion cubic feet of gas since 2000, and that Chevron and its partner companies expect to spend \$300 to \$350 million for exploration and capital projects in Cook Inlet over the next several years.

Newer companies include Benchmark Oil and Gas, which is focusing on Upper Cook Inlet; Pioneer Natural Resources, which has one oil-producing project in Southcentral; and Rutter and Wilbanks, which is operating three projects: the Copper River project (gas), the Northern Lights project (oil), and the onshore Eagle/West Eagle project (oil and gas). Renaissance Resources and Stormcat Energy are also involved in exploration of undeveloped areas.

Many of the smaller companies are staying onshore, according to industry spokesmen, and all companies are affected by the higher costs of exploration in Alaska and the lower price of gas, compared with other areas of the country.

The number of exploratory wells in the past few years falls far short of the numbers in the 1960s, despite rising prices. At the forum, representatives of the gas producers said the price still hasn't offset the high costs of doing business in the inlet. The U.S. Department of Energy estimates the cost of identifying and developing just half the reserves it believes may remain in the inlet (13 to 17 trillion cubic feet) at more than \$5 billion, in current dollars.


Figure 12 shows the U.S. Minerals Management Service's estimate of how much the supply of Cook Inlet gas would increase, at different wholesale prices for that gas. MMS estimates that at a price of \$4.50 per thousand cubic feet, the additional supply might be 0.64 trillion cubic feet. But at double that price, the additional new supply would also nearly double—because the oil companies would have more incentive to explore.

The Cook Inlet producers also argue that they need more access to prospective fields. The producers estimate that between 30% and 50% of the prime exploration areas have restricted access or are entirely off limits, because they fall within protected areas of federal or state conservation units.

Industry spokesmen and representatives of the Minerals Management Service identified other things hindering large-scale exploration in Cook Inlet. Those include aging platforms, lack of a jack-up rig, regulatory matters—including gas well spacing and bonding requirements—and a general lack of 3-D seismic data of the basin. They say that these problems, as well as company reorganizations and the limited sale area in 1997, continue to hinder exploration.

The next Cook Inlet Special Interest lease sales are scheduled for 2009 and 2011.

Figure 12. Estimated Effects of Price on Additional Cook Inlet Gas Supply

Additional supply at:		
\$4.50/thousand cubic feet		.64 trillion cubic feet
\$9.00/thousand cubic feet		1.1 trillion cubic feet

Source: U.S. Department of the Interior, Minerals Management Service

WHAT ABOUT TAX INCENTIVES?

In 2006 the Alaska Legislature passed the Petroleum Production Tax (PPT), a major revision in the state's method of taxing oil and gas production. Among other things, the new PPT is intended to encourage more investment in oil and gas exploration.

The PPT operates differently on the North Slope and in Cook Inlet. It caps per-unit tax liability for Cook Inlet producers at the level of the old production tax system, during the year before the PPT was passed in April 2006. This means that even if the price of gas or production rises, Cook Inlet producers—current and future—will never pay more than the average per-unit tax rate in April 2006.

In essence, the PPT will not just limit or lower taxes in Cook Inlet—it *should also encourage new exploration and production*. Because the PPT is so new, it's too early to say what effect it might have on future gas supplies.

WHAT ARE THE ALTERNATIVES?

What about finding other energy sources or reducing consumption as a means of dealing with falling gas reserves? At the forum Dunmire Consulting discussed alternatives for increasing gas supplies from outside Cook Inlet, reducing consumption, and replacing gas with other sources.

The Dunmire analysis was funded by the Alaska Natural Gas Development Authority, which is a state corporation approved by Alaska voters in 2002 to promote construction of a natural gas pipeline from the North Slope. ANGDA has so far concentrated on plans for some sort of pipeline—either a spur from a main pipeline or a pipeline directly from the North Slope to Southcentral Alaska—to supply in-state consumers with North Slope gas.

Below we just report the alternatives Dunmire Consulting identified. Their order below doesn't indicate feasibility or the length of time they would take to develop, if they were feasible. Some could help ease potential gas shortages relatively soon, but many would have long lead times and uncertain capital costs.

- **Conservation.** If Alaskans conserved more natural gas and electricity, they could save anywhere from 3.0 to 7.5 billion cubic feet of gas a year, according to estimates of Dunmire Consulting. Conservation measures include things like upgrading residential and commercial appliances and improving weatherization of houses and businesses. Some analysts believe Alaskans won't conserve more unless the prices of residential and commercial heat and electricity increase more than they already have.

- **North Slope Gas.** A major uncertainty affecting the future of Cook Inlet gas development is when North Slope gas might be available to Southcentral consumers. That uncertainty makes it more complicated for Cook Inlet producers to decide how much to invest in exploration and development in Cook Inlet and for utilities and other consumers to decide about investing in gas-using equipment.

The North Slope has very large known reserves of natural gas. The North Slope oil producers have said they support construction of a pipeline to carry natural gas to world markets—although by the end of 2006 they hadn't actually committed to building a pipeline.

But at some future time, Southcentral consumers could get North Slope gas either through a spur line from a main pipeline or through a direct bullet line—that is, a pipeline direct from the North Slope to Southcentral. A pipeline bringing North Slope gas to Southcentral could also be enriched with hydrocarbons, to make certain kinds of industrial development feasible.

- **Coal Gasification.** Agrium is investigating a proposal to substitute synthetic gas from coal for natural gas from Cook Inlet. The proposed Project Blue Sky would take coal from Healy in the Interior south by rail, transfer it to barge, and ship it to a coal gasification plant on the Kenai Peninsula. The synthetic gas would be used to produce fertilizer and could also add electricity to the Southcentral power grid.

Proponents say coal gasification allows for efficient capture of concentrated streams of carbon dioxide (CO₂), virtually eliminating emissions of this greenhouse gas. The captured CO₂ could then be used for advanced oil recovery. It's estimated that 13 Cook Inlet oil fields might produce an additional 300 million barrels, through enhanced oil recovery using CO₂.

- **Other Potential Sources of Gas in Southcentral.** The Bristol Bay area and Alaska Peninsula have been estimated to hold anywhere from 7 to 23 trillion cubic feet of gas and the Nenana Basin 3 to 10. It's beyond the scope of this paper to describe how this gas could be brought to market.

- **Import LNG.** Southcentral Alaska could import LNG via the Kenai LNG plant, if the plant were modified to import rather than export LNG. This option would not have as long a lead time as some other alternatives and it would ensure ample supply—but Alaskans would be exposed to world market prices (which are significantly higher than current local prices). A big consideration in the feasibility of this option would be the capital costs of modifying the LNG plant.

- **Coal-Bed Methane.** Coal-bed methane is a form of natural gas that has been identified in the Susitna Basin north of Anchorage. However, the economic potential of coal-bed natural gas has not been established, and its development in Alaska has been controversial.

- **Coal.** Alaska has abundant sources of coal. An objection to coal is that it has higher CO₂ emissions than other energy sources. But the state government sponsored construction of a clean-coal plant at Healy, to help generate electricity. That plant has yet to be operated, because the utility originally planning to use the coal decided not to—but there are now plans to start it up, possibly within the next 18 months. It could offset some demand for gas to generate electricity. Additional coal supplies could further reduce natural gas use for electricity but at a high capital cost.

- **Wind Power.** With support from Chugach Electric, Municipal Light and Power, and others, the Fire Island Wind project is underway, with preliminary permitting and feasibility to be completed by 2011. This project would involve construction of wind turbines on Fire Island, just offshore from Anchorage. The turbines would be able to supply electricity to the Southcentral power grid and help offset demand for natural gas. However, there is uncertainty about how the wind turbines might affect air traffic at Anchorage's nearby international airport.

- **Hydropower.** Chugach Electric already uses hydropower to a small extent. Proponents say use of this renewable resource has relatively few effects on land and water systems. But further development of hydropower in this region would require a long lead time for licensing and a significant amount of capital for plant development.

- **Nuclear Power.** A small-scale nuclear "demonstration project" is being proposed for the community of Galena along the Yukon River. It would start up in 2012. Power from this facility, if it were built, would not be available for Southcentral. However, if it were successful it could promote more local interest in this abundant but controversial source of energy. Problems with nuclear power include long-term land use, the risk of accidents, and nuclear waste storage.

- **Tidal Power.** A demonstration project of tidal power in Knik Arm is scheduled to be under construction by 2015. Tidal power is a renewable resource—but it might affect aquatic life and boat traffic.

- **Geothermal Power.** A geothermal unit began operating at Chena Hot Springs Resort in the Interior in August 2006. Other potential geothermal sites, including Mt. Spurr in Southcentral, are under consideration. Geothermal power is a renewable resource, but the costs of connecting to the local electrical grid may make many sites uneconomic to develop.

- **Distributed Generation.** Distributed generation is the practice of replacing central gas-fired generation with on-site co-generation, or fuel cells. If those systems were fueled by sources other than gas, they could reduce gas consumption. Distributed generation may eventually become a realistic option in Southcentral, as the costs of the technology continue to fall.

WHAT ABOUT ECONOMIC CONTRIBUTIONS OF COOK INLET GAS?

So far in this summary we've talked about the importance of Cook Inlet gas to residential, commercial, and industrial consumers. The gas also broadly contributes to the state economy, because it is an inexpensive source of energy. ENSTAR estimates, for example, that it makes an annual economic contribution of \$230 million to the economy.

People attending the forum pointed out that petroleum operations in Cook Inlet also create jobs for Alaskans and add to local tax bases. The economic effects of Cook Inlet gas are most concentrated in the Kenai Peninsula Borough.

In 2006, the oil and gas industry paid property taxes of over \$10 million in that borough. The Cook Inlet producers and Agrium made up nine of the top ten taxpayers, with the highest assessed property valuations in the borough. In 2005, the industry supported 1,340 jobs, or 7.4% of borough employment, and 18.7% of total borough payroll.

Petroleum industry jobs also pay well—the average annual wage for oil and gas workers in 2005 was \$88,764, compared with the average of \$35,148 among all workers in the Kenai Peninsula Borough.

Statistics on the economic contribution of Cook Inlet gas for the other two boroughs were not provided at the forum. But it is clear that the petroleum industry also provides a significant wage and tax base for both Anchorage and the Mat-Su Borough.

WHAT DID WE LEARN FROM THE FORUM?

In the past few decades, residents of Southcentral Alaska have enjoyed abundant gas supplies at low prices. Unfortunately for consumers, demand is now starting to run ahead of supply. Opinions differ on how much more gas is yet to be found in Cook Inlet and on the best way to stimulate exploration for new supplies.

Whether the two biggest current users of Cook Inlet gas—the LNG and fertilizer plants on the Kenai Peninsula—will keep operating in the face of shrinking supplies and rising prices makes the future market for gas uncertain. However, residential and commercial demand for both heating and gas-generated electricity are expected to keep growing.

Uncertainty also surrounds the future sources of gas supply (including gas from the North Slope) and the feasibility of developing alternative fuels that may be able to help offset some of the demand for natural gas. Many of the proposed alternatives come with long lead times and unpredictable costs.

But one thing is clear. Southcentral Alaska needs to find additional supplies of gas, or ways to offset demand. Otherwise, the region may soon see large-scale shortages.

A list of forum participants and transcripts of presentations are on AOGCC's Web site: www.aogcc.alaska.gov

Comments on this summary or the forum can be mailed or sent by e-mail to:

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Alaska Department of Natural Resources: www.dnr.state.ak.us

Division of Oil and Gas: www.dog.dnr.state.ak.us

Alaska Department of Revenue, Tax Division: www.tax.state.ak.us

Alaska Natural Gas Development Authority: www.angda.state.ak.us

Alaska Oil and Gas Association: www.aoga.org

Alaska Oil and Gas Conservation Commission: www.aogcc.alaska.gov

Anchorage Chamber of Commerce: www.anchoragechamber.org

Anchorage, Municipality of: www.ci.anchorage.ak.us/homepage/index.cfm

Aurora Power: www.aurorapower.com

Benchmark Oil and Gas: www.benchmarkoil.se

BP: www.bp.com

Chevron: www.chevron.com

Chugach Electric Association: www.chugachelectric.com

Conoco Phillips: www.conocophillips.com/index.htm

Cook Inlet Regional Citizens Advisory Council: www.circac.org

Dunmire Consulting, Carolyn Dunmire: dunmire@fone.net

ENSTAR Natural Gas Company: www.enstarnaturalgas.com

Kenai Peninsula Borough: www.borough.kenai.ak.us

Matanuska-Susitna Borough: www.matsugov.us

Municipal Light and Power: www.mlandp.com

National Energy Technology Laboratory:

www.netl.doe.gov/technologies/oil-gas/index.html

Pioneer Natural Resources: www.pioneernrc.com

Regulatory Commission of Alaska: www.state.ak.us/rca

Science Applications International Corporation: www.saic.com

Stormcat Energy: www.stormcatenergy.com

U.S. Department of the Interior, Minerals Management Service:

www.mms.gov/alaska/re

Usibelli Coal Mine: www.usibelli.com/index.html

Information on Coal to Liquids and Fischer-Tropsch refining processes:

www.aidea.org

Cook Inlet Energy Supply Alternatives Study available at:

www.angda.state.ak.us

Kenai Peninsula Borough information on Cook Inlet oil and gas:

www.cookinletoilandgas.org

ACKNOWLEDGMENTS

The authors thank many people for help with this summary. AOGCC commissioners Dan Seamount and John Norman sponsored the preparation of the summary and tried to ensure that the forum's agenda was objective and represented as many stakeholders as possible. Bill Popp of the Kenai Peninsula Borough also helped the commission line up participants for this forum. The Oil and Gas Division of the Alaska Department of Natural Resources also contributed to the forum's success.

Jody Colombie and Ceresa Tolley at the AOGCC provided the forum with logistical support and helped the authors collect and disseminate information from the proceedings.

Dan Dieckgraef of ENSTAR, Will Nebesky and Brian Havelock of the Alaska Division of Oil and Gas, and Charles Thomas of Science Applications International Corporation promptly answered follow-up questions from the authors.

The authors appreciate help from Fran Ulmer, Linda Leask, Clemencia Merrill, and Darla Siver of ISER.

Finally, the authors thank all the forum participants for taking the time to discuss this important issue.

Energy Options for Fairbanks

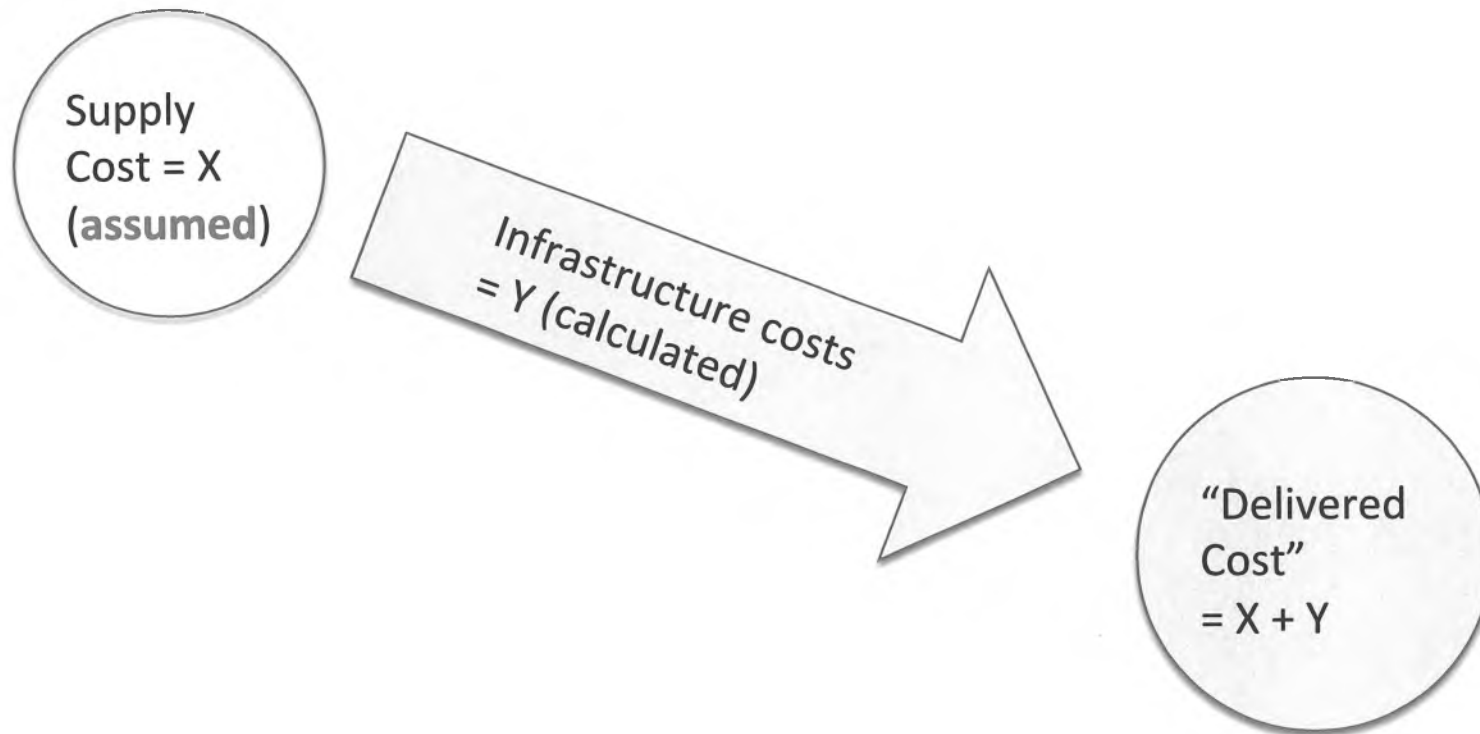
Research by Alaska Center for Energy
and Power and Antony Scott (UAF)

1/16/2013

What's Unique about the Study

- First to compare, on an apples to apples basis, alternatives for reducing Fairbanks energy costs
 - Trucking LNG off North Slope
 - ASAP project(s) (500MMcf, but also 250MMcf and 1Bcf)
 - Spur line off a Major Gas Sale (LNG to Asia)
 - 12", fit-for-purpose pipeline from North Slope to Interior
 - Beluga to Fairbanks pipeline
 - Susitna-Watana
 - HVDC (heat and power for Fairbanks)
 - Coal to liquids

A Usual Way of Modeling Projects: “Assumed Net-forward pricing”



- Focuses on the “easy” part of engineering costs, utility rate making

Simplified, Data-driven view of Alaska Commodity Markets

- “Stranded” ANS gas generally priced off DNR Gas Royalty Settlement Agreement

$$\text{Price/MMBtu} = .0464 * (\text{ANS WC } \$/\text{Bbl})$$

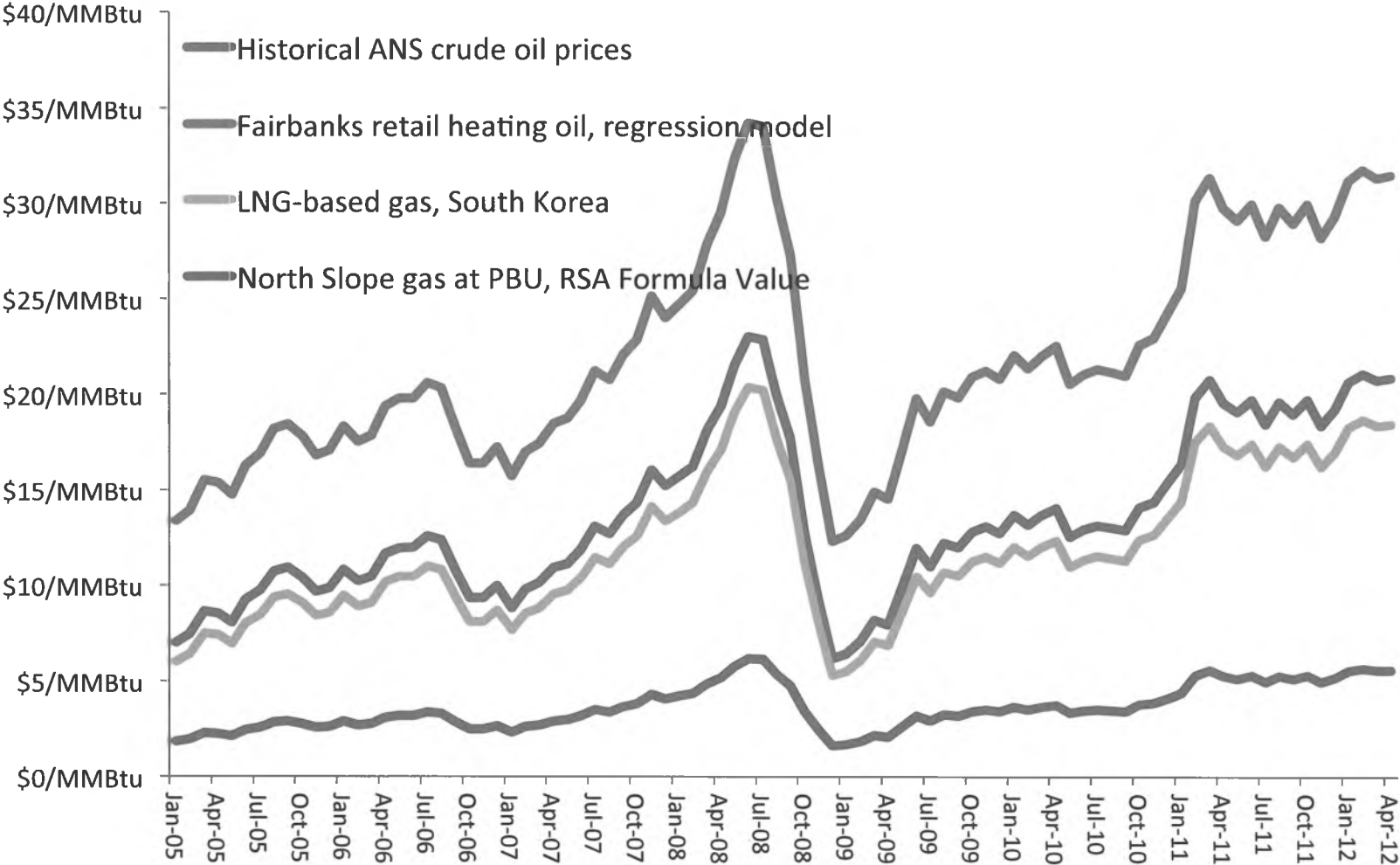
- Gas from long term contracts placed in Asian Pacific LNG market priced off oil, roughly:

$$\text{Price/MMBtu} = .90 + .1485 * (\text{ANS WC } \$/\text{Bbl})$$

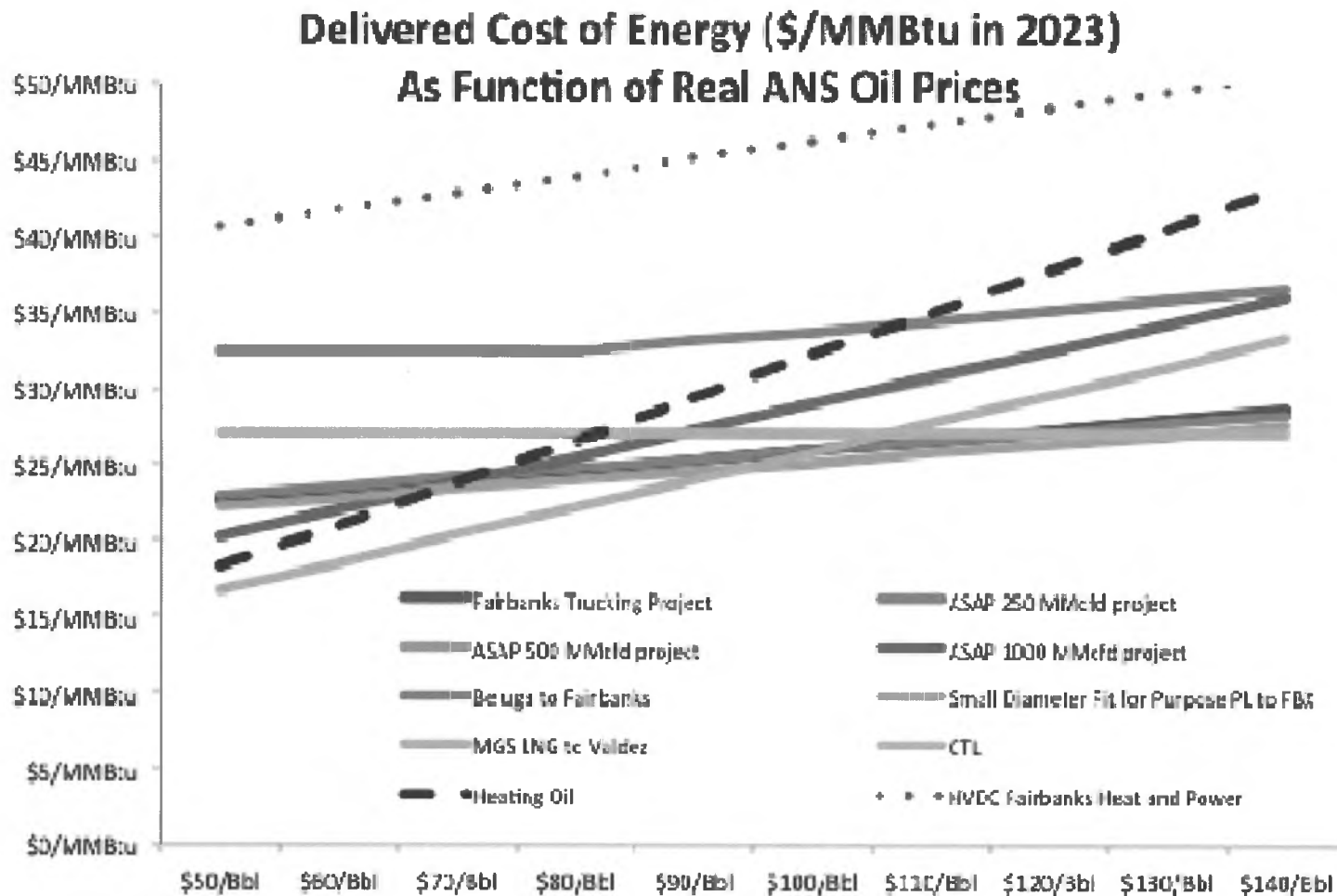
- FBX Heating oil

$$\text{Price/MMBtu} = 4.20 + .225 * (\text{ANS WC } \$/\text{Bbl})$$

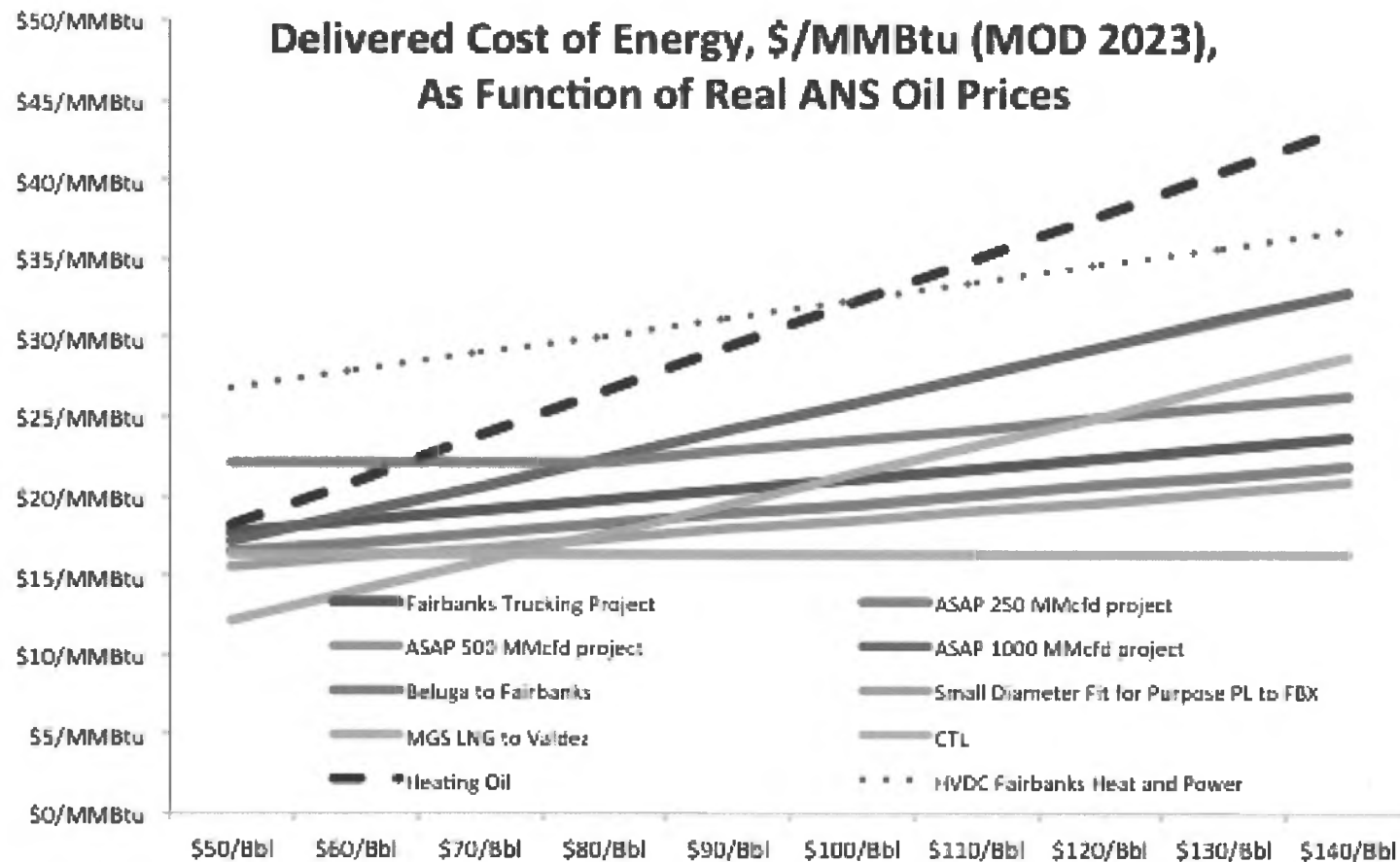
Illustrative Commodity Price Volatility as Function of Historical ANS Crude Prices



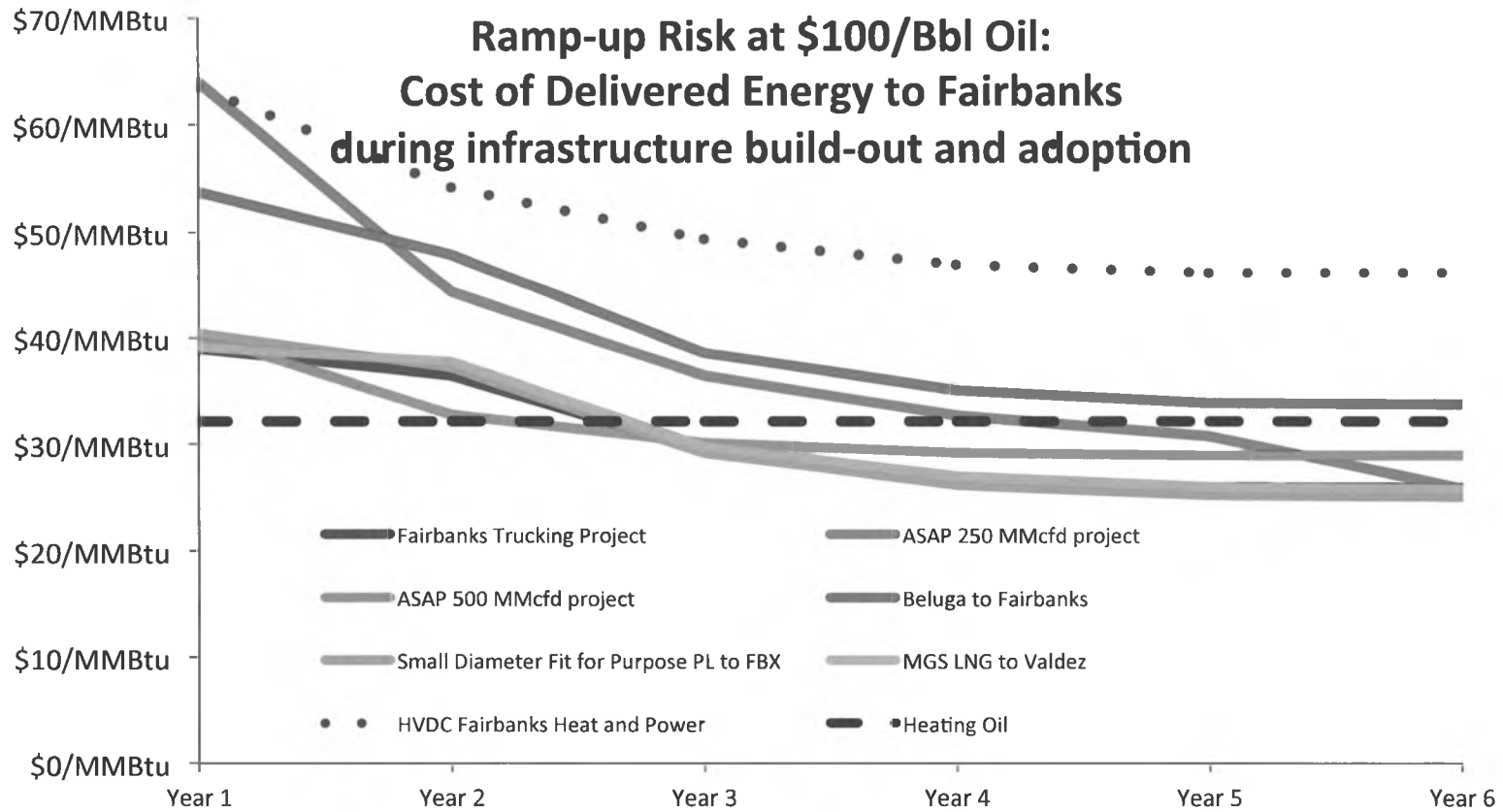
Private Ownership, Full Projects



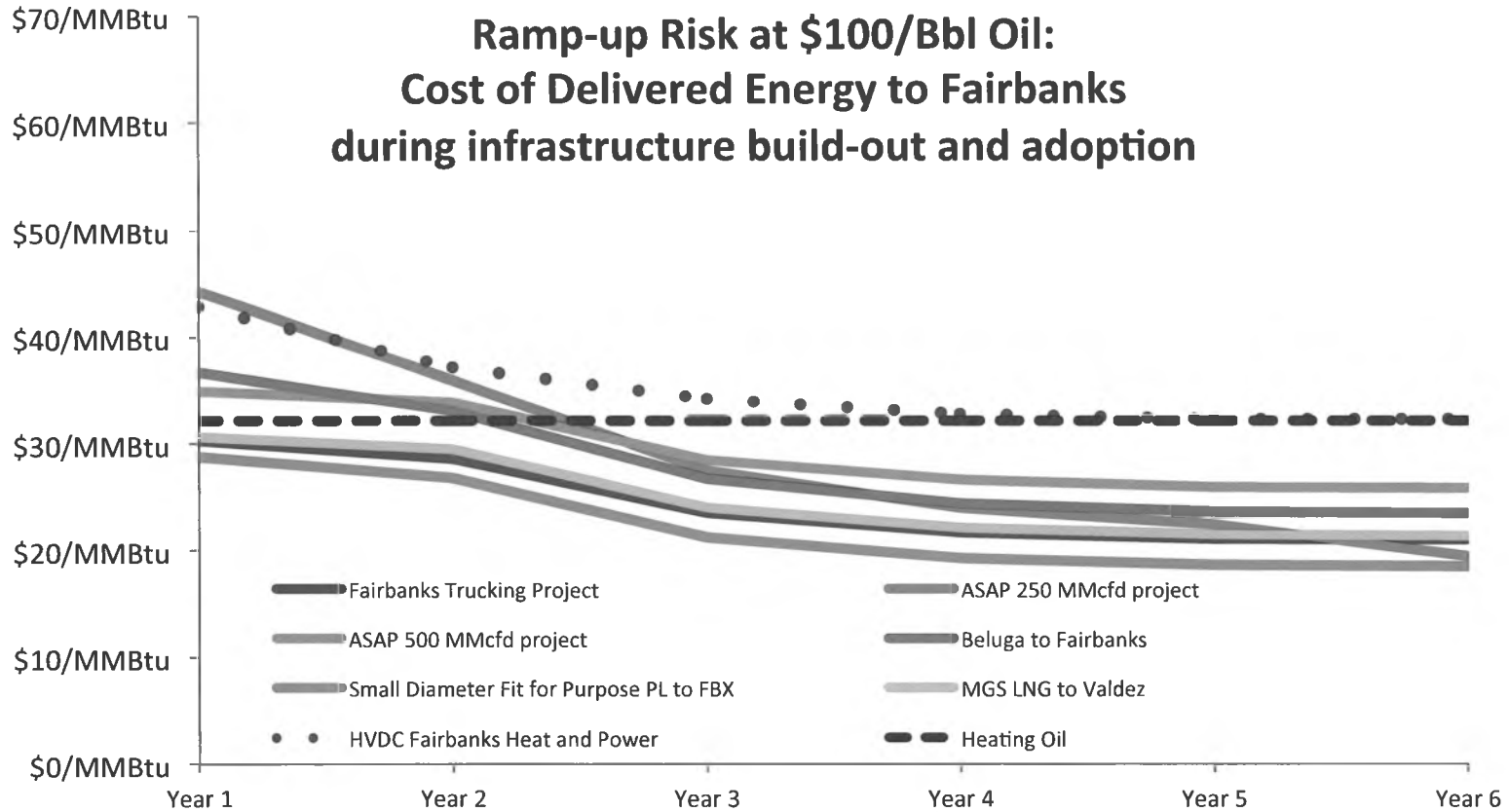
State Ownership, Full Projects



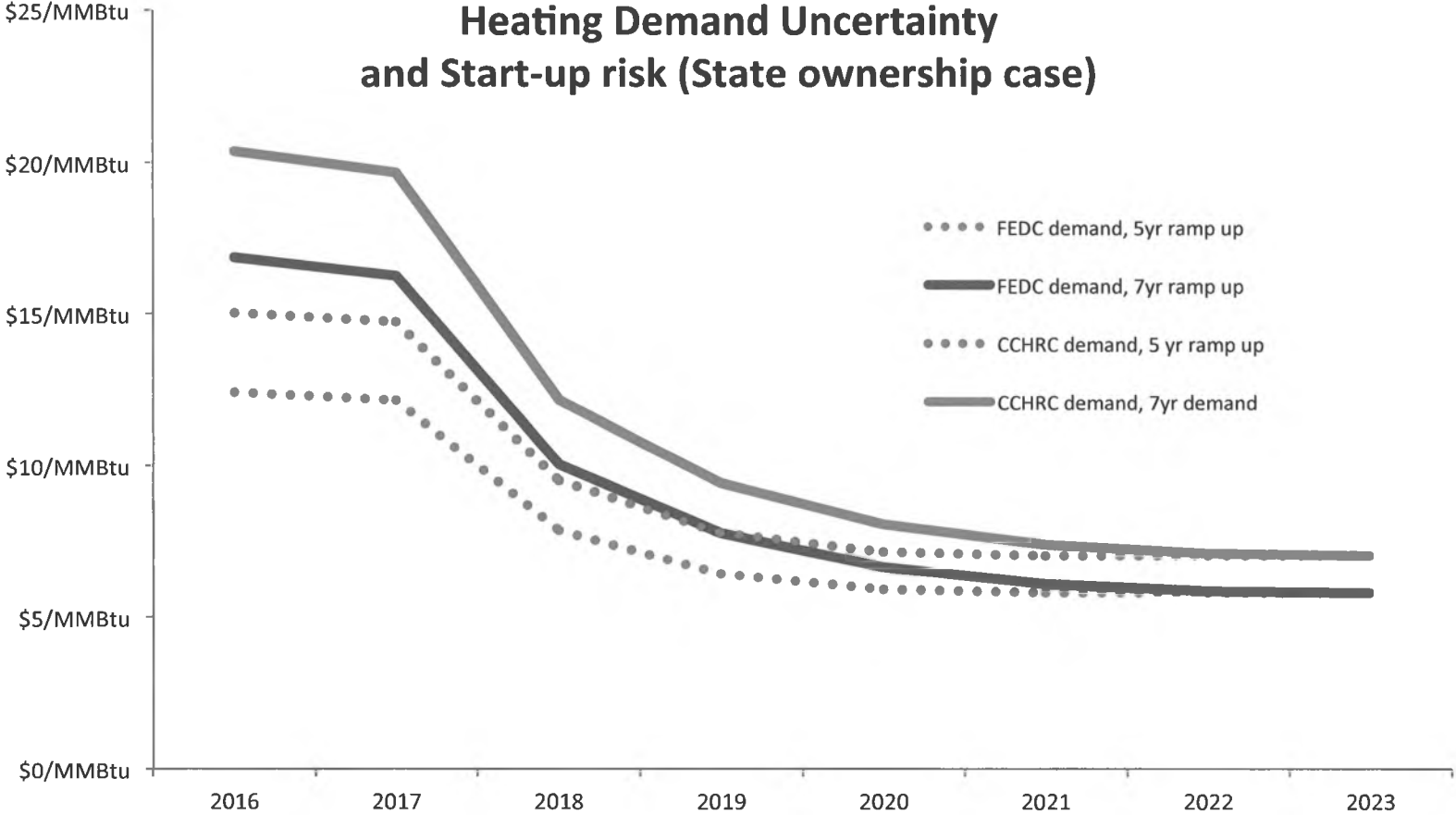
Private Ownership, Ramp-up Risk



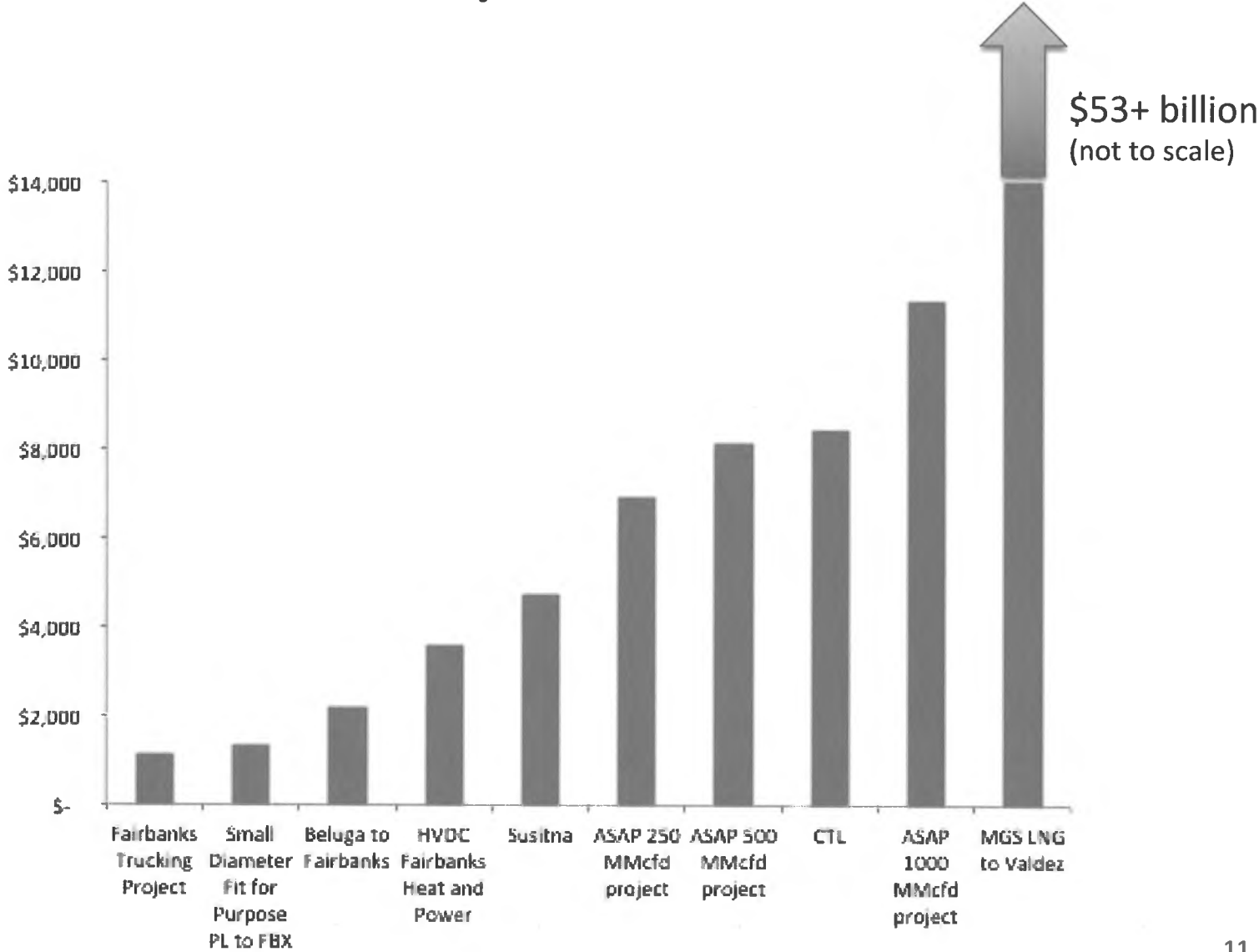
State Ownership, Ramp-up Risk



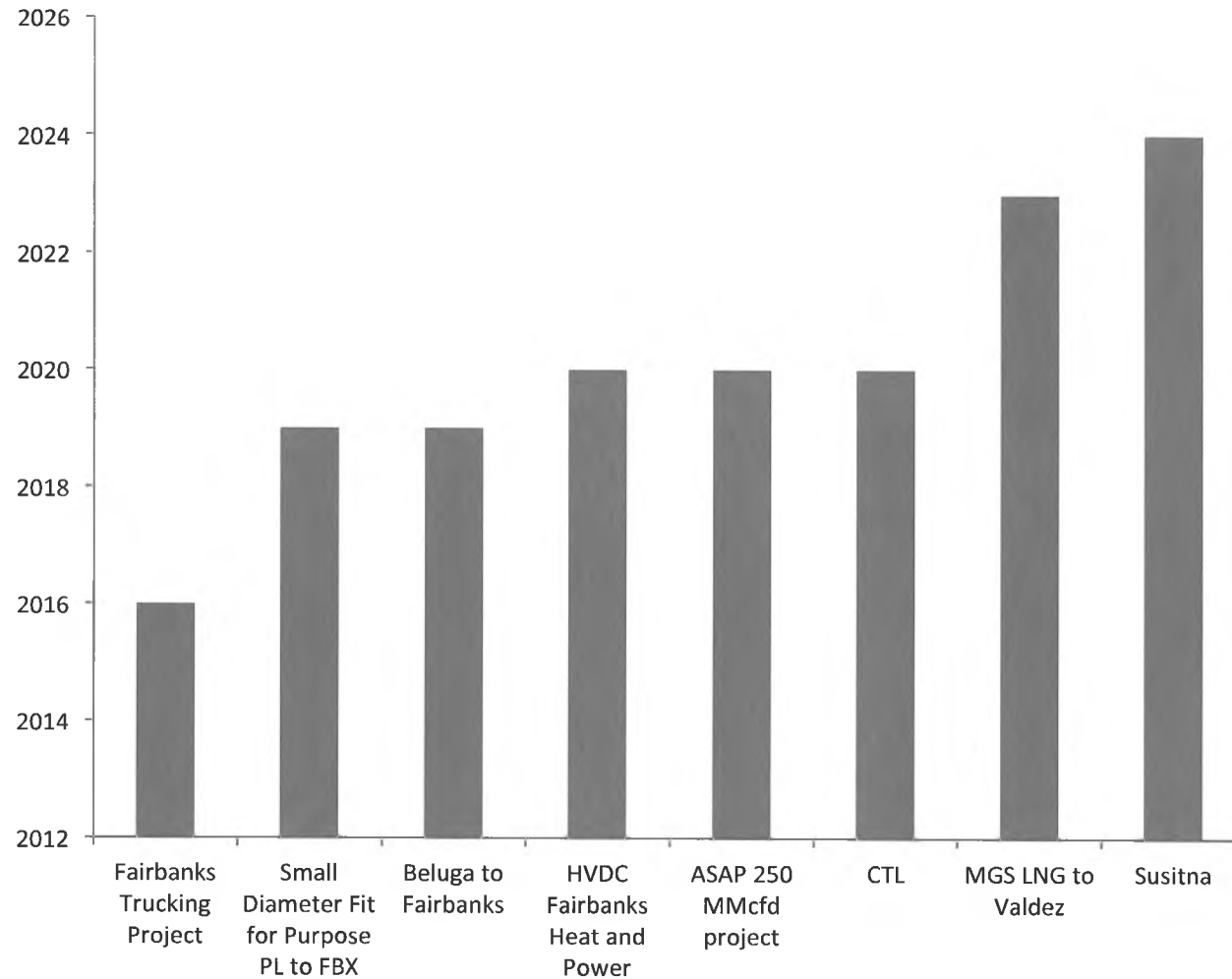
Effect of FBX Demand Uncertainty Local Distribution Infrastructure Costs



Project Total CapEx, Millions \$2012



Project Start Dates (no hiccups)



Summary

- Analysis focuses on dimensions of project risk
- Key drivers of results:
 - Focus both on commodity prices
 - Prices to Alaskans will be market driven, not “fair”
 - Almost all non-fuel costs assumed to be fixed
 - *No project optimized, all stylized*
- Focus on transportation capacity customers, gas supply contract terms



Cook Inlet Natural Gas Study 2012 Update

Senate Resources Committee

January 16, 2013

Peter J. Stokes, P. E.
Petrotechnical Resources of Alaska



Cook Inlet Natural Gas Study Update – 2012

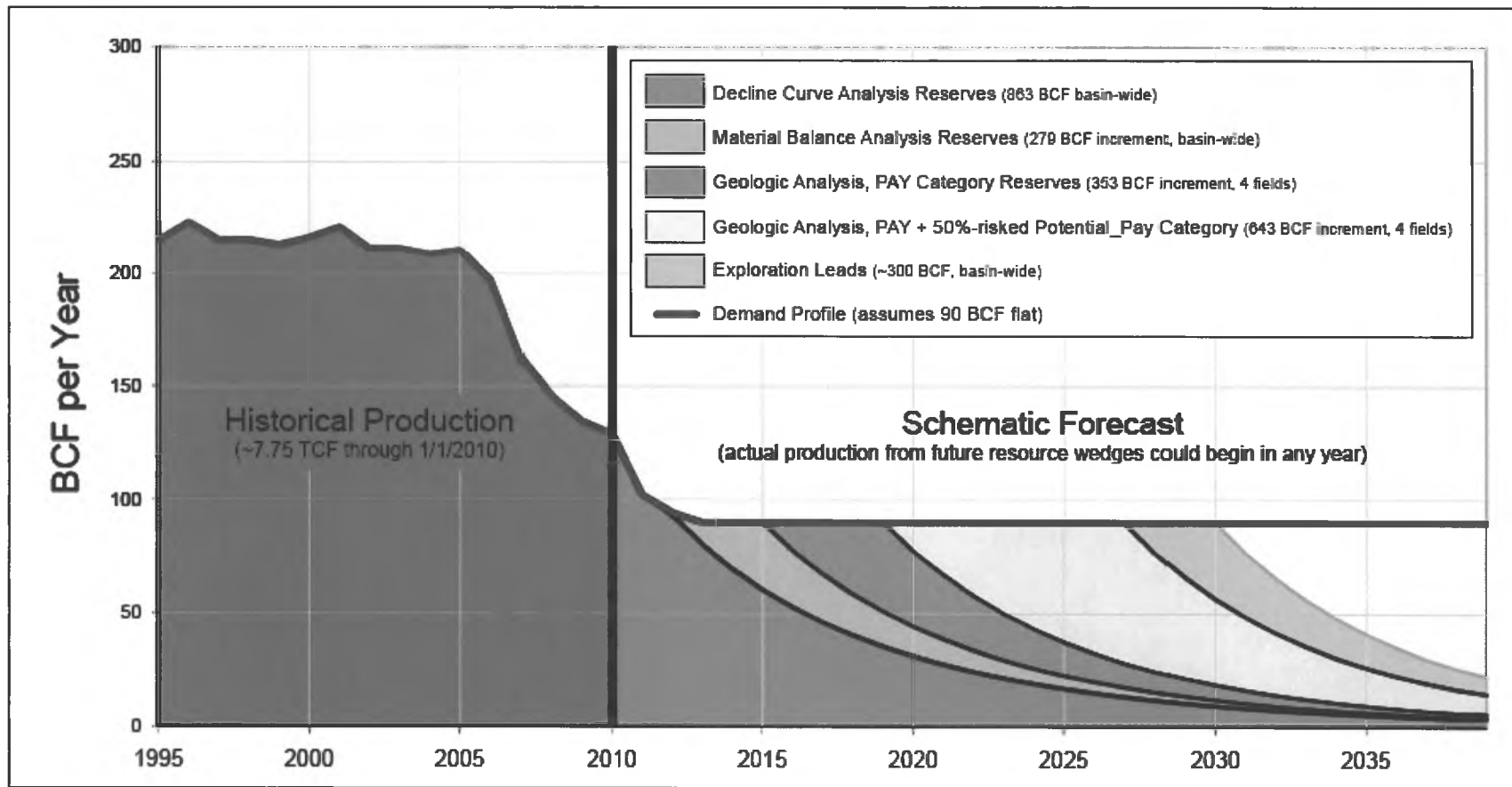
- ▶ **Southcentral Alaska Gas Supply/Demand 2012-2020**
- ▶ **Possibilities to meet Southcentral Demand**
- ▶ **Impact of the CINGSA gas storage project in mitigating winter peak demand**

2010 PRA Cook Inlet Study

- ▶ ENSTAR, Chugach Electric and ML&P commissioned PRA to perform a study of Cook Inlet Supply from existing Fields

- ▶ 2010 Study allowed Cook Inlet Utilities to better understand their gas supply
 - Impact and drivers of drilling/development activity
 - Further understanding of DNR 2009 CI Gas Report
 - Help predict when gas would need to be imported into the Cook Inlet market

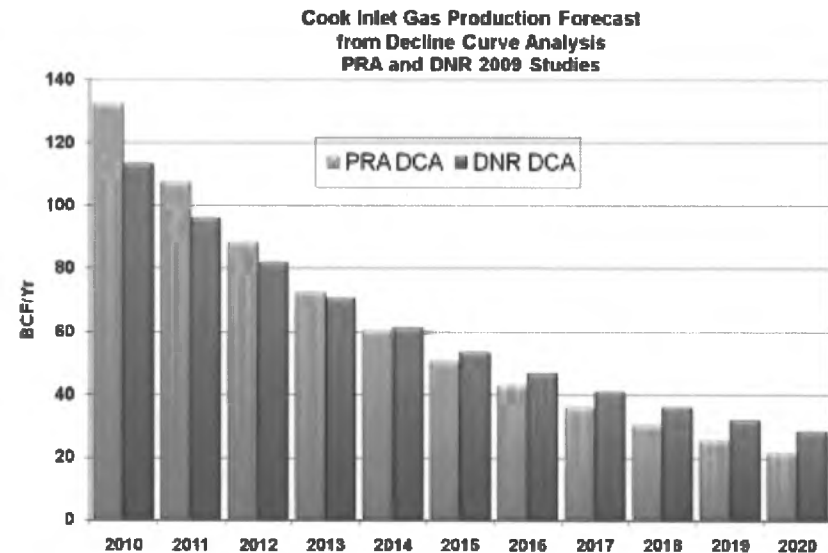
Annual Supply - DNR 2009 Report



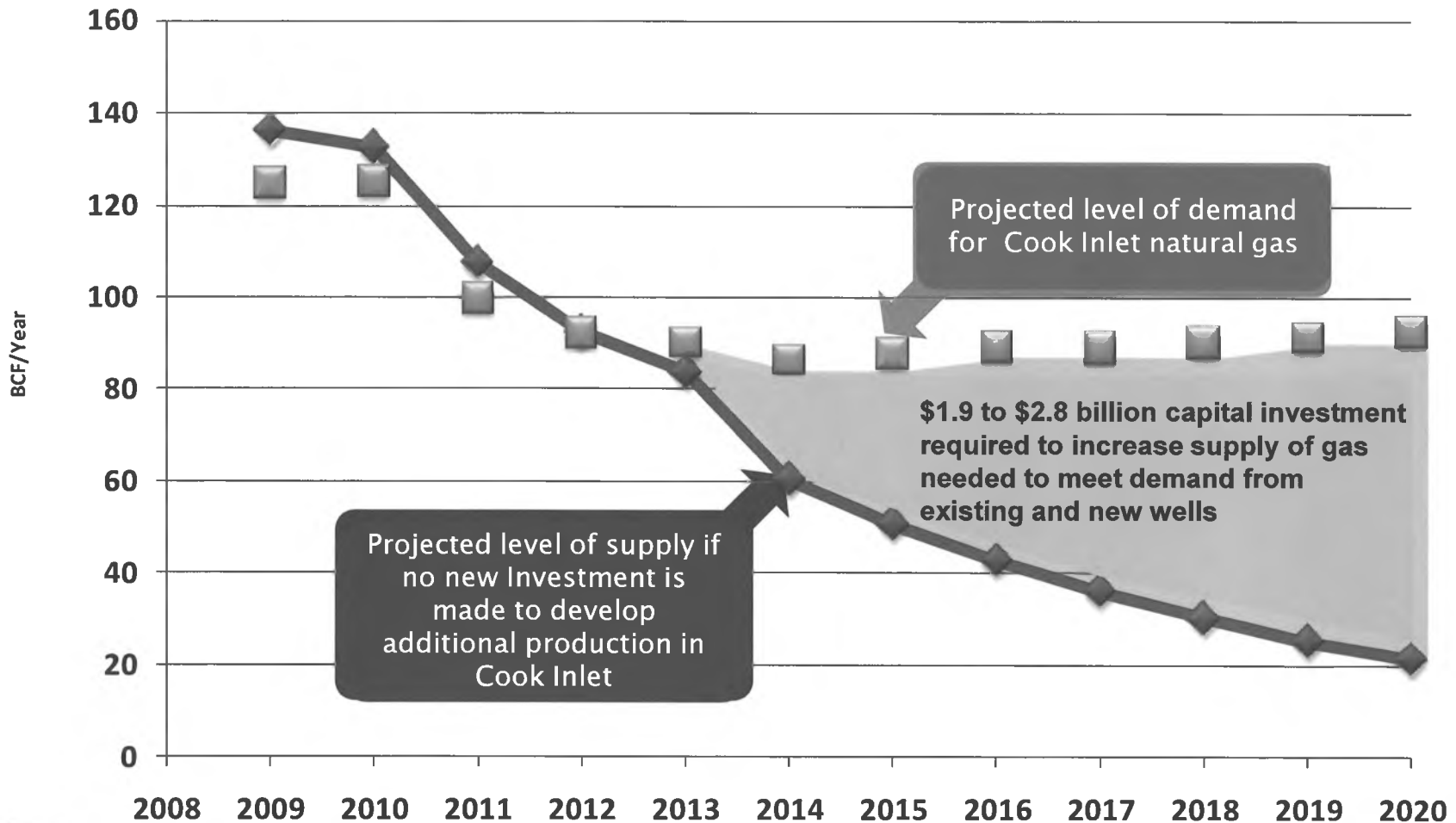
Source: AK DNR December 2009 Study

Comparison of DNR and PRA Decline Curve Analysis (DCA)

- ▶ Cook Inlet declines in 2010 PRA Study compared favorably with DCA in DNR 2009 Study



2010 PRA Study Summary



DNR 2011 CI Gas Cost Study

DNR concluded:

- ▶ CI Basin, with investment in exploration and production, is capable of meeting needs until 2018-2020 at prices below available alternatives
- ▶ Failure to make investments in lockstep with demand will result in the need for alternative sources sooner.

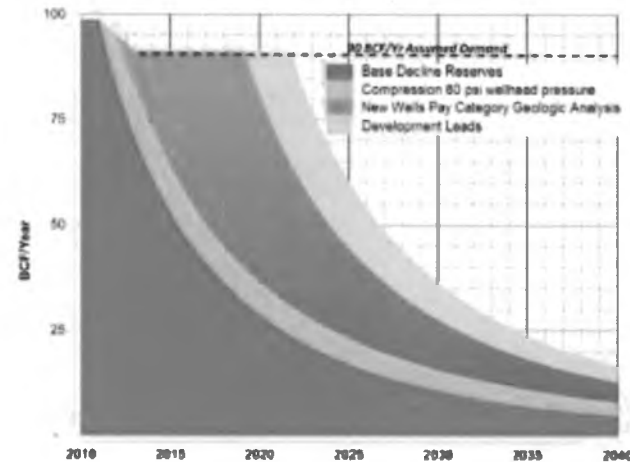


Figure 7. Hypothetical production forecasts resulting from this study for the Cook Inlet basin assuming a constant 90 BCF/Year demand after 2011. Production from future resource wedges could begin in any year. The projected "pay" volumes (green wedge) for this study are greater than that of the 2009 study (Figure 2) due to an error resulting in the understatement of McArthur River Grayling Gas Sands new well pay reserves potential. This error is corrected in this Figure.

2012 Update

- ▶ PRA was asked by the CI Utilities to update the 2010 Study to estimate the current supply from existing Cook Inlet fields for comparison with the current CI Demand Forecast.
- ▶ Due to drilling and compression additions since 2009, the predicted shortfall from existing fields has moved from 2013 to 2014.

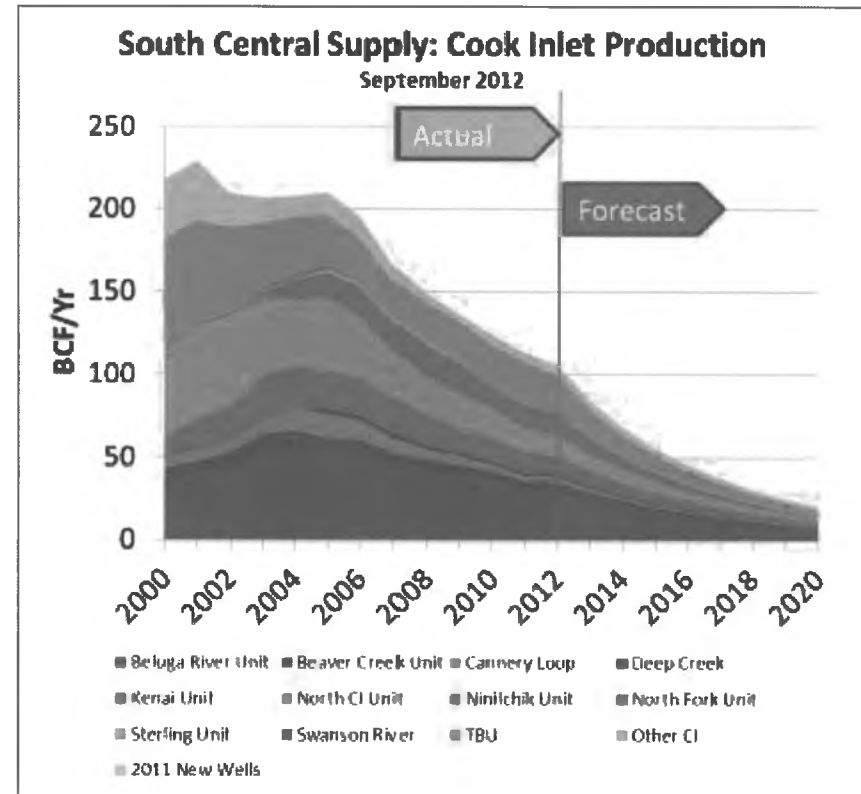
Cook Inlet Production Past and Future

2000-05: High production supported Nikiski plants

- ▶ Agrium Chemical Plant
 - Shut down in 2007
- ▶ LNG Exports continue
 - Future uncertain - License Extension ends March 2013

2014+: Production for

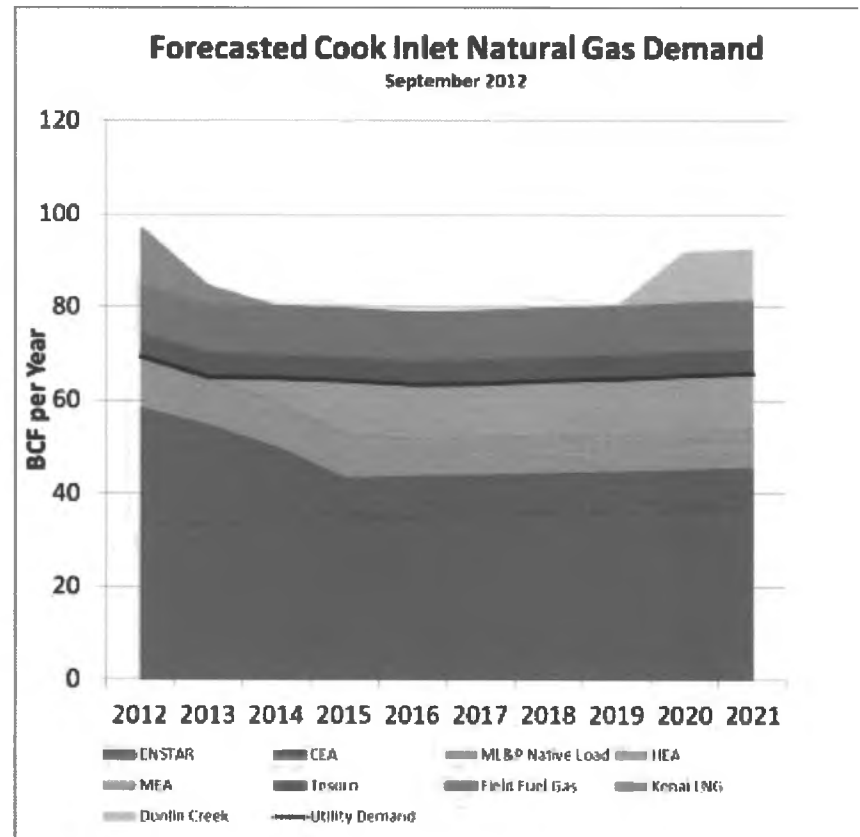
- ▶ Utilities
- ▶ Refinery
- ▶ O&G / Mining Fuel



Southcentral Future Demand

Projected Users 2014-19

- ▶ ENSTAR 44%
- ▶ Chugach Electric 13%
- ▶ O&G Fuel Gas 13%
- ▶ HEA/MEA 12%
- ▶ ML&P 11%
- ▶ Tesoro 7%



Why Do Utilities Care About Cook Inlet Gas?

▶ ENSTAR

- Cook Inlet gas provides 100% of supply

▶ Chugach Electric

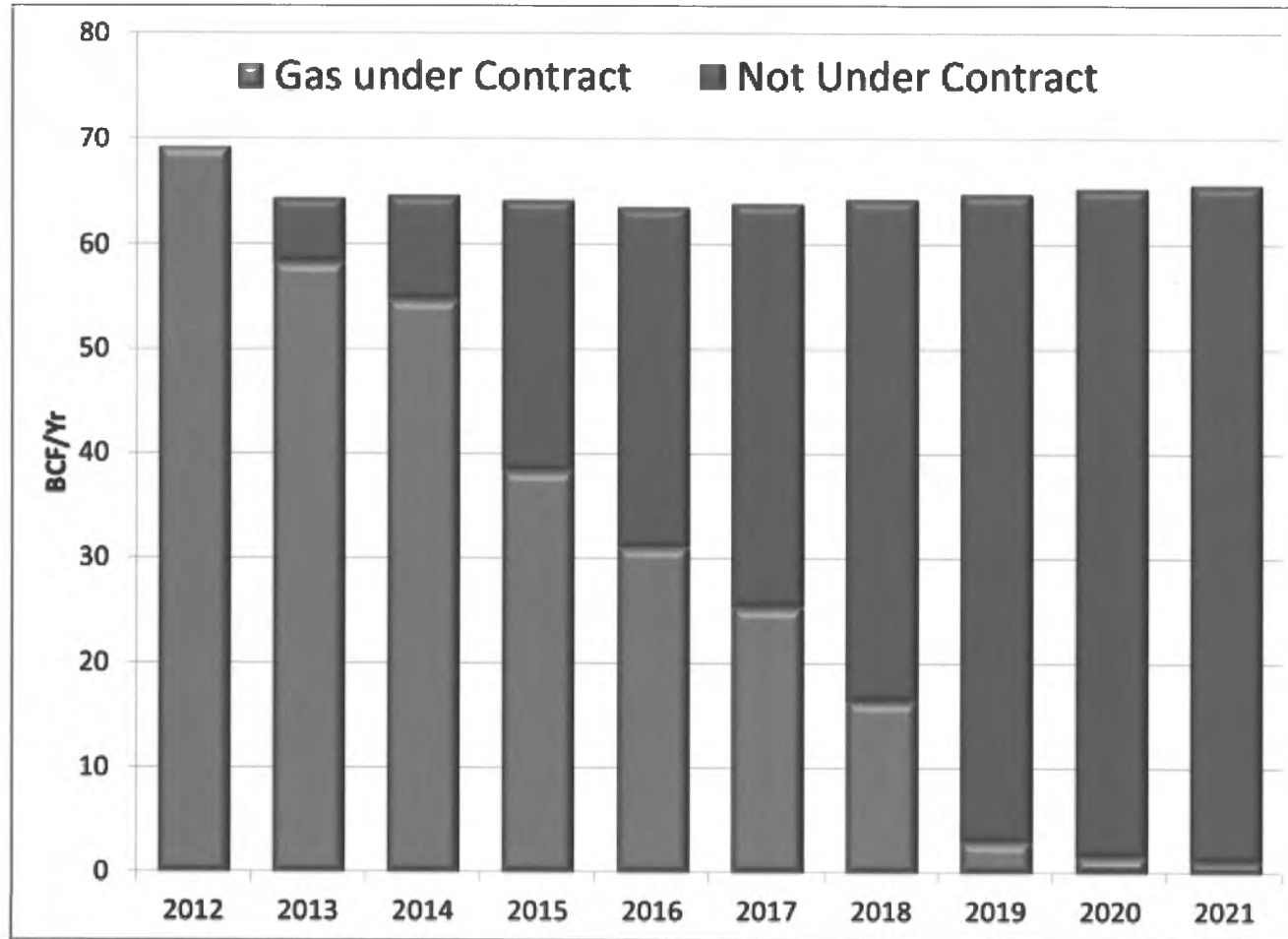
- Cook Inlet gas used for 90% of generation

▶ ML&P

- Cook Inlet gas used for 88% of generation

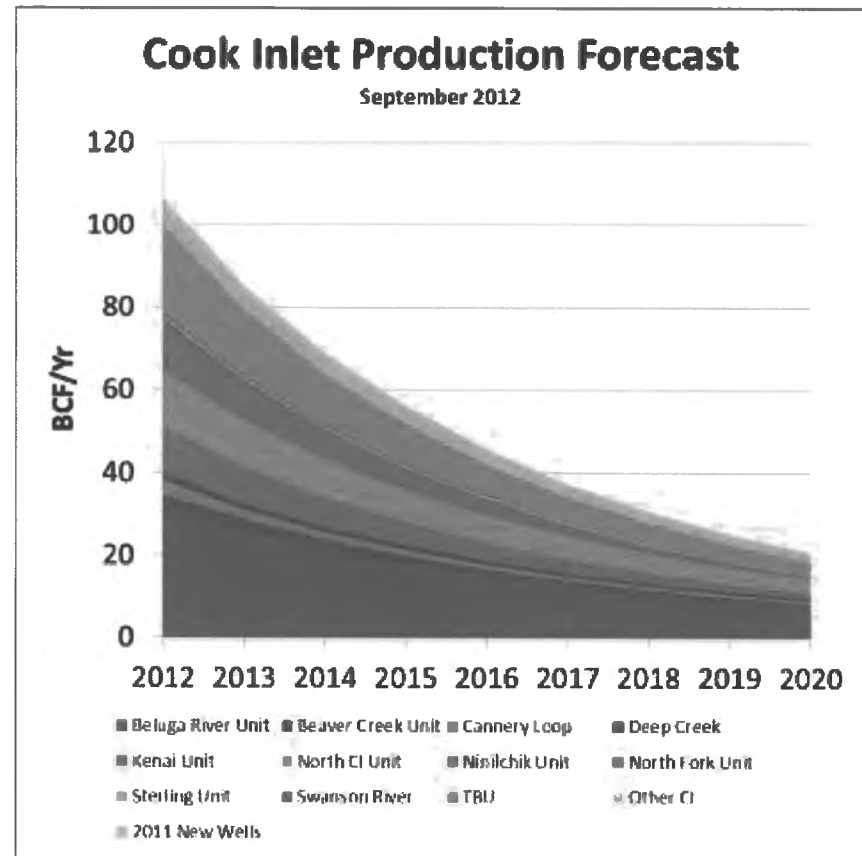
Southcentral Utility	2012 Predicted Consumption, BCF
ENSTAR	33.6
Chugach	25.0
ML&P	10.6

Total Utility Contracted and Not Contracted Gas Demand - 2012



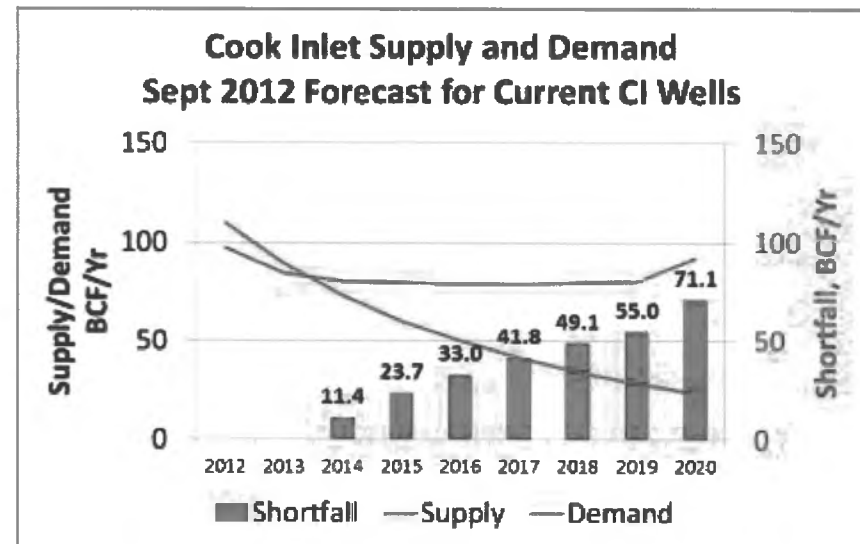
2012 Cook Inlet Supply Prediction

- ▶ PRA Decline Curve Analysis of existing fields and wells
 - 16-17% Annual Decline
- ▶ Does not include future developments or wells



2012 Supply vs. Demand Current Wells

- ▶ Based on current wells only, predicts a shortfall as early as 2014
- ▶ 2010 PRA Study forecasted need of 13-14 new gas completions per year to avoid shortfall
- ▶ Only 5-8 new wells per year were actually completed 2009-2012



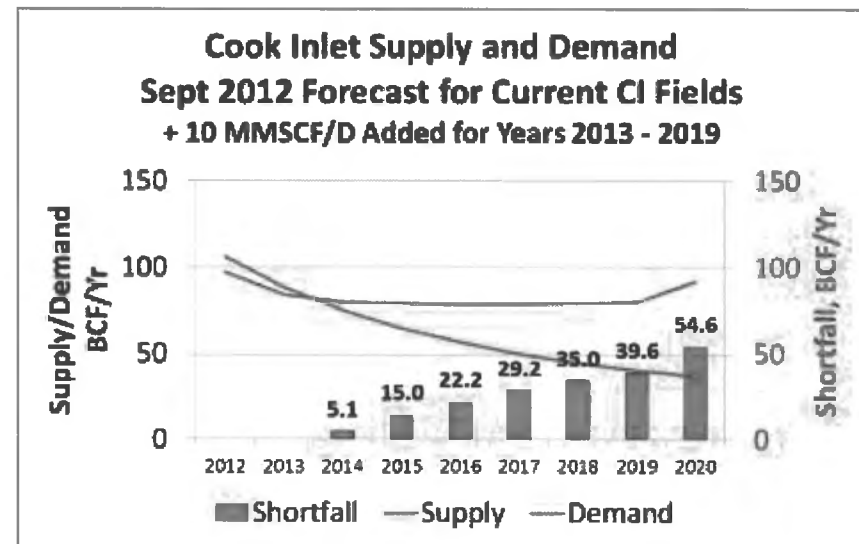
Cook Inlet Drilling Results

Period	Gas Wells Completed	Average Wells per Year	Initial Production (MMCF/day)
2001-2009	105	12.3	3.6 per well
2007-2009	34	13.6	3.1 per well
Nov-09 to Oct-10	5	5	3.7 per well
Nov-10 to Oct-11	6	6	1.7 per well
Nov-11 to Oct-12	8	8	3.6 per well

Supply vs. Demand:

Current Wells + Yearly Add of 10 MMSCF/D

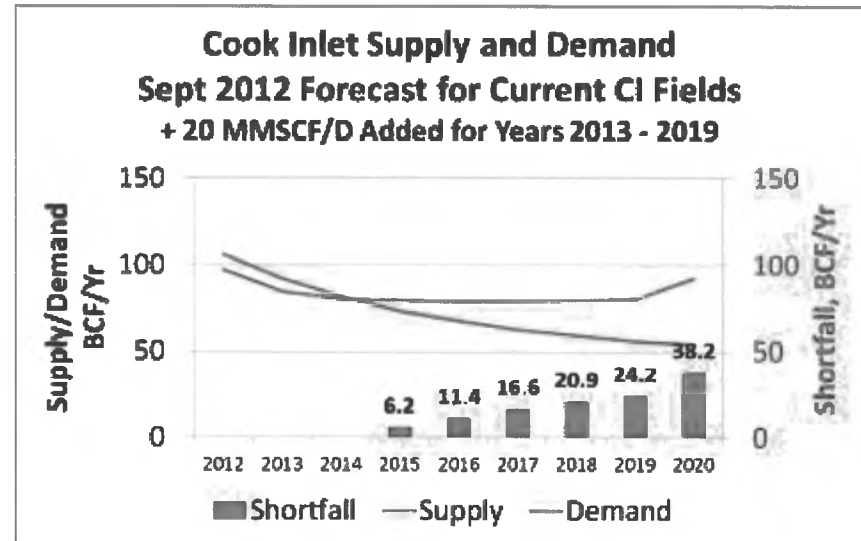
- ▶ This sensitivity assumes 3-4 new gas completions added per year 2013-19.
- ▶ Shortfall still predicted in 2014.



Supply vs. Demand:

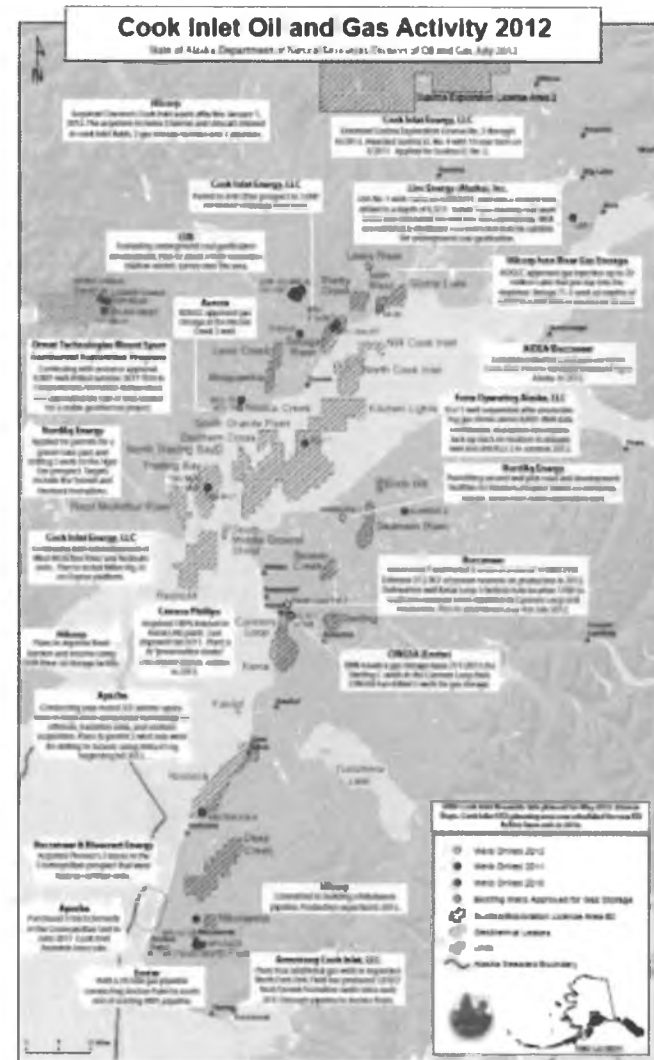
Current Wells + Yearly Add of 20 MMSCF/D

- ▶ This assumes 6-8 new gas completions added per year 2013-19.
- ▶ Shortfall predicted in 2015.
- ▶ Could be changed by additional near term infield developments
 - Hilcorp
 - CPAI
 - Buccaneer
 - Armstrong
 - Others



Methods of Meeting Southcentral Demand

- ▶ Infield development
 - Hilcorp
 - CPAI
 - Armstrong, Buccaneer, CIE, Aurora and Others
- ▶ Exploration
 - Onshore: NordAq, Apache, Buccaneer and Others
 - Offshore: Furie, Apache, and Buccaneer
- ▶ Instate Gasline: ASAP
- ▶ Gas Imports



Infield Development

- ▶ Hilcorp has stated that they will spend \$203 million in capital in 2012 to develop oil and gas
 - Will likely spend \$150 million per year over next 2 years
 - This is a marked increase over the activity levels of Chevron and Marathon
 - Red Pad is now producing
- ▶ ConocoPhillips drilled 2 wells at Beluga River
- ▶ Buccaneer is completing Kenai Loop #4
- ▶ Armstrong has permitted 4 wells at North Fork
- ▶ Other infield development include Aurora and CI Energy

Unless more or high rate gas wells are developed, shortfall likely occurs in 2015+ timeframe.

Exploration – Onshore

- ▶ Hilcorp: 3D program at Deep Creek
- ▶ NordAq: Delineating Shadura and Exploring
 - Shadura not to be developed until 2013
 - Exploring at Tiger Eye Prospect in 2012-13
- ▶ Buccaneer exploring near Homer
- ▶ CIE exploring west Cook Inlet
- ▶ Apache shooting large 3D Seismic Program, plans to drill 4th Quarter 2012 near Tyonek

If successful exploration wells are found near current infrastructure and be quickly developed, there can be an impact on timing of shortfall.

Exploration – Offshore

- ▶ Furie is drilling exploration wells with Spartan 151 jack up rig
 - Announced discovery at Kitchen Lights #1; did not complete
 - Drilled and suspended Kitchen Lights #2 and #2A
- ▶ Buccaneer has mobilized Endeavour jack up rig to CI to drill Cook Inlet prospects
 - Plans to drill at Cosmopolitan this winter
- ▶ Apache shooting offshore 3-D Seismic

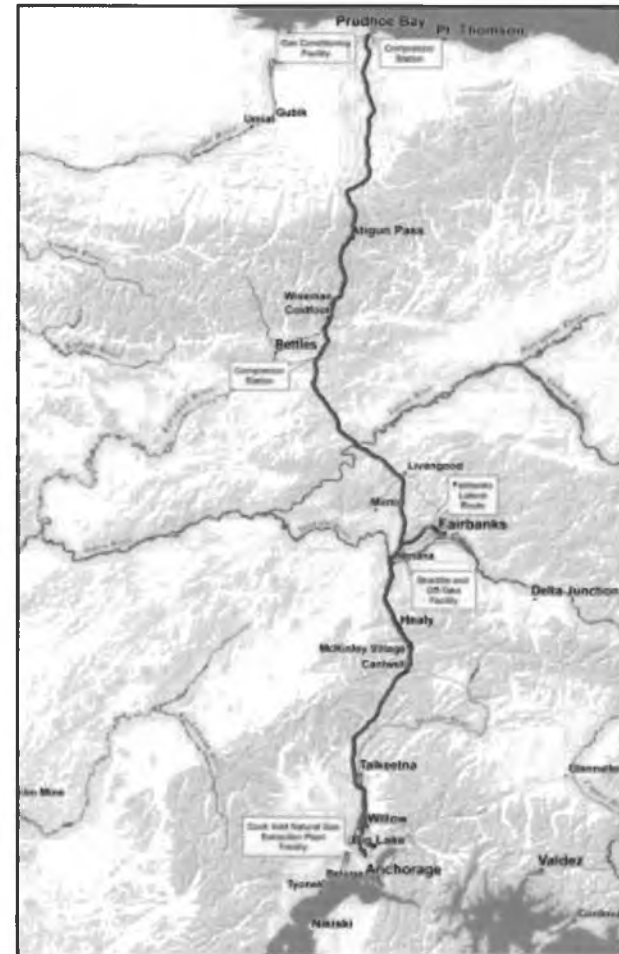
Timing for first gas production likely to be 3-5 years after discovery due to offshore permitting and construction lead times.

Alaska Stand Alone Gas Pipeline

2011 ASAP Project Plan

- ▶ Estimated to Cost \$7.5 billion (2011\$) +/- 30%
- ▶ Gas to South Central by 2020 at earliest.

ASAP will not solve 2015-2019 shortfalls in Cook Inlet gas supply.



Import Gas to Cook Inlet: LNG or CNG

- ▶ LNG is a commodity that can be contracted for import into Cook Inlet
 - Use of Nikiski Plant or other for regassifying
- ▶ LNG from North Slope
 - Large number of truck deliveries to meet SC shortfall
- ▶ Compressed Natural Gas (CNG) is another option for importing gas
 - Possibly a cheaper option than LNG

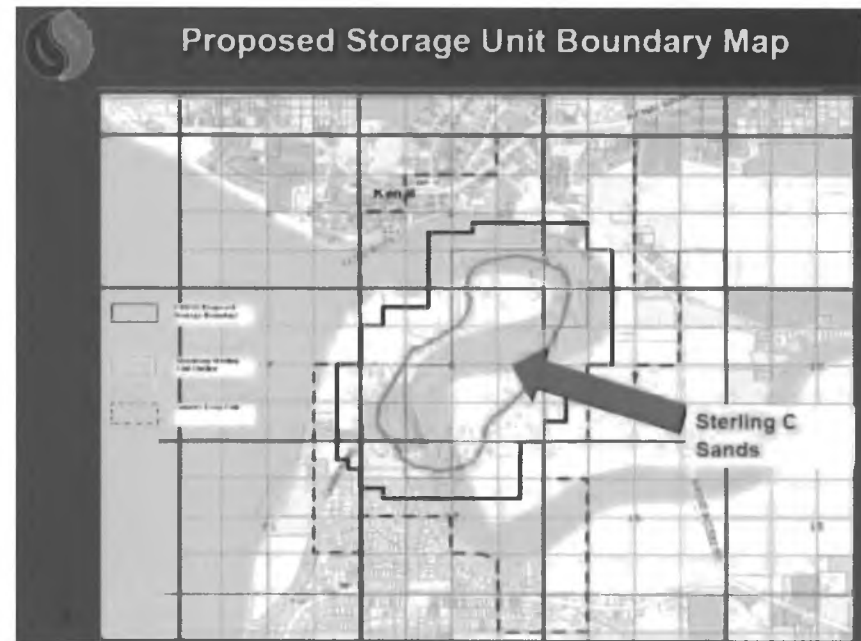
With timely engineering and permitting, LNG or CNG could be imported to fulfill short-term needs.

Summary: Possibilities to Meet 2012–2020 Demand

- ▶ Infield drilling: Recent history of activity level indicates that this will not meet demands past 2015
- ▶ Onshore Exploration: Not proven and if successful would need time for development; could impact timing of shortfall
- ▶ Offshore Exploration: Not proven and 3-5 years from discovery to production
- ▶ Instate Gas Line: Will not be operational until 2020
- ▶ Imported LNG or CNG: Could bridge demand shortfall until exploration and/or instate gas line provide for sufficient supply

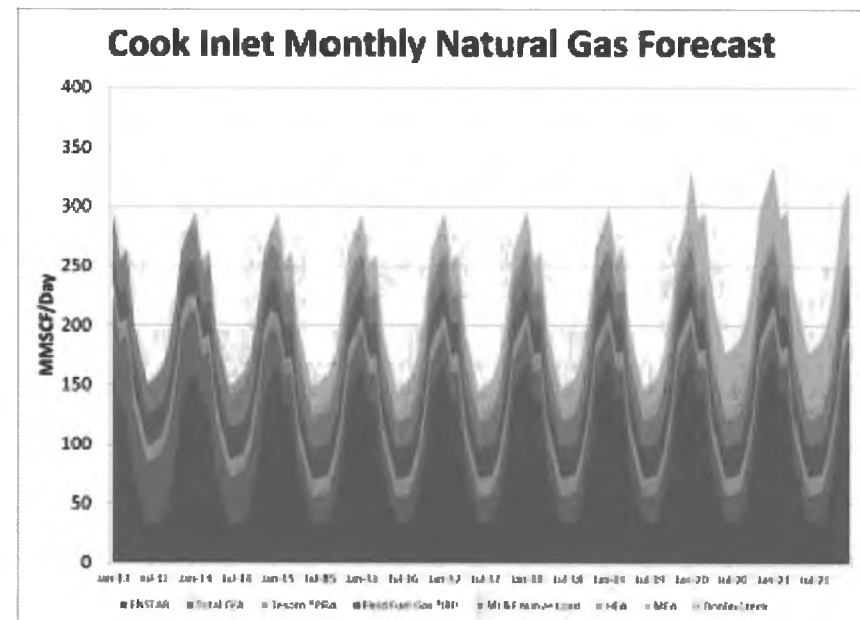
CINGSA Project

- ▶ 5 horizontal wells and compression installed
- ▶ CINGSA Storage Project allows for 11 BCF of active storage
- ▶ Winter peak capacity of 140 MMSCF available from CINGSA storage



CI Peak Gas Demands

- ▶ Large swing between Summer and Winter gas demands
 - Summer: 150 MMSCF/D
 - Winter: 300 MMSCF/D
- ▶ CINGSA gas storage allows injection of CI gas during summer to help meet winter peak demands



Impact of CINGSA

- ▶ Currently allows for storage of 11 BCF/Year.
- ▶ Will allow for meeting 45% of monthly average peak demand in the winter.
- ▶ Allows for purchase and storage of gas during summer season for use during winter peak demands.
- ▶ Available for storage of future imported LNG or CNG.
- ▶ Will help alleviate need of overproducing wells to meet peak daily utility demand.



Source: Alaska Business Monthly
Photo by Robin Barry, ENSTAR

Conclusions

- ▶ Absent major new large discoveries that can be brought online in 1-2 years, the current pace of development could mean a shortfall in Cook Inlet supply to meet demand in 2014 or 2015.
- ▶ LNG or CNG import is only “certain” method to ensure no shortfall.
- ▶ CINGSA storage is capable of storing CI produced gas or imported gas for winter peak demand.

Questions?

ALASKA

Envisioning a Bright New Era



Alaska is on the path to a new petroleum boom aided by a state government determined to make it, once again, a giant in the world's oil and gas industry. Explorers of all sizes are rediscovering the massive potential of the U.S.'s only arctic state.

This special report has been produced by Star Communications for distribution with *Oil & Gas Journal*

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The sleeping giant awakens

Ambitious targets, industry revival driven by reforms

Before the Gulf of Mexico and the shale gas revolution, Alaska rode high as a giant of the North American oil and gas industry.

In the late 1980s, more than 2 million barrels of oil flowed south every day through the Trans Alaska Pipeline System (TAPS), supplying the US with 25% of its oil needs.

The Alaska oil boom began to fade in the 1990s, and today the flow of oil through TAPS has ebbed to less than 600,000 barrels of oil per day.

But the sleeping giant is stirring thanks to a combination of forces that have put the United States' only arctic state on the path to a new energy boom.

Alaska's state taxes on onshore oil production - the highest in North America - are undergoing a reform effort to remove what many petroleum companies regard as the biggest barrier to new investment and production.

These moves have coincided with the recognition that Alaska's oil and gas potential is still greater than most other places around the world.

The re-rating of Alaska is highlighted by Shell's determination to drill in arctic waters off the north coast. Shell has already invested \$5 billion before sinking the first exploration well.

Alaska's place within an OECD country has also elevated it in global assessments. Unlike many of the big-oil destinations to emerge over the past 20 years, Alaska has a predictable fiscal and legal regime.

The shift towards a more positive investment climate has already led to a breakthrough in a potential new LNG

project based on multi-TcF reserves at Point Thomson and the legacy oil fields on the North Slope.

The project partners hope to capitalise on Alaska's proximity to Asia and build on the state's impeccable record as a



"We're going out of our way to let the world know that Alaska is interested in doing business with them and growing our economy in the process."

SEAN FARNELL, Governor

supplier of cargoes from the Kenai LNG plant since 1969.

Signs of the coming boom in Alaska's energy industry can be seen in a revival already underway in the state's traditional petroleum hotspots - the Cook Inlet in the south and the North Slope in the arctic.

A new wave of companies has entered the Cook Inlet over the past two years, reflected in high levels of bidding in recent annual oil and gas lease sales.

On the North Slope, explorers are racing to establish positions onshore and offshore. Prudhoe Bay, North America's largest oil field with almost 17 billion barrels already produced, is now being seen as just the beginning. The United States Geological Survey (USGS) and the U.S. Bureau of Ocean Energy Management collectively place a mean estimate of 40 billion barrels of oil still technically recoverable from the North Slope and in waters off Alaska's northern coast, along with 207 TcF of gas, not including shale gas and other unconventional sources such as viscous oil, heavy oil and gas hydrates.

These are big numbers that befit what is still one of the biggest and most exciting frontiers for the world's petroleum industry



Offshore oil and gas production in the Cook Inlet

Alaska facing up to critical need for change

The declining flow of oil through TAPS is much more than a symbol of Alaska's economic health.

With no state income tax, sales tax or property taxes, the Alaskan administration relies almost exclusively on taxes charged to the oil and gas industry. In the year to 30 June 2011, taxes on the petroleum industry generated \$7 billion, or 92% of the state budget.

Alaska's public finances are in enviable health today, with a triple A rating, a budget reserve of \$20 billion and another \$40 billion parked in the Alaska Permanent Fund Corporation, a sovereign wealth fund established in 1980.

High oil prices of recent years have helped to insulate the state from the full effects of a long-term decline in production that has averaged about 5 percent per annum.

But with no short or medium term prospects of a reversal in the downward trend, the long-term outlook for Alaska's public finances is ringing alarm bells for the state's administrators.

The declining flow of oil through TAPS is also creating technical and potential environmental safety issues for the operator, Alyeska Pipeline Service Company.

These critical financial and technical issues led Alaska's Governor, Sean Parnell, to announce in March 2011 a goal to

rebuild the flow through TAPS to one million barrels of oil per day over the next 10 years.

Parnell says it will take a broad range of stakeholders to achieve the target, but government can take a leading role by

"We have to make it more attractive for the billions of dollars of investment we will require to get to that target of one million barrels per day."

DAN SULLIVAN, Commissioner DNR



improving the tax and regulatory regime.

Tax cuts for oil and gas producers were passed last year by Alaska's House of Representatives, but were subsequently blocked by the state Senate.

Parnell says changing the tax regime is still his top priority, despite the barriers put up by the Senate.

"We have the public much better educated than they were a year and a half ago, and they see the connection between taxing and revenue for the state. Taxing more means less production and less revenue for the state of Alaska. It means less money for schools and everything else."

He says Alaska is actively working to develop its vast resources for the benefit of its people. "To do that, we recognise that we need to be more competitive. And we're going out of our way to let the world know that Alaska is interested in

doing business with them and growing our economy in the process."

Parnell is also actively encouraging the Obama Administration to follow the state's lead in creating a better investment climate for energy companies on Federal lands, which occupy around half of Alaska's land area, and in Federal waters on the outer continental shelf.

He argues that Alaska still has a key role to play in creating energy security for the United States. The state continues to produce about 11% of the nation's oil needs, and has the potential to increase this dramatically.

Obama has supported Alaska's energy revival by establishing an inter-agency working group to improve coordination between the federal agencies that are responsible for authorizing onshore and offshore work by Shell, Statoil and others companies planning to drill in the Arctic.

Tax reform

Alaska's Commissioner of the Department of Natural Resources, Dan Sullivan, leads the administration's efforts to achieve the target of one million barrels per day.

He says the administration is "very focused" on achieving its ambitious target.

"We believe it is achievable given the sheer size of the resources in the North Slope region. We are also benefiting from a shift in investment back to OECD countries. If you look around at countries with that combination of resource potential and stable political/legal systems, Alaska is probably the best place in the world right now."

Sullivan, who served in federal government from 2006 to 2009 as Assistant Secretary of State for Economic, Energy and Business Affairs, is leading his department's work on a multi-pronged strategy that begins with enhancing Alaska's global competitiveness and investment climate.

He says it is imperative that Alaska creates the right investment climate and cost structure. "We have to make it more attractive for the billions of dollars of investment we will require to get to that target of one million barrels per day."

"That will be principally through tax reform, but it's also through infrastructure development. We have invested significant amounts on improving our transport infrastructure, including maintaining the road to Prudhoe Bay."

Sullivan says Alaska already has very favorable and competitive tax rules that applied to the front end of projects, such as generous tax credits for exploration costs.

"Where we need to be more competitive is at the production end, particularly at times of higher oil prices."

The tax reforms so far envisioned include replacing a single marginal tax rate on oil production, which is currently one of the highest in the world, with a progressive tax similar to bracketed tax rates on personal income.

The reforms are also targeted at promoting infield drilling by existing producers, which is seen as the best way to get more oil into TAPS in the short term.

Sullivan says the state administration is focused on getting a tax reform package through the legislature as soon as possible.

"We have to succeed with this. It's critical for the investment climate and the future of the state."

Alaska's Commissioner of the Department of Revenue, Bryan Butcher, says the high cost of working in Alaska's remote areas, combined with the state's high taxes, has made other destinations more attractive for petroleum companies.

"Our resources are far greater than North Dakota and Texas. We have larger resources than a lot of the areas that are booming right now, but we're not getting the development they are getting. We can't



Petro Star refinery at the North Pole



Aivia towing Shell's Kulluk



Ooguruk Drill Site in the Beaufort Sea



Prudhoe Bay Oil Fields

do anything about the remoteness, but we can do something to bring taxes down to a reasonable level."

Butcher says the state had become complacent in the past about attracting investment because of the huge size of the Prudhoe Bay and Kuparuk fields.

"We have to compare ourselves to every other state and country and ask 'how do we stack up?'"

"That's what this administration is doing, and looking at what we need to do to still get Alaska's fair share but also allow private industry to function at a profit that is competitive with elsewhere."

In addition to the ongoing effort on tax reform, he and Commissioner Sullivan have embarked on a comprehensive campaign – in the Lower 48 and around the world – to pitch Alaska and encourage new investment.

Permitting

The second key strategy for attracting energy investment is an overhaul of the petroleum permitting system in Alaska, which Sullivan says had changed little since the birth of Alaska's energy industry in the 1960s.

"We are reforming our state-wide permitting system, which is a really important issue. My agency has hired 35 new people and trained them as part of our larger effort to make our permitting much more efficient, timely and certain."

"We have passed through the legislature reforms that get rid of duplication and we have also invested in new technology so that permits can move more quickly."

Sullivan says the state is also working closely with the Federal Government on improving the handling of permits on Federal lands, which includes some of Alaska's most prospective areas.

Next phase

A third key strategy is clearing a path for the next phase of oil and gas development on the North Slope. The first phase was the discovery and development of Prudhoe Bay and neighbouring Kuparuk field, which are the largest and second largest oil fields in North America respectively.

These have dominated the North Slope for decades, but attention is now turning to dozens of nearby fields that are small by Alaska's standards, but would be moderate to large discoveries anywhere else.

Sullivan points out that the US Geological Survey in its last assessment of

the North Slope said there were dozens of smaller conventional pools.

"They define smaller as anywhere between 30 million and 300 million barrels. Now a lot of people would think 300 million barrels is not so small, but for Alaska that's small, and there are dozens of them."

The state is also encouraging development of unconventional plays, including shale oil, viscous oil and heavy oil. A new



"Our resources are far greater than North Dakota and Texas. We have larger resources than a lot of the areas that are booming right now"

BRYAN BUTCHER, Commissioner DOR

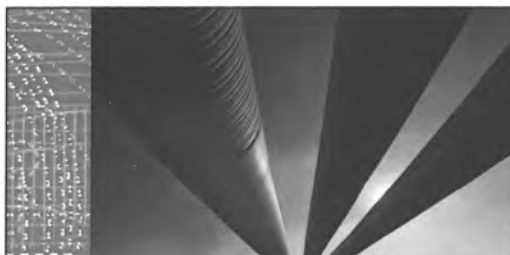
shale oil play in Alaska is beginning to emerge with investors like Riverstone and service companies like Halliburton focusing on the huge potential of shale oil in Alaska. To prepare for the different regulatory challenges of unconventional energy, Sullivan's department has set up a shale gas taskforce. In addition, Sullivan and his

staff has held a series of meetings with their counterparts in North Dakota.

The next phase of North Slope development is expected to rely heavily on smaller, more nimble companies outside the ranks of the supermajors. As experience in the North Sea has shown, independents can generate new waves of development activity in mature regions by exploiting the opportunities considered too small by the oil majors.

Texas-based Pioneer Natural Resources has led the charge with the discovery and rapid development of its near-shore Oooguruk oil field, about 250 km south-east of Barrow. The field represented the first production by an independent operator on the North Slope.

Brooks Range Petroleum is another independent securing a long-term presence on the North Slope with the recent discovery of the Mustang oil field on the southwestern boundary of the Kuparuk River. The Anchorage-based explorer has recently announced plans to bring the 40 million barrels field into production as early as 2014 at a rate of up to 14,000 barrels per day.



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Big frontier, even bigger opportunities

Onshore, offshore, diverse resource mix spur demand for acreage

Alaska has a reputation as a big frontier for mineral and energy resources, but the size and richness of its natural endowment is still hard to grasp.

The US Geological Survey (USGS) estimated in 2008 that Alaska's North Slope has more oil than any other Arctic nation, with a mean estimated resource of 36 billion barrels of oil and natural gas liquids.

North Slope gas resources are also among the largest in the Arctic circle, with an estimated resource of 221 trillion cubic feet.

More recently, the USGS has increased the estimate of undiscovered, technically recoverable oil on the North Slope to 40 billion barrels.

These figures do not include potentially tens of billions of barrels in unconventional resources, including heavy and viscous oil, shale oil and tight gas.

The USGS has also made big estimates for untapped resources in the Cook Inlet area, where Alaska's oil and gas industry began with the discovery of oil at Swanson River in the late 1950s.

Mean recoverable oil resources are estimated at 600 million barrels, with 13.7 Tcf of conventional gas and 5.3 Tcf of unconventional gas.

While these figures are dwarfed by the North Slope estimates, the Cook Inlet on the south coast of Alaska is easily accessible and is well south of the Arctic circle.

The Cook Inlet also offers a much more attractive tax regime than the North Slope, with no production tax on oil and tax credits of up to \$25 million on the first three exploration wells.

North Slope activity

The USGS studies suggest that explorers have still only scratched the surface of Alaska's petroleum potential, despite the production of almost 17 billion barrels of oil already from the North Slope. The high likelihood of undiscovered resources

TAPS Operating excellence



Proposals to construct the Trans-Alaska Pipeline System (TAPS) were fiercely opposed by environmental groups in the early 1970s. Approval was finally granted in 1973 by a special act of the US Congress.

Opponents predicted many adverse consequences, including the decimation of caribou herds.

In fact, caribou have thrived over the past 35 years. The Central Arctic caribou herd, which occupies summer ranges surrounding Prudhoe Bay, has grown from 5,000 in 1975 to over 70,000 today.

The growth of the caribou herd is one of many environmental success stories for TAPS, which is operated by Alyeska Pipeline Service Company.

Alyeska's chief executive officer, Thomas Barrett, says the company's two major accomplishments are the safe movement of 17 billion barrels of oil and the validation of the environmental protection built into TAPS.

"It's a fabulous piece of infrastructure that withstood a major earthquake in 2002 and has withstood wildfires. We're constantly making it safer and even more efficient."

Alyeska last year received an award from the Association of Environmental and Engineering Geologists for engineering and operating excellence.

is also borne out by the light amount of exploration activity. Only 500 wells have been drilled in the history of exploration on the North Slope. By comparison, the much smaller area of Wyoming has been subject to 19,000 wells.

The biggest news on the North Slope was the start this year of Shell's drilling program on the outer continental shelf, almost five years after it was awarded acreage in the Beaufort and Chukchi Seas.

The campaign did not make as much progress as Shell had hoped for because of delays with certification of a purpose-built spill containment vessel, but the supermajor was able to complete a number of top holes ahead of its return next season.

Shell's campaign has attracted global interest and is being closely watched by its major competitors on the outer continental shelf, Statoil and ConocoPhillips. Statoil - an Arctic specialist - was next in the queue to drill, but recently deferred plans for exploration wells until at least 2014. ConocoPhillips continues to work towards drilling in 2014.

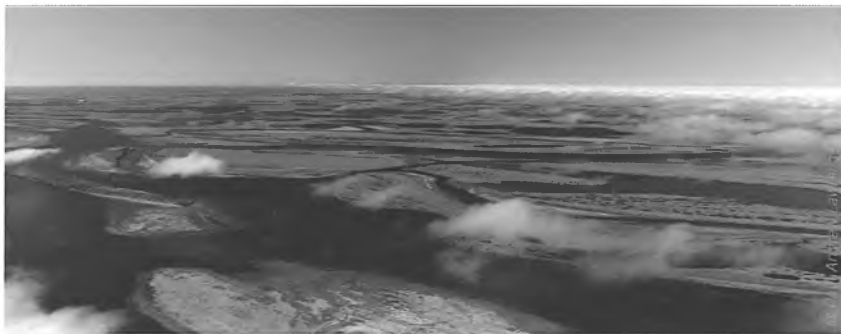
Onshore, activity on the North Slope is surging ahead, as reflected in the success of recent lease sales.

ConocoPhillips, which is already Alaska's largest oil producer through its interests in Prudhoe Bay, Kuparuk and Alpine fields, has staked out new positions onshore as it heads west into the National Petroleum Reserve - Alaska (NPR-A).

ConocoPhillips was the first company to explore in the NPR-A in 2008. It is set to become the first producer when it develops the CD5 satellite of the Alpine field. Production is expected to reach up to 18,000 barrels of oil per day when output begins in 2015.

The onshore lease sale also attracted new players such as Royale Energy, which is targeting conventional oil and a potential shale oil play.

Spanish energy giant Repsol is another new arrival. The company bid aggressively



Colville River on the North Slope, separating NPR-A from the Alpine oil field

in the 2010 onshore lease sale for 500,000 acres and followed up quickly with plans for a campaign of up to 15 exploration wells. Only three wells were drilled before a blowout at its Qugruk 2 cost it the rest of the drilling season. Smaller companies are playing a major role in the revival of the onshore North Slope, including Pioneer Natural Resources and home-grown independent Brooks Range Petroleum.

Other independents are looking closely at new ways to commercialize the region's many undeveloped discoveries, including the Umiat heavy oil field. Discovered in 1946, the Umiat has an estimated 70 million barrels of oil, but the high gravity of the crude has defeated previous production efforts.

Cook Inlet renaissance

Two years ago, the Cook Inlet was near dormant in terms of exploration activity. Since then, the entry of Apache Corporation and other newcomers has revitalized the region, with up to 15 exploration wells expected over the next year.

Hilcorp Energy, Linc Energy, NordAq, Cook Inlet Energy and Armstrong Oil & Gas are other newcomers boosting investment in exploration and development.

Apache's acquisition of about 800,000 acres is seen as highly positive for the Cook Inlet, given the company's enviable exploration record and its keen eye for opportunities around the globe.

The company's exploration leaders believe there is still as much oil to be found in the Cook Inlet as has been produced in the 55 years since the first discovery.

The company has begun a large campaign of 3D seismic surveys both onshore and offshore, featuring the use of new wireless technology that avoids the need to clear seismic lines through forest and other vegetation.

Hilcorp is major new entrant to the Cook Inlet. The privately owned company specializes in working over existing assets and applying new engineering to boost production.

Earlier this year, Hilcorp bought 165,000 acres from Chevron and is set to become

the largest producer in the Cook Inlet region with a buy out of Marathon Oil.

Hilcorp President Greg Lalicker reportedly told the Anchorage Chamber of Commerce the company would invest more than \$500 million in the Cook Inlet by the end of 2014, when it plans to achieve production of 25,000 barrels of oil per day.

Alaska's own shale gale on the way

Alaska's potential shale resources rival those driving the "shale gale" in the Lower 48 states.

The USGS has assessed mean potential shale resources on the North Slope of 940 million barrels of oil, 262 million barrels of natural gas liquids and 42 Tcf of gas.

The good news in the USGS assessment for Governor Sean Parnell is the best shale potential sits within Cretaceous and Triassic rocks beneath state lands.

Development of unconventional resources is already moving ahead, with Alaska-based independent Great Bear Petroleum drilling the first shale oil well in August on leases immediately south of Prudhoe Bay. The program is designed to tap directly into the oil-rich shales that have sourced the giant 20+ billion barrel Prudhoe Bay field.

North Slope exploration wells are usually drilled in winter on ice pads but Great Bear worked in summer by using previously built gravel pads adjacent to the Dalton Highway.

The company has formed a partnership with Halliburton and is working towards first production as early as next year.

LOOKING FORWARD

Arctic Slope Regional Corporation relies on the teachings of our ancestors, using our *liñupiaq* values as our guide, to impart a prosperous heritage to future generations.

Our values are the cornerstone of our success as a community partner and as a company.



Native corporations part of Alaska's energy revival

Vision, diversification and resources create shareholder value

Alaska's native corporations play a major role in the business of petroleum exploration and production. The state's 13 native corporations were created in 1971 by an Act of US Congress to settle the claims of Alaska's traditional landowners. Today, native corporations own about 11% of Alaska's land area.

This includes some of the most petroleum prospective land in the state, which makes native corporations frequent partners with petroleum companies in exploration and development.

Native corporations were set up as for-profit companies with a mandate to develop businesses that could generate ongoing dividends to their native shareholders.

Native corporations have become spectacular success stories. A number of them operate engineering, drilling and petroleum service companies that provide essential support to the upstream industry, including the world's largest oil companies.

The Arctic Slope Regional Corporation (ASRC), which represents the business interests of its 11,000 Iñupiat Eskimo shareholders, has been the largest locally owned and operated business in Alaska for almost two decades. It has 10,000 employees worldwide and revenues of more than \$2.5 billion in 2011.



Doyon Drilling Rig 16 in Prudhoe Bay

ASRC has four main divisions in energy services, petroleum refining and marketing, government services and construction industries.

ASRC Energy Services has emerged as one of Alaska's largest oilfield service providers. The skills developed in serving the oil and gas industry on the North Slope are now being exported to projects in the Gulf of Mexico, Russia and Canada.

ASRC Energy Services was also selected recently as the lead engineer on a new refinery on the Fort Berthold Indian Reservation in western North Dakota.

Native corporations are also moving increasingly into the exploration business in their own right.

Doyon, Limited, a Fairbanks-based native corporation with 18,600 shareholders, recently approved plans to spend \$37 million on oil and gas exploration within Doyon's lands and nearby State lands.

Doyon is the largest private landholder in the state with 12.5 million acres in Interior Alaska, spread across an area the size of France.

Doyon President and CEO, Aaron Schutt, says recent government incentives and changes in oil production taxes in frontier basins had encouraged Doyon to step up its petroleum exploration activity.

"In the next five to ten years I would really like to see us make an oil and gas discovery in Interior Alaska. That would be a game changer for us and why we are aggressively pursuing that goal."

"But because oil and gas exploration is very risky, we have aggressive growth plans as well for our service companies and government contracting. These will see us grow outside of Alaska, as well as in the Cook Inlet and the North Slope where we have operated for 30 years."

Schutt says Interior Alaska has been overlooked by petroleum explorers, with industry attention focused on the north and south coastal areas.

"There are multiple basins with potential for large, giant-sized oil fields that have never had wells drilled. That includes the Yukon Flats and the Nenana Basin, where the US Geological Survey has confirmed the existence of excellent oil source rock and deep basins."

"That would be an enormous shot in the arm for the state economy to have

"In the next five to ten years I would really like to see us make an oil and gas discovery in Interior Alaska. That would be a game changer for us and why we are aggressively pursuing that goal."

AARON SCHUTT, President & CEO, DOYON

production on that scale happen off the North Slope or the Cook Inlet."

Doyon's exploration plans focus on the Nenana Basin and the Yukon Flats.

The Nenana Basin was explored by Arco, Unocal and others in the 1960s and 1970s, with seismic surveys and two shallow wildcat wells.

Doyon conducted seismic surveys of its own in 2005 and drilled one well in 2009, with more seismic following in 2012, the first deep test of an Interior basin. It failed to make a commercial discovery, but yielded valuable data about the geology of the basin.

Schutt says Doyon is now seeking partners to explore over 400,000 acres in the basin. The corporation will submit permits for drilling at one location in summer 2013 and is looking to permit two other locations.

In the Yukon Flats, Doyon conducted a seismic survey in 2010. Geochemical surveys over the last two years have demonstrated a widespread surface expression of



CIRI's Fire Island Wind turbines

oil. Doyon plans a 3D seismic survey for 2013. Prior to Doyon's recent efforts, exploration has not occurred in the area since the 1980s, when Exxon conducted large 2D seismic surveys.

"They were very excited about the results but literally finished the program the day the Exxon Valdez ran aground. That distracted them for many, many years and no-one has been back in the Yukon Flats since then," Schutt says.

CIRI is another native corporation exploring for petroleum resources. The Anchorage-based company is owned by 7,600 Alaska Native shareholders who have ties to the Cook Inlet region.

CIRI President and Chief Executive Officer, Margaret Brown, says "we see energy becoming a core business segment, rather than just a passive royalty interest."

In the Cook Inlet we have just announced a large exploration agreement with Apache and we also have a relationship with Hilcorp. Additionally, we have what looks like a commercial discovery on our property on the Kenai Peninsula with a company called NordAq. And so we have every hope that we will have additional production coming off our land."

"We have royalty interest in those lands, but we are also looking for ways to become a more active participant, either by taking working interest in some of our leases or other mechanisms to support the industry here."



Through its subsidiary Stone Horn Ridge, CIRI is developing an underground coal gasification (UCG) project that is scheduled to begin commercial operations as soon as 2015.

The project is sited on remote CIRI land selected because its geology and groundwater conditions minimize environmental risk.

CIRI's core drilling programs have confirmed significant commercial coal reserves that can support safe, clean and economic UCG development.

The initial project will provide synthetic gas (syngas) that can be used to generate electricity. The project will also process syngas for use as a feedstock for clean liquid fuels, fertilizer and other petrochemical projects.

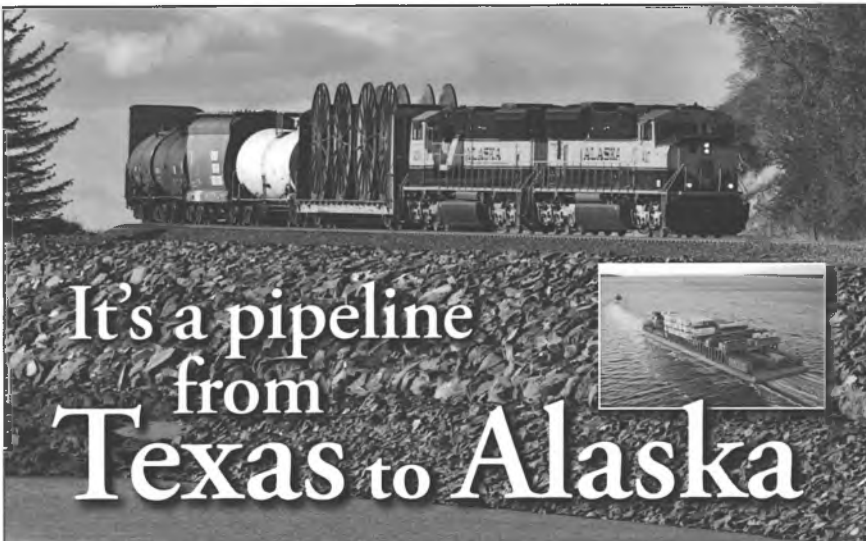
CIRI is also a leading developer of renewable energy, having just commissioned Alaska's first wind power generation project on Fire Island just west of Anchorage.

CIRI operates the project through its wholly owned subsidiary Fire Island Wind. The first phase of the project includes

"We see energy becoming a core business segment, rather than just a passive royalty interest."

MARGARET BROWN, President & CEO, CIRI

11 wind turbines capable of producing a total of 17.6 megawatts of electricity, which is enough to power more than 6,000 homes. A second phase could see the addition of 22 wind turbines.



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Frontiers no barrier for Alaska's transport operators

Investment, inter-modal logistics and infrastructure connect to resources

Alaska is a vast frontier more than twice the area of Texas, but size and remoteness have never been hurdles for the state's infrastructure operators.

The \$8 billion Trans Alaska Pipeline System (TAPS) is one of the world's largest pieces of infrastructure and indicative of what Alaskans can achieve when necessity calls.

The state's transport network is another innovative response to the geographic and climatic demands of the state.

Inter-modal connections of water, road and rail make it possible to transport heavy goods, construction equipment, chemicals and drilling supplies at any time of year from the lower 48 states to the North Slope.

Equipment and supplies can also be shipped direct to Prudhoe Bay in the openwater season from about July to October.

The state-owned Alaska Railroad Corporation (ARRC) is the backbone of the state's freight and passenger network.

The corporation operates a 470-mile railroad running from the southern ports of Seward and Whittier through Anchorage to Fairbanks, the largest city in the state's interior.

Alaska's rail network is connected to the Lower 48 states by sea barges. Rail cars roll onto the sea barges at Seattle and roll off at Whittier. The multi-level barges also carry shipping containers and road trucks.

ARRC's Vice President, Business Development, Dale Wade, says the sea and rail arrangement "is a very cost effective way of moving traffic. We have rail from the Lower 48 to Alaska, we just float part of the way."

When rail cars reach the end of the line at Fairbanks, goods are loaded onto surface carriers to complete the journey by road to Prudhoe Bay.

The ease of switching between transport modes and the cost efficiency of Alaska's rail network creates some interesting customer behaviours.

For example, road trucks have a clear run up the Alaska Highway to Fairbanks, but between 50 and 60 trucks each night roll onto ARRC flat cars and are freighted by rail instead.

"The cost per ton favors rail, especially in the summer season when the road is heavy with tourist traffic. Truck drivers can get there faster by road, but they can't get there more economically than going by railroad," Wade says.

ARRC plays a key role in moving goods and materials for the oil and gas industry, as well as taking its products to market. One of the railroads' biggest customers is Flint Hills Resources, which produces jet fuel at its North Pole refinery (near Fairbanks) from crude oil travelling down

TAPS to Valdez. Flint Hills' jet fuel is freighted by ARRC to Anchorage airport.

Wade says one of ARRC's key mandates is to support state-wide economic development. This means it is involved in a number of projects to expand the rail network, particularly where these support the development of Alaska's resource industry.

ARRC recently received approvals to develop a 30 to 45 mile extension of the rail network to Port MacKenzie, which is located opposite Anchorage on the western bank of the Cook Inlet's Knik Arm.

The extension will connect the small existing facilities of Port MacKenzie with minerals projects in the Alaskan interior and pave the way for bulk commodity exports. This could include a major increase in coal exports to Russia and Asia from the Usibelli coal mine near Healy in the mountains of the Alaska Range.

ARRC is also extending the northern limits of its network by building a bridge across Tanana River. The project is funded by the Department of Defence, which has military installations in the area. The project is also seen as a possible first step in a longer-term vision to connect Alaska's rail network to western Canada.

Development of transport infrastructure is one of the top priorities of the Parnell administration.

The FY 2013 budget allocated more than \$1.6 billion in funding for transportation infrastructure projects across the state.

This spending includes \$1.4 billion for state-wide highway and aviation projects and \$550 million for state-funded marine transportation projects such as ferries, docks and harbors.

Infrastructure spending includes the Roads to Resources initiative, which was recently allocated \$28.5 million to improve access for communities and resource explorers to fish, timber, minerals and petroleum resources.



Train transporting gravel

© Red Bradley



Trans Alaska Oil Pipeline through the Brooks Range of Alaska

The largest component of Roads to Resources is a further \$10 million for environmental assessment work and evaluation of routes from the Dalton Highway to Umiat. The project has already received \$25 million in previous years.

The road would provide access to oil and gas resources along the northwestern foothills of the Brooks Range.

Public funds have also been allocated for development of all-season access roads to the Ambler district on the southern margin of the Brooks Range, which is highly prospective for copper deposits. Funding is also being provided for a road to Tanana in concert with the development work by ARRC.

The development of Alaska's transport infrastructure is also taking place at the Ted Stevens Anchorage International Airport. The airport is vital to the oil and gas industry, with most of the North Slope's fly-in, fly-out workers commuting through Ted Stevens every two weeks from their homes in Anchorage or the lower 48 states.

The airport this year began developing a new master plan that will look at how its services and facilities will need to grow over the next 10 years to meet the needs of users.

Anchorage airport is much more than a transport centre for Alaska's communities and local industry. It has become one of the busiest airports in the world in terms of cargo throughput because of its

"We have rail from the Lower 48 to Alaska, we just float part of the way."

DALE WADE, VP Business Development, ARRC



proximity to North America, Asia and Europe. The airport claims to be within 9.5 hours flying time of 90% of the developed world.

On the North Slope, air transport services were boosted recently with the opening of the Deadhorse Aviation Centre (DAC), owned by Offshore Support Services, Fairweather and the Kaktovik Inupiat Corporation. DAC is designed to provide oil companies and their suppliers with a safe and efficient aviation command center for onshore and offshore operations.

The centre is located at the Federal Aviation Authority-approved Deadhorse Airport, with access to the Dalton Highway and the ocean. Facilities include terminal and hangar facilities, logistics support, staging and storage, office space and accommodations for sleeping and dining. The 21,000-square-foot aircraft hangar can accommodate two to three large helicopters or smaller fixed-wing aircraft.

CENTRAL ALASKA Continental Rift Basins

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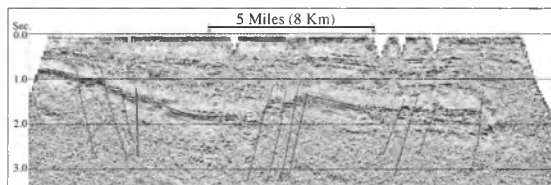
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Environmental protection, a condition “sine qua non”

“No impact” standards, new technology and collaboration safeguard the environment

Alaska’s state administration is leaving no stone unturned on its bid to attract new investment in oil and gas exploration, but one area it will not compromise is protection of the environment.

Commissioner of the Department of Natural Resources, Dan Sullivan, says he makes no apology for the costs of meeting Alaska’s world-class environmental standards.

“For projects in Alaska, there are inherent costs of doing business because of the remoteness of the location, the arctic climate, and the fact that we have probably the highest environmental standards of any hydrocarbon basin in the world.”

“We’re very proud of that, and we tell businesses if you don’t want to abide by those standards, if your company does not have a commitment internally, we don’t want you up here.”

Sullivan says this hard-line approach is a deterrent to some companies, but he believes the size and abundance of Alaska’s exploration opportunities is more than adequate compensation.

The environmental debate has raged in Alaska since the discovery of the Prudhoe Bay oil field on the North Slope in 1968.

“Our efforts to develop resources on the North Slope while also protecting the environment and wildlife have been successful. We have a great record, with the one horrible exception of the Exxon Valdez, which was due to human error.”

The Cook Inlet on the south central coast is further proof the success of Alaska’s environmental standards. Oil and gas producers have successfully co-existed with world-class fisheries in the Cook Inlet for almost 50 years.

Alaska’s environmental standards are based on a philosophy of “no impact” exploration. No activity is allowed within one mile of polar bear dens, and leases are not

Port of Adak Reopens to serve oil industry



Drilling in the Arctic means much more than one or two drillships. Large flotillas of support vessels are required to comply with unprecedented safety and environmental safeguards.

To meet growing demand from the oil industry for port services and logistics, Aleut Corporation has teamed up with Offshore Systems, Inc. (OSI) to re-open Port of Adak, the westernmost port in the Aleutian Island chain.

The local native corporation bought the Adak settlement and its impressive transport infrastructure from the US government in 1997. Adak was a former Navy and Coastguard base that closed after the Cold War.

Anchorage-based OSI is an experienced operator of port services and logistics for the oil industry and is confident Port of Adak can attract new business.

The port has 2,750 lineal feet of deep-draft berthing space and is ice-free year-round. Services include a modern, high capacity fueling system, electrical power, crane support and fresh water.

Port Adak’s airport is one of its competitive biggest advantages, with two paved runways that can accommodate 737 aircraft.

granted in environmentally sensitive areas.

The “no impact” approach means onshore exploration drilling is allowed only in winter. Heavy equipment is brought out to remote sites on ice roads and drilling rigs are assembled on ice pads.

When the ice melts, there is no trace of the pad remains. The only visible sign of drilling activity is an eight-by-eight foot well house that will remain on location because the well is part of a field under development and will one day produce oil.

In short, it is possible to explore for oil on the North Slope and leave no visible footprint.

Development and production also have stringent standards, with the state mandating the use of the best available technology for oil discharge containment, storage, transfer, and cleanup. Even rainwater is not permitted to run off gravel drill pads on the surrounding tundra.

Onshore pipelines must be buried where possible to minimize impacts on wildlife, and if pipelines are built above ground, they must be elevated so caribou can migrate.

Commissioner Sullivan says Alaska’s stringent environmental standards have forced innovation on the oil and gas industry and led to new technologies that have had enormous environmental and financial benefits.

“Many of the horizontal drilling techniques that are now used all over the world were developed by operators in Alaska to meet our environmental standards.”

Advances in horizontal and multi-lateral drilling technology over the past 30 years have led to a dramatic reduction in the surface footprint of drilling.

For example, 54 wells have been drilled at the Alpine field from a single pad of only 13-acres.

Technology also allows much greater reach below ground. In the 1970s, wells



Central Arctic caribou herd is thriving

from one pad could span only three square miles. By 1999, this had increased to 50 square miles, while up to 100 square miles is now possible.

Sullivan says the development debate has not kept up with these advances and the benefits they have created for the environment.

He says new drilling technology also allows a more a cost-effective way to develop remaining oil.

“Extended-reach horizontal drilling means that today, the same level of production can be achieved with fewer wells. It also means that more complicated stratigraphic plays can be developed.”

The use of extended, directional drilling to minimize environmental impact is a feature of Pioneer Natural Resources’ Ooguruk near-shore field.

The project consists of three main components – an offshore drill site, an onshore production support facility, and a system of flowlines, power cables, and

communications cables connecting the onshore and offshore facilities.

The offshore drill site is a four-metre high artificial gravel island about five miles from the shoreline that covers an area of only six acres. The drill rig has been specially modified to allow close spaced drilling of a large number of production and injection wells from the small pad.

State and federal governments are not the only guardians of Alaska’s environment. Native corporations, which represent the traditional owners of Alaskan land, arguably have a greater interest in its protection than any other stakeholder.

Rex Rock is the President and Chief Executive Officer of the Arctic Slope Regional Corporation (ASRC), Alaska’s largest native corporation.

He says ASRC is a partner to the energy industry, but also understands its own communities on the North Slope are on the front line of development and carry some of the highest risks with respect to food security.

“We recognize that Arctic resource development has a global impact. With that in mind, we do not want to become sideline observers to development that occurs in our region. We need to be a part of it.”

He said native corporations can work successfully with petroleum companies to achieve development that benefits all parties.

“An example of a successful collaboration and the building of trust is spelled out in the story of CD-5. This satellite field will be the first commercial production from National Petroleum Reserve in Alaska, on lands owned by Kuukpik and ASRC.”

“It took time, but Kuukpik, the Native Village of Nuiqsut, the City of Nuiqsut, ASRC, the North Slope Borough and ConocoPhillips finally came to an agreement on how best to mitigate impacts to the community and environment of the CD-5 development.”

He said it was encouraging to have such a diverse stakeholder group come together and reach an agreement.

“The project was originally denied (federal approval). However, due to the alignment of all the parties on the




“We do not want to become sideline observers to development that occurs in our region. We need to be a part of it”

ROCK A. REX SR., President & CEO, ASRC

proposed development, we were all able to work together for the reversal of the Army Corps of Engineers’ decision to deny the project and finally win approval for the CD-5 development,” Rock says.


ASRC is one of many stakeholders that will ensure Alaska’s environment remains protected, despite the growing interest in the region from petroleum companies around the world and increased pressure for exploration and development.



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Energy for Alaska

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Alaska's new era on the way

Determination, development, LNG potential's pledge for the future

The future potential of Alaska's petroleum industry looks brighter than at any time since the discovery of the Prudhoe Bay field in 1968.

While the declining flow of oil through the Trans Alaska Pipeline System (TAPS) is causing headaches and a worrying decline in state revenue, all the signs suggest a turnaround is inevitable in the medium to long term.

Exploration activity onshore on the North Slope is surging ahead, with new fields already being discovered. Exploration for shale gas and other unconventional resources is moving ahead rapidly. The economics of bringing old fields into production are also being re-examined under the promise of a more favourable tax regime.

Lower production taxes on the North Slope are still not law, but the Parnell Administration is working hard to convince skeptics in the state's Senate that Alaska cannot afford to not be more tax competitive.

Even without a new tax regime, TAPS is guaranteed new volumes from the Point Thomson field following a breakthrough in the stand-off between the state and the field's partners — ExxonMobil, ConocoPhillips and BP.

Point Thomson, 60 miles east of Prudhoe Bay, is Alaska's largest undeveloped petroleum field, with 8 TcF of gas and hundreds of millions of barrels of oil and condensate.

The field is equivalent to 25% of all the gas reserves on the North Slope and development of the project is key to realizing the gas potential of the entire region.

The settlement of the dispute announced in April by Governor Parnell includes a commitment from the Point Thomson partners to begin initial liquids production of 10,000 barrels a day by 2016.

While this is small scale, the settlement also includes a commitment to build a new common carrier pipeline from Point Thomson to Prudhoe Bay with a capacity of 70,000 barrels per day.



A prosperous future must hold a positive outlook for all

That sort of production would make a meaningful contribution to refilling TAPS, and is indicative of the potential the Point Thomson partners see for the eastern end of the North Slope.

In the central and western areas of the North Slope, exploration programs by ConocoPhillips, Repsol and a growing number of independents hold promise of additional volumes in the short to medium term.

Looking further ahead, the huge exploration investments by Shell, ConocoPhillips, Statoil and others in the Chukchi and Beaufort Seas point to a new golden age for Alaskan oil production.

There are no certainties in the exploration game, but assessments by the USGS suggest huge potential rewards on the outer continental shelf and minimal risks. A number of supermajors are backing that view with multi-billion dollar exploration budgets.

Another bright spot in Alaska's petroleum future is this year's real progress in monetising the vast gas reserves of the North Slope.

The construction of TAPS in the 1970s created a vital linkage between the North Slope's giant oil fields and global markets.

The region's gas reserves are still stranded 35 years later, but the Point Thomson partners and TransCanada have aligned for the

first time to develop plans to export their gas as LNG to Asia. The dimensions of the proposed LNG project are staggering. In a project update released in October, the partners estimated a development cost as high as \$65+ billion.

This would cover the cost of constructing a gas pipeline alongside TAPS to bring up to three billion cubic feet of gas every day from the North Slope to a LNG plant somewhere on the southcentral coast.

The three-train LNG plant would produce between 15 million and 18 million tonnes of LNG per annum, ranking it as one of the largest projects of its kind in the world.

According to the partners in a 1 October letter to Governor Parnell, the proposal represents "a megaproject of unprecedented scale and challenge; up to 1.7 million tons of steel, a peak construction workforce of up to 15,000 and a permanent workforce of over 1,000 in Alaska."

These figures are adding to the buzz that has developed in 2012 around Alaska and its petroleum industry. There are still many hurdles to clear, but the industry has momentum as well as the support of the vast majority of Alaska's communities, including Alaskan natives. A bright new era looks inevitable.

Alaska General Data

Official name: State of Alaska, USA

Nick name: The Last Frontier

Statehood: 49th State, 3 Jan. 1959

Capital: Juneau (-1 CST)

Largest city: Anchorage (-2 CST)

Governor: Sean Parnell (R), 2009

Native Corporations: 13

ANCSA: Established 1971

Population: 722,718 (July 2011 est.)

Total Area: 1,717,853 km² / 663,267 mi²

Land area: 1,481,346 km² / 571,951 mi²

Water Area: 236,507 km² / 91,316 mi²

Coastline: 10,686 km / 6,640 mi

Languages: English (*official*), Native (22), mostly belonging to Eskimo-Aleut and Na-Dene language families

Climate: Arctic in the north; subarctic in the interior; continental subarctic in the northwest; subarctic oceanic in the southwest; subarctic oceanic in the south central; mid-latitude oceanic in the southeast

Location and Geography: Northwest extremity of the North American continent, bordering Canada to the east, Arctic Ocean to the North, Pacific Ocean to the west and south, Russia further west across the Bering Strait

Land Ownership: 60% Federal, 28% State, 11% Native, 1% Private

Economy

GDP: \$49 billion (2010)

GDP per capita: \$63,424 (2010)

Real growth rate: 1.9% (2010)

Inflation rate: 1.8% (2010)

Alaska Permanent Fund: \$40 billion

Rating: Triple A

Main industries: Oil, gas, mining, fishing, forestry, tourism, government services, military, food processing

Natural resources: Oil, gas, coal, precious and base metals, timber, water

Exports: \$5.2 billion (2011 est.)

Export commodities: Seafood, petroleum, primary/precious metal, forestry products

Imports*: \$18.26 billion (January 2011 est.)

Import commodities: Capital equipment, petroleum, foodstuffs

* includes imports to the US

Energy Overview

ALASKA RESOURCE ASSESSMENTS* (*undiscovered, technically recoverable*)

	Mean Oil Est.	Mean Gas Est.
Onshore Arctic:	15.9 billion bbl	99 tcf
Offshore Arctic:	23.8 billion bbl	108 tcf
Interior basins:	234 million bbl	5.5 tcf
Upper Cook Inlet:	599 million bbl	19 tcf
Other Southern Alaska:	2.9 billion bbl	23.5 tcf
TOTAL:	43 billion bbl	255 tcf

* excludes shale oil, shale gas, methane hydrates and CBM

PRODUCTION

Total crude oil production:	209 million bbl (2011)
North Slope:	562,000 bpd (2011) 591,000 bpd (2010)
Cook Inlet:	10,000 bpd (2011) 10,000 bpd (2010)
Share of US total production:	11%
North Slope exploratory wells to date:	500 (2012)
North Slope Shale Potential - OIL:	Up to 2 billion bbl (2011 est.)
North Slope Shale Potential - GAS:	Up to 80 trillion cf (2011 est.)
North Slope Coal Potential:	3.5 trillion metric tons (2011 est.)

TAPS

Throughput to date: 16.3 billion bbl	Length: 800 mi / 1,287 km
Construction time: 3 years, 2 months	Diameter: 48 inches / 1.2 m

Sources: DNR, US Census Bureau, US Department of Commerce, Northrim Bank, Office of Trade and Industry Information, Statista, USGS, Institute for Energy Research, US Energy Information Administration (EIA), TAPS

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StarCommunications

www.star-communications.us



Northstar is the first Arctic offshore field connected to shore by pipeline only. Northstar oil flows to the Trans-Alaska Pipeline System through a subsea pipeline. Northstar was developed by BP when it acquired a major interest in 1995. Production started in 2001. (Photo ©BP)