



RESEARCH SUMMARY

DOLLARS OF DIFFERENCE: WHAT AFFECTS FUEL PRICES AROUND ALASKA?

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The spike in oil prices has hit rural Alaskans especially hard, because they rely mostly on fuel oil for heating. But some rural residents are paying much more than others—at times 100% more.

The Alaska Energy Authority asked ISER to analyze what determines the prices rural households pay for fuel oil and gasoline. The agency hopes this research can help identify possible ways of holding down fuel prices in the future. In this summary we report only fuel oil prices, but the full report (see back page) also includes gasoline prices.

We studied 10 communities that reflect, as much as possible, the forces driving fuel prices. We collected information in November 2007, and fuel prices have gone up a lot since then. Crude oil sold for \$120 a barrel in mid-May, up from about \$80 in fall 2007.

But the factors that influence fuel prices haven't changed—and it's those factors that are most important, rather than prices at a specific time.

The map tells a big part of the story. The 10 study communities are scattered across Alaska. They include places that get fuel by truck, barge, and air. Some are much closer to refineries and distribution hubs than others. Some can get fuel through fairly simple transportation routes, and others get fuel only after it has been loaded and unloaded several times.

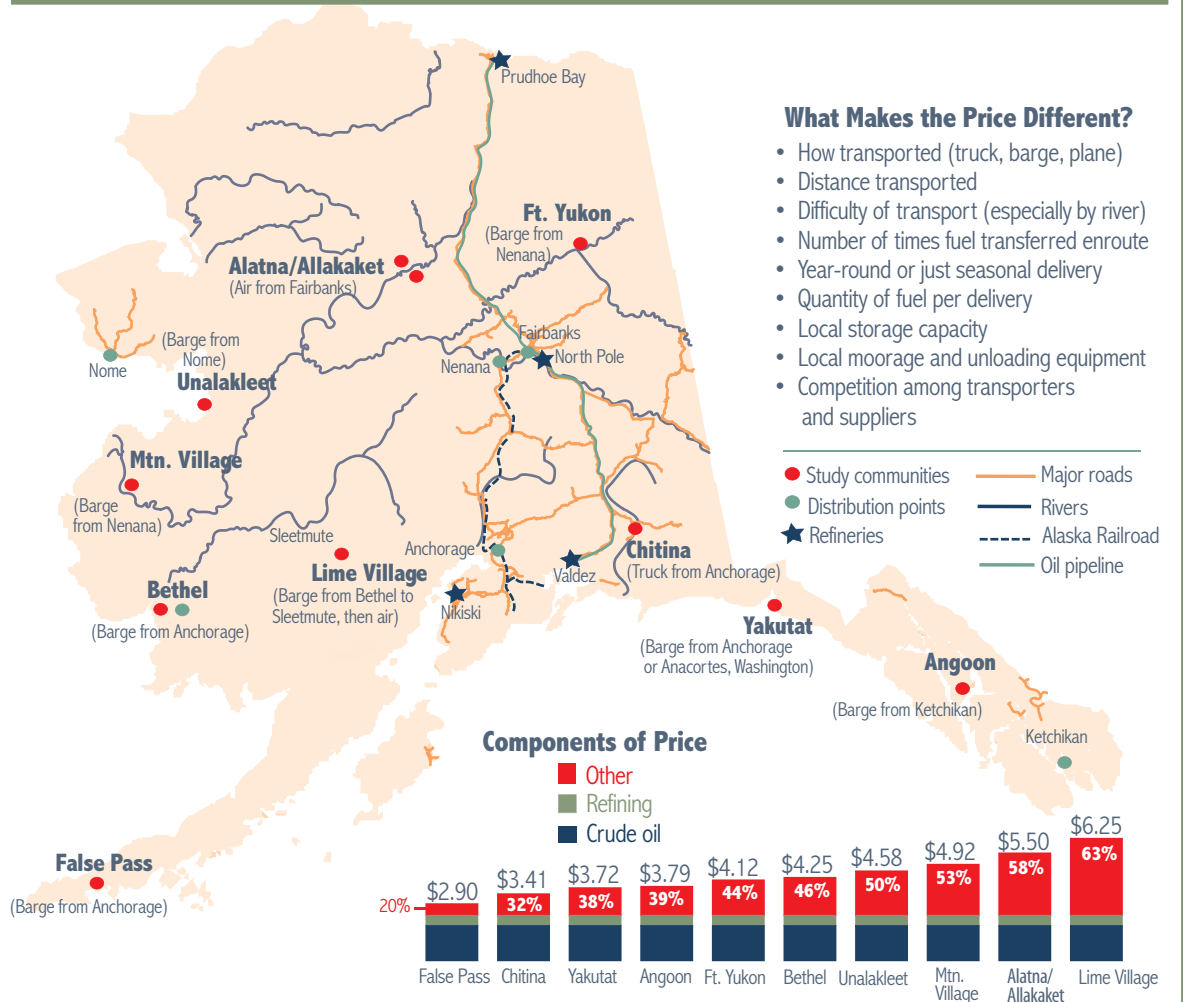
All those things influence prices. But so do less obvious factors, like the condition of local docks and fuel-handling equipment,

the amount of competition among both suppliers and transportation companies, and community storage capacity. Sometimes small remote communities can take advantage of economies of scale, if commercial operators maintain large local storage tanks.

At the base of fuel prices are the costs of buying and refining crude oil (the blue and green bars in the map). In November 2007 those costs together accounted for an estimated \$2.31 of the price Alaska households paid for a gallon of fuel oil. Transportation and other costs added 59 cents to \$3.94 to the price in various study communities—making up from 20% to 63% of the final price for a gallon of fuel oil.

Inside we discuss all the factors that make fuel prices so different around Alaska—and the possibilities for influencing those prices.

\$2.90 to \$6.25 Per Gallon: Price of Fuel Oil in Study Communities, November 2007



WHAT AFFECTS THE PRICE OF FUEL OIL?

Fuel oil (also often called diesel) is one of several products distilled from crude oil and used for heating fuel or engine fuel. Fuel used for home heating is exempt from federal and state taxes, but not from local sales taxes.¹ Many but not all rural communities have sales taxes.

When we refer to fuel oil prices, we specifically mean the price *households* pay. Most rural Alaskans rely on fuel oil for heating houses and other buildings and generating electricity. Anchorage and a few nearby towns—and Barrow on the North Slope—have access to natural gas. Some places in southeast Alaska have hydro-powered electricity.

All communities have special characteristics that influence prices, but there are a few common contributing factors:

- *Crude oil and refining costs.* For this analysis, we assumed these costs were the same for fuel sold in all communities. In reality they vary, depending on when the fuel was purchased and other factors. But we couldn't get enough data to assign crude-oil costs to fuel in each community. Instead we based our estimates on costs the Energy Information Administration reported for September 2007.
- *Cost of transporting, storing, and distributing fuel.* These costs make up most of the difference in price among communities, but they are very difficult to segregate.
- *Other factors,* like the effects of competition (or lack of competition) are hard to quantify but also affect prices.

World Price of Crude Oil

Crude oil is processed into fuel oil, gasoline, jet fuel, and other fuels. Petroleum is also used in hundreds of other products, including tires, medicines, and plastics. The price of crude oil is driven by worldwide demand for petroleum products, but it's also influenced by political events and natural disasters that disrupt or threaten oil flows.

Oil from the North Slope has made Alaska a top U.S. oil producer since the late 1970s, and some oil is also still produced in Cook Inlet, where it was first discovered in the 1950s.

Refining Crude Oil into Fuel Oil

Fuel oil for most of Alaska is produced in Alaska. The big exception is southeast Alaska, where communities are strategically located to

take advantage of the best prices available from either Alaska or West Coast refineries. Alaska's refineries are at North Pole in the Interior, Nikiski on the Kenai Peninsula, and Valdez, the terminal of the oil pipeline (see map, page 1). Oil companies also operate two refineries on the North Slope—but their production is only for North Slope operations, and we don't include it in this discussion.

Much of the oil for Alaska refineries comes from the North Slope, some from Cook Inlet, and some from other countries. Alaska refineries currently produce something in the range of 127,000 barrels (or 5.3 million gallons) of petroleum products daily. Production varies during the year, with demand for jet fuel and gasoline higher in the summer and demand for fuel oil higher in the winter.

As the figure at the bottom of the page shows, fuel for home heating and for vehicles makes up on average about 11% of the production at Alaska refineries. Even though winters are long and cold, the state population is small, at about 675,000. Also, the city of Anchorage (where 40% of Alaskans live) and nearby communities have access to natural gas for home heating.

Gasoline, the main product of many U.S. refineries, makes up only about 15% of Alaska's refinery production. Again, that's because the in-state market is small. Jet fuel is the main product of state refineries, making up about 60% of total production but 70% or more at individual refineries during the summer season. Anchorage's international airport creates much of the demand for jet fuel, but the Fairbanks airport and Air Force bases in the state also buy jet fuel.

Refineries in Alaska can compete with other U.S. refineries because transporting fuel the long distance to Alaska usually eliminates whatever price advantage the Outside refineries might have. From 2000 to 2007, average wholesale prices (adjusted for inflation) for a gallon of fuel oil in Alaska were comparable to those in the West Coast and Rocky Mountain regions and somewhat higher than the U.S. average.

Average U.S. Wholesale Prices, Gallon of Fuel Oil,* 2000-2007 (In 2007 Dollars)

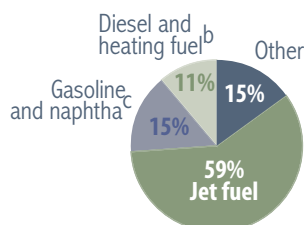
Gulf Coast	\$1.30
U.S. average	\$1.34
Midwest	\$1.36
Alaska	\$1.42
West Coast	\$1.43
Rocky Mountain	\$1.45

*# 2 fuel oil

Source: U.S. Energy Information Administration

Estimated Production by Petroleum Refineries in Alaska, 2008^a

(Based on average production. Seasonal production varies.)



Estimated total production:

Approximately 127,250 barrels (5.3 million gallons) per day^a

- Jet fuel is the main product of Alaska's refineries, varying from 50% to 70% of production at individual refineries.
- In other states, gasoline is the main refinery product. But in Alaska the market for gasoline is small (because the population is small) and the market for jet fuel is large, mostly because of traffic at Anchorage's international airport. The Fairbanks airport and Air Force bases in Alaska also use locally produced jet fuel.
- The level and composition of production varies substantially by season and with demand. Demand for jet fuel and gasoline climbs in the summer and demand for heating fuel drops.

^aThis estimate is based on information available from Alaska refineries, which have different mixes of products and report their production at different levels of detail. It includes production at the Flint Hills refinery at North Pole, the Tesoro refinery at Nikiski, and the Petro Star refineries at Valdez and North Pole. It does not include production at the two refineries on the North Slope, operated by BP Alaska and Conoco Phillips, which produce about 2,700 to 3,800 barrels per day of Arctic heating fuel for industry needs on the North Slope.

^bIncludes various products distilled from oil that can be used as a fuel for heating homes and other buildings or for vehicles, boats, generators, and other machinery.

^cNaphtha is a byproduct of gasoline production and is used as a feedstock for the manufacture of chemicals and other products. Most naphtha produced in Alaska is exported. A small amount of light naphtha produced in Alaska is used to power generators.

^dIncludes asphalt, propane, and various other products, some of which are exported. Also includes the share of production the Flint Hills refinery uses to fuel its own needs.

Sources: Alaska Division of Oil and Gas; Flint Hills Resources; Tesoro Refineries; and Petro Star Inc.

Getting Fuel to Communities

Fuel buyers typically have contracts with transportation companies, specifying fuel delivery charges. We weren't able to learn current contract delivery prices, because companies keep that information confidential. Instead, we looked at all the factors that contribute to the costs of getting fuel to communities.

Sometimes fuel oil goes directly to Alaska communities from the refinery. But most often, fuel is first transported by rail, pipeline, truck, or barge to distribution hubs and then on to small rural communities.

Almost all rural Alaska communities are along the coast or on rivers or lakes. Some, mostly in southcentral and interior Alaska, are on the road system. So most rural places get fuel by barge and perhaps a couple of dozen by truck. A very small number—typically on rivers too shallow for fuel barges to navigate—routinely get fuel by air.

Trucking fuel is generally cheapest. Road communities are usually closer to distribution hubs, can get more frequent deliveries, and have lower storage and inventory costs. But so many factors affect fuel prices—for example, the timing of a fuel purchase—that even road communities don't always have the lowest prices.

Flying fuel is the most expensive, and communities will only get fuel by air if they have to because of their location or if they face a fuel shortage at a time when barges can't deliver.

Barging fuel is complex and risky, and in many places barges can only deliver during a short ice-free season. So while barging is cheaper than flying, it's still expensive, for many reasons. Those include:

- *Distance from the refinery.* The further away the community, the higher the cost. Also, communities closer to more than one refinery can choose among sources and take advantage of any lower prices.
- *Quantity of fuel purchased.* Communities can save money by buying fuel in larger quantities, because the fixed delivery costs are spread over more gallons of fuel. But to buy more fuel, communities must have the money not only to buy the fuel but also to increase their storage capacity.
- *Short seasons.* Ice prevents deliveries in many western and northwestern communities during the winter—so fuel transporters have to recover their capital costs during the short shipping season.
- *Fuel transfers.* Fuel for some small communities has to be transferred several times on its way from the refinery. Loading and unloading the fuel, storing it at hub communities, and incurring other transfer costs all add to the price at the final destination.
- *Navigational hazards.* Many stretches of Alaska rivers are risky, increasing running time and insurance and crew costs. Also, navigating rivers requires a lot of local knowledge—making it hard for inexperienced firms to compete.
- *Custom-built barges.* Barges operating in Alaska's western rivers must be custom-built to draw no more than 3.5 feet of water.
- *Small and shallow ports.* In many communities, fuel from has to be lightered ashore in smaller vessels, increasing the handling costs.
- *Inadequate moorage and fuel-pumping equipment*—making it more difficult, time consuming, and risky to unload fuel in some locations.

Storing and Distributing Fuel

Communities across Alaska also face the costs of storing fuel once it arrives. Fuel tanks are expensive to buy and maintain and have to meet government environmental regulations. And finally, distributing fuel to individual customers also adds to the price. A few communities allow customers to pick up the fuel themselves.

STUDY COMMUNITIES

The maps on this page and the next show transportation routes to the 10 study communities and community fuel oil prices (in order from the lowest to the highest) as of November 2007.

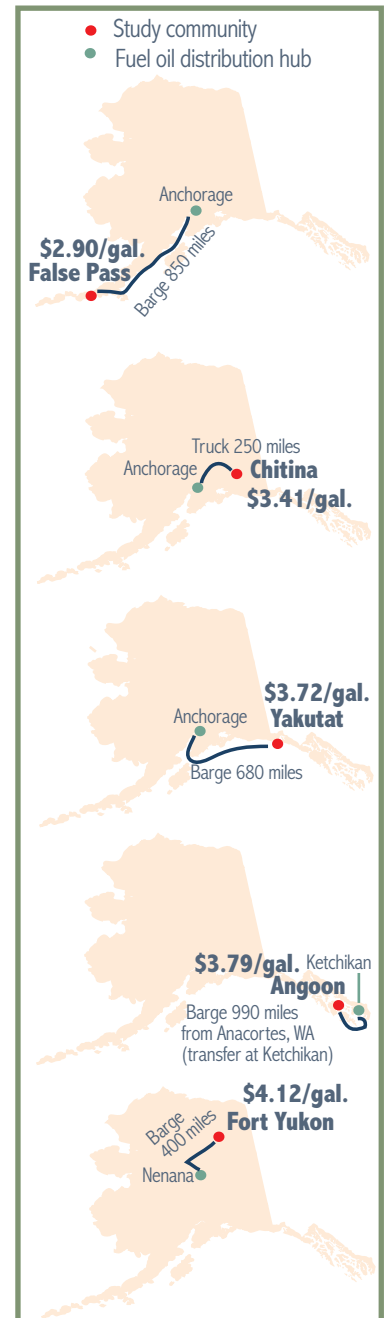
- *False Pass* (population 54) is in the Aleutians. Fuel is barged 850 miles from Anchorage (or Dutch Harbor) once a year—which can have price benefits, depending on the timing of the fuel purchase. A seafood processor maintains 330,000-gallon storage tanks there; local residents can also buy that fuel. Local sales tax on fuel is 3%.

- *Chitina* (population 110) benefits from being on the road, 250 miles from Anchorage. But storage is limited, and frequent fuel purchases mean the community is quickly affected by rising prices. There is no local sales tax on fuel.

- *Yakutat* (population 620) is on the Gulf of Alaska and has an ice-free, deep harbor. Fuel is barged from Anchorage (680 miles) or Anacortes, Washington (1,300 miles). Very large storage tanks (6.5 million-gallon) owned by a transportation company and a major airline benefit residents. Local sales tax on fuel is 4%.

- *Angoon* (population 500) is on Admiralty Island. Fuel can be barged year-round from Anacortes (or Anchorage), which helps reduce prices. But the fuel has to be transferred at Ketchikan and lightered ashore at Angoon. Also, the community has little storage. There is no local tax on fuel.

- *Ft. Yukon* (population 570) is on the upper Yukon River. Fuel has to be barged 400 miles upriver from Nenana and lightered ashore. Ice prevents winter deliveries. But there is relatively large (660,000-gallon) storage capacity. The local tax on fuel sales is 3%.



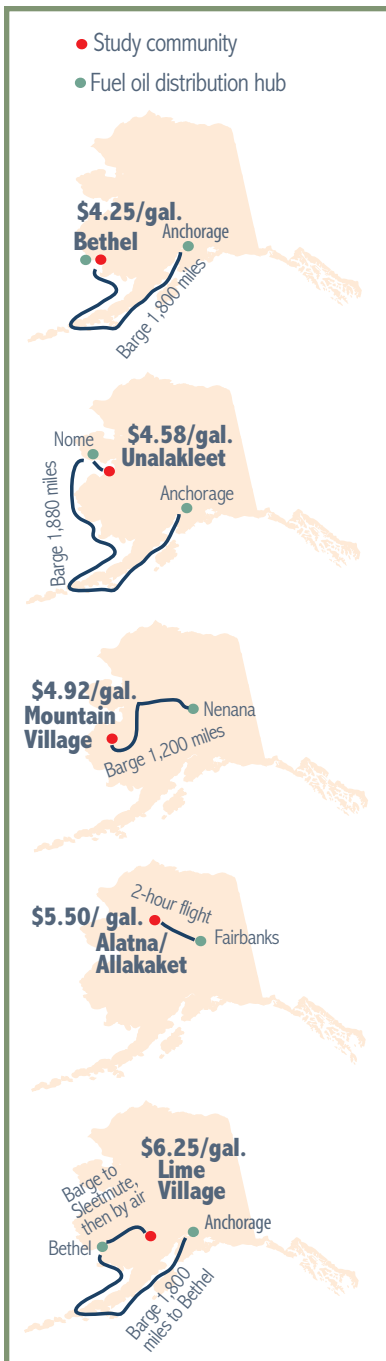
- *Bethel* (population 5,800) is a fuel distribution hub on the Kuskokwim River in southwest Alaska. It benefits from large (14.8 million-gallon) storage tanks a transportation company owns there. But fuel is barged 1,800 miles from Anchorage, ice prevents winter deliveries, and fuel has to be lightered ashore. There is no local tax on fuel.

- *Fuel for Unalakleet* (population 710) on Norton Sound is first barged nearly 1,900 miles from Anchorage to the Nome fuel hub. Ice prevents winter deliveries, and fuel is lightered ashore. Local sales tax on fuel is 3%.

- *Fuel for Mountain Village* (population 790) on the lower Yukon River is usually barged nearly 1,200 miles downriver from Nenana. Fuel can be delivered only during a short season, in a shallow-draft barge. The community has limited storage capacity. Local sales tax is 3%.

- *Allakaket and Alatna* (population about 125) are neighboring villages on the upper Koyukuk River, where barges can't navigate. They get fuel by air from Fairbanks. They also have small (16,000 gallon) storage tanks. There is no local sales tax.

- *Lime Village* (population 25) is on the Stony River in the Kuskowim Delta. Barges can't reach the community. Fuel comes 1,800 miles by barge from Anchorage to Bethel, where it is transferred and shipped up the Kuskokwim River to Sleetmute, then flown to Lime Village. The storage tank holds only 1,800 gallons. There is no local sales tax.



CONCLUSIONS

We weren't able to break out all the factors driving fuel prices, because we couldn't distinguish some distribution costs from profits. Also, some of the study communities are so small and hard to reach that typically just one or two companies compete for their business. It's impossible to specify the price effects of that limited competition.

Still, we learned a lot about what drives fuel prices and have thought about what the state might do to help hold down prices. It's important to point out that the state has already created or expanded programs

to help communities buy fuel or pay fuel companies and to help low-income households having trouble paying their energy bills.

The Alaska Energy Authority and the Denali Commission are also working together to improve fuel-storage capacity in many rural communities. Being able to store more fuel should help reduce community fuel prices. Other potential policies include:

- Consider selling state royalty oil to Alaska refineries at below-market prices, since the price of crude oil has a big effect on fuel prices. But the state wouldn't be able to control the downstream costs, and it's not clear how much benefit households would see after the fuel had passed through the entire distribution chain.

- Investigating the extent of cooperative buying in communities among utilities, schools, the state (which buys fuel for state facilities), and others would be worthwhile. Our research didn't include that assessment, but we heard anecdotally that deliveries may not be well-coordinated. Taking advantage of economies of scale could have price benefits.

- Having non-profit brokers to coordinate and fund collective fuel purchases could help reduce prices. We know that lack of cash frequently limits how much fuel small communities can buy at one time.

- Investigating possibilities for improving barge landings in small communities. Delivering fuel in places with inadequate infrastructure is harder and more expensive. But building barge landings is expensive for small communities, and there are also potential liability issues in the event of fuel spills. If there were a way to improve barge landings and resolve liability questions, both the delivery costs and the risk of fuel spills might be reduced.

Fuel will always cost more in small, remote places than in bigger, more accessible places. Public policies can't change that. But there are a number of points along the chain of fuel distribution where policymakers might find ways to help alleviate high fuel oil prices.

And in the long run, rural Alaskans may have other energy choices. The North Slope has one of the largest accumulations of natural gas in the U.S., and the state and oil companies are considering options for building a pipeline to carry that gas to market. The Alaska Natural Gas Development Authority is also examining ways to make the gas available in-state. The Alaska Legislature has appropriated money for a variety of renewable energy projects and studies. But it's still uncertain when rural Alaskans might have access to natural gas or other less-expensive energy sources.

NOTE

1. Although fuel oil is not subject to state or federal taxes, diesel for motor fuel—a virtually identical product—is taxed. In other states, fuel oil is dyed to distinguish it from the taxable motor fuel. But because Alaska markets are so small, Alaska is not required to dye fuel oil, and the two products can be shipped together. Because the taxable and non-taxable fuels are typically mixed for shipment, it is possible that at times households may in fact pay taxes on fuel oil—because the taxes have been levied at some earlier point. In that case, households can apply for refunds on those taxes. But our research indicates that in most cases households do not pay federal and state taxes on fuel oil. Instead, wholesale or retail sellers (depending on the circumstances of the sale) determine which sales are exempt from federal and state taxes, and apply for refunds of any such taxes they paid on fuel ultimately sold for home heating.

This summary is based on the report, *Components of Delivered Fuel Prices in Alaska*, by the same authors. That full report will be available in summer 2008 and will be posted on ISER's Web site:

Web site: www.iser.uaa.alaska.edu

Editor: Linda Leask • Graphics: Clemencia Merrill