Components of Alaska Fuel Costs: An Analysis of the Market Factors and Characteristics that Influence Rural Fuel Prices

Prepared for:
Alaska State Legislature
Senate Finance Committee

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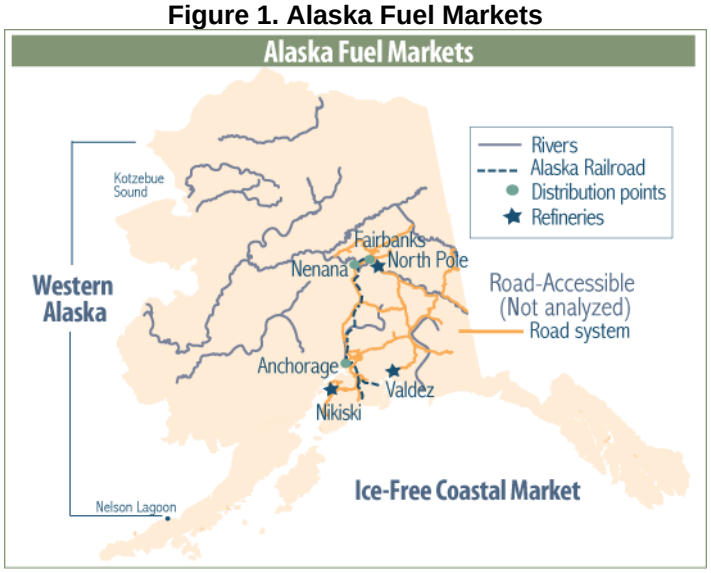
EXECUTIVE SUMMARY

Many Alaskans face extremely high, volatile fuel prices. Little is publicly known about the actual structure of Alaska's rural fuel markets and what drives prices at the community level. The Alaska State Senate Finance Committee asked economists at the University of Alaska Anchorage, Institute of Social and Economic Research (ISER) to investigate rural Alaska fuel markets and identify policy options that could be considered for legislative action to reduce fuel prices. This study is *both* an update *and* an evolution of previous ISER *Components of Fuel Costs* studies.[1] It does not include road-accessible communities.

Western Alaska Fuel Market

The Western Alaska fuel "market" is comprised of North Aleutian villages beginning with Nelson Lagoon proceeding north along the coast to Kotzebue Sound. Also included are ports of call on tributary rivers, the most prominent being the Yukon and Kuskokwim Rivers (Figure 1).

Figure 1. Alaska Fuel Markets



Three major competitors historically served the Western Alaska fuel distribution market, Crowley Marine Services, Yukon Fuel Company, and Delta Western. Crowley bought Yukon Fuel in 2005 and Ruby Marine, LLC (currently serving Yukon River customers) began operation in 2007, making a current total of three competitors.

While it is possible to fly fuel to most locations, it can only be done cost effectively to communities within a few hundred miles of Kenai or Fairbanks refineries and then only in quantities of less than five thousand gallons. Marine transportation remains the most cost-effective way to deliver fuel to most Western Alaska communities. Due to the shallow waters

[1]Wilson, Meghan, Ben Saylor, Nick Szymoniak, Steve Colt and Ginny Fay, 2008. *Components of Delivered Fuel Prices in Alaska.* Prepared for the Alaska Energy Authority, Anchorage: University of Alaska Anchorage Institute of Social and Economic Research. Available at: http://www.iser.uaa.alaska.edu/Publications/Finalfuelpricedelivered.pdf and Wilson, Meghan, Ben Saylor, Nick Szymoniak, Steve Colt and Ginny Fay, 2009. *Components of Delivered Fuel Prices in Alaska January 2009 Update.* Prepared for the Alaska State Legislature, Senate Finance Committee. University of Alaska Anchorage Institute of Social and Economic Research. Available at: http://www.iser.uaa.alaska.edu/Publications/fuelpricedeliveredupdate.pdf

of most ports of call, only a tug and barge combination is a viable method for delivery. Seasonal ice and remoteness are major factors influencing fuel transportation costs.

The competitive landscape in the marine delivery market has changed significantly over the last fifteen years. In the mid 1990s, Yukon Fuel's activity was primary on the Yukon River, and Delta Western and Crowley served the rest of the Western Alaska market. Beginning in the late 1990s and after a failed attempt to buy Yukon Fuel, Delta Western started to exit the small delivery market to focus on linehaul and tank farm operations. Also, during the late 1990s Yukon Fuel started an aggressive pricing program to expand its service territory. This plan was successful and took Yukon Fuel's small-delivery volume from seven million gallons in 1995 to nineteen million gallons in 2002. This increase in volume came from securing former Crowley customers and by picking up old Delta Western customers.

During this time both Crowley and Yukon Fuel charged some customers rates below cost, trying to secure additional market share. The strategy was to try to gain efficiencies and economies of scale that would lower the costs for all deliveries. One part of the plan benefited customers with larger tank farms.

By 2002 this strategy had increased Yukon Fuel's market share but resulted in relatively low profitability. In 2005, Yukon Fuel was sold to Crowley. As a direct result of very low profits, the market saw almost no reinvestment in equipment that would be expected to occur in a healthy market.

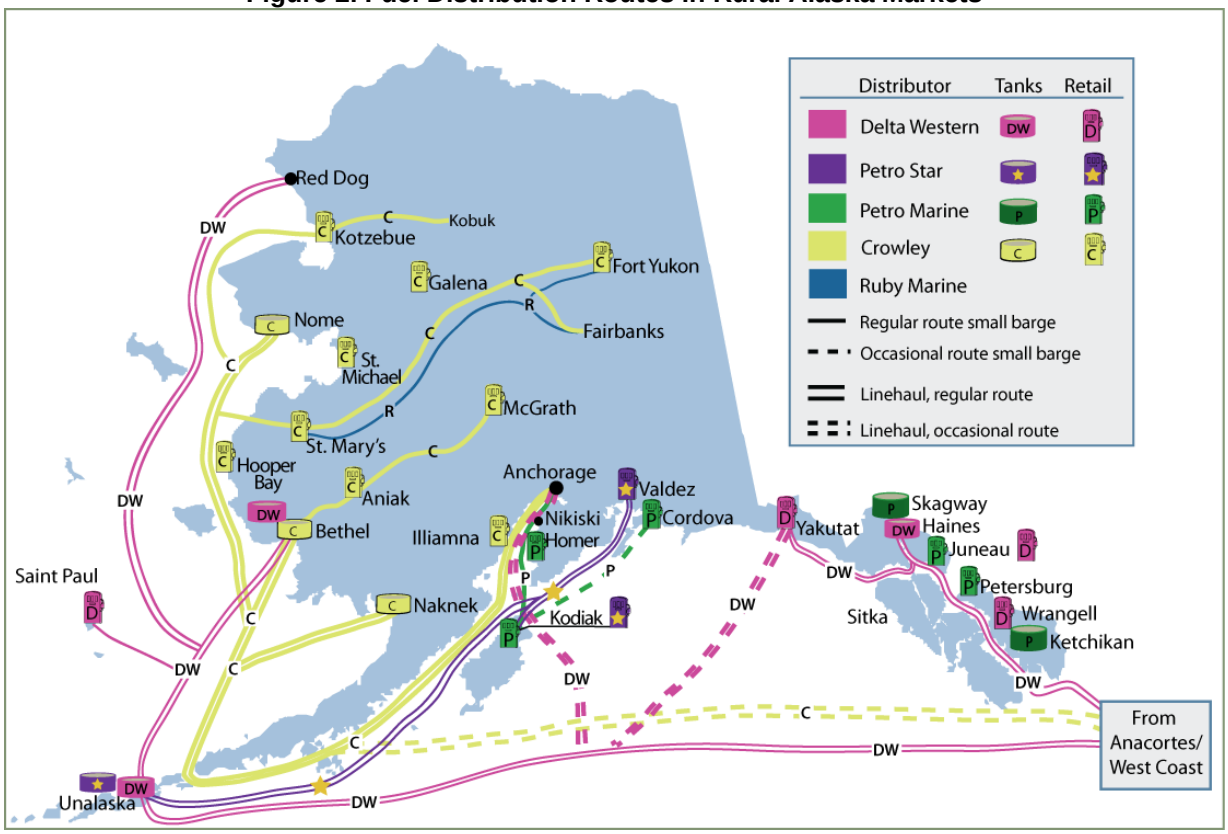
Since Yukon Fuel's purchase in 2005 prices have been increasing. However, evidence of prices remaining at depressed levels is the continued absence of Delta Western in the majority of the market. Delta Western has the capital and operational knowledge to compete for fuel sales in small Western Alaska communities yet they have had a relativity small role in the market from 2006 to 2009. When comparing current fuel delivery prices to fuel delivery prices from more than five years ago it must be factored in that prices from that time period were not sustainable, as evidenced by the sale of Yukon Fuel and the lack of participation by Delta Western.

There are many physical movements to transport fuel from the refinery to the end user's tanks.

1. Fuel is purchased from the refinery and shipped via a linehaul barge (the term used to reflect a large ocean-going barge) or trucked, as is the case for the upper Yukon River.
2. Fuel is put into a tank farm at a regional terminal or fuel hub or a smaller barge for storage.
3. Fuel is loaded from the terminal/fuel hub into smaller barges for delivery of fuel to each smaller community's local tank farm.
4. Local tank farms sell fuel to individual customers either at the tank farm or by truck distribution.

Figure 2 shows the fuel distribution routes of the major distributors in both the Western Alaska and ice-free coastal fuel markets.

Figure 2. Fuel Distribution Routes in Rural Alaska Markets



The estimated average cost of delivering fuel from Cook Inlet to Western Alaska communities is approximately $1.00 per gallon. These costs can easily increase by $0.20 per gallon for docking and fuel off-loading deficiencies that increase the time, safety, and environmental risks of fuel handling. Another estimated average of $1.60 in costs occurs once the fuel is delivered to communities, to cover the cost of fuel storage tanks, working capital of holding fuel until sold, and tank-farm operations such as fuel sales. If, in our hypothetical example, the refinery price of fuel was $2.00, the final average cost of transporting and selling the fuel in the "average" community served by the small barge fleet would be $4.60. More risky or challenging delivery circumstances would increase these costs.

This analysis found no evidence of excessive charges by fuel distributors. Most of the variation in fuel prices appears to be variations in retail price-setting practices at the community level. Potential reasons for variations in prices include differences in fuel sale operating hours and costs; differences in safety and environmental compliance implementation levels; differences in collections for tank-farm repair and replacement and operation and maintenance practices; differences in the cost of debt for bulk fuel loans; and mark-ups to collect revenues for other community purposes. Information on retail mark-up practices is proprietary, and most of the communities we contacted would not provide the requested information.

Ice-Free Coastal Alaska Fuel Market

The fuel markets of the Ice-Free Coastal Alaska (IFCA) region have a different logistic and price structure than the fuel markets in Western Alaska and fuel markets on the Alaska road system. The IFCA region spans Southeast Alaska, Prince William Sound, the Kodiak area, the Alaska Peninsula, and the Aleutian Islands. The major characteristics of fuel markets in the IFCA region are:

1. Ice-free ports allow for year round delivery, reducing communities' storage requirements.
2. Fuel distributors are more likely to operate retail stores than they are in Western Alaska and more likely to face less competition than on the Alaska road system.
3. If the fuel distributer sells to an independent retailer, the sale is less likely to be under a contract with a predetermined pricing formula, which is typical in Western Alaska.

Fuel in IFCA is typically less expensive than fuel in Western Alaska but more expensive than fuel on the Alaska road system. The costs of transporting, storing, and retailing fuel in the ICFA are also all less than the costs of similar activities in Western Alaska but higher than costs on the Alaska road system.

Three companies distribute most of the fuel in the IFCA region: Harbor Enterprises (Petro Marine, Petro Express, and Shoreside Petroleum), Delta Western, and Petro Star. The only communities served by more than one of these fuel distributers are Dutch Harbor, Kodiak, Ketchikan, and Juneau. In the other IFCA communities it appears all fuel is supplied by only one fuel distributor.

Vertically integrated fuel markets eliminate clear transaction points along the supply chain that reveal the cost of each segment to move fuel from the refinery to the end user. Further, many ICFA community submarkets only have one distributor. A sole distributor in a market is a price setter, and this price does not necessarily reflect the cost of distributing fuel. This erodes the relationship between distributors' selling prices and their costs.

The price of fuel sold under contract, as in Western Alaska, is determined by a formula, accounting for the refinery lift price and the cost of transporting fuel to the community. As a result, Western Alaska landed wholesale fuel prices fluctuate with refinery gate and world oil prices.[2] No formula exists for most fuel sales in the IFCA region, since most fuel is not sold under contract. The lack of a fuel contract does not in itself increase fuel prices, but it does significantly reduce the transparency of fuel distributors' costs.

Most communities in Southeast Alaska have fuel supplied by one of the large three distributors. The independent fuel retailers have little control over the price of fuel they purchase from the fuel distributor because most fuel is not sold under a contractually determined price. Independent retailers do not pick the source refineries, the brand of fuel purchased, whether it is purchased on contract from a refinery, or the way it is delivered to the

[2] For more information on refinery and world crude oil markets and prices see, Wilson, Meghan, Ben Saylor, Nick Szymoniak, Steve Colt and Ginny Fay, 2008, *Components of Delivered Fuel Prices in Alaska*, prepared for Alaska Energy Authority, Institute of Social and Economic Research, University of Alaska Anchorage, June. Available at: http://www.iser.uaa.alaska.edu/Publications/Finalfuelpricedelivered.pdf

community. As a result, the price the independent fuel retailer pays for fuel is determined entirely by the fuel distributor. The only component of the cost that is not determined by the fuel distributor is the retail markup.

The fuel distributors know the amount of the retail markup of independent fuel retailers, because it is simply the price of the fuel they sold the retailer, subtracted from the retailer's posted price. Knowing the retailer's markup allows the distributor to essentially determine the retail price of an independent fuel retailer. The distributor can set the wholesale price of the fuel it sells to the retailer at exactly the known retail markup, subtracted from the desired final retail price. This allows a fuel distributor to exert monopoly pricing power in a market where it is the only fuel distributor but not the only fuel retailer. The retail fuel price is further influenced by the fuel distributor, because often neither the independent fuel retailer nor the community has fuel-purchase contracts with the distributor.

In the IFCA region fuel distributors do not sell their fuel on contracts that include a pricing formula. Instead, they usually have full freedom to set their price at their retail stores or in sales to other retailers. There is no legal commitment to sell their fuel at a predetermined price or with a predetermined transportation charge. In addition, it appears that in some community submarkets, especially in Southeast Alaska, there are only distributors selling at their own retail outlets and no one else competing to supply fuel at the wholesale or retail level. This creates a fuel-distribution monopoly in those community submarkets. The exception to this is Juneau, which has two distributors as well as multiple independent retailers.

IFCA fuel markets facilitate natural monopolies because significant economies of scale exist and potential competitors face a high cost of entering the market. Economies of scale exist because many of the costs of distributing fuel, such as barges and storage tanks, are relatively fixed. The result is decreasing "per gallon" costs of distributing fuel as the amount of fuel that a company distributes increases. For example, one fuel distributor could import two million gallons of fuel on a linehaul tanker cheaper than two fuel distributors can import one million gallons each on smaller fuel barges. A single large, fuel distributor in a region is probably able to distribute fuel at a lower cost than multiple smaller distributors. This naturally leads to consolidation to the point where the entire IFCA market is only served by a small number of distributors, in this case three.

While consolidating fuel distributors may lower *costs* of fuel, it does not necessarily lower *prices* paid by the consumers. Instead, a sole fuel distributor would be capable of exercising its market power and charging a price higher than would be expected in a competitive market.

Without access to proprietary information, it is unclear whether fuel distributors in the IFCA region generate a larger than expected return on investment (profit) or charge monopolistic prices. The structure of fuel markets in the IFCA allows for fuel distributors to price fuel higher than they could in a competitive market. However, the State of Alaska Attorney General's Office recently investigated—with access to proprietary information— that question, and the resulting report indicates that fuel distributors in the ICFA region are not exercising

their market power and pricing fuel significantly higher than would be expected in a fully competitive market.[3]

IFCA fuel markets with only one distributor may also be exposed to a higher risk of fuel price shocks. In a competitive market, a fuel distributer wants to avoid purchasing fuel at the peak of a short-term fuel price increase. If it did, and a competitor was able to purchase fuel at a lower price, the distributor would have to reduce its fuel selling price below its purchase price to maintain market share.

The fact that Western Alaska and the IFCA rural fuel markets are less than competitive means retail fuel customers absorb the full impacts of high and volatile fuel prices— because fuel distributors can pass on these costs. Recent higher prices for fuel delivered to Western Alaska communities seem to result from the sudden convergence of several factors:

- Higher crude oil prices
- Price recovery among fuel distributors, after earlier competition for market share pushed prices below sustainable levels
- Repair and replacement of aging tugs and barges, including federally required use of double-hulled tankers
- Construction of new fuel tank farms in many communities, with business plans that require pricing to include costs of tank repair and replacement.

Community Fuel Survey Results

ISER surveyed 10 communities around Alaska in 2008, 2009, and 2010 to get information on local fuel prices. The major findings of the third round of community surveys are:

- Increases in fuel prices persisted from January 2009 to January 2010, despite the lower cost of crude oil during most of 2009.
- Fuel prices in rural Alaska vary significantly and are inconsistent across communities at the retail level.
- Some communities have much larger retail price mark ups than others.
- For some communities, delivery costs and retail markup are a large portion of the fuel price.
- Getting reliable local information on fuel sales and practices remains a challenge.
- Residents of surveyed communities are frustrated because they have limited options for coping with high fuel prices.

From January 2009 (date of last update) to January 2010, crude oil prices decreased on average 37%. Refinery gate prices in Anchorage increased 13% for gasoline and decreased 7% for diesel for heating (DF#1). In Anacortes, refinery gate prices decreased 7% for gasoline and 54% for diesel for heating (Ultra Low Sulfur, DF#1). On average across the surveyed communities, retail prices for gasoline decreased 6% and diesel for heating decreased 13%. Nonetheless, only five of the study communities surveyed paid lower prices for gasoline and

[3] Alaska Department of Law, Rural Fuel Pricing In Alaska: A Supplement to the 2008 Attorney General's Gasoline Pricing Investigation, February 2010.
See also: 2008 Alaska Gasoline Pricing Investigation; Attorney General's Report, January, 2009, at: http://www.law.state.ak.us/pdf/press/2008GasolinePricingReport.pdf.

diesel for heating (DF#1).Because the crude oil and refinery components of costs comprise a relatively small portion of final fuel prices (less than 50% in Western Alaska), these declines result in much smaller declines in retail prices, even if passed on fully to customers.

Policy Options

The conventional interventions are unlikely to produce optimal results. There is currently sufficient competition—or threat of new market entrants—to keep businesses minimizing costs. Regulation of fuel prices would be administratively burdensome, and most likely result in higher prices, because fuel distributors would be free to replace aging capital with a more certain return on investment. Fuel price subsidies remove market signals that encourage people to conserve when prices increase. That said, maintaining and funding the Low Income Home Energy Assistance Program to offset to a base amount of fuel costs is critical, especially during price spikes that result in families paying close to 50% of their incomes for home energy use. Improvements and consolidation of state bulk fuel loan programs, and expansion of their fuel sales and management training components, would address retail-pricing issues. Also, continued funding of municipal assistance would reduce the need for fuel price markups to support other community services. Continued funding of the weatherization program provides both short- and long-term relief by reducing the amount of fuel purchased by households, though the high fixed costs of transporting and storing fuel will be distributed over fewer gallons. Infrastructure improvements, such as replacing marine headers and interconnecting clustered communities with transmission lines and roads, may provide the most long-term benefits to lowering energy prices and maintaining rural communities.

INTRODUCTION

Many Alaskans face extremely high, volatile fuel prices. Little is publicly known about the actual structure of Alaska's rural fuel markets and what drives prices at the community level. The Alaska State Senate Finance Committee asked economists at the University of Alaska Anchorage, Institute of Social and Economic Research (ISER) to investigate rural Alaska fuel markets and identify any fuel market inefficiencies that could be considered for legislative action to reduce fuel prices.

This study is *both* an update *and* an evolution of previous ISER *Components of Fuel Costs* studies.[4] It updates the most recent *Components of Fuel Costs* study by collecting and reporting the most recent fuel prices in the ten previously surveyed rural communities. It is an evolution of the previous investigations, providing greater detail and scope on rural fuel markets. (It does not include fuel markets in road-accessible communities.) In addition, at the request of the Alaska Senate Finance Committee we present potential policy options and their potential impacts for addressing the cost of fuel in rural Alaska.

Fuel is sold in rural Alaska communities through two distinct markets. The first market area includes the (seasonally) ice-bound portion of Western Alaska. The presence of winter ice exerts tremendous influence on marine and river navigation to these non-road-accessible areas. The second market area is comprised of the ice-free coastal regions. Results are presented first for ice-influenced Western Alaska and then for the ice-free coastal area. An update of the previous ten community analyses follows. The final section is a summary and discussion of potential policy options.

To conduct this analysis, ISER researchers collaborated with a number of Alaska's fuel market participants including refineries, distributors, retailers, fuel purchasing cooperatives, and government agencies involved in community fuel purchases. Participation in this study by previously active players in the Western Alaska fuel market provided new access to information on that market. We did not have the same level of participation in the ice-free coastal market so were unable to provide an equivalent level of detail.

WESTERN ALASKA FUEL MARKET

This section includes background and detailed cost information regarding the downstream fuel market in Western Alaska. This region's referenced "market" is comprised of North Aleutian villages beginning with Nelson Lagoon proceeding north along the coast to Kotzebue Sound. Also included are ports of call on tributary rivers, the most prominent being the Yukon and Kuskokwim Rivers (see Figure 1). It draws on more than 30 years of combined experience of former owner/operators and executives at major fuel distribution companies and independent research done to evaluate market opportunities.[5] The numbers used in this report reflect the best estimates and memories of historical costs but should not be considered exact without confirming data with current fuel distribution companies.

[4] See footnote 1.

[5] The majority of this Western Alaska section was researched and written by Justin Charon and Mark Smith who worked for Crowley Marine Services and Yukon Fuel.

Three major competitors historically served the Western Alaska fuel distribution market, Crowley Marine Services, Yukon Fuel Company, and Delta Western. Crowley bought Yukon Fuel in 2005 and Ruby Marine, LLC (currently serving Yukon River customers) began operation in 2007, making a current total of three competitors.

While it is possible to fly fuel to most locations, it can only be done cost effectively to communities within a few hundred miles of Kenai or Fairbanks and then only in quantities of less than five thousand gallons. With current aviation fuel prices, the most competitive air deliveries have a transportation component of ~$1.25 per gallon per hundred air miles. The price is even higher for the many villages with airports unable to accommodate the 4,900 gallon DC-6 transport planes operated by Everts Air Cargo.

Marine transportation remains the most cost-effective way to deliver fuel to most Western Alaska communities. Due to the shallow waters of most ports of call, only a tug and barge combination is a viable method for delivery.

The competitive landscape in the marine delivery market has changed significantly over the last fifteen years. In the mid 1990s, Yukon Fuel's activity was primary on the Yukon River, and Delta Western and Crowley served the rest of the Western Alaska market. Beginning in the late 1990s, and after a failed attempt to buy Yukon Fuel, Delta Western started to exit the small delivery market to focus on linehaul and tank-farm operations. Also, during the late 1990s Yukon Fuel started an aggressive pricing program to expand its service territory. This plan was successful and took Yukon Fuel's small-delivery volume from seven million gallons in 1995 to nineteen million gallons in 2002. This increase in volume came from securing former Crowley customers and by picking up old Delta Western customers.

During this time both Crowley and Yukon Fuel charged some customers rates below cost trying to secure additional market share. The strategy was to try to gain efficiencies and economies of scale that would lower the costs for all deliveries. One part of the plan benefited customers with larger tank farms— such as the Alaska Village Electric Cooperative (AVEC)— in a major way. Most customers only had enough tanks for eight months of storage, meaning they all needed fuel first thing in the spring and as late as possible in the fall. In order to meet that demand, more sets of equipment were needed than if the deliveries could have been scheduled more systematically. As a result, there was too much equipment in the market during the mid-summer months. Given the high fixed costs, taking the equipment out of service did not help. Instead, very low-priced fuel was sold to AVEC and others who had 12 months of storage and could take mid-summer deliveries.

By 2002 this strategy had increased Yukon Fuel's market share but resulted in relatively low profitability. The company changed directions and began dropping accounts that were losing money, or increasing prices to reach a break-even point. This resulted in small-boat volume dropping from nineteen million gallons in 2002 to twelve million gallons in 2005. Also, during this time the effects of the Denali Commission's new tank farms began to change the demand for midsummer deliveries, as more customers had twelve months of storage capacity—making spring deliveries less critical. In 2005, Yukon Fuel was sold to Crowley.

As a direct result of very low profit, the market saw almost no reinvestment in equipment, such as would be expected to occur in a healthy market. Yukon Fuel's fleet was over 40 years old and well beyond its useful life of 27 years.[6] Under healthy market conditions, assets would be replaced on a systematic basis, with the average asset age close to half the useful life of the asset, 13.5 years in this case.[7]

Since Yukon Fuel's purchase in 2005 prices have been increasing. But evidence of prices remaining at depressed levels is found in the continued absence of Delta Western in the majority of the market. Delta Western has the capital and operational knowledge to compete for fuel sales in small Western Alaska communities, yet it had a relativity small role in the market from 2006 to 2009. As profitability returns to the market place, expect to see Delta Western build a greater presence. The fact that Crowley has actively been building new tugs and barges to operate in Western Alaska is a sign of economic improvement or long-term view of the market. Another positive sign is that in 2006 Ruby Marine was formed and began competing with Crowley for fuel sales on the Yukon River. Ruby Marine is owned and operated by a former executive of Yukon Fuel, and it competes with Crowley in that market.

When comparing current fuel delivery prices to fuel delivery prices from more than five years ago, it must be factored in that prices from that time period were not sustainable, as evidenced by the sale of Yukon Fuel and the lack of participation by Delta Western.

Fuel Movement Process

There are many physical movements to transport fuel from the refinery to the end user's tanks:

1. Fuel is purchased from the refinery and shipped via a linehaul barge (the term used for large ocean-going barges) or trucked, as is the case for the upper Yukon River.
2. Fuel is put into a tank farm at a regional terminal or fuel hub or a smaller barge for storage.
3. Fuel is loaded from the terminal/fuel hub into smaller barges for delivery of fuel to each smaller community's local tank farm.
4. Local tank farms sell fuel to individual customers, either at the tank farm or by truck distribution.

Fuel Purchasing

Process Description

None of the distribution companies in Western Alaska possess refinery capabilities, so the fuel movement process begins when the distribution company purchases fuel from a refinery.[8] The Alaska refineries providing the most of the fuel to Western Alaska are located in Valdez (Petro Star), North Pole (Flint Hills), and Nikiski (Tesoro). Additionally, Tesoro, Flint Hills and Chevron terminals in Anchorage can off-load to fuel delivery barges. The Cook Inlet area serves Western Alaska from either Nikiski or Anchorage. The product is sold "free on board"

[6] Office of Management and Budget, Circular No A-76 Appendix 3 item 1930.
[7] In the case with a 27 year life, 1/27 of the fleet should be getting replaced each year.
[8] Most of the fuel distribution companies have had some experience over the years with bringing in international tank ships with fuel products. The per-ship quantities are large (10 million+ gallons) and this method is common for Dutch Harbor seafood processors and the Red Dog Mine in Northwest Alaska. We know of no other tankers actually bringing fuel into this market.

or FOB[9] at the refinery or Port of Anchorage dock.[10] The Yukon River is supplied by fuel trucked to the Port of Nenana from a North Pole refinery.

Typical Costs

Unlike retail markets in Anchorage, wholesale barge prices are indexed to major markets with Los Angeles (LA) or Anacortes typically used. Los Angeles, in particular, is a major port where arbitrage ties the U.S. West coast with the world market represented by Singapore. Two major companies maintain Los Angeles and Anacortes pricing indexes, OPIS[11] and Platts.[12] Both yield similar results in "price discovery," by canvassing commercial customers daily to establish going rates.

Typical Cook Inlet Diesel #1[13] costs are LA Platts Jet plus approximately $0.06 per gallon. Over the last ten years, refineries at times offered prices based on other related products and city indexes, but LA remains the most common reference. On the rare occasions when pricing has been made public, different fuel distribution companies all post similar prices for similar volume purchases. Even when considering different indexes and different companies, the range of prices likely varies only +/- $0.02 per gallon when averaged over the last ten years. In other words, the Lower 48 refinery market is competitive.

Linehaul Transportation

Process Description

The next stage of delivery is transporting the product from Cook Inlet to Western Alaska. It is not cost-effective to take smaller delivery equipment (typical barge capacity of 275,000 gallons) to Cook Inlet to pick up fuel. Instead a larger linehaul barge is used (typical capacity of 2.5 million to 3.5 million gallons) to bring the fuel closer to the market place. The linehaul barge then delivers fuel to the smaller barges and terminals with tank farms. Linehaul equipment being positioned in Alaska for the summer season usually carries fuel from west coast refineries on the trip north. Delta Western also brings fuel directly from the west coast to Dutch Harbor[14] but the majority of fuel to the Western Alaska market is transported from Cook Inlet.

Several industrial customers who own tank farms large enough to accommodate a fuel load of over a million gallons receive their fuel directly from the linehaul barge. The largest of this type is Teck Alaska at the Red Dog mine, which takes ~18 million gallons per year. Another example is the Western Alaska Fuel Group (WAFG), which includes the large utilities in Nome, Dillingham, Naknek, and Kotzebue. The WAFG takes approximately 7 million gallons total. The role of the fuel distribution companies is largely to coordinate the buying and

[9] FOB stands for "Free On Board", and is used in conjunction with a port of loading. Indicating "FOB port" means that the seller pays for transportation of the goods to the port of shipment, plus loading costs. The buyer pays the costs of marine freight transport, insurance, unloading, and transportation from the arrival port to the final destination. The passing of risks occurs when the goods pass the ship's rail at the port of shipment.
[10] Tesoro did sell some fuel FOB Bethel in 1998 but discontinued that option.
[11] Oil Price Information Services, www.opisnet.com
[12] Platts, www.platts.com
[13] Diesel #1 (DF1) is commonly used as heating fuel throughout most of rural Alaska. This is same fuel the refineries sell as Jet fuel (Jet A), and in many tank farms it is stored as Jet A until sold as DF1. Because Diesel #2 (DF2) is more common through the rest of the U.S., DF2 is often used as the index price with an adder for the higher priced DF1.
[14] Mike O'Shea, Delta Western, personal communication, January 2010.

delivery process, so the gross margins[15] for these industrial customers are very thin (estimates of $0.04-0.06 per gal). The major motivation for the fuel distribution companies to sell to the large industrial companies is not the margin but the economies of scale and to maximize linehaul equipment utilization.

Each of the fuel distribution companies handles linehaul services differently. Crowley Marine Services largely meets its needs internally by having a division of the company that owns linehaul equipment and charging itself a quasi-market price. Delta Western had a sister company (Sea Coast Towing), which handled its needs until 2005, when Sea Coast Towing was sold to K-Sea Transportation. K-Sea Transportation continues to provide service to Delta Western under charter agreements. Yukon Fuel largely out-sourced all of its linehaul needs. One of Yukon Fuel's major linehaul providers was Sirius Maritime, which was also sold to K-Sea Transportation in 2007.

The current landscape of linehaul providers in Western Alaska consists of Crowley and K-Sea Transportation. This is unlikely to change without a major change in market conditions.

Typical Costs

Economies of scale are the biggest factor in linehaul pricing. The providers as a whole have been fairly efficient in keeping prices to the rough formula shown in Figure 3.

Figure 3. Fuel Distributor's Charge Formula

$$\frac{\text{Daily Operating Costs} + \text{Daily Capital Costs}}{\text{Total Number of Gallons Sold}} \times \text{Profit Margin} \times \text{Number of Voyage Days} = \text{Price per Gallon Charged by Distributor to Deliver Fuel}$$

This formula favors the largest volumes and the shortest routes. The traffic between Valdez and Dutch Harbor, for instance, provides significant economies of scale and customers along the route benefit from this more efficient supply line. On the other end of the spectrum are customers on the North Slope. That route takes several weeks to transit and the barges must wait several days for lightering-barges to off-load the larger barges over the course of several days. The current rates range from a few cents per gallon between Valdez and Anchorage to over 40 cents per gallon for transportation to the Beaufort Sea.

Another consideration in pricing the seasonal gallons delivered to Western Alaska and the North Slope is the fact that the ports of call are very far from the home ports of the linehaul fleet. Whereas a trip from Puget Sound to Ketchikan may take a few days, the trip from Puget Sound to Barrow takes a few weeks. Because of the cost of mobilization, the only cost-effective linehaul scenario is to deploy a tug and barge pair, known as a "set," for the five to six month ice-free season. Current fuel distributors estimate the fixed cost of a tug and barge set at $2.5 million for the season. Vessel

[15] Selling price less cost of the fuel. This ignores taxes and operating expenses.

delivery operations may be by charter or by a subsidiary. In addition to these fixed costs, the costs of tug fuel and other miscellaneous items for a six-to-seven trip season between Cook Inlet and the Bering Sea ports is another $3.5 million. A typical linehaul barge carries three million gallons of fuel, for a total of eighteen million gallons for a six-trip season. This results in approximately $0.19 per gallon in cost for transportation only. An alternative metric is the cost per "useful" day of the linehaul that starts with the ice opening of the Kuskokwim River approximately June 1 and ends approximately October 1 when deliveries are wrapping up. The applicable math is $3.5 million divided by 120 days, for a daily rate of almost $30,000.

Linehaul costs increased after the late 1990s and will continue to do so. The Oil Pollution Act of 1990 (OPA 90)[16] requires that all single-hull barges over 1,600 tons (smaller barges are exempt in Western Alaska) be replaced by double-hull barges by 2015. In the late 1990s, Western Alaska saw linehaul rates of less than $0.09 per gallon due to a surplus of single-hull barges in the market.[17] From 2000 to 2005, rates increased to the $0.13-0.15 per gallon range, and much of the equipment used was still single-hull. On October 29, 2009, K-Sea Transportation announced it would accelerate the retirement of its single-hull linehaul barges. That news, plus a poor market for fuel delivery, led to the share price of the company declining by half in two days—thus the company lost half its market capitalization. This suggests that K-Sea Transportation is not making excessive profit in the linehaul market.

Given that the cost of a new double-hull barge is more than three times the value of an older single-hull barge, we expect the linehaul cost of shipping fuel from Cook Inlet to Western Alaska to rise inevitably, from the current $0.19-$0.22 per gal to over $0.25 per gallon or higher in the near future.

Trucking

Process Description

In the case of the Yukon River, fuel is trucked to the Nenana terminal from a North Pole refinery. This is a straightforward process with costs of less than $0.05 per gallon. There are a number of trucking companies active in this market. From the Tanana River at Nenana, fuel is shipped to the Yukon River, supplying fuel to communities as far downstream as Mountain Village and as far upstream as Fort Yukon.

Terminal Operations

Process Description

The distinction between a regular tank farm and a "terminal" lies in the ease with which the tank farm can accept fuel and reload it to other barges at a later date. Generally, that means the tank farm needs the capacity to accept linehaul barges. The tank farms in that class in Western Alaska are Dillingham, Naknek, Bethel, Nome, and Kotzebue. Of those, only Nome and Naknek can handle a fully loaded linehaul barge. The draft (depth) limitations of the other ports require the linehaul to off-load to smaller barges first, lightening the linehaul and enabling them to complete the transit to port. For instance, the controlling depth for river transit into the port of Bethel is 12 feet, requiring typically loaded linehaul barges with drafts

[16] http://epw.senate.gov/**opa90**.pdf

[17] Note that one company providing these low rates, Newport Petroleum, went out of business. These rates were likely a contributing factor.

of 18 to 20 feet to lighter off one-third of their cargo. Any time fuel needs to be transferred it adds to the costs of delivery.

Not all fuel being delivered to Western Alaska goes through a terminal. The fuel off-loaded from the linehaul to the small barges often goes directly to the customer. In general, the delivery strategy is to avoid terminal use whenever possible. However, it is not possible to avoid using a terminal for all gallons, because that would require a much larger fleet of equipment in order to transfer and deliver all the fuel from a linehaul. That equipment could not be fully utilized because of the short ice free season. This, in turn, would drive up the cost of small barge operations.

Typical Costs

With nearly all terminals in Western Alaska, the tank farm also stores locally used community fuels in addition to serving as a regional fuel hub. The costs associated with those needs are discussed in a later section entitled "Variation in Retail Markups in Western Alaska". The costs described here are in addition to those normal local operating costs:

1. The barge fleet runs 24 hours a day and is also subject to tides and weather. So when a fuel delivery is scheduled outside a normal work day, a tank farm employee must come to work to accept the fuel. A linehaul offload can take as long as 24 hours and requires multiple people/shifts to work the shore-side end of the delivery. These incremental costs are in the range of $0.04-$0.06 per gallon.
2. In several cases in Western Alaska, a distribution company owning the terminal must pay the city, which owns the dock, a per gallon fee. This fee is usually in the range of $0.02-$0.04 per gallon.
3. When only one fuel distribution company owns a terminal at a location, it is common for that the owner company to make space available to other distribution companies. This terminal fee, which is in addition to the fee described in number two above, typically ranges from $0.07 - $0.15 per gallon.

Small Lighterage Delivery

Process Description

The most difficult and challenging part of the delivery process is getting the fuel from a linehaul or terminal to the specific community. The smaller tugs and barges that carry fuel from linehaul barges or terminals to the delivery point are sometimes referred to as "lighterage" equipment. A typical coastal set carries about 275,000 gallons fully loaded. A barge contains many separate compartments, in order to haul several types of fuel at the same time. All risk of a fuel spill is borne by the fuel distribution company until the fuel passes through the customer's header pipe upon delivery. The time it takes to get to each community varies not only by distance from the terminal but also by a host of other operational challenges. These challenges are discussed in detail in the June 2008 "Components of Fuel Costs" report (available at www.iser.uaa.alaska.edu).

Typical Costs

The cost structure for the fuel distribution lighterage fleet is complex. The first factor to consider is capital cost. A new set (tug and barge) for coastal operations costs about $6 million. That set could deliver between 2.5 million to 3.5 million gallons over 120 to 135 days, depending where it is put into service.

A costal set of equipment would have direct operating costs of about $750,000 per year. Those costs are largely made up of labor, running fuel, insurance, and regulatory compliance. In this estimate, fuel makes up $100,000 of annual operating costs (approximately 40,000 gallons of fuel at $2.50 per gallon). An increase in the price of barge fuel of one dollar results in an operating cost increase of about 5%, or $40,000. Labor is a large portion of these costs—about 40% or $300,000—and has grown significantly in the last five years. Industry rates for labor from deck hands to captains range from $225 to $550 per day, respectively. The tax and benefits burden rate is a minimum of 45% on top of the daily pay rates. These wage rates reflect the premium for the high skills required to operate in these challenging delivery environments.

Another challenge faced by the fuel distribution company is that these costs are largely fixed.[18] In order to break even, the set of equipment must be fully utilized. A coastal tug and barge combo can handle a maximum of approximately three million gallons in a shipping season. Table 1 shows a simple cost structure of operating a fully utilized coastal tug and barge set for one year. It assumes a 10% return on capital investment.

Table 1. Annual Barge Costs

Capital Costs	$	600,000
Operating Costs	$	750,000
Total Costs	**$**	**1,350,000**
Gallons Delivered		3,000,000
Cost per Gallon	**$**	**0.45**

Delivering three million gallons of fuel with one tug and barge set would be considered excellent utilization and can only be accomplished if the equipment is making shorter trips close to a terminal. More often than not, a set will work in several different areas over a season. Rather than charge everyone the same price, rate tables are developed based on actual experience and average delivery times.

The final landed wholesale prices charged in communities vary significantly because distances and travel times vary significantly between terminals and different communities. These wholesale price variations reflect delivery cost variations. Delivering fuel to more remote communities requires a longer trip, resulting in the barge being unable to deliver its potential maximum of three million gallons per season. There are other loading conditions that can prevent a barge from maximum capacity (e.g., it must carry running fuel for the tug). The example given in Table 2 assumes the 275,000 gallon barge is delivering 250,000 gallons to communities that require a 15-day round trip per delivery.

[18] Analysis conducted at YFC showed small boat operations had a fixed costs of 70% and variable cost of 30%,

Table 2. Barge Cost per Trip

Annual Barge Cost	$	1,350,000
Operating Days		135
Daily Cost	$	10,000
Trip Length (days)		15
Cost per Trip	$	150,000
Gallons per Trip		250,000
Cost per Gallon	**$**	**0.60**

The example in Table 2 is for a coastal tug and barge set operating in a more efficient area of the market. Areas such as the Yukon and Upper Kuskokwim rivers have operating seasons that are about 30 days shorter due to a longer ice season, and barges often deliver less than two million gallons per year—a 50% reduction from easier to serve coastal areas. Extremely difficult deliveries in rivers around Kotzebue Sound, the rivers of Bristol Bay, or communities such as Huslia require very time-consuming deliveries with very low volumes. As seen in Table 3, those changes drive the cost up to $0.77 per gallon for the tug and barge set.

Table 3. Alternative Barge Cost per Trip

Annual Barge Cost	$	1,350,000
Operating Days		105
Daily Cost	$	12,857
Trip Length (days)		15
Cost per Trip	$	192,857
Gallons per Trip		250,000
Cost per Gallon	**$**	**0.77**

Some rivers have an additional price variable because barges commonly carry deck freight. Freight has a higher delivery charge per ton than a ton of fuel,[19] but requires that other equipment, such as forklifts, be on board, slowing down the trip. Given the lower margins on fuel, it is likely that deck freight subsidizes fuel margins in some markets during years with large freight projects.

Based on the best information available, the estimated range of costs for Western Alaska small barge deliveries is $0.40-$0.80 per gallon for most locations.

Other Costs of Delivery

There are a host of other costs outside of the direct costs of transportation. These include working capital and administration. These costs contribute significantly to the costs of delivering fuel, but it can be difficult to attribute some of these costs to specific gallons of fuel delivered. As a result, they are often spread over all of the gallons delivered. These other costs are discussed briefly below.

Working Capital

While fuel distributors are in possession of fuel, it ties up large amounts of cash that could be invested elsewhere. This opportunity cost of cash is calculated as the working capital cost of transporting fuel, and it increases as the length of time increases between the time the refinery

[19] A ton of fuel is about 294 gallons.

is paid for the fuel and when the final customer pays for the delivered fuel. The fuel distribution company gets relatively short payment terms from the refinery, which adds to the distributor's costs. The potential impact of these short terms can be illustrated in an example, which assumes a term of 15 days.[20] The fuel takes about 10 days to get from the refinery to a terminal, and it could be another 30 days before it gets to the customer. So the delivery process takes as much as 40 days for Western Alaska. Add to the delivery process an invoice collection time to the customer of 30 days,[21] and the amount of time the fuel distribution company must cover the costs for the fuel purchases increases to 55 days (10+30+30=55). Assuming a fuel cost of $2.20 and an interest rate of 8%, this working capital cost is $0.026 per gallon.[22]

Administration

There are many administrative functions that are critical to the fuel delivery process, including spill response preparedness, safety, sales, dispatch and collections. These costs are spread over all the gallons in the system and are estimated at $0.05-$0.10 per gallon.

Safety and Environmental

The fuel delivery business is highly regulated by many government agencies. Keeping up-to-date on changes and reporting takes several full-time employees. OPA 90 requires that all fuel distributors have spill clean-up plans in place. In Western Alaska, the non-profit organization Chadux provides spill preparedness, response, and training services. All fuel distributors in the region are Chadux members.

Sales

The sales solicitation process starts in the winter. Distributors contact known customers to see if they will be using the supplier for the year. Usually several contacts are made before the distributor secures a confirmed order. The sales department stays in contact with the customer as the delivery date gets closer. Orders change frequently. The sales department also works with the larger customers who request bids. This is a time-consuming process that requires several full-time employees.

Dispatch

Coordinating linehaul barges meeting the small boats and keeping all the equipment working (critical to being able to make a profit) is a difficult task. This also takes several well-trained employees.

C*ollections*

A large number of customers pay their fuel bills with government assistance such as bulk fuel loans or revenue sharing. Helping customers through the process and getting payment is another difficult process.

Marine Delivery Cost Build

Fuel distribution companies charge for delivering fuel to local community tank farms. The customer is quoted a single price that reflects the costs to deliver fuel. The customer's final

[20] Each refinery has a different policy and it has varied over the last 10 years.
[21] Some customers are on COD basis while others have terms.
[22] $2.20 x 8% divided by 365 days x 55 days

delivered price combines the distributor's transportation charge with the price the distributor paid for the fuel at the refinery. The reported price of fuel at the refinery is usually pegged to a major index such as OPIS or Platts.

Table 4 pulls estimates from previous examples to construct the distribution cost structure for a hypothetical community. If LA Platts Jet fuel was $2.00 per gallon when the distributor purchased it, then the wholesale price would be $2.98 per gallon. This does not include any applicable taxes.

Table 4. Distribution Cost Structure Example (per gallon)

Purchase differential	$	0.06
Linehaul	$	0.19
Terminal use	$	0.03
Small barge operations	$	0.60
Working capital	$	0.03
Administration	$	0.07
Total Distribution Cost	**$**	**0.98**

This cost structure depends on the location. The fuel distribution company can make small adjustments to this structure to reflect the costs of the customer's order. Use caution in assuming this is the general cost of each site—because Alaska is a very large place with extreme variations in cost structure.

Variation in Delivered Prices

The variations in the price that distributors charge for delivered fuel to different communities cannot always be explained by the barging costs alone. The price may vary between two communities because of the timing of when the distributor lifted the fuel at the refinery, or other factors that change the transportation charge directly.

The community/retailer has no influence on world crude oil prices or the market for refined fuel. However, for every $10 per barrel crude oil price change there is an approximately $0.24/gallon price change in refined product. The oil market has been extremely volatile over the last few years. Communities that receive fuel even a few weeks apart could have a cost difference of $0.50/gallon. Some communities try to time the market to purchase fuel when they think the prices will be the lowest. These efforts are largely unsuccessful and do not help with fuel costs over time. What communities could do to control the impact of volatile refinery lift prices, caused by volatile crude oil prices, is use financial instruments to hedge against price increases. The use of these instruments is discussed in the sections on Ice-Free Coastal Alaska and Policy Options. However, this is a sophisticated strategy out of the realm of the technical capabilities of most Alaska communities.

The transportation charge is the component of the delivered fuel price that the fuel distributor charges to transport fuel for the community. In Western Alaska, it is generally negotiated from fuel contract to fuel contract and reflects the fuel distributor's costs and risks of delivering fuel to each customer. Two villages that may be close together on the map may have very different delivery challenges. Missing header or pipelines and docking issues are not uncommon. This

could represent a $0.10-0.15 per gallon difference in the price the fuel distribution company charges a community.

There are usually multiple fuel purchases in each community. The electric utility, the fuel retailer, the school district, and the government buildings may all purchase fuel directly from the fuel distributor and the fuel distributor may charge each entity a different price. The price differences are generally based on the quantity ordered and whether the order was placed far enough in advance to coordinate the least expensive delivery. A multitude of other characteristics of customers can be expected to influence the sales price, such as whether customers pays their bills promptly or whether they can be depended on to meet the delivery barge—however, fuel distributors claim to not charge premiums for these things.

Most retail fuel buyers must have the cash on hand to purchase fuel during the shipping season when the fuel distributor's barge is in the area. If a community does not have enough money or is late applying for a loan, it may not have the cash to pay for the fuel when the barge arrives. In these cases, the distributor must do a special barge trip later in the year to deliver fuel, which forces the transportation costs to be spread over fewer gallons and thus increasing the cost of fuel. In an even worse scenario, if a community is unable to purchase fuel during the barge-shipping season, it is forced to fly in fuel after the rivers freeze. The cost of flying fuel is much higher than the cost of barge delivery. A similar scenario occurs if a community buys an inadequate supply of fuel for the winter season because it didn't have sufficient funds during the barge delivery season. The community is then forced to fly in fuel before spring breakup.

Cost to Retail Fuel in Western Alaska

Once the fuel reaches the tank farm by barge, it is stored until purchased by the end customer. In order to make it through the winter, tank farms need eight to nine months of fuel in storage. Having such large storage requirements is expensive both in terms of the capital costs for the tanks and the working capital for the fuel inside the tanks.

Fuel distribution companies own terminal tank farms in hub Western Alaska communities.[23] Crowley is the only fuel distribution company with small local tank farms off the road system; it has eight of these sites. The rest of the 150 small tank farms in Western Alaska are owned by local entities, usually the city or local tribal entity.[24] Since there is no common ownership, tank farms—even ones in close proximity—are operated differently. Each community usually has several tanks farms. The electrical generation provider has tanks for its own needs, the school districts have their own tanks, and finally, there is a tank farm for retail sales.

The pricing of fuel begins with the price charged by the fuel distribution company. When new fuel arrives, prices are adjusted. For the fuel distribution companies that own tank farms, the new price is most often based on the weighted average of the previous fuel in the tanks and the incoming product. This leads to very different pricing in each community, due to varying amounts of last year's fuel remaining in the tanks. After adjusting the fuel price for existing

[23] The exceptions are in Nome where Bonanza Fuel owns one of two terminals and in Dillingham where Alliance Fuel owns one of two terminals.
[24] Assuming about 50 villages with three tank farms in each village.

fuel on hand, tank farm costs must be added to the price. For the most sophisticated sellers, a target margin is added on to the cost-build of the tanks to determine the final price of fuel.

Fixed Capital Costs

The condition of tanks in many locations is poor and often out of compliance with state and federal environmental regulations, although that situation is improving with Denali Commission assistance and increased regulatory enforcement. In 1998, the Denali Commission was formed to help bring up the standards of these tank farms. The purpose of the program is to replace environmentally unsound storage tanks that were not properly maintained because repair and replacement (R&R) funds were either not collected or saved to replace the tanks. Since 1999, the commission has competed projects in about 100 locations of the 175 statewide identified as in need of repair or replacement.[25]

While the Denali Commission requires a community to draft an approved business plan outlining the R&R and O&M collection and expects the community to follow the business plan, there are no provisions to ensure that occurs. It is unclear how many communities collect R&R and O&M funds. A community that does not maintain its tanks or set aside revenue for future R&R will have lower fuel costs than a community that does. This is true of all communities, not just those receiving a Denali Commission tank farm.

Tank farms in each community were built at different times, and the farms are different sizes, which makes comparisons difficult. Using Denali Commission cost estimates,[26] a 350,000-gallon tank farm costs between $2.6 million and $2.9 million to build. A responsibly designed tank farm would have at least a ten-month storage capacity.[27] This means a 350,000-gallon tank farm could have sales of 420,000 gallons per year. Assuming a 10% return on capital, the owner would need to add $0.61 per gallon to the price to cover the cost of the tank.[28] Larger tank farms have a clear advantage, since the construction cost per gallon decreases and there are more gallons over which to spread the costs.

As mentioned previously, not factoring in the cost of capital and resulting underinvestment (and under pricing) of the capital value of the storage tanks was a contributing factor to the widespread problem of tank farms that were out of compliance. Larger companies and the fuel distribution companies are held to a higher standard for environmental compliance and fund these investments privately, resulting in higher prices.

Working Capital Costs

A tank farm owner must have eight to ten months of fuel on hand in the fall. In the springtime the inventory on hand is small and then starts to work its way back up. This results in an average inventory level of about half the tank's capacity. So in this example that would result in an additional $0.10 per gallon needing to be added to the price.[29]

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[25] https://www.denali.gov/dcpdb/index.cfm?fuseAction=IndicatorDisplay.ShowBulkFuelProgress

[26] Denali Commission. Final Denali Commission Project Costs Containment Assessment Projects in Various Alaska Villages. April 2002.

[27] The Denali Commission uses even a higher number of 13 months storage capacity.

[28] $2.6M x 10% divided by 420,000 gallons

[29] 350K gallons of storage is 175,000 of average inventory. Assuming the price of $2.98/gallon used in the marine example that is $521,000 of average working capital investment. If the borrowing cost were 8% that is $42,000 in interest each year. Spreading the interest costs over all 420,000 gallons results in a $10/gallon cost.

Operation Costs

Tank farm costs are similar in nature to marine delivery costs in that labor, insurance, and regulatory compliance make up a large part. They are also very fixed in nature. For smaller tank farms in the 200,000 to 800,000 gallons per year size range, we estimate annual operating costs of $350,000 to $400,000. Given that these costs are fixed, this significantly favors the larger tank farms that only need to add $0.50/gallon to cover expenses. In contrast, the 200,000-gallon facility would need to add $2.00/gallon to cover these operating costs. It should also be noted that when a facility exceeds 420,000 gallons in capacity, it falls under increased state environmental regulations, which also affects the cost structure. Assuming operating costs of $350,000, if a tank farm sells 420,000 gallons, the cost increases $0.83 per gallon.

Summary for Costs

$2.98 Fuel purchased from the fuel distribution company
$0.61 Tank farm capital cost
$0.10 Working Capital
$0.83 Tank farm operations
$4.52 per gallon before tax

Again, note that this summary is for example purposes only. Because capital and operating costs are fixed, small changes in a community's annual volume can significantly change the cost structure.

Other community costs include facility compliance training for operators in proper spill management and other safety training. This training is expensive and time-consuming. Different communities tend to have different levels of training and compliance.

Some communities have tank farms that are open long hours every day, while others might be open only a few hours a day or not every day. Some locations include charges for trucking home heating fuel in the price, while others add it separately or do not have a delivery option. Service differences could account for up to $0.30/gallon variations in prices.

In some communities, the city or local tribal entity may own the tank farm and prices are set as part of a "larger financial picture." One community may charge high prices to fund community services, while another may charge very low prices and fund the difference from other city revenue.[30] Since these operations may be co-mingled with other services, determining the margin from fuel sales may be difficult. What is known, however, is that each spring most communities do not have much money with which to buy new fuel supplies.

Variation in Retail Markups in Western Alaska

It appears the majority of the fuel price variability—after accounting for the effects of volatile world crude oil prices—is the result of local fuel retailer practices. The reasons for the price

[30] The Alaska Energy Authority training manual for operating community tank farms states that: "The use of business funds to subsidize other operations (such as street maintenance, fire and police) is OK only if all of the fuel business's costs, including long-term repair and renewal, also are being included in the price." page 2.

variability are as diverse as the communities themselves. For every community, there appears to be a different set of circumstances that influence the retail price of fuel. These factors are also constantly changing within and across communities.

Cost of Debt

A significant portion of many communities retail fuel price is debt costs. When a community does not collect sufficient revenue from fuel sales to cover its costs and to purchase fuel the following year, it must use a loan to finance the next fuel purchase. Fuel distributors used to allow a community to purchase fuel on credit, but this practice has been largely abandoned or scaled back due to the increasing risk of default resulting from higher prices. Fuel distributors have reported that their credit collection costs increase with the price of fuel, but they charge no credit risk premium to communities that have struggled paying off credit the in past. Instead, the extra cost of this risk is spread across communities.

Also, the state and federal governments have taken on more of this financial risk through fuel loan programs. The Alaska Energy Authority manages the state Bulk Fuel Revolving Loan Fund and program. The purpose of the Bulk Fuel Revolving Loan Fund is to assist small rural communities, utilities, or fuel retailers to purchase emergency, semi-annual or annual bulk fuel supplies. Each community is allowed a maximum loan of $750,000. The first year the interest rate on the fuel loan is zero; the second year it is 5%; and the third year it is an average municipal bond rate. Some communities complain that the loan application process is cumbersome, and that the time to receive the loan puts the community at risk of not securing funds in time to pay fuel bills. Applying for the loan also increases the retailer's administrative costs.

The Bulk Fuel Bridge Loan program is a state program administered under contract by Rural Alaska Fuel Services (RAFS). RAFS is a not-for-profit organization that was initially capitalized by the Denali Commission to provide operation and maintenance training in communities receiving bulk fuel tank farms financed by the commission. The commission provided the first two years of operating funding and capitalization for RAFS. RAFS offers its fuel sales operation management and training as a part of the bulk fuel bridge loan program.

The Bulk Fuel Bridge Loan program targets distressed communities that do not qualify for an AEA bulk fuel loan. These communities do not have enough cash to purchase the fuel for the upcoming season and are not sufficiently credit worthy to qualify for the AEA Bulk Fuel Revolving Loan Program. RAFS pays the distributor for the community's fuel and then works with the community to develop a plan to repay the loan, as well as any existing debt, so the community can qualify for a Bulk Fuel Revolving Loan Fund loan in the future—or better yet, price fuel accurately to collect sufficient revenue to pay for future fuel deliveries without loans.

The RAFS bridge loan has no interest charges. It is mandated that RAFS provide training and guidance on retail operating and price setting to ensure that the community is able to pay back the loan and purchase fuel in the future. In order to receive this training from RAFS, a community must first fail to collect enough revenue from fuel sales enough times to become ineligible for an AEA loan. By the time that happens, the community may be deep in debt and must significantly raise the price of its fuel to pay it off. There is also a reverse incentive in this

loan system, because the only way fuel retailers can obtain the training and zero-interest financing they need to address their problems is by first letting the problems get worse.

Accurately Pricing Fuel

Pricing fuel properly requires a significant amount of accounting sophistication, to price it in a manner that recovers all costs while also generating a reasonable return or profit. Rural fuel retail bookkeeping is a complicated task, and many communities struggle to retain qualified employees. Interviews with rural fuel experts indicate that many communities struggle to price fuel properly. Some common problems are listed here.

Problems with fuel inventory

It can be difficult matching the recorded inventory of fuel written in the books with the actual amount fuel in the tanks. It is vital for local owners to know how much fuel remains when they're ordering fuel for the next year. If the existing inventory is not known, the community risks not ordering enough or ordering too much fuel the following shipping season.

Getting expenses right

All expenses associated with retailing fuel must be accounted for so they can be included in the price of fuel. This allows for accurate cost recovery when fuel is sold. Expenses commonly include tank farm O&M, tank farm R&R, administration and operating costs (including salaries for employees), and insurance.

Pricing

The price of fuel should include all costs associated with storing and retailing fuel, as well as generate enough revenue to purchase fuel the next shipping season. This means that current fuel prices should be raised if the price is expected to be higher next year. Fuel retailers often have difficulty accounting for all associated costs and properly distributing them over the number of gallons of fuel sold.

Accounting for revenue

Simply collecting enough revenue to purchase fuel the following year is not the only task facing retailers; they must also ensure that the collected revenue is retained and identified for purchasing the next fuel shipment. Inadequate accounting can result in the funds being spent during the course of the year. This is the case when fuel and other revenues are held in the same account and that account is used to purchase inventory for the grocery store or for other community purchases and services.

Fuel-price training is vital for the success of rural fuel retailers and is provided by two relatively autonomous providers: The Denali Commission bulk fuel farm upgrade program and Rural Alaska Fuel Services. The fuel purchasing cooperative Northstar Gas also provides less formal guidance.

Retail fuel price training is provided in connection with bulk fuel farms constructed by the Denali Commission. The commission historically funded this training through the State of Alaska's Department of Labor and Workforce Development (DLWD). The Alaska Energy Authority applies for this training money, hires a contractor to teach the course, and facilitates the training course. This training course was not offered last year due to lack of state financing,

and its future is in doubt. The DLWD fund can only be used if the training creates new jobs, as opposed to retaining jobs. Since the fuel training program cannot prove that it creates new jobs, it is not eligible for the DLWD funds. Interviews with trainers indicate that the training program is successful if there is both follow up and continual training, as there is a high turnover rate for fuel retail operator positions.

The goal of RAFS operation management and training is to get the community fuel retailer in a financial standing that allows it to purchase each year's fuel with cash. Communities in need of a RAFS fuel loan generally either have not been charging enough for the fuel— preventing them from building necessary cash reserves for future orders—or failing to save the money they do collect on fuel sales for future fuel purchases.

ICE-FREE COASTAL ALASKA FUEL MARKET

The fuel markets of the Ice-Free Coastal Alaska (IFCA) region have a very different logistic and price structure than the fuel markets in Western and Arctic Alaska and fuel markets on the Alaska road system. The IFCA region includes Southeast Alaska, Prince William Sound, the Kodiak area, the Alaska Peninsula and the Aleutian Islands. The major characteristics of fuel markets in the IFCA region are:

1. Ice-free ports allow for year-round delivery, reducing communities' storage requirements.
2. Fuel distributors are more likely to operate retail stores than they are in Western Alaska and more likely to face less competition than on the Alaska road system.
3. If fuel the fuel distributor sells to an independent retailer, the sale is less likely to be sold under a contract with a predetermined pricing formula, which is typical in Western Alaska.

Fuel in IFCA is typically less expensive than fuel in Western Alaska but more expensive than fuel on the Alaska road system. The costs of transporting, storing, and retailing fuel in the ICFA are also all less than costs of similar activities in Western Alaska but higher than on the Alaska road system.

Vertically integrated fuel markets eliminate clear transaction points along the supply chain that reveal the cost of each segment to move fuel from the refinery to the end user. Further, many ICFA community sub-markets only have one distributor. A sole distributor in a market is a price setter, and this price does not necessarily reflect the cost of distributing fuel. This erodes the relationship between distributors' selling prices and their costs.

The price of fuel sold under contract, as in Western Alaska, is determined by a formula, accounting for the refinery lift price and the cost of transporting fuel to the community. As a result, Western Alaska landed wholesale fuel prices fluctuate with refinery gate and world oil prices.[31] No formula exists for most fuel sales in the IFCA region, as most fuel is not sold under contract. The lack of a fuel contract does not in itself increase fuel prices, but it does significantly reduce the transparency of fuel distributors' costs.

The Western Alaska section of this report benefited from contributions of experts from the fuel distribution industry in that market. No similar expert on the IFCA fuel distribution industry contributed to this section on the IFCA market. Current industry employees and agents supplied generous amounts of information on the structure of ICFA fuel markets. But information on the level we were able to get for Western Alaska fuel markets is generally considered a trade secret or proprietary information. Despite the lack of specific and detailed information on fuel cost components in the IFCA region, the following description of the structure of the IFCA fuel market provides insight into why fuel prices in IFCA are what they are.

[31] For more information on refinery and world crude oil markets and prices see, Wilson, Meghan, Ben Saylor, Nick Szymoniak, Steve Colt and Ginny Fay, 2008, *Components of Delivered Fuel Prices in Alaska*, prepared for Alaska Energy Authority, Institute of Social and Economic Research, University of Alaska Anchorage, June.

Fuel Supply

Within the IFCA region, each fuel distributor and subregion has different supply chains. These supply chains are also relatively fluid, as they change depending on the location of the community, price differences of many refineries, and the current location of the fuel barge fleet. The supply chain for a typical IFCA community is:

1. Fuel is purchased from the refinery and shipped via a linehaul tanker or barge. Fuel for Southeast Alaska typically comes from the south, while communities in the area from Prince William Sound to the Aleutian Islands also receive fuel from Alaska refineries and foreign refineries in Asia.
2. Fuel is off loaded into a regional terminal tank farm or "fuel hub."
3. Fuel is loaded from the fuel hub tank farm into smaller barges that go to each community to deliver fuel to the local tank farm.
4. Local tank farms sell fuel to individual customers either at a retail station at the tank farm or by truck distribution.

In Southeast Alaska most fuel is imported from refineries in California, Washington, and British Columbia. Most of the fuel Petro Marine sells in Southeast Alaska south of Juneau is distributed out of Ketchikan, its regional fuel hub. Table 5 shows the amount of gasoline and distillate fuel oil (diesel and heating fuel) that is barged into and out of major Southeast Alaska ports. The U.S. Army Corp of Engineers data does not include information on all Southeast ports. It is also reported that Skagway received eleven million gallons of naptha. Petro Marine operates a fuel farm in Skagway, and it is likely that this fuel was transported inland to serve Petro Marine's Yukon Territory fuel brand North 60°.

Table 5. 2007 Fuel Shipments to Southeast Alaska ports (thousands of gallons)[32,33]

	Distallate Fuel Oil			Gasoline		
	Reciepts	Shipments	Net	Reciepts	Shipments	Net
Craig	1,391	-	1,391	2,149	-	2,149
Elfin Cove	57	-	57	49	-	49
Hoonah	1,657	622	1,035	849	314	535
Juneau	16,483	2,758	13,724	20,327	1,679	18,648
Kake	211	-	211	240	-	240
Ketchikan	20,576	18,714	1,862	20,804	12,022	8,782
Metlakatla	296	-	296	293	-	293
Pelican	76	-	76	62	-	62
Petersburg	4,068	-	4,068	2,031	65	1,966
Sitka	3,385	-	3,385	4,142	3	4,139
Skagway	591	-	591	1,610	0	1,609
Wrangell	946	-	946	811	1	810

Analysis of the Corp of Engineers' Waterborne Statistics suggests that in 2007, 36 million gallons of gasoline and 34 million gallons of distillate fuel oil were imported into Alaska through Revillagigedo Channel. The data also suggests that eight million gallons of gasoline and six million gallons of distillate fuel oil were shipped into Southeast Alaska through Icy Strait from Alaska refineries from the north.

[32] U.S. Army Corp of Engineers. Waterborne Commerce of the United States. Available at: http://www.iwr.usace.army.mil/ndc/index.htm

[33] ISER Calculations

Much of the fuel for the ICFA west of Southeast Alaska is distributed from the ports of Anchorage, Nikiski, and Valdez (Table 6). These three ports are primarily fuel exporters, but Anchorage and Nikiski also import significant amounts of fuel, especially gasoline. In this regard, Anchorage and Nikiski act as both fuel exporters and fuel hubs for the IFCA. Dutch Harbor is the only pure fuel hub in this subregion.

Table 6. 2007 Fuel Shipments to Southcentral and Western Alaska ice-free ports (thousands of gallons)[34,35]

	Gasoline			Distillate Fuel Oil		
	Receipts	Shipments	Net	Receipts	Shipments	Net
Anchorage	76,026	44,261	31,765	2,087	44,426	(42,339)
Atka	58	-	58	62	-	62
Cordova	1,658	-	1,658	2,738	-	2,738
Dillingham	5,437	1,426	4,012	1,798	123	1,675
Egegik	38	-	38	119	-	119
Homer	48,613	1,298	47,315	2,711	126	2,586
King Cove	297	2,195	(1,899)	2,394	802	1,591
Kodiak	8,484	-	8,484	13,702	-	13,702
Nikiski	33,382	60,641	(27,259)	14,009	300,056	(286,047)
Seldovia	188	-	188	230	-	230
Seward	-	-	-	-	-	-
Unalaska	6,608	4,860	1,748	61,676	14,270	47,406
Valdez	-	73,782	(73,782)	1,029	21,110	(20,082)
Whittier	-	-	-	38	-	38

Most IFCA communities receive fuel shipments throughout the year. Communities with large fuel markets generally receive at least one fuel shipment per week, while smaller communities may receive a fuel delivery every few months. This reduces the amount of fuel storage capacity required by a community. Frequent deliveries also reduce the retail cost of fuel, by spreading the fixed cost of storage over more gallons of fuel. In communities with just seasonal barge access—such as those in Western Alaska—the entire annual cost of storage must be spread over one or two deliveries of fuel.

The frequency of fuel deliveries in ICFA communities is limited by the cost of shipping fuel on barges. Economies of scale exist, making it cheaper to linehaul ship large amounts of fuel at a time. This means that when shipping fuel in barges or tankers, the shipping cost per gallon of fuel decreases as more gallons of fuel are delivered. Sailing a barge to a community from a refinery or storage hub costs about the same regardless of how full the barge. Filling the barge to capacity reduces the shipping costs, as the fixed costs are spread over more gallons of fuel. In addition, the cost per gallon to ship fuel decreases as the size of the barge or tanker increases. The result is that the cheapest way to transport fuel is by moving as much as possible at a time, resulting in larger, more infrequent deliveries.

[34] US Army Corp of Engineers. Waterborne Commerce of the United States. Available at: http://www.iwr.usace.army.mil/ndc/index.htm
[35] ISER Calculations

Shipping larger quantities at a time, however, must be balanced against storage costs. As a result, the optimal frequency of fuel deliveries finds a balance between shipping and storage costs. The logistic model most frequently employed in IFCA involves using large barges or tankers to transport fuel from the refinery to a fuel hub, where it is stored and transferred into smaller barges for deliveries throughout the region. The fuel is transported into the region as cheaply as possible and the amount of needed storage is minimized. Ketchikan is the fuel hub for Southeast Alaska, receiving fuel shipped from refineries in the Lower 48 and Canada. Dutch Harbor is the fuel hub for the Aleutian Island and Alaska Peninsula submarkets.

The fuel hub model is ideal for minimizing shipping and storage costs, but results in a lag between when fuel is lifted from the refineries to when it is sold to the final consumer. Rapidly changing world oil prices can drastically change the value of a distributor's inventory of fuel between the time it is lifted and the time it is retailed. Distributors must choose to price their fuel either to reflect the cost incurred to purchase the fuel or the cost to replace the fuel at current market prices. The lack of contract-based prices allows fuel distributors to price their inventory either way, at any time.

Distributors

Three companies distribute most of the fuel in the IFCA region, Harbor Enterprises (Petro Marine, Petro Express, and Shoreside Petroleum), Delta Western, and Petro Star. The only communities served by more than one of these fuel distributers are Dutch Harbor, Kodiak, Ketchikan and Juneau (Table7). In the other IFCA communities it appears all the fuel is supplied by only one fuel distributor. The only significant independent fuel retailers appear to be Anderes Oil in Ketchikan and Taku Oil in Juneau.

Table 7. Communities Served by Fuel Distributors[36,37,38,39]

	Petro Marine	Delta Western	Petro Star	Independent Source
Ketchikan	X			Anderes Oil
Petersburg	X			
Thorne Bay	X			
Kake	X			
Wrangell		X		
Sitka	X			
Juneau	X	X		Taku Oil
Craig	X			
Haines		X		
Skagway	X			
Yakutat		X		
Cordova	X			
Valdez			X	
Kodiak	X		X	
Dutch Harbor		X	X	

[36] Petro Marine Services, www.petromarineservices.com
[37] Delta Western, www.deltawestern.com
[38] Petro Star, www.petrostar.com
[39] Communication with regional fuel retailers

Petro Marine is the largest distributor of fuel in the IFCA. Petro Marine is a wholly-owned subsidiary of Harbor Enterprises, Incorporated of Seward, Alaska. Petro Marine distributes fuel throughout Southeast Alaska, Prince William Sound, the Kenai Peninsula, and Kodiak Island. Petro Marine distributes fuel to company-owned retail stores, independent retailers carrying the Petro Marine/Express brand, and independent fuel retailers using their own brand name. Harbor Enterprises previously distributed fuel in Dutch Harbor, but exited the market in the mid 1990s.

Petro Marine's fuel for Southeast Alaska is purchased from refineries in Washington, California, or British Columbia. The fuel is shipped into Alaska on linehaul barges capable of carrying 2.5 to 3.4 million gallons of fuel. These linehaul barges generally unload in Ketchikan, Juneau, and Skagway. Linehaul barges typically do not visit smaller communities. Instead, fuel from linehaul barges is stored in Ketchikan until a smaller barge can distribute the fuel to smaller communities throughout the Southeast. Such smaller barges have a capacity of one million gallons of fuel.

Petro Marine also purchases fuel from the Tesoro and Flint Hills refineries. This fuel is lifted either from the bulk fuel storage farm at the Port of Anchorage or directly from the Tesoro refinery in Nikiski. This fuel is used for all of Petro Marine's markets in Homer, Kodiak Island, and, at times, Southeast Alaska and the southern coast of the Alaska Peninsula. The Petro Marine barge servicing this area has a capacity of two million gallons. K-Sea Transportation operates all of Petro Marine's fuel barges though the smaller barges are owned by Petro Marine.

Delta Western has the largest distribution area of any distributor in Alaska. It distributes fuel from Wrangell in Southeast Alaska to Dutch Harbor in the Aleutians to Red Dog Mine in Northwest Alaska. Delta Western purchases most of its fuel from West Coast refineries, but will at times purchases fuel from Alaska refineries and refineries in Asia. Delta Western distributes fuel in Southeast Alaska with a 1.7 million gallon linehaul barge that transfers fuel directly from West Coast refineries to Southeast communities. Delta Western also transports fuel from West Coast refineries to Dutch Harbor and other markets in Western Alaska in linehaul barges. Its largest barge servicing this route is a 3.4 million gallon, double-hull barge. K-Sea Transportation also operates barges carrying fuel for Delta Western.

The third large distributor in the IFCA region is Petro Star. Petro Star, a subsidiary of Arctic Slope Regional Corporation, is a vertically integrated fuel company, owning refineries in North Pole and Valdez. Petro Star distributes fuel in Valdez, Kodiak, Dutch Harbor, and St. Paul. Petro Star does not own its own fleet of tankers and barges. Instead, it contracts with Crowley Marine Services to transport its fuel to markets.

Market Conditions

Every community in Southeast Alaska has fuel supplied by one of the three large distributors, and they appear to distribute most of the fuel in IFCA. The only significant exceptions appear to be Taku Oil in Juneau and Anderes Oil in Ketchikan. Most of the fuel in Southeast Alaska is either retailed by the fuel distributor itself or sold to an independent fuel retailer. The independent fuel retailers have little control over the price of fuel they purchase from the fuel

distributor, because most fuel is not sold under a contractually determined price. Independent retailers do not choose the source refineries, the brand of fuel purchased, whether it is purchased on contract from a refinery, or the way it is delivered to the community. As a result, the price the independent fuel retailer pays for fuel is determined entirely by the fuel distributor. The only component of the cost that is not determined by the fuel distributor is the retail markup.

But the fuel distributors know the amount of the retail markup of independent fuel retailers, because it is simply the price of the fuel they sold the retailer, subtracted from the retailer's posted price. Knowing the retailer's markup allows the distributor to essentially determine the retail price of an independent fuel retailer—by setting the wholesale price of the fuel sold to the retailer at exactly the known retail markup, less the desired final retail price. This would allow a fuel distributor to exert monopoly pricing power in a market where it is the only fuel distributor but not the only fuel retailer.

The retail fuel price is further influenced by the fuel distributors because often neither the independent fuel retailer nor the community has fuel-purchase contracts with the fuel distributor. As previously mentioned, these fuel-purchase contracts are common in Western Alaska. In Western Alaska the fuel purchaser and fuel distributor agree on a contract price, based on an index of refinery prices at the time fuel leaves the refinery, or the fuel is "lifted," plus a transportation premium. This premium is comprised of the cost of delivery, including return on capital investment plus a profit reflecting the risk of the operation. Fuel distributors bid for the contract based on their costs of transporting fuel.

In the IFCA region fuel, distributors do not sell their fuel on contracts that include a pricing formula. Instead, they usually have full freedom to set their price at their retail stores or in sales to other retailers. There is no legal commitment to sell their fuel at a predetermined price or with a predetermined transportation charge. In addition, it appears that in some community submarkets, especially in Southeast Alaska, there are only distributors selling at their own retail outlets and no one else competing to supply fuel at the wholesale or retail level. This creates a fuel distribution monopoly in those community submarkets. The exception to this is Juneau, which has two distributors as well as multiple independent retailers.

IFCA fuel markets facilitate natural monopolies because significant economies of scale exist and potential competitors face a high cost of entering the market. Economies of scale exist because many of the costs of distributing fuel, such as barges and storage tanks, are relatively fixed. The result is decreasing "per gallon" costs of distributing fuel as the amount of fuel that a company distributes increases. For example, one fuel distributor could import two million gallons of fuel on a linehaul tanker cheaper than two fuel distributors can import one million gallons each on smaller fuel barges. A single large, fuel distributor in a region is probably able to distribute fuel at a lower cost than multiple smaller distributors. This naturally leads to consolidation to the point where the entire IFCA market is only served by a small number of distributors, in this case three.

While consolidating fuel distributors may lower *costs* of fuel, it does not necessarily lower *prices* paid by the consumers. Instead, a sole fuel distributor would be capable of exercising its market power and charging a price higher than would be expected in a competitive market.

Without access to proprietary information, it is unclear whether fuel distributors in the IFCA region generate a larger than expected return on investment (profit) or charge monopolistic prices. The structure of fuel markets in the IFCA allows for fuel distributors to price fuel higher than they could in a competitive market. However, a recent investigation by the State of Alaska Attorney General's Office suggests that fuel distributors in the ICFA region are not exercising their market power and pricing fuel significantly higher than would be expected in a competitive market.

IFCA fuel markets with only one distributor may also be exposed to a higher risk of fuel price shocks. In a competitive market, a fuel distributor wants to avoid purchasing fuel at the peak of a short-term fuel price increase. If it did, and a competitor was able to purchase fuel at a lower price, the distributor would have to reduce its fuel selling price below its purchase price to maintain market share. In a market with only one fuel distributor, the distributor's prices do not need to reflect the cost of bringing new fuel into the market, allowing it to pass on the full cost of the fuel purchased.

Fuel distributors in competitive markets must compete for market share with other distributors who may have purchased fuel on a different day at a lower price and must lower their prices to match their competitors. They avoid the financial losses associated with finding themselves with a higher priced fuel inventory in two ways: 1) contracts with refineries and 2) financial tools. An unintended effect of fuel distributors' protecting themselves with these tools is a more stable price for consumers.

Most of the gasoline in the U.S. is sold under contract. The contract between the distributor and the refinery generally guarantees that the distributor has access to a certain quantity of fuel at a predetermined price. The contract price is determined by either a fixed rate or a formula that relates it to spot or futures markets. Contracted fuel prices are slightly more expensive then spot prices under normal market conditions, but most distributors in competitive markets pay this premium and utilize them to insulate themselves from price and supply shocks.

It appears (the actual fuel purchasing procedure is proprietary) that the fuel distributors in the IFCA region purchase fuel on spot markets and do not utilize fuel contracts. Petro Star is the exception, as it is a vertically integrated company, owning the refining, distribution, and retail components. When a supply shock occurs and a spot market price spike ensues, the refinery price also spikes. The distributors are rarely in significant danger of losing market share or of not being able to move their high priced inventory, because they operate in many non-competitive community submarkets. Their customers do not have the option to purchase fuel from a company purchasing lower-priced contract fuel. In this situation, the end user and not the fuel distributor carries the price rise risk burden.

Another method of insulating a fuel distributor from price spikes is participation in financial markets buying and selling futures and options contracts. Futures and options markets are

structurally different but both can be utilized to hedge against price spikes or drops. Most commonly they are used to protect fuel distributors from the risk of the price of fuel dropping after a large purchase of inventory. In this case, the fuel distributor may have to sell the fuel for less than it was purchased for in order to compete with other sellers. The loss incurred on the sale of the physical product can be made up for by profits made by hedging in the financial markets, by "betting" that the price of fuel will decrease.

Fuel intensive industries generally use financial markets in order to hedge against the increased business costs associated with price increases. A common example is an airline company that bets in the financial market that fuel prices will increase. If prices do in fact increase, then the airline will lose money by flying people with higher priced fuel but will still have earnings in financial markets that offset the operational losses. Alternatively, if prices decrease, they will lose money in the financial market but the losses will be offset by higher revenues resulting from flying people with less expensive fuel. Without financial markets, the airline will make more money when prices go down but risk losing money when prices increase. Financial instruments can ensure more steady revenues. Though financial markets are primarily used by fuel intensive industries, they can also be used by a small fuel distributor to protect against the financial risk of purchasing fuel on the spot market.

Using fuel purchase contracts and financial markets to protect against fuel price volatility generally comes at a significant transaction cost. This cost is generally accepted in most markets as a premium paid to ensure supply and price stability. Using fuel contracts and financial markets in Alaska would create an additional cost to be passed on to the consumer in the final price of fuel. The result would be reduced price shocks and risks that prices may increase substantially, but at the cost of prices that are generally slightly higher. The net difference between what customers pay for fuel in a less competitive market in which they shoulder the risk of price shocks and what they would pay in a more competitive market with financial hedging and options is uncertain.

Fuel Pricing

Fuel distributors in IFCA typically sell fuel in either their own retail stations or to independent retailers without a contract determined pricing formula. This leaves the fuel distributors a large degree of freedom to set prices. Researchers were unable to obtain the proprietary pricing policies of ICFA fuel distributors, but analysis of existing data provides some clues into how prices are structured.

The Fisheries Economic Data Program has collected monthly marine diesel prices from over a dozen IFCA communities since 1999. An analysis of this data provides an indication as to how fuel is priced in IFCA. A comparison with the State of Alaska Community Fuel Price Survey indicates that the price of marine diesel fuel and heating fuel in a community is highly correlated in this region (see Figures 4-7). Marine diesel and home heating fuel are typically the same fuel sold to different users. The relationship between their prices are not exact but are sufficiently correlated to allow marine diesel to act as a proxy.

Figure 4. Price Comparison of Heating Fuel and Marine Diesel: Kodiak[40,41]

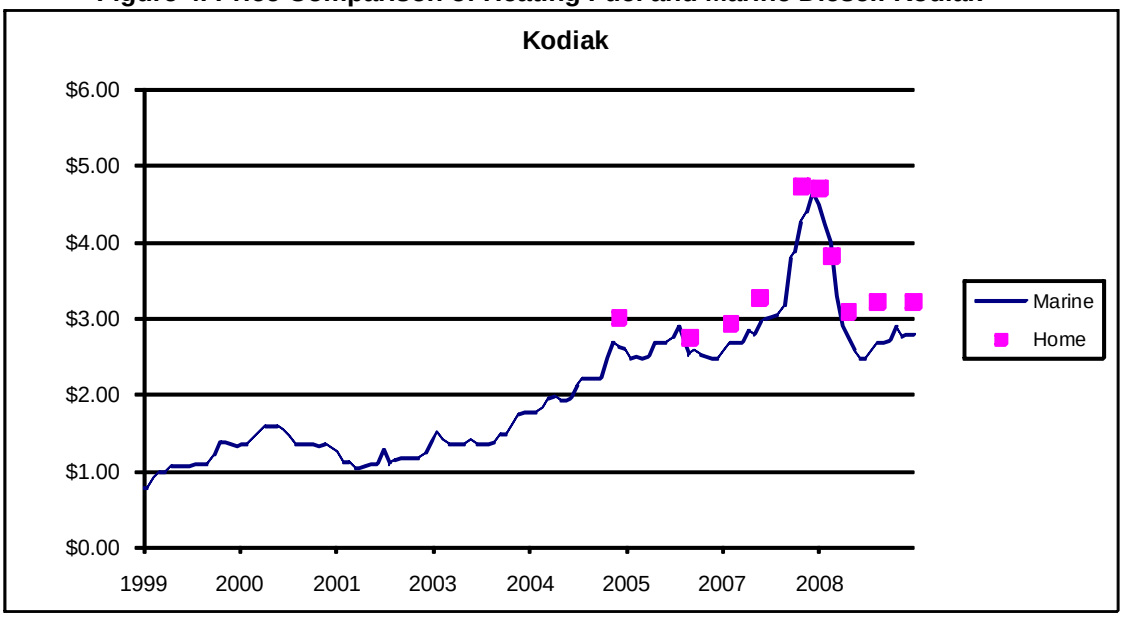
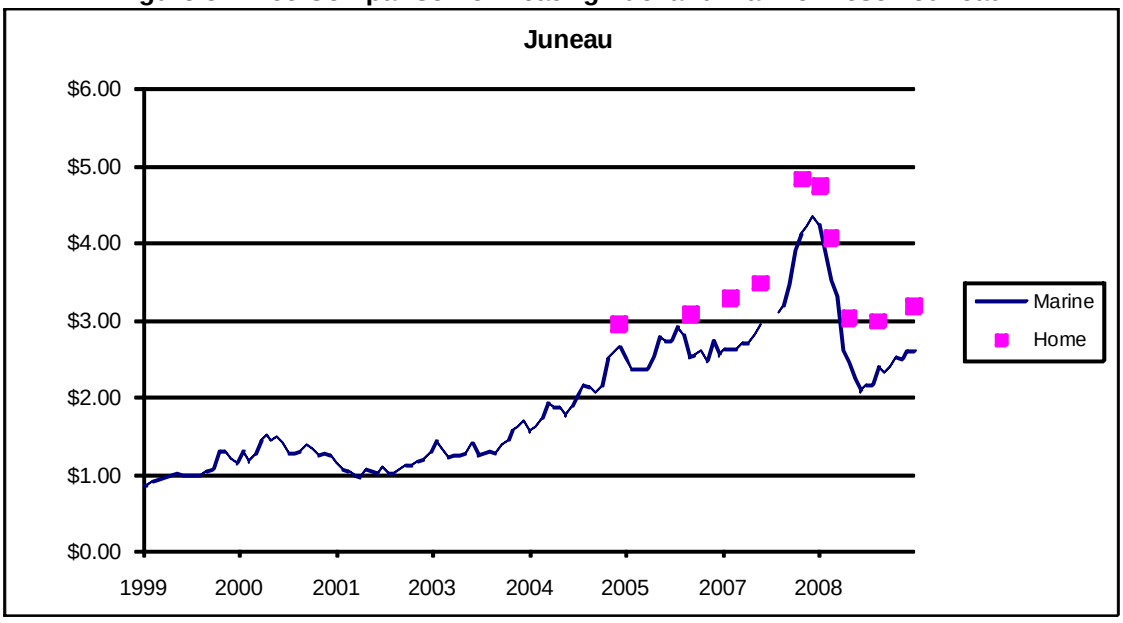


Figure 5. Price Comparison of Heating Fuel and Marine Diesel: Juneau



[40] Fisheries Economic Data Program, Monthly Marine Fuel Prices. Available at: http://www.psmfc.org/efin/data/fuel.html
[41] State of Alaska, Division of Community and Regional Affairs. *Current Community Conditions: Fuel Prices Across Alaska. January 2010 Update.* Available at: http://www.commerce.state.ak.us/dca/pub/Fuel_Report_Jan_2010_final.pdf

Figure 6. Price Comparison of Heating Fuel and Marine Diesel: Dutch Harbor

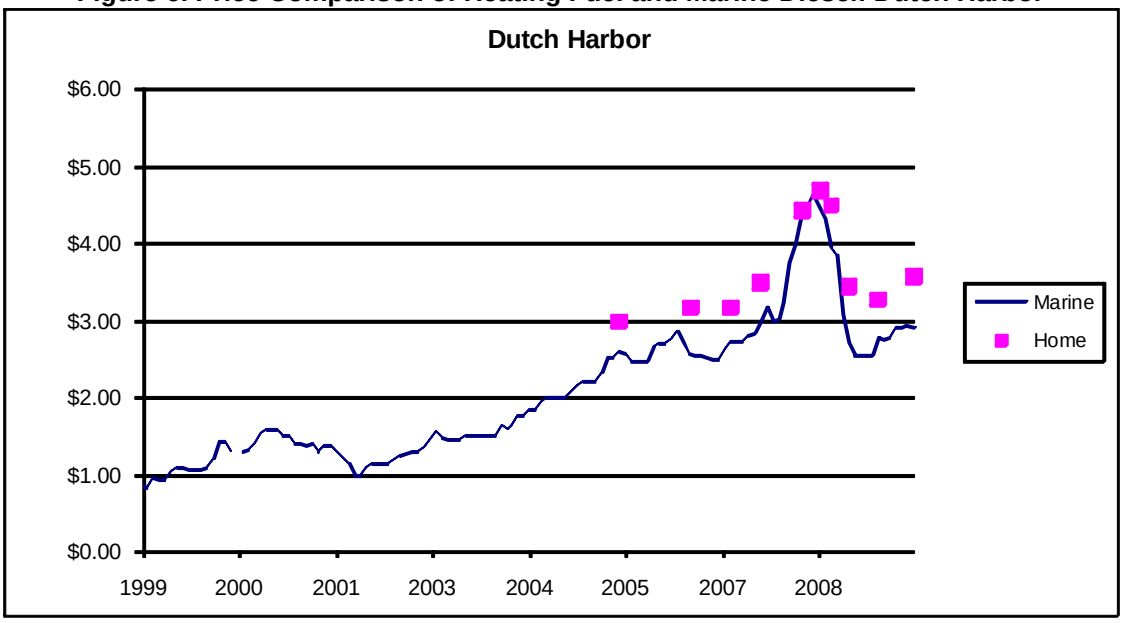
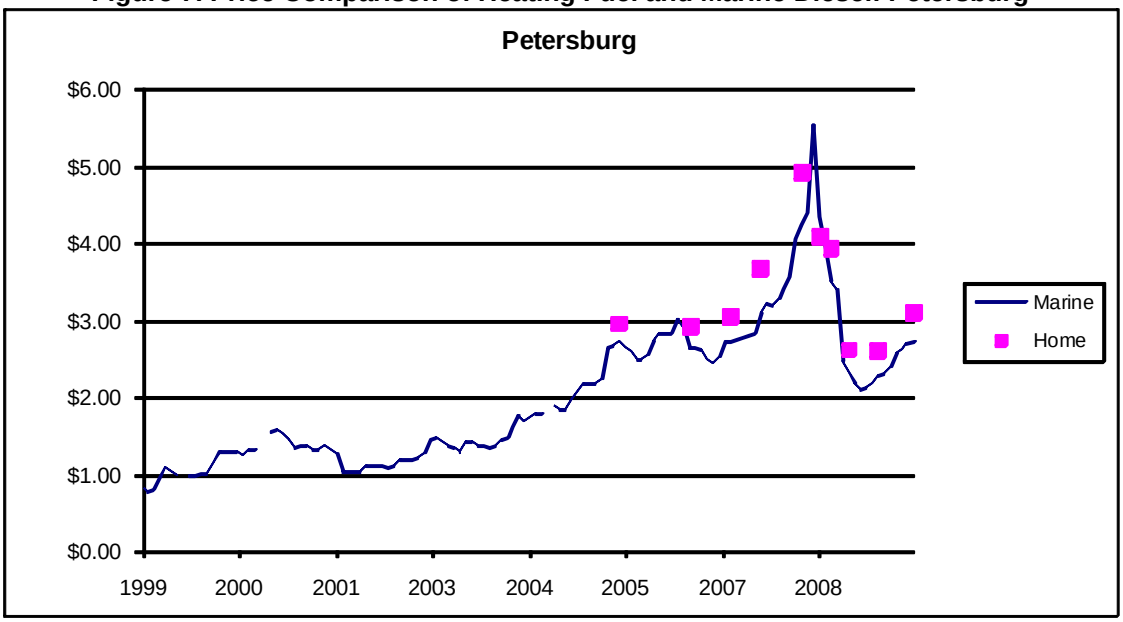


Figure 7. Price Comparison of Heating Fuel and Marine Diesel: Petersburg

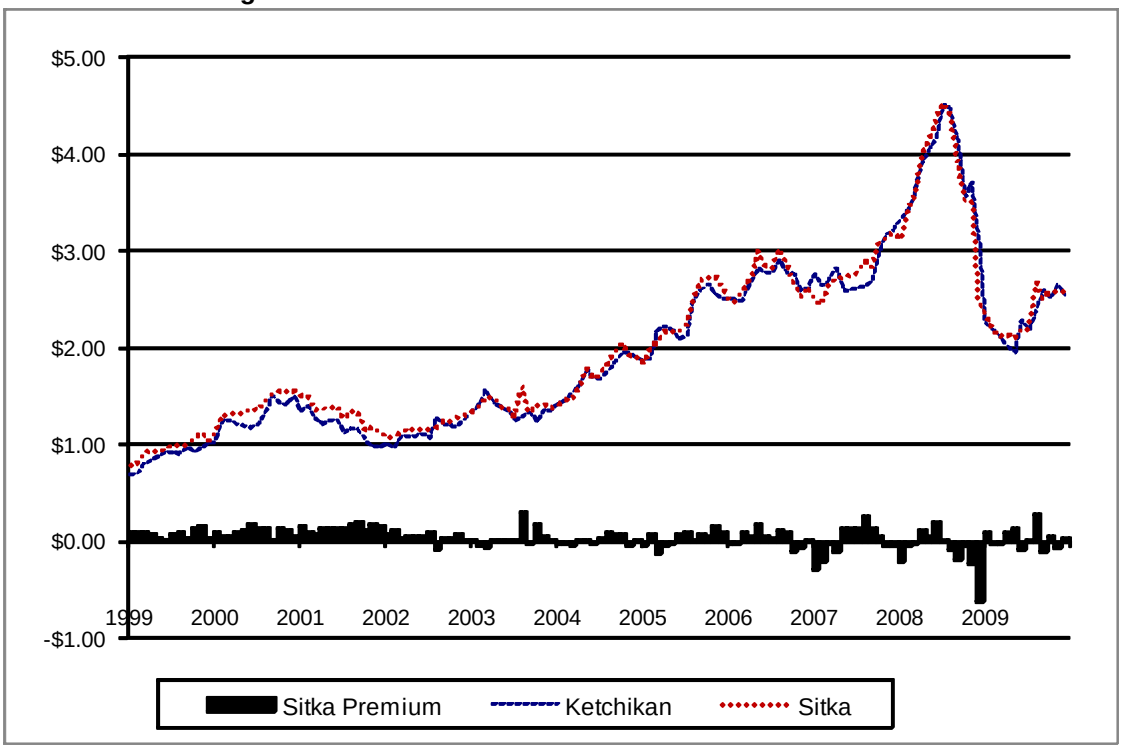


In Southeast Alaska it appears that the retail price of fuel is not solely based on the cost of supplying fuel to a community. It is unclear exactly how prices are determined, but a comparison of marine diesel costs for Sitka and Ketchikan reveal that these two markets tend to have similarly priced fuel (Figure 8). If fuel prices were based on costs, we would expect Sitka to have consistently higher fuel prices, as these two fuel community submarkets appear to have clearly different cost structures. All of Sitka's fuel is first transported to Ketchikan by linehaul barges and stored in Ketchikan fuel tanks until a smaller fuel barge transfers it to

Sitka. The cost of fuel in Sitka includes all the costs of getting fuel to Ketchikan, plus the additional barge costs and storage costs in Sitka.

Before 2005, fuel prices were more stable and Sitka appeared to be paying an average of $0.08 more per gallon. This is the price difference that would reasonably be expected if prices were based primarily on the cost of distribution. Since 2005, the price differential between Sitka and Ketchikan decreased to an average of $0.01 per gallon, although no major change in cost structure is apparent.

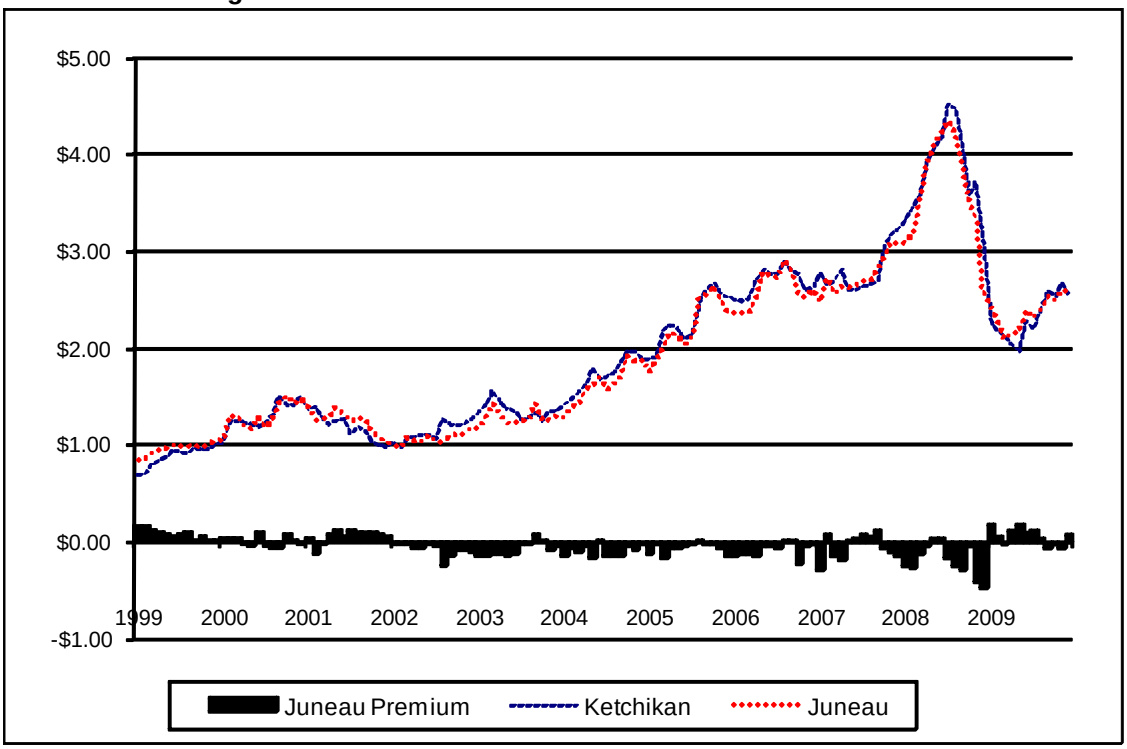
Figure 8. Marine Diesel Prices in Ketchikan and Sitka[42]



The relationship between the fuel price in Juneau and Ketchikan followed a similar pattern. Prior to 2005, fuel prices were an average of $0.02 less per gallon in Juneau. After 2005, fuel prices were an average of $0.06 cents cheaper per gallon in Juneau (Figure 9). Again, no known changes in the costs of distributing fuel are apparent, suggesting that fuel prices in Southeast Alaska are somewhat independent of costs.

[42] Fisheries Economic Data Program, Monthly Marine Fuel Prices. Available at: http://www.psmfc.org/efin/data/fuel.html

Figure 9. Marine Diesel Prices in Ketchikan and Juneau[43]



This analysis suggests that prices are not established only on the basis of community specific costs. This could be the result of two pricing strategies by fuel distributors. First, fuel distributors are setting prices based on what individual community submarkets can bear, regardless of the actual costs to distribute fuel to that submarket. Second, fuel distributors may not be allocating the costs of distributing fuel in the region to specific community submarkets. As a result, prices in different community submarkets may reflect more the total costs of distributing fuel in the region than they do the specific costs of distributing fuel to that specific community. Fuel prices are most likely based on a combination of both strategies. In addition, the fact that individual community submarket prices may not be based solely on direct costs does not necessarily mean that distributors are earning exceptionally high margins and profits. The cost of analysis to calculate purely cost-based retail prices is likely high and not a "necessary" cost of doing business in a less than competitive market.

Further analysis of the marine diesel price data suggests that changes in the price of fuel in Southeast Alaska significantly lag behind changes in the price of fuel at the refinery. Price lags are common in all fuel markets, but the magnitude of this lag suggests that fuel prices are based on the cost the distributor paid when they purchased the fuel at the refinery, not the cost to replace the fuel at current market prices. This means that the fuel distributors are not taking on any fuel price risks. If they were, pricing at "replacement costs," or the current cost of fuel on the world market, they would be at risk of prices dropping between the time they purchase the fuel and the time they sell it, resulting in them selling the fuel for less than they paid for it. By basing the final price of fuel on the initial cost to procure it from the refineries, the

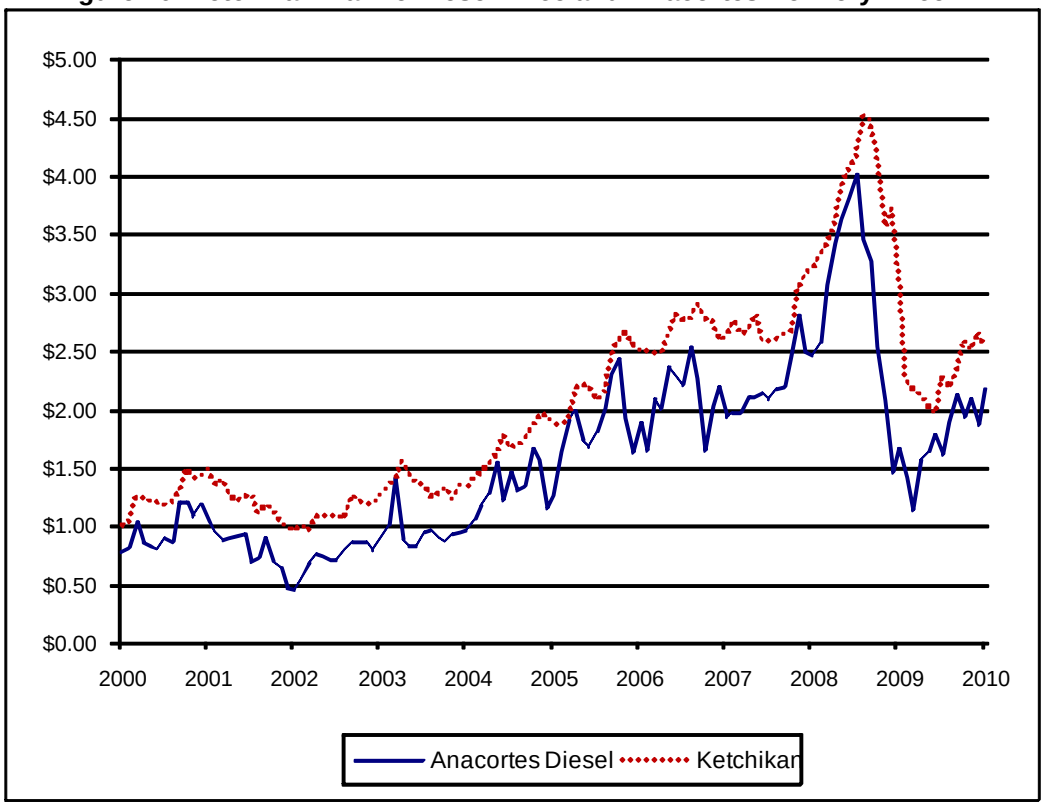
[43] Fisheries Economic Data Program, Monthly Marine Fuel Prices. Available at: http://www.psmfc.org/efin/data/fuel.html

distributors avoid exposing themselves to any financial risk if the price changes. Again, this is a "luxury" usually only available in less than fully competitive markets.

The long supply chain of fuel markets in the ICFA region can mean that the lag between changes in the world market price for fuel are not reflected in ICFA fuel prices for weeks or even months.

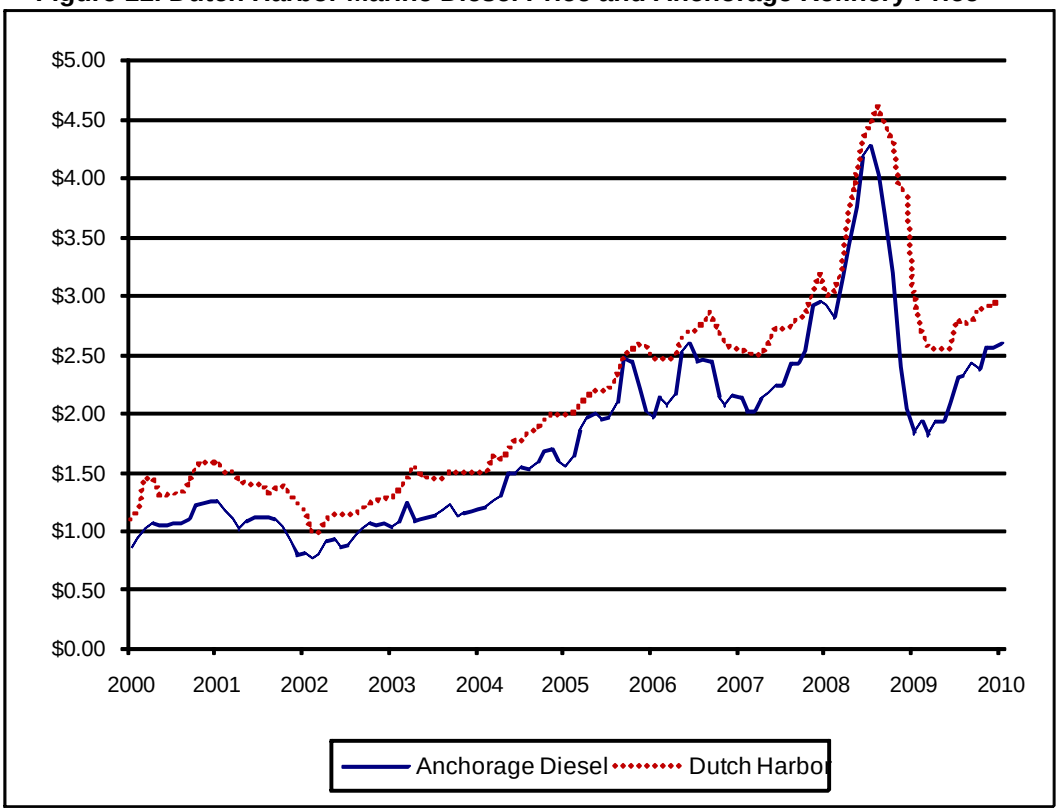
Figure 10 compares the price of Anacortes diesel and Ketchikan marine fuel. Figure 11 compares the price of Anchorage diesel and Kodiak marine fuel. A lag in the time it takes for changes in the refinery price to appear in the retail price is visually apparent. Anacortes diesel is the blended price of ultra-low sulfur diesel and regular diesel at the Anacortes refinery. Anchorage diesel is the price of regular diesel at the Anchorage rack at the Port of Anchorage.

Figure 10. Ketchikan Marine Diesel Price and Anacortes Refinery Price[44,45]



[44] OPIS Standard Rack Prices Weekly for Anacortes, monthly average price for all diesel price
[45] Fisheries Economic Data Program, Monthly Marine Fuel Prices. Available at: http://www.psmfc.org/efin/data/fuel.html

Figure 11. Dutch Harbor Marine Diesel Price and Anchorage Refinery Price[46,47]



The exact length of the price lag is not clear with the level of data available, but statistical analysis indicates that prices in Ketchikan and Dutch Harbor lagged behind Anacortes and Anchorage refineries, respectively, by about two months. A statistical analysis, which also includes Kodiak and Juneau, compared the correlation between refinery prices and retail prices of fuel lagged zero, one, two, three, and four months. For example, a one month lag would be February retail prices reflecting January refinery prices; a two month lag would be March retail prices reflecting January refinery prices. The results indicate that refinery prices are most correlated with retail prices with a one or two month lag (Table 8).

Table 8. Correlation between Rack Prices and Retail Prices with Lags

	Rack	No Lag	1 Month	2 Month	3 Month	4 Month
Dutch Harbor	Anchorage	0.958	0.979	0.980	0.966	0.939
Kodiak	Anchorage	0.964	0.984	0.981	0.962	0.932
Juneau	Anacortes	0.937	0.973	0.973	0.952	0.919
Ketchikan	Anacortes	0.929	0.965	0.974	0.961	0.928

The analysis of rack prices and retail prices also revealed that margins have increased over time. Figure 12 and Table 9 show the margin for each community and the closest rack prices with no lag. Figure 13 and Table 10 show the margins with a two month lag. Both approaches clearly illustrate that margins have increased over time, as well as the variance in the amount

[46] OPIS Standard Rack Prices Weekly for Anacortes, monthly average price for all diesel price
[47] Fisheries Economic Data Program, Monthly Marine Fuel Prices. Available at: http://www.psmfc.org/efin/data/fuel.html

of the margin. Both the increased margin and variance seem to correspond to increases in oil prices. It also appears that refinery rack prices decline more slowly than they increase.

Figure 12. Fuel Margins with No Time Lag

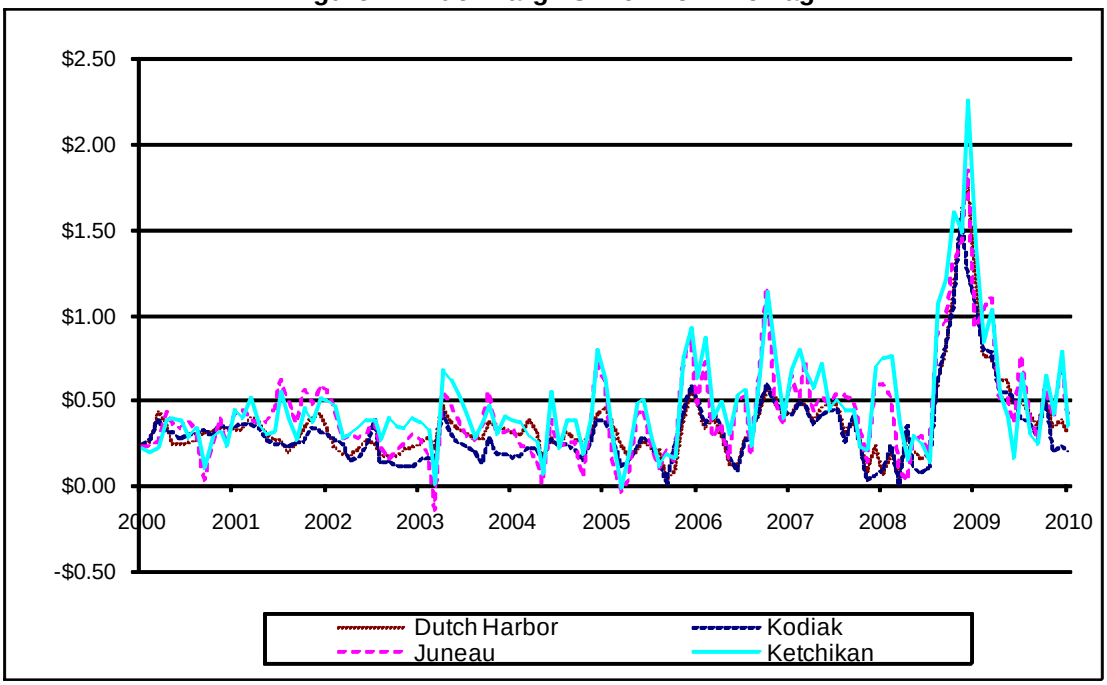


Figure 13. Fuel Margins with Two Month Time Lag

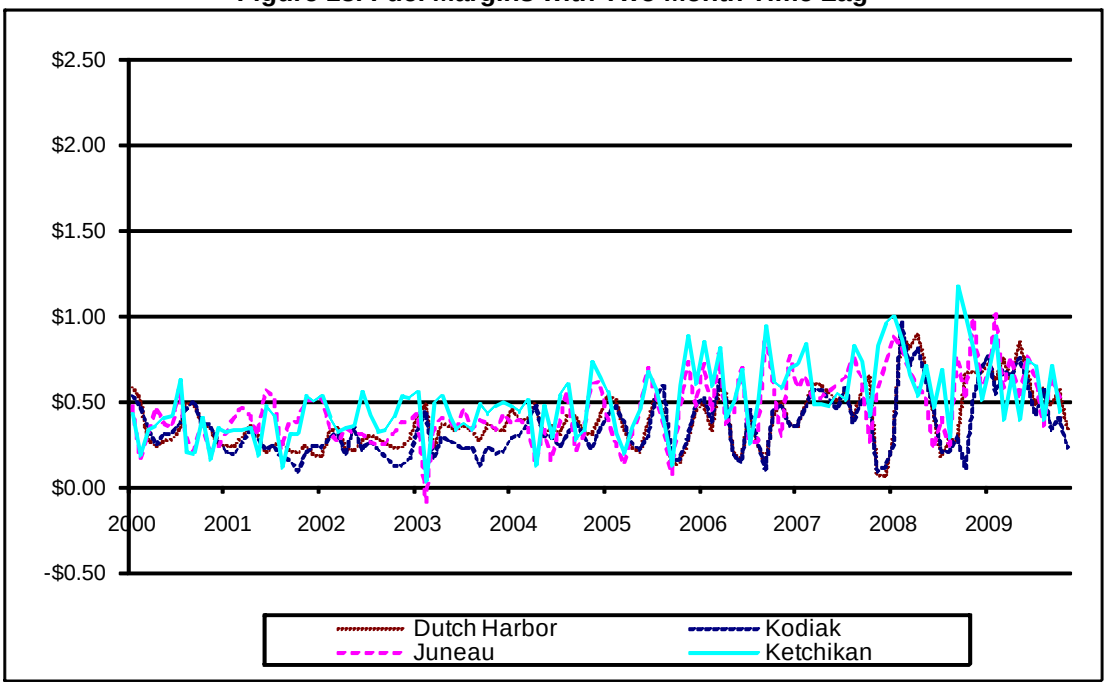


Table 9. Average Fuel Margin with No Time Lag

	2000 to 2004	2005 to 2010	2000 to 2010
Dutch Harbor	$0.29	$0.43	$0.36
Kodiak	$0.25	$0.40	$0.33
Juneau	$0.33	$0.53	$0.43
Ketchikan	$0.37	$0.59	$0.48

Table 10. Average Fuel Margins with Two Month Time Lag

	2000 to 2004	2005 to 2010	2000 to 2010
Dutch Harbor	$0.27	$0.46	$0.39
Kodiak	$0.27	$0.43	$0.35
Juneau	$0.35	$0.55	$0.45
Ketchikan	$0.39	$0.61	$0.50

It is unclear what caused the increased margin between refinery and retail prices. It may have been caused by an increase in the costs to transport and distribute fuel, or by an increase in profit margin. Some increase in the distribution costs is expected, as transporting fuel is a fuel intensive industry and the costs will increase with the cost of fuel. It is clear that some change in the structure of fuel prices has taken place in the last few years beyond an increase in the refined price of fuel. It may be that capital replacement lagged in the IFCA similar to the way it did in Western Alaska, and this necessary "catch up" is reflected in recent prices.

COMMUNITY FUEL SURVEY RESULTS

The major findings of the third round of community surveys are:

- Increases in fuel prices persisted from January 2009 to January 2010, despite the lower cost of crude oil during most of 2009.
- Fuel prices in rural Alaska vary significantly and are inconsistent across communities at the retail level.
- Some communities have much larger retail price markups than others.
- For some communities, delivery costs and retail markups are a large portion of the fuel price.
- Getting reliable local information on fuel sales and practices remains a challenge.
- Residents of surveyed communities are frustrated because they have limited options for coping with high prices.

From January 2009 (date of last update) to January 2010, crude oil prices decreased on average 37%. Refinery gate prices in Anchorage increased 13% for gasoline and decreased 7% for diesel for heating (DF#1). In Anacortes, refinery gate prices decreased 7% for gasoline and 54% for diesel for heating (Ultra Low Sulfur, DF#1). On average across the surveyed communities, retail prices for gasoline decreased 6% and diesel for heating decreased 13%. Nonetheless, only five of the surveyed communities paid lower prices for gasoline and diesel for heating (DF#1). But because the crude oil and refinery components of costs comprise a relatively small portion of final fuel prices (less than 50% in Western Alaska), these declines result in much smaller declines in retail prices, even if passed on fully to customers.

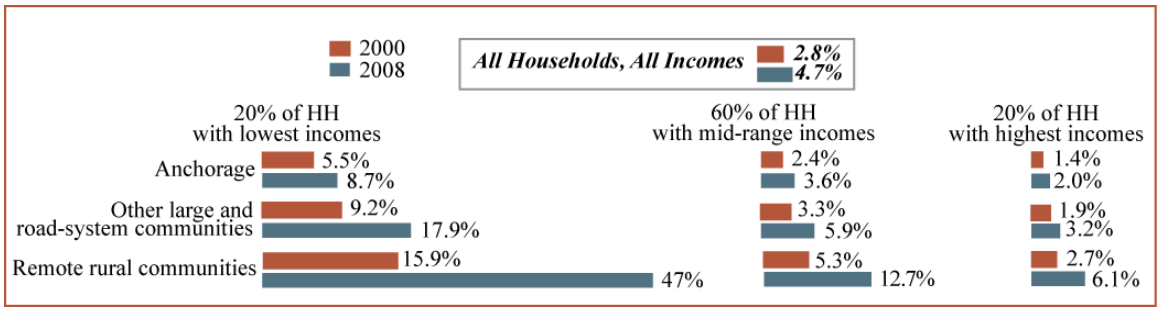
POLICY OPTIONS

The fuel delivery and storage processes in rural Alaska, and especially Western Alaska, are labor and capital intensive and have a very limited number of gallons over which to spread the costs. As a result, there are no easy solutions. This section identifies current programs and some additional policy options and their potential impacts. This discussion is by no means exhaustive.

Weatherization, Conservation and Energy Efficiency

From an individual household perspective, reducing fuel use provides immediate savings. From a regional and community perspective, some of the savings to an individual household would be offset by the need to spread the fixed costs of delivery and storage across fewer gallons. Purchasing smaller quantities of fuel is a protection against the impacts of volatile fuel prices on household budgets (Figure 14).[48] Continued state investment in programs such as weatherization, conservation, and energy efficiency can reduce the impact of high and uncertain fuel prices in both the short and long term.

Figure 14. Estimated median share of income Alaska households spend for home energy use, 2000 and 2008



State Bulk Fuel Loans

The state offers two bulk fuel loans programs. The Alaska Energy Authority administers a revolving bulk fuel loan, and the Division of Community and Regional Affairs, through a contract with Rural Alaska Fuel Services (RAFS), offers the Bulk Fuel Bridge Loan program. These programs have been effective in insuring that communities have access to the necessary cash to buy fuel. These programs offer loans with either no interest or a low, subsidized interest rate. If the fuel distribution companies or private banks were funding this credit, the interest costs would be higher and passed on in higher fuel prices per gallon. In addition, offering fuel on credit significantly increases the working capital requirements of fuel distributors, which would need to be recovered in fuel prices. By shouldering the financing risk, lowering fuel distributor working capital costs, and eliminating or lowering interest costs, these programs reduce fuel market transaction costs.

Consolidating the bulk fuel revolving loan and RAFS bulk fuel program would improve operational efficiency, which could free administrative costs to be shifted to loan capitalization. The Bulk Fuel Bridge Loan program appears to be both a more effective and

[48] Haley, Sharman, Ben Saylor, and Nick Szymoniak, 2008, *Estimated Household Costs for Home Energy Use*, May 2008, Web Note No. 1, Revised June 24, 2008.

efficient program. It is more effective because as a condition of receiving a state subsidized loan, the community/borrower receives fuel sales operations and management training, to help the community learn how to collect sufficient revenue to purchase fuel without a loan in the future. It appears to be more efficiently administered, through a contract with a not-for-profit organization.

As it currently structured, a community is not eligible for a RAFS loan until rejected for a Bulk Fuel Revolving Fund loan, and every year the community must reapply for loans. Originally, receiving a RAFS loan was a three-year process and RAFS worked with a community/borrower to be debt-free at the end of three years. The current loan system encourages chronic debt financing of fuel and provides no support or training to develop sound management and pricing of fuel sales. Coupling subsidized fuel loans with business and accounting training provides the tools for future self-sufficient fuel sales operations. These same business and accounting skills are valuable and transferable assets in rural Alaska.

However, if the programs are not consolidated, the process for applying for a loan could still be streamlined by moving to one shared application and by making a loan application good for a three-year period. Each interim year the community/borrower would complete a shortened version of the application. This would lower administrative costs and reduce the risk of loans not being approved in time to purchase fuel. But since this would make it easier to obtain loans each year, it might encourage habitual use of the AEA bulk fuel loan. This problem could be addressed by expanding the RAFS training program.

Municipal Assistance and Revenue Sharing and Energy Assistance

The dual problems of high energy costs and low incomes can distress communities and local organizations that provide public services (local governments, public utilities, and village corporations). The state can provide financial assistance to local governments to help address the financial burden and stress of high fuel costs. Municipal Assistance and Revenue Sharing and the Community Energy Assistance program can help local governments provide public services when high energy prices consume much of their budgets. State Revenue Sharing funds were vetoed for FY04; no additional appropriations were made to the program until FY 10, when three years of funding were appropriated. These years without Revenue Sharing coincide with years of rising and volatile fuel prices.

In addition to helping local governments fund public services and operations, revenue sharing may also help stabilize fuel prices. There is anecdotal evidence of local governments, tribal councils, or local village corporations selling fuel at higher mark up to raise revenues to provide other local public services. They may do this because they have a small tax bases or it is administratively easier to collect revenue on fuel sales than on other services (e.g., washeteria, water and sewer). Revenue sharing can provide communities with a stable revenue source, reducing the need to collect revenue by increasing fuel prices. By contrast, a community energy assistance program that allocates funds to communities based on their price of fuel would create an incentive for communities to increase prices.

Fuel Cooperatives

There have been fuel cooperatives in the market for more than 10 years.[49] Fuel cooperatives hope to reduce the price of fuel by increasing the market share of the fuel buyer and thus increase their leverage in negotiating rates. Fuel cooperatives have also been suggested to reduce administrative costs by allowing the fuel distributor to only do business with one entity instead of many. A fuel cooperative can also assist communities by providing business support to help ensure that each community has the cash on hand to purchase fuel each year. This could reduce the risk of needing special barge trips later in the year or extra financial costs associated with using loans to purchase fuel.

Despite the possible benefits of fuel cooperatives, in actual practice they have had mixed results, as they face significant challenges in rural fuel markets. Some of the challenges include: credit risk, cost shifting, and reduced competition.

Credit Risk

In the past, the fuel cooperative would purchase all the fuel for the group. If one member of the cooperative failed to pay the cooperative, this threatened to take the whole organization under. This was the case with Wave Fuels through much of the mid-2000s, until the model was changed. Starting then, the cooperative did not own the fuel and only provided marketing services.

Cost Shifting

The market is already highly concentrated among organized buying groups. Customers such as AVEC, North Star Gas, and various school districts make up the bulk of the gallons sold in the market. Given that the industry is not excessive in profit, any further consolidation of fuel buying would most likely yield no concessions from the fuel distribution companies. Without excess profits, any price concessions given to larger buying groups mean the fuel distribution companies must raise prices for another group of customers to maintain a reasonable margin for its operations as a whole. This cost shifting results in a zero sum gain for the market as a whole. In general, it is the smaller, less sophisticated segments of the market that tend to lose out with cost shifting. This is already occurring to some extent, with larger buyers generally paying lower prices. But increased consolidation would likely exacerbate the situation.

Reduced Competition

If a new or larger fuel cooperative was created and purchased all its fuel from only one distributor, the likely effect is that since only Crowley has the necessary equipment to service the whole group, the only bid would come from Crowley. While this may seem counterintuitive, the end result is to decrease competition because it removes from the market smaller volumes that smaller operators and/or new operators could service. This realization resulted in the market actually going in the other direction. AVEC, the largest fuel purchaser for small communities, allowed its volume to split in the last bidding cycle to allow a new market entrant, Ruby Marine, a chance to bid in the market area it services.[50] Northstar Gas also attempts to purchase fuel from multiple distributors, though the only market not served entirely by Crowley is Bethel. In Bethel Northstar Gas purchases its fuel from Delta Western.

[49] Wave Fuels reorganized as North Star Gas.
[50] Ruby Marine was the successful bidder.

Infrastructure Improvements

Opportunities exist for lowering the cost of fuel by making investments in infrastructure projects that the private sector or local governments would otherwise not make. These projects are expensive, but further investigation may reveal the costs are outweighed by the associated social benefits.

Community Connections

Investment in roads and power lines connecting communities may present the most important potential option for reducing energy costs (indeed, all costs) in rural Alaska and in promoting the development of economic activity in rural communities. For example, if two communities are connected by a road, then only one bulk fuel farm and one barge delivery is required. The associated fixed costs are shared by both communities and spread over more gallons of fuel. A truck can transport fuel from one community to the other as needed. Additionally, a power line connecting the two communities would reduce the need for multiple power plants. The remaining power plant will have a larger and potentially more stable load, allowing it to operate at higher efficiencies. Renewable energy systems could be scaled to potentially be more economically viable.

A research project could assess the capital and operational costs of road and transmission expansion between communities. This should focus on community clusters, as opposed to connection to the road system as an initial opportunity. This would mitigate local opposition, since connections will be limited, but still allow for economies of scale and reductions in other capital investments that will offset the cost of roads and wires. The cost of constructing roads and power lines in rural Alaska is high but the benefits would surely expand beyond lower fuel and energy costs. While not all communities would welcome these connections, there are likely a sufficient number that would welcome the opportunity to test this sustainability model.

Denali Commission Tank Farms

In over 100 communities with previously inadequate fuel storage capabilities, the Denali Commission has constructed new fuel storage capacity. These new storage facilities are environmentally sound, reducing the risk of environmental costs associated with a spill. The increased storage capability also reduces the amount of expensive fuel that needs to be flown in due to inadequate storage. However, in order for the new Denali Commission tank farms to be sustainable into the future, some entity needs to ensure that business plans associated with each new tank farm are followed. Otherwise two things can happen: 1) The tank farm falls out of compliance or minimum safety standards due to lack of maintenance. 2) Prices become unfairly competitive to surrounding villages. This does not represent a true competitive advantage, but instead, neglect.

Marine Facilities

The state could invest in improvements that would lower the cost of delivering fuel, such as consolidated and safe marine headers in each community or a terminal that could take large international fuel tankers. The Denali Commission recently partnered with the U.S. Army Corp

of Engineers to investigate potential improvements to barge landings in the Alaska.[51] Improvements to barge landings could reduce the environmental risk of delivering fuel, reduce fuel costs by shortening the time it takes to deliver fuel, and increase competition by making it easier to deliver fuel for newcomers into the market. Before improving barge landings for the sake of fuel costs, a cost analysis should be performed as the cost of fuel may increase if the cost of the projects is greater than their savings. However, it may be difficult to value the environmental benefits of reduced spill risk.

By improving and consolidating marine headers the state could reduce the cost of delivering fuel to small communities served by barges. Currently, in some communities each fuel entity has a separate marine header. This requires that for the barge to deliver to each entity it must pull up to a separate area of the beach. In communities where deliveries are constrained by tides this can add significantly to delivery times.

Further, the state could reduce marine transportation costs by investing in improved maritime support. Any actions to reduce risk or decrease delivery times in the transportation industry could result in lower transportation differentials. Currently Alaska lags behind the rest of the U.S. in ocean and river charting, aids to navigation (e.g., lights, buoys, channel markers), and dredging of critical channels that constrict draft and related efficiency. The lack of these critical maritime tools adds costs and risks to carriers.

Fuel Price Risk Management

In recent years the price of petroleum and its refined products has become increasingly more volatile. Volatile prices create financial risk for participants in the fuel market. In rural Alaska fuel markets, it appears that the entire fuel price risk falls on the final consumer.

Fuel distributors in rural Alaska bear none of the financial risk, as they are able to pass on the entire price of the refined products. When fuel is purchased on contract, as it generally is in Western Alaska, the contract stipulates that the price the distributors sells to the community is based on the price of the refined product at the time it was purchased plus a transportation differential. If the price of fuel increases or decreases while during transport, it does not impact the fuel distributor's sales price. In ICFA, where fuel is less likely to be purchased under a contract determined pricing formula, communities still bear the full risk of volatile fuel prices, as the distributor has no competition and is able to pass on the full purchase cost of the fuel, even if world market prices have fallen since the fuel was lifted at the refinery.

By bearing the full risk of fuel price volatility, rural communities do not necessarily pay higher prices. They do not, however, pay stable prices. When a community in Western Alaska enters into a fuel contract in early spring, the fuel distributor provides a quote for the expected delivered price of fuel. If prices are higher at the time the distributor purchases fuel from the refinery, the community will have more expensive fuel than expected. When a community does not know how much its fuel will cost, it is difficult to financially plan for the year, especially when fuel prices constitute such a large portion of household income. IFCA communities have the same exposure to price risk, but the risk is less because frequent

[51] Denali Commission, Barge Landing Report Executive Summary. http://denali.gov/index.php?option=com_docman&task=doc_download&gid=283&Itemid=101

deliveries mean that the next shipment results in another round of prices. Unlike Western Alaska communities, IFCA communities are not locked in at one price for an entire year.

A state sponsored fuel price hedging service would not reduce the price of fuel a community pays, but it would create certainty about the price of fuel a community would pay. A state sponsored financial institute could purchase financial instruments in the spring when communities are putting fuel contracts to bid. These instruments, such as the purchase of a futures contract to buy fuel at a future date at specific prices, could be used to ensure that communities know how much fuel will cost when it arrives during the summer. If a community participates in the financial program it may be locked into fuel either more or less expensive than it would be otherwise. On average, fuel would actually be slightly more expensive as purchasing futures contracts would involve a small premium. The benefit would be that the community would know exactly how much cash it needs to have on hand when the barge arrives and its residents would know exactly how much their heating bill and electricity would be the following year. Everyone would know how much they have to save, and whether they will have enough money to make other investments or purchases (e.g., a new outboard or a trip to Anchorage).

A similar policy option would be to require more transparency on the fuel invoices that communities pay when they purchase fuel from distributors under contract. Currently, distributors disclose the cost of the refined product at the refinery but, unless asked, do not supply the lift date of the fuel. There is also no clear chain of custody that ensures that the fuel purchased by the community was actually lifted on the day the distributor claims. It is not expected that the fuel distributors are unfairly reporting the refinery lift price of the fuel they sell, but this research could not find evidence of accounting practices that could prove that they were not. The state could implement standards that would require increased accounting transparency for fuel purchased under contract. This would have little impact on prices unless fuel distributors are inaccurately reporting refinery prices and lift dates.

Community Assistance

Direct Subsidization

Direct subsidies can take three forms: a price subsidy, baseline subsidy, and income subsidy. Each type of subsidy tends to have different impacts on market efficiencies, benefactor well being and perceived benefactor well being. While it appears there is little the state can do to actually reduce the cost of fuel in rural communities the state has the option to offer energy relief with subsidies and has done so in the past.

Price Subsidy

The Power Cost Equalization program is an example of a price subsidy. It reduces the price of electricity for residences and community facilities in communities with high electricity costs. Consumers use more of a commodity with price subsidies than when paying the full cost. The PCE program caps the amount of electricity a residential customer can use at 500 kWh per month in an effort to reduce overuse.

The price of fuel is already indirectly subsidized in rural communities. The Denali Commission tank farms, and AEA and RAFS fuel loans and training programs, all indirectly reduce the cost

of fuel by offering services and capital to fuel retailers below actual costs. The state could use a subsidy to directly reduce the cost of fuel in rural communities in any number of ways. The state could create a maximum price cap for fuel and pay the difference between actual cost and the desired price, or it could simply reduce the price of every gallon by a certain amount for all communities. Either method would distort market price signals; economic theory suggests people would purchase more fuel than economically efficient. A price cap would cause more price distortion than a fixed price reduction, as communities with the highest cost fuel would have no incentive to purchase less fuel than communities with cheaper fuel.

A price subsidy tends to be appealing to the affected communities (and their political leaders) because their residents no longer feel the "sting" of price signals. When people do not pay a price for fuel that is representative of the high cost of supplying it, they are not likely to complain about fuel prices, though the underlying problems of high costs and low incomes go unaddressed. A price subsidy is akin to treating the symptom instead of the disease.

Baseline Subsidy

A baseline subsidy, for lack of a better term, refers to the type of subsidy where a certain quantity of good necessary to basic survival is given free to households. The aim is to give the household a sufficient "survival" supply of the good. The Venezuelan state-owned oil company CITGO heating fuel program that gave 100 gallons of heating fuel to each household in rural Alaska in past winters is a good example of a baseline subsidy.

The state could duplicate this type of subsidy and purchase a number of gallons of heating fuel for each household in rural Alaska. Customers could purchase fuel and the retailer could simply bill the state for a set number of gallons for each customer. This would not likely result in significant over-use of fuel, as households would have to pay full price for all additional fuel. This type of subsidy would ensure that every household has a critical minimum amount of heating fuel, regardless of the household's income or the price of fuel.

Large amounts of fuel purchased by the state government would reduce incentives for local retailers and distributors to keep fuel prices low. Communities might actually have an incentive to increase the price of fuel, if the state were paying for a large share of it. If the retailer artificially increases the price per gallon by one dollar, then every gallon purchased by the state brings in one new dollar to the local economy. Anecdotal evidence exists that some communities may have increased the price of fuel in anticipation of CITGO purchasing fuel for residents. This increases the cost of the program for CITGO, but the increased costs results in increased new money in the community.

Income Subsidy

An income subsidy provides cash for households to purchase fuel. The federally funded Low Income Heating Assistance Program (LIHEAP) is an example of an income subsidy. The program provides a direct income transfer to low income households to assist with their heating costs. Beginning in the spring of 2008 the State of Alaska began to financially supplement and expand LIHEAP with the legislatively created Alaska Heating Assistance Program. The $1,200 "energy rebate" included in the 2008 Alaska Permanent Fund Dividend check is another example of an income subsidy. Though this was not tied to income and may have offset higher energy prices, it freed up income for "quality of life" purchases (such as

airline tickets to Hawaii) that some income groups might otherwise have needed for energy costs.

Economists generally prefer income subsidies over price subsidies, as they preserve price signals. That means households receiving the subsidy still have incentive to conserve heating fuel and purchase an economically efficient amount. Every dollar of assistance they do not spend on heating fuel, they are free to spend on something else, so they weight the value of additional heating fuel against the value of another good.

An income subsidy equal to a price or baseline subsidy increases the benefactors' sense of well-being the most, as they are still free to spend the money in the manner they feel is best. The price signal still stings when they purchase fuel, so while they are better off, they still feel that high fuel prices are a problem. An income subsidy only makes a person more able to pay for fuel. It does not ease the impact of spending $6.50 per gallon for fuel when they used to only pay $2.25, for example. Income subsidies are the most efficient way to solve the economic problem associated with high fuel costs and low incomes, but they are ineffective at alleviating the associated social and political pressure associated with high prices.

Regulation

As a result of the utility-like nature of fuel deliveries, there has been talk of price regulation for many years. Assuming the regulations were based on some approved rate of return on assets, there are a number of issues to be considered.

1. Competitive Forces Reduction. When prices are regulated there is less incentive for competitors to try to win market share. In fact, regulation over the last ten years would have likely cost consumers $90 million.[52]
2. Burden of Regulation. The entrance of Ruby Marine into the market illustrates that a small operator can overcome the barriers to entry. Complying with a regulated market is going to require specialized manpower and is going to favor the larger operators who can afford to hire these specialists.
3. Service Area Reduction. Currently, fuel companies serve unprofitable locations and try to make up the loss in other places. There is a chance regulation could result in fuel companies discontinuing unprofitable service to some locations. This would force these locations to fly in fuel at a much higher cost to the customer.
4. Efficiency Moral Hazard. Currently the fuel distribution companies are motivated to use the least amount of equipment to deliver the most amount of fuel. If their return is based on investment (assets) then a likely reaction will be to increase the number of assets. It would be nearly impossible to determine if a company was 'overinvesting' in delivery equipment.

Increasing Competition

There is typically only one tank farm in a community, so it is not uncommon to hear the assertion that competition is needed to reduce prices. An example of this occurred in Bethel during 2003. Yukon Fuel purchased the 10 million gallon facility from the local operator in 2000. The exact purchase amount is proprietary, but based on Denali Commission price

[52] The Western Alaska small delivery market is about 30 million gallons. The price was undervalued by about $0.30 per gallon. (30 million x $.3 x 10 years) per Charon and Smith.

guidelines the cost would be approximately $25 million. The market size was about 12 million gallons per year. The cost to run a facility this size is about $1.5 million per year. So the basic cost structure, excluding working capital and corporate overhead, would be:

$0.20/gallon Capital Costs ($25 million x 10% / 12 million gallons)
$0.13/gallon Operating Costs ($1.5 million / 12 million gallons)
$0.33/gallon Total

In 2003, Crowley built a new 5 million gallon tank farm. Using Denali Commission prices, this represents an investment of $12.5 million. Assuming Yukon Fuel could scale expenses by only 30%, its new operating costs would have been about $1 million per year. Assuming Crowley's smaller facility was a little less expensive to operate, operating expenses of $750,000 per year are assumed.

The new cost structure for the communities combined facilities was:

$0.31/gallon Capital Costs ($25 million+$12.5 million) x 10% /12 million gallons
$0.14/gallon Operating Costs ($1 million+$.750 million / 12 million gallons)
$0.45/gallon Total

Starting in 2003, prices to consumers at both tank farms began to increase over index costs. When costs and market size are fixed, adding capital into the marketplace may have the opposite effect as was the intention. This is especially true when costs are not linear but decline with size, as is the case with tank farms.

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GLOSSARY OF TERMS

Diesel #1: Also known as DF1 or Jet A. Diesel #1 is commonly used as heating fuel throughout most of northern rural AK. Diesel #1 has a lower gel temperature than Diesel #2 which is sold for heating fuel in warmer climates. Diesel #1 is same fuel the refineries sell as Jet fuel (Jet A), and in many tank farms it is stored as Jet A until sold as DF1.

Diesel #2: Is commonly used throughout the US. In Alaska it is used for marine and highway diesel as well as heating fuel in warmer regions. Diesel #2 is preferred over #1 where it is warm enough as it has a higher energy content.

Distillate Fuel Oil: A generic name for a refined petroleum product. It can refer to diesel, heating fuel or jet fuel.

Economies of Scale: Economies of scale exist when the per unit cost decreases as the number of units increase. This is typically the result of large fixed costs that are independent of quantity. As the number of units are increased, the fixed costs are spread of more units, bring down the fixed cost per unit.

FIFO, or First In First Out: An inventory accounting technique which each addition to the existing stock of inventory retains the price it was purchased at when it is sold. The oldest inventory in stock is the first to sell.

Fixed Cost: A cost of doing business that does not increase as more business is done. For example, the lease a store pays does not increase if it sells more or less product.

Fuel Distributor: Transports fuel from refineries to fuel retail stores in Alaska communities. Some distributors actually own the fuel and resell it and others just act as a contracted transporter.

Fuel Hub: A community with a large storage capacity. Fuel is delivered to the fuel hub from the refinery on a linehaul barge. Smaller barges lift fuel from the fuel hub and distribute to communities in the region. The fuel can also be a called or serve as a fuel terminal.

Fuel Retailer: Fuel retailers sell fuel to final consumers. They can be gas stations, marine fuel docks or heating fuel deliverers.

Futures Contract: A futures contract is an agreement to purchase or sell fuel at a predetermined price. Futures contracts can be used to hedge against an undesirable change in the price of a commodity or to profit on speculation of future prices of a commodity.

Ice Free Coastal Alaska: The region along Alaska's southern coast. Ice Free Coastal Alaska communities have year round ice free ports and are not on the Alaska road system.

Independent Retailer: Independent retailers are retailers that are not owned by a fuel distributer, refiner or oil company. Independent retailers can either carry their own brand or carry the brand of a distributor.

Jobber: A fuel wholesaler that purchases fuel from wholesale racks and transports to third party retailers. A jobber may or may not own its own retail store.

LIFO, or Last In First Out: An inventory accounting technique which each addition to the existing stock of inventory retains the price it was purchased at when it is sold. The newest inventory in stock is the first to sell.

Lift: The act of purchasing fuel from a refinery. A lift date is the day the fuel was physically transferred from the refinery to the barge or fuel truck.

Lighter: To use smaller tugs and barges to transport fuel from linehaul barges or fuel terminals into smaller communities or shallow ports. The smaller barges are sometimes called the lighterage fleet.

Linehaul Barge: A large ocean going barge used to transport fuel in bulk from the refinery into a fuel hub. Linehaul barges are the largest barge in a fuel distributor's fleet and generally don't deliver fuel to communities that are not fuel hubs.

Market Share: The percent of total sales of a certain good that one seller supplies. When fuel retailers maintain steady price differences they often are able to also maintain steady market shares.

Naphtha: A generic name for a refined petroleum product. It is heavier than natural gas liquids but lighter than kerosene.

Natural Monopoly: In economics, a natural monopoly occurs when, due to the economies of scale of a particular industry, the maximum efficiency of production and distribution is realized through a single supplier. Electric utilities are a common example of a natural monopoly.

OPA 90 (Oil Pollution Act of 1990): A bill signed into law in response to the Exxon Valdez oil spill in Prince William Sound. OPA 90 mandates that all fuel shippers have spill response plans and that all single hull tankers and barges be fazed out by 2015.

OPIS (Oil Price Information Service): A for fee services that supplies information on wholesale rack prices for petroleum fuel.

Option Contract: An option contract gives the purchaser of a contract the right but not the obligation to purchase or sell a commodity at a particular price in the future. A purchaser of an option contract generally must pay a fee for the right to buy or sell at a predetermined price.

Platts: A provider of energy and energy price information.

Price Setter: A company with monopolistic supply with the power to set the price of a good in a market.

Rack Price: Price at which the majors and independent refineries sell branded or unbranded gasoline to jobber/wholesalers. It is related to the commodity spot price, but adjusted for transportation, overhead, and profit.

Refinery: A plant used to separate the various components present in crude oil and convert them into usable products or feedstock for other processes.

Spot Market: A market where commodities are sold for cash and delivered immediately.

Tank Farm: A collection of fuel tanks that store enough fuel to last a community between fuel deliveries.

Terminal: A large tank farm capable of handling a full linehaul barge full of fuel. Terminals often serve as a fuel hub for a region, storing fuel from a linehaul barge until a smaller barge can transport it to neighboring communities.

Vertically Integrated Company: A company that owns multiple links in the supply chain of an industry. An example is an oil company that owns refineries, distributors and retail stores. Since every link is owned by the same company the fuel never experiences a sale as it moves from the oil fields to the gas station.

Western Alaska: The area of Alaska that is not on the road system and without access to year round marine access due to seasonal icing. It includes North Aleutian villages beginning with Nelson Lagoon proceeding north along the coast to Kotzebue Sound. Also included are ports of call on tributary rivers, the most prominent being the Yukon and Kuskokwim.

Working Capital: The fuel owned by a distributor. The fuel ties up cash while the distributor waits to sell it. This cash could be used for other investments and while the cash is owned by the distributor it must earn a similar return. The result is increasing prices the longer a distributor must hold fuel before selling.

APPENDIX A. RESULTS OF COMMUNITY FUEL PRICE SURVEY JANUARY 2010

Rural communities across Alaska continue to face high fuel prices. People in these remote, cold places need large quantities of fuel for heat, electricity, and transportation. The estimated household cost for energy in remote rural Alaska increased significantly since 2000—increasing from approximately 16% of total household income in 2000 to 47% in 2008 for the lowest income rural households. Compared to Anchorage, energy costs are a higher portion of income for all income levels in remote rural Alaska.[53] High energy costs exacerbate the issues of a shortage of cash paying jobs, limited local economic bases, and local governments struggling to provide basic services to residents and businesses.[54] Even though the crude oil components of the retail price for fuel were generally lower in 2009, rural communities continue to pay higher prices for fuel. Of the eleven[55] communities surveyed for this report, six communities paid the same or higher prices for fuel; only in five communities fuel prices decreased.

Transportation costs are a critical factor affecting fuel prices in Alaska rural communities. Fuel sold in these communities is transported by air, barge, truck or a combination of these methods which increase the price as many communities must purchase their fuel prior to "freeze up" in the cold winter months in order to allow time for delivery to remote villages. Other factors affecting fuel prices are limited and costly storage, small market size and financing costs associated with holding large inventories.

The surveyed communities are:

1. Alatna/Allakaket[3]
2. Angoon
3. Bethel
4. Chitina
5. False Pass
6. Fort Yukon
7. Lime Village
8. Mountain Village
9. Unalakleet
10. Yakutat

In the previous editions of this report, Alatna and Allakaket were treated as one community because they are very similar, fuel for both communities is delivered to Allakaket, and retail fuel prices were generally the same. As we continue to identify more of the components of fuel

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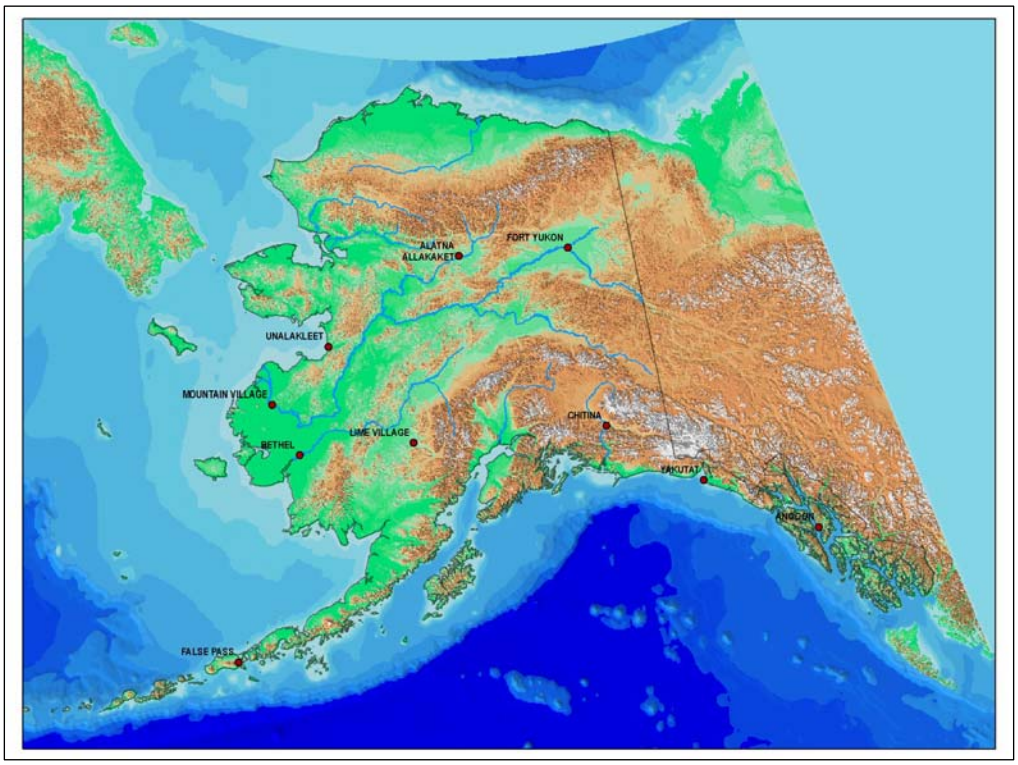
[53] Ben Saylor, Sharman Haley, and Nick Szymoniak, *Estimated Household Cost for Home Energy Use*, May 2008, Note No. 1 Revised June 24, 2008.
http://www.iser.uaa.alaska.edu/publications/webnote/LLFuelcostupdatefinal.pdf
Ben Saylor, Sharman Haley, *Effects of Rising Utility Costs on Household Budgets, 2000-2006*, March 2007. See http://www.iser.uaa.alaska.edu/publications/risingutilitycosts_final.pdf

[54] Division of Advocacy – Report to the Commissioner. January 2007. *Current Community Conditions – Fuel Prices across Alaska Fall – Winter 2006 Update*.

[55] We surveyed the same communities as in the previous studies but this time surveyed Alatna and Allakaket separately.

prices some differences in their price structure have become more apparent. Therefore, in this report they appear in the same section but we have identified some of the differences. At the end of this section updated methodology information is included.

Figure 1. Map of Eleven Case Study Communities



The major findings of the third round of community surveys are:

- Increases in fuel prices persisted from January 2009 to January 2010 despite the lower cost of crude oil during most of 2009.
- Fuel prices in rural Alaska vary. We surveyed the same communities as in the previous studies but this time surveyed Alatna and Allakaket separately.
- Fuel prices vary significantly and are inconsistent across communities at the retail level.
- Some communities have much larger retail price mark ups than others.
- For some communities delivery costs and retail markup are very large portion of the fuel price.
- Availability and reliability of local information remains a challenge.
- A general sentiment in these communities towards their fuel cost situation is frustration, as they have limited options to cope with high fuel prices.

From January 2009 (date of last update) to January 2010, crude oil prices decreased on average 37%. Refinery gate prices in Anchorage[56] increased 13% for gasoline and decreased 7% for diesel for heating (DF#1). In Anacortes,[57] refinery gate prices decreased 7% for gasoline and 54% for diesel for heating (Ultra Low Sulfur, DF#1). On average across the surveyed communities, retail prices for gasoline decreased 6% and diesel for heating decreased 13%. Nonetheless, only five of eleven communities paid lower prices for gasoline and diesel for heating (DF#1).

In January 2010, retail prices in rural communities vary significantly. Alatna and Allakaket paid the highest price for gasoline and diesel for heating (DF#1) at $7 and $6.50 per gallon, respectively. Chitina paid the lowest price for gasoline at $3.80 per gallon, and False Pass paid the lowest price for diesel for heating (DF#1) at $3.45 per gallon. Most of the key factors affecting delivered fuel prices have been identified; however these factors do not fully explain variations in retail fuel prices in rural Alaska communities. For instance between January 2009 and January 2010, in Alatna the crude oil and refining components decrease from 35% to 30% for gasoline and retail price remain the same. The diesel for heating price also remained despite the crude oil and refining components increasing from 35% to 52%.

Obtaining local data from these communities continues to be difficult. We called repeatedly and sometimes were never able to contact the most knowledgeable person—this is especially true in publicly owned and operated fuel outlets. Some communities do not seem to systematically track their fuel sales and inventories. The willingness to share information that is available also varies. Some communities are willing to share their information in an effort to educate the public of their situation. Others are reluctant to give any information because they feel nothing can be done to remedy the high prices or that the information is proprietary. Because of these challenges, the information used for the communities' analysis was gathered from varied sources such as distributors, governmental offices and retailers. Despite these limitations, in the following pages we provide a detailed description of the eleven communities surveyed.

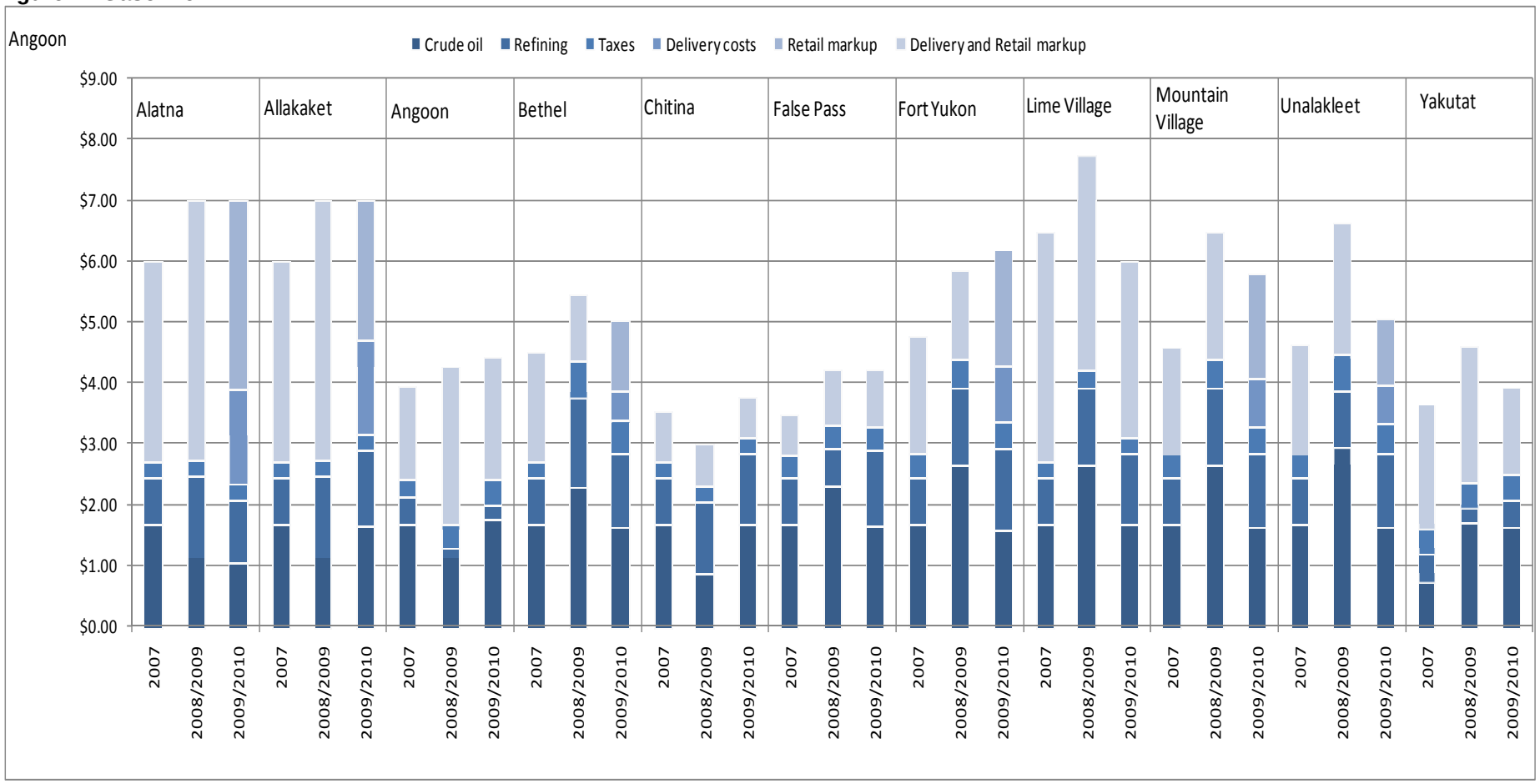
Table 1 provides a summary matrix of the factors affecting fuel prices in the eleven case study communities. The table includes previous and current prices of fuel (gasoline, diesel for heating (DF) #1 and diesel fuel #2) as well as updated local tax and recent delivery information. Unless otherwise noted, other data are from the original 2007 study and the January 2009 update and has not been updated. Figures 2 and 3 provide summary comparisons of fuel prices in 2007, 2008/2009 and 2009/2010. These figures are followed by community summaries and figures.

[56] Estimate using Anchorage refinery gate prices. The "refining" component is calculated as the difference between the OPIS wholesale rack price and the EIA reported U.S. crude price.
[57] Estimate using Anacortes refinery gate prices (calculated as described in footnote 1)

Table 1. Community Analysis

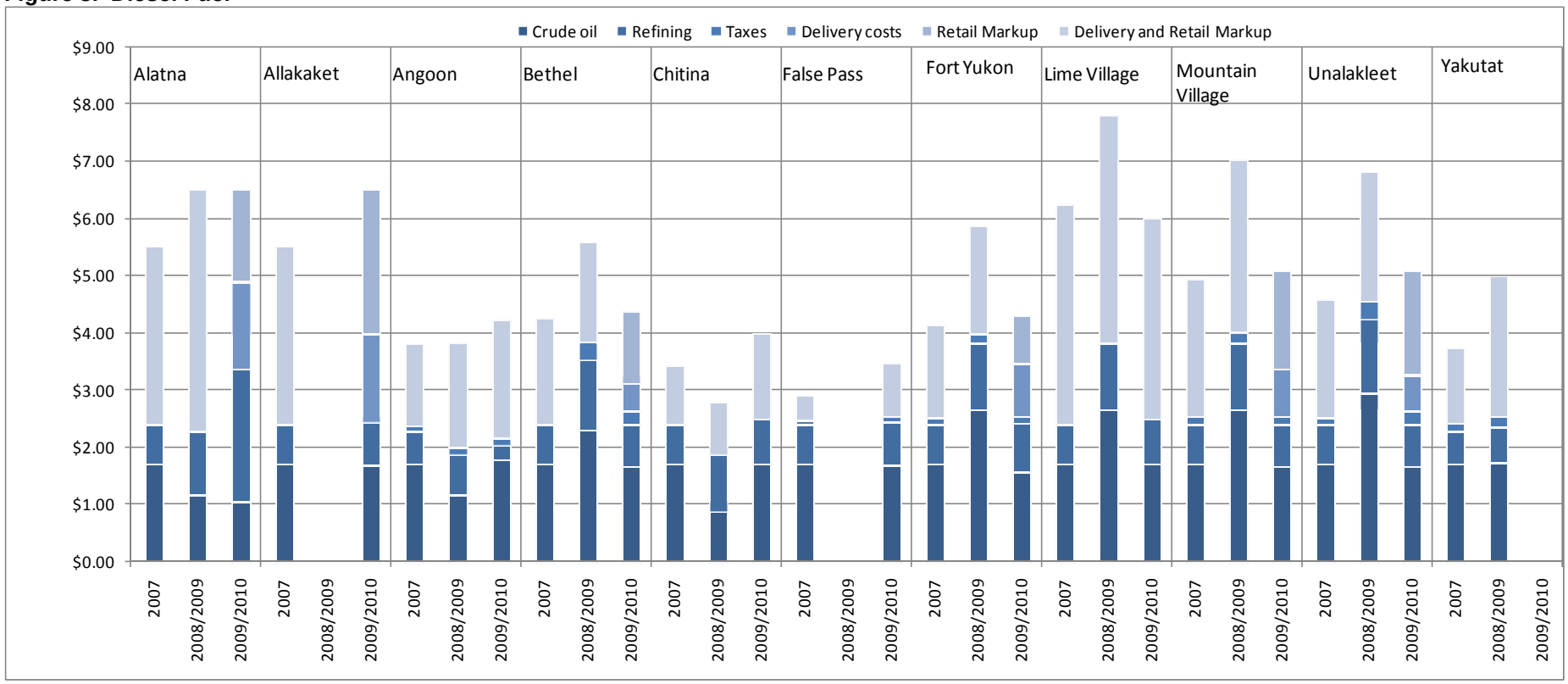
Components of Fuel Prices Analysis Ten Community Case Study Results											
	Community										
	Alatna	Allakaket	Angoon	Bethel	Chitina	False Pass	Fort Yukon	Lime Village	Mountain Village	Unalakleet	Yakutat
Population	22	137	442	5803	117	41	585	19	782	725	608
Fall 2007 Prices											
Crude (Sep 2007)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
Refining Cost (Sep 2007)											
gasoline	0.75	0.75	0.46	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.46
diesel # 1	0.69	0.69	0.57	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.57
diesel # 2	0.81	0.81	0.57	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.57
Retail (Nov 2007)											
gasoline	6.00	6.00	3.96	4.52	3.52	3.49	4.79	6.50	4.60	4.65	3.67
diesel # 1	5.50	5.50	3.79	4.25	3.41	2.90	4.12	6.25	4.92	4.58	3.72
diesel # 2	NA	NA	NA	4.54	NA	2.85	3.65	NA	NA	4.58	NA
Winter 2008-2009 Prices											
Crude (Estimated Month of delivery)	1.16	1.16	1.16	2.31	0.88	2.33	2.67	2.67	2.67	2.96	1.72
Refining Cost (Estimated Month of delivery)											
gasoline	1.32	1.32	0.15	1.49	1.20	0.61	1.28	1.28	1.28	0.94	0.23
#1 diesel	1.11	1.11	0.71	1.21	0.98	1.02	1.14	1.14	1.14	1.29	0.62
#2 diesel	1.11	1.11	0.71	1.21	0.98	0.98	1.14	1.14	1.14	1.29	0.62
Retail (Jan 2009)											
gasoline	7.00	7.00	4.27	5.48	3.03	4.23	5.85	7.75	6.50	6.64	4.64
diesel # 1	6.50	NA	3.82	5.58	2.79	NA	5.87	7.80	7.02	6.81	4.98
diesel # 2	NA	NA	NA	NA	NA	4.18	5.86	NA	7.28	6.49	4.85
Crude (Estimated Month of delivery)	Nov-08	Nov-08	Nov-08	Sep-08	Dec-08	Mar-08	Aug-08	Aug-08	Aug-08	Jun-08	Oct-08
Most recent fuel delivery	Dec-08	Dec-08	Jan-09	Oct-08	Jan-09	Apr-08	Sep-08	Sep-08	Sep-08	Jul-08	Dec-08
Winter 2009-2010 Prices											
Crude (Estimated Month of delivery)	1.06	1.67	1.77	1.65	1.69	1.67	1.59	1.69	1.65	1.65	1.65
Refining Cost (Estimated Month of delivery)											
gasoline	1.04	1.24	0.26	1.21	1.18	1.24	1.35	1.18	1.21	1.21	0.46
#1 diesel	2.29	0.77	0.26	0.75	0.81	0.77	0.83	0.81	0.75	0.75	0.32
#2 diesel	2.25	0.77	0.26	0.75	0.81	0.77	0.83	0.81	0.75	0.75	0.32
Retail (Jan 2010; except Allakaket & False Pass Oct 2009)											
gasoline	7.00	7.00	4.42	5.03	3.80	4.23	6.18	6.00	5.79	5.07	3.94
diesel # 1	6.50	6.5	4.22	4.37	3.99	3.45	4.29	6.00	5.07	5.07	
diesel # 2	NA	NA	NA	4.71	NA	2.70	NA	NA	NA	NA	4.29
Crude(Estimated Month of delivery)	Mar-09	Oct-09	Nov-09	Aug-09	Dec-09	Oct-09	Sep-09	Dec-09	Aug-09	Aug-09	Aug-09
Most recent fuel delivery	Apr-09	Nov-09	Jan-10	Sep-09	Jan-10	Nov-09	Oct-09	Jan-10	Sep-09	Sep-09	Oct-09
Sources:											
U.S.Energy Information Administration: Weekly United States Spot Price FOB Weighted by Estimated Import Volume (Dollars per Barrel)											
http://tonto.eia.doe.gov/dnav/pet/hist/wtotusaw.htm											
Oil Price Information Service: Wholesale Rack Prices for Anchorage											
Note: Anacortes refinery price data was used for Angoon and Yakutat. Anchorage refinery price data was used for all other communities.											

Figure 2. Gasoline



Sources: See Table 1, Community Analysis.

Figure 3. Diesel Fuel

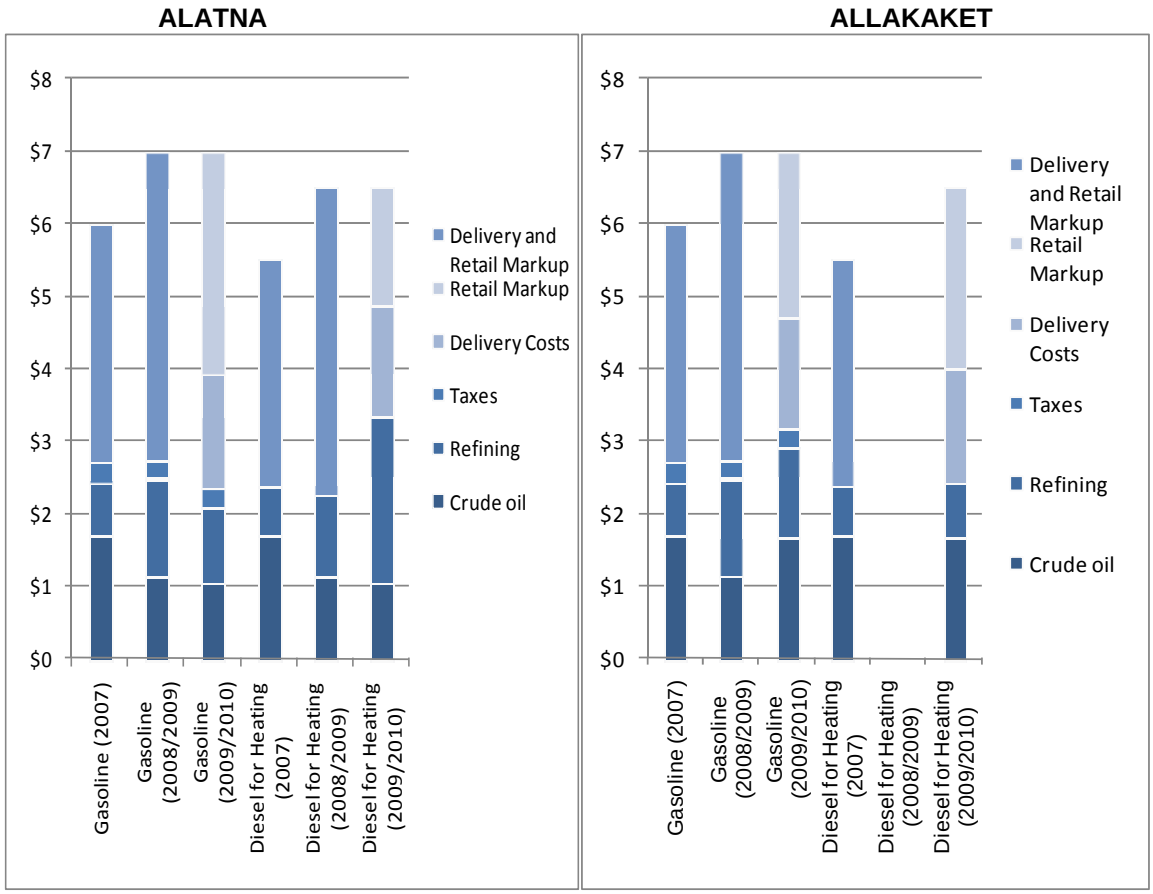


Sources: See Table 1, Community Analysis.

Alatna/Allakaket

The neighbor communities of Allakaket and Alatna are located in northern Alaska, above the Arctic Circle, across from each other on the Koyukuk River. Alatna has a population[1] of 22 and Allakaket of 137. Both communities receive their fuel by airplane (from Fairbanks), because fuel barges cannot navigate the upper Koyukuk River. Fuel is trucked from Allakaket to Alatna when the river is frozen.

In November 2007, gasoline retailed for $6.00 per gallon and diesel for heating (DF #1) was $5.50 per gallon in Alatna and Allakaket. In January 2009, gasoline retailed for $7.00 per gallon for both communities and diesel for heating (DF#1) was $6.50 per gallon for Alatna. In January 2010, the price of gasoline and diesel for heating remained at the same price of $7.00 and $6.50 per gallon, respectively in both communities. There is no local sales tax in either community. Several factors tend to increase or ameliorate the "other" components of prices in these locations:



Increasing factors:

- Only method of transportation is by air. The communities no longer purchase their fuel from Everts Air. Therefore, there is only one supplier of fuel, Brooks Fuel Inc. that delivers fuel to these communities.
- Due to the small populations, delivered quantities are small hence the delivery charge is spread across fewer gallons, raising the price per gallon.
- Barriers to entry in air transportation are low compared with those in barging allowing potential for competition. However, competition is hindered by the small village's purchasing power and the lack of supplier interest.
- Alatna gets fuel about six times a year and only when the river is frozen. Allakaket receives fuel about once a month year round. The last shipment of fuel to Alatna was April 2009 and to Allakaket was November 2009.

Ambivalent factors:

- In Alatna fuel is sold by the Village Council. In Allakaket, fuel is sold by the city government.
- Alatna's storage capacity is about 20,000 gallons and the tanks are located in Allakaket; but this does not seem to be a constraint on deliveries, because the quantity delivered in 2009 was 18,000 gallons. Allakaket received about 36, 000 gallons of fuel in 2009.

Crude oil prices were significantly higher during fall 2007 accounting for $1.70 of the final retail refined product price as compared to $1.16 in November 2008—a $0.54 or 32% decline per gallon. Despite this decline in crude oil prices, the price of gasoline increased $1.00 or 17% per gallon and diesel #1 increased $1.00 or 18% per gallon. By fall 2009, crude oil price decrease for Alatna to $1.06 or 9%; and for Allakaket crude oil price increase $1.67 or 44%, but retail prices for both gasoline and diesel for heating remain the same as in November 2008, $7.00 and $6.50 respectively at both communities.

Angoon

Angoon is located on Admiralty Island in Southeast Alaska, southwest of Juneau. Angoon has a current population of 442; the population has decreased over the past few years. Fuel is barged to Angoon by Petro Marine.

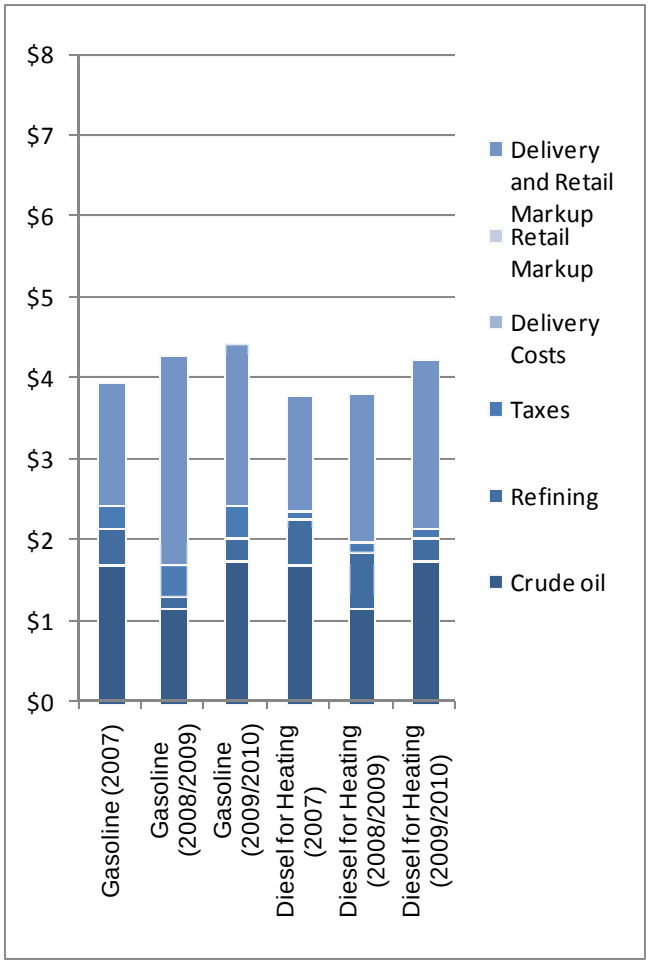
In November 2007, gasoline retailed for $3.96 per gallon and heating oil (DF #1) for $3.79 per gallon. In January 2009, gasoline retailed for $4.27 per gallon and diesel for heating (DF #1) for $3.82. In January 2010, prices continue to increase; gasoline retailed for $4.42 and diesel for heating (DF#1) for $4.22. Angoon has a local tax of 3% that is not included in these cited fuel prices. Factors tending to increase or ameliorate these "other" costs include:

Ambivalent factors:

- Only fuel delivery method is by barge from Petro Marine about every three weeks. Most recent shipment was January, 2010.
- Fuel is sold in the community by a private entity, Angoon Oil and Gas.

Decreasing factors:

- Ice-free port in Southeast Alaska, roughly 900 miles from both Anacortes and Anchorage.
- Fuel can be delivered any time; typically there are eight deliveries per year.
- Tlingit/Haida Energy program is helping to provide fuel in community.



Crude oil prices were significantly higher during fall 2007, accounting for $1.70 of the final retail refined product price as compared to $1.16 in December 2008—a $0.54 or 32% decline per gallon. By November 2009, crude oil prices increased above September 2007 levels by $0.61 or 53% per gallon. Despite the crude oil price decline between fall 2007 and December 2008, gasoline prices in January 2009 were $0.31 or 8% per gallon higher than fall 2007.One year later, in January 2010, gasoline price declined $0.15 or 3.5% per gallon. Diesel #1 increased $0.03 or less than a 1% between November 2007 and January 2009 and $0.40 or $11% by January 2010.

Bethel

Bethel is located at the mouth of the Kuskokwim River and has a population of 5,803. All fuel for Bethel is barged on the Kuskokwim River. It is a regional fuel distribution hub with a storage capacity of almost 15 million gallons.

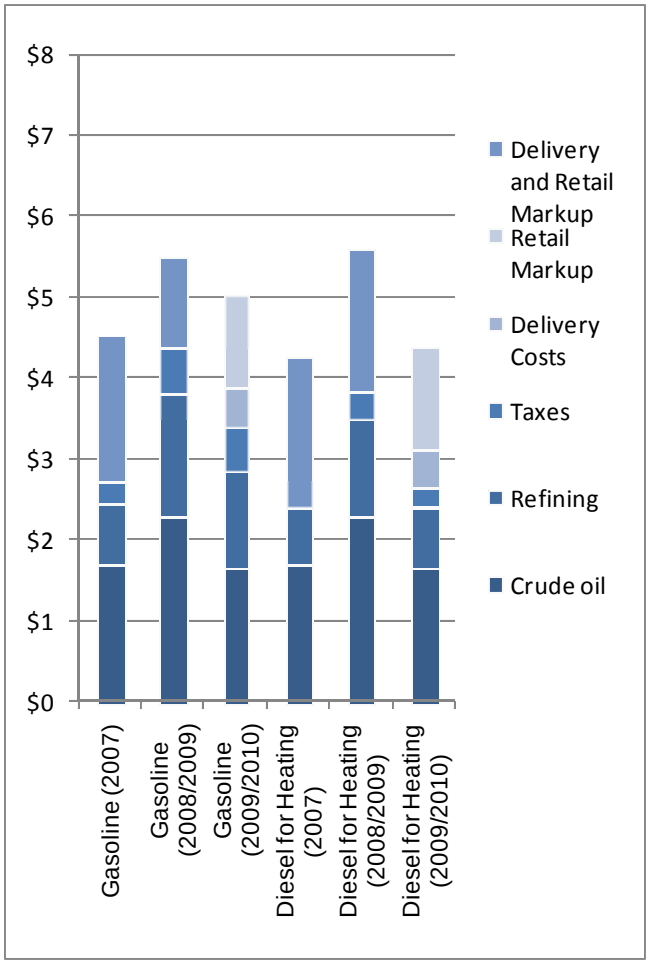
In November 2007, gasoline retailed for $4.52 per gallon and diesel for heating (DF #1) for $4.25 per gallon. In January 2009, gasoline retailed for $5.48 per gallon and diesel for heating (DF #1) for $5.58 per gallon. In January 2010, retail prices decreased to $5.03 for gasoline and $$4.37 for diesel for heating. Bethel has a 6% sales tax that is included in the price of fuel. Factors affecting the costs include:

Increasing factors:

- Port and river both freeze in winter.

Ambivalent factors:

- Large fuel hub community and large storage facility owned by Crowley Marine Services. Costs for Bethel are spread across more gallons because of its status as a fuel hub. We do not know what portions of fuel stored in the community is distributed to other regional communities versus goes to Bethel residents.
- Can receive multiple shipments per year about 6 to 8 from May to September/October when the river is not frozen. The most recent fuel delivery was September 2009.



In contrast to Alatna, Allakaket and Angoon, Bethel's October 2008 fuel delivery coincided with higher crude oil prices as compared to fall 2007. The estimated September 2008 crude oil component of final retail fuel prices was $2.31 as compared with $1.70 per gallon, a $0.61 or 36% increase. In addition, the September 2008 refinery gate fuel price was $0.74 per gallon higher on gasoline and $0.52 per gallon higher on diesel for heating than in fall 2007. In August 2009, crude oil prices decreased $0.66 or 28.5% compared to September 2008. The price per gallon of gasoline increased $0.96 or 21% than fall 2007. It later decreased $0.45 or 8% in August 2009. Diesel for heating increased by $1.33 per gallon or 31%, higher than fall 2007. It then decreased by $1.21 or 22% in August 2009.

Chitina

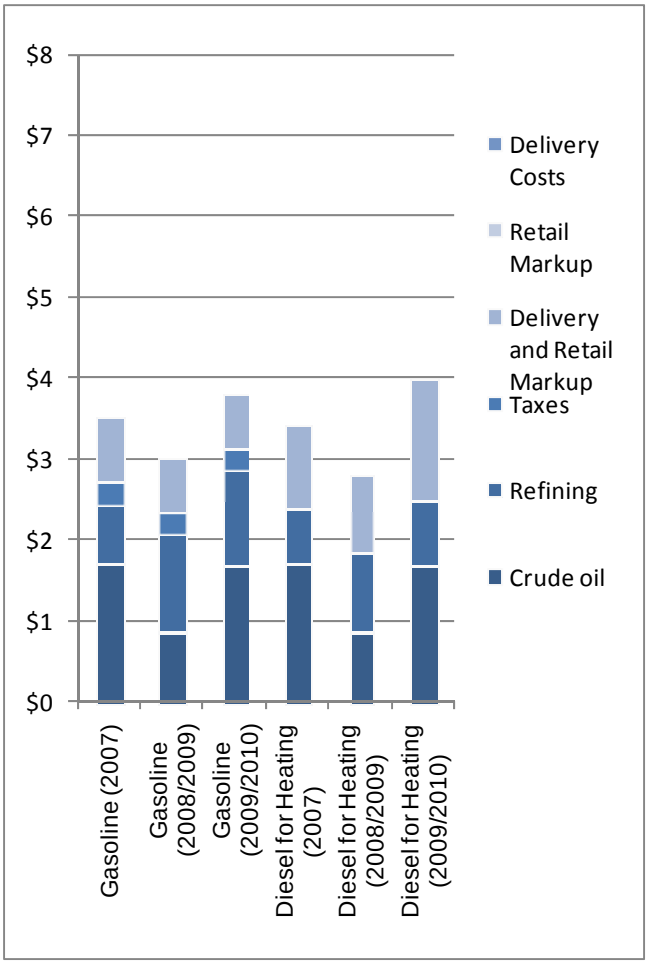
Chitina is on the road system in Southcentral Alaska. Chitina and has a population of 117. All fuel in Chitina is transported by road from Anchorage via Glenallen.

Gasoline retailed for $3.52 per gallon and diesel for heating (DF #1) was $3.41 per gallon in November 2007. The price in January 2009 for gasoline was $3.03 per gallon and $2.79 per gallon for heating fuel (DF #1). One year later, in January 2010, the retail price for gasoline increased to $3.80 and for heating fuel to $3.99 per gallon. Chitina does not have a local tax. Various factors tend to increase or decrease the "other costs" components:

Decreasing factors:

- On the road system only 247 miles from Anchorage.
- Can receive fuel any time; not weather dependent. Fuel comes by truck. The most recent fuel delivery was January 2010.

Similar to Angoon, Chitina had fuel deliveries in January 2009 when crude oil prices had dropped. Crude oil prices were significantly higher during fall 2007 accounting for $1.70 of the final retail refined product price as compared to $0.88 in December 2008—a $0.82 or 48% decline per gallon. In January 2010, crude oil prices increased 92% to September 2007 levels of $1.69 per gallon. The retail price of gasoline decreased $0.49 or 14% from November 2007 to January 2009. It rose by $0.77 or 25% per gallon in January 2010. The price of diesel for heating (DF #1) declined $0.62 or 18% from November 2007 to January 2009, and it significantly increased $1.20 or 43% per gallon for heating fuel by January 2010.



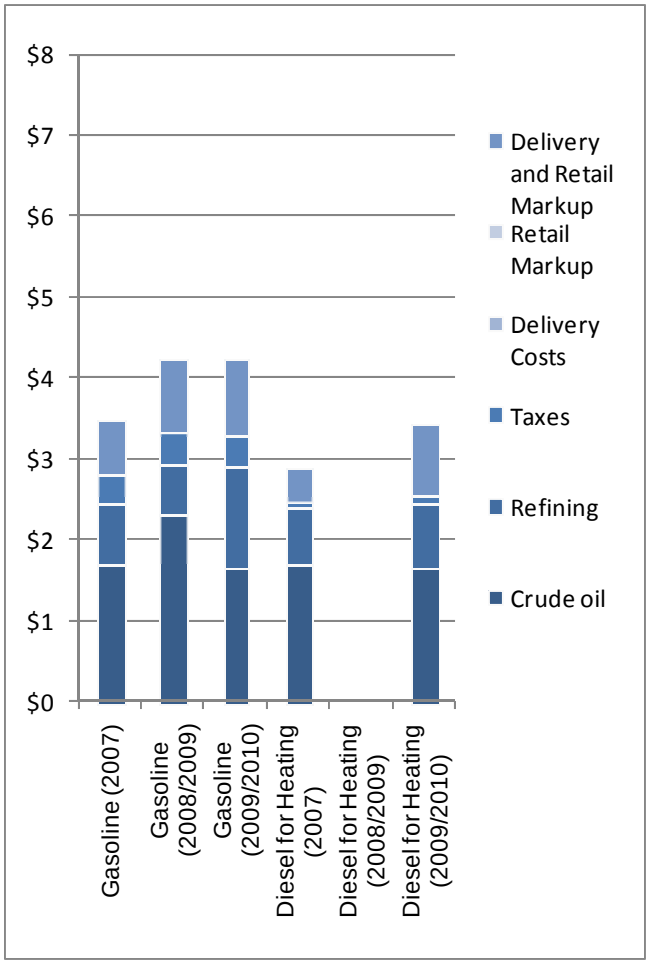
False Pass

False Pass is on Unimak Island in the Aleutian Chain. It has a year-round population of about 41, the population increases when fishermen and fish processors arrive for the fishing season. All fuel for False Pass is barged.

In November 2007, gasoline retailed for $3.49 per gallon and fuel oil (DF #2) for $2.85 per gallon. In January 2009, gasoline retailed for $4.23 per gallon and fuel oil (DF#2) for $4.18 per gallon. In October 2009, retail price for gasoline continues to be $4.23 per gallon and fuel oil (DF#2) decreased to $2.70. The community has a 3% sales tax that is not included in the fuel price. Several factors tend to increase or hold down costs:

Decreasing factors:

- Only receives one delivery per year but has a large storage capacity to serve many commercial fisherman and fish processors in the area.
- Storage facility is owned by Peter Pan Seafood. Large throughput due to fishing fleet and location near multiple fishing grounds.
- Fuel is sold by a private entity, Peter Pan Seafoods.
- Can only receive fuel directly from linehaul barge.
- Ice-free port.
- Relatively close to large ports (Dutch Harbor and Anchorage).
- Small marine distance from larger facilities.



Most recent delivery was November 2009. The April 2008 delivery was prior to the July peak in crude oil prices but still higher than fall 2007 when the crude oil component of delivered fuel prices was an estimated $1.70 rather than the March 2008 $2.33, a $0.63 per gallon or 37% increase. The price of gasoline increased $0.74 per gallon or 21%; fuel oil (DF #2) increased $1.33 per gallon or 47%. Compared to the other communities surveyed, the fall 2007 False Pass diesel fuel price was a comparatively low price. In October 2009, crude oil prices decreased $0.66 or 28% per gallon since March 2008, and there was no change in retail price for gasoline and a $1.48 or 35% decrease per gallon on fuel oil (DF#2).

Fort Yukon

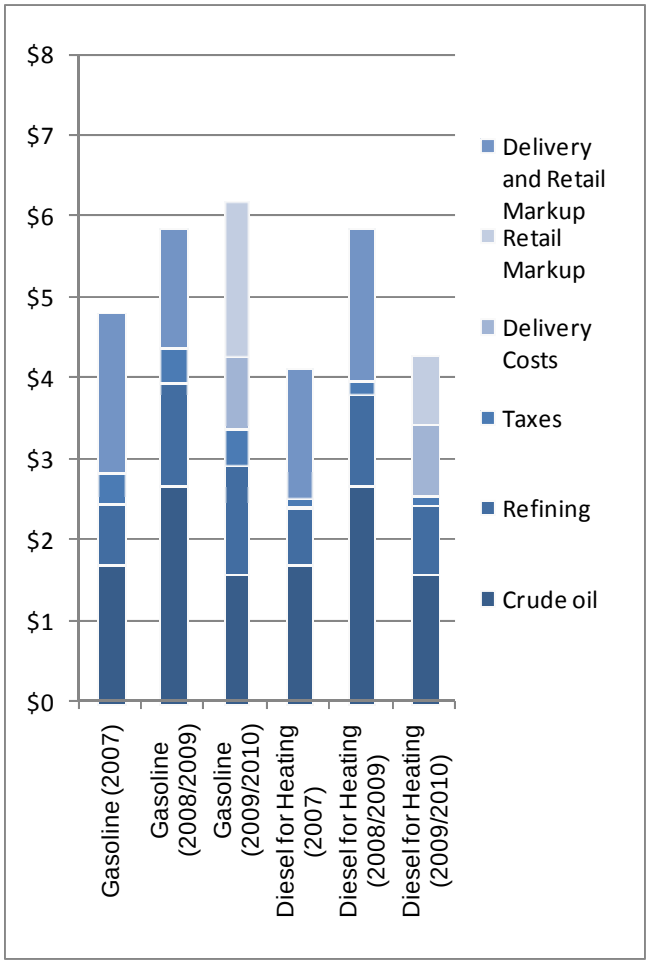
Fort Yukon is on the upper Yukon River northeast of Fairbanks and has a population of 585. All fuel for Fort Yukon is barged upriver from Nenana by Crowley Marine Services. Ruby Marine also services this area of the river.

Gasoline retailed for $4.79 per gallon and heating fuel (DF #1) for $4.12 per gallon in November 2007. In January 2009, gasoline retailed for $5.85 per gallon and heating fuel (DF #1) for $5.87 per gallon. In January 2010, gasoline retailed for $6.18 and heating fuel (DF#1) for $4.29. The community has a 3% tax not included in the price of fuel. Costs can largely be attributed to several factors:

Increasing factors:

- River and port freeze up during winter.
- Fuel barged 400 river miles upriver from Nenana.

Fort Yukon's estimated most recent fuel delivery was October 2009. In August 2008, crude oil prices accounted for $2.67 per gallon of refined fuel prices as compared to $1.70 in fall 2007—a $0.97 per gallon or 57% increase. By September 2009, the crude oil price had significantly decrease to $1.59 – a $1.08 or 40% less than in August 2008. In January 2009, the price of gasoline was $1.06 per gallon higher or 22% higher and diesel for heating #1 was $1.75 per gallon or 42.5% higher than in November 2007. In January 2010, retail price for gasoline increased $0.33 or 6% and diesel for heating #1 decreased $1.58 or 27%.



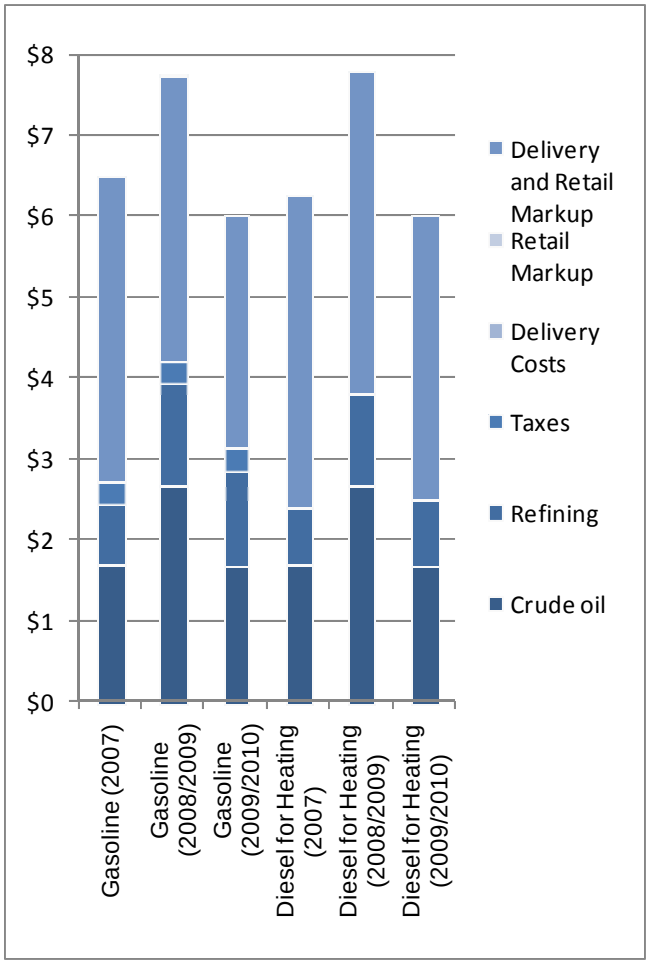
Lime Village

Lime Village is on the Stony River in the Kuskokwim Delta of western Alaska. It has an estimated total population of 19; the population has declined over the past few years due to lack of jobs and the school closing. All fuel for Lime Village is delivered by air.

In November 2007, gasoline retailed for $6.50 per gallon and fuel for heating (DF #1) for $6.25 per gallon. In January 2009, gasoline retailed for $7.75 per gallon and fuel for heating (DF #1) for $7.80 per gallon. In January 2010, both gasoline and diesel for heating prices decrease to $6.00 per gallon each. The community does not have a local tax. Several things account for these costs:

Increasing factors:

- All fuel has to come by air, because barges cannot navigate the Stony River to Lime Village
- Very short runway for airplanes; can only handle small shipments per trip.
- Fuel was barged from Bethel to Sleetmute and then transferred to planes for delivery to Lime Village. Most recently, Sound Aviation delivers fuel purchased in the retail Anchorage market. In an effort to keep transportation cost to a minimum fuel is only delivered when Lime Village residents are flying to and from Anchorage.
- Storage facility is publicly owned, but is very small (only 1,800 gallon capacity for the community).
- Small population means delivery charges are spread over fewer gallons. Each fuel shipment is between 150 and 200 gallons. The community's diminish purchasing power has caused them to be without fuel for periods of time.



Ambivalent factors:

- Fuel is sold by the Traditional Council.
- Can receive fuel shipments any time of the year. It receives about 6 to 8 shipments of fuel per year.

Lime Village's most recent fuel delivery was January 2010. Crude oil component of fuel prices increased from $1.70 in fall 2007 to $2.67 per gallon in August 2008, a $0.97 per gallon or 57% increase. In December 2009, crude oil prices decrease to $0.98 or 38%. Gasoline prices increased $1.25 per gallon or 19% from November 2007 to January 2009 and decreased $1.75 or 22.5% per gallon in January 2010. Similarly, the price of diesel for heating #1 increased $1.55 per gallon or 25% from November 2007 to January 2009 and later decrease to $1.80 or 23% in January 2010.

Mountain Village

Mountain Village is on the Yukon River in Northwest Alaska, close to Norton Sound and the Bering Sea. About 782 people live there. Most fuel for Mountain Village is barged down the Yukon River from Nenana, but occasionally deliveries are lightered from ocean-going vessels at the mouth of the Yukon and shipped upstream.

In November 2007 gasoline retailed for $4.60 per gallon and diesel for heating (DF #1) for $4.92 per gallon. In January 2009, gasoline retailed for $6.50 per gallon and diesel for heating (DF #1) for $7.02 per gallon. In January 2010, retail price for gasoline was $5.79 per gallon and diesel for heating (DF#1) for $5.07. The community has a 3% tax that is not included in the fuel price. Several things tend to influence costs:

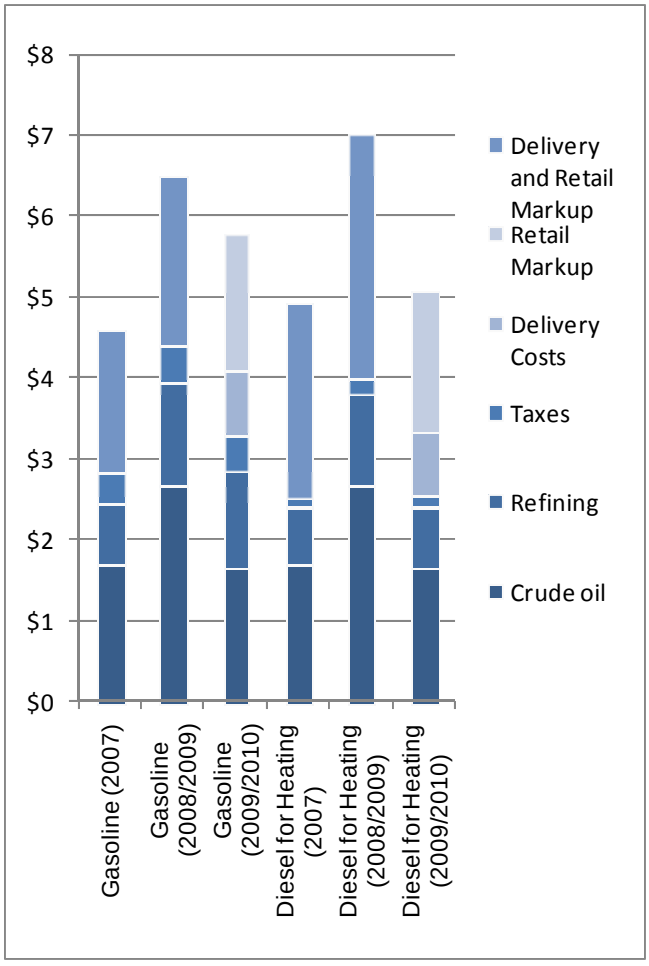
Increasing factors:

- Can only deliver during times of the year when river is not frozen. Mountain Village receives fuel two times a year, once in the spring and once in the fall.
- Fuel has to be transported in a shallow draft barge; Nenana is main hub port, roughly 1,200 miles upriver.

Ambivalent factors:

- Fuel is sold by the city government.
- Publicly-owned storage facility, with a capacity of 200,000 gallons.

Mountain Village received its most recent fuel delivery in September 2009.In August 2008, crude oil prices accounted for about $2.67 per gallon of refined fuel prices as compared to $1.70 in fall 2007—a $0.97 per gallon or 57% increase. Crude oil prices then decreased $1.02 or 38% per gallon in August 2009. In January 2009 the price of gasoline was $1.90 per gallon or 40% higher than in November 2007.It later decreased $0.71 or 11%. For diesel for heating (DF #1), the price increased $2.10 or 43% from November 2007 to January 2009. It later decreased $1.95 or 28% per gallon in January 2010.



Unalakleet

Unalakleet is in northwestern Alaska, on Norton Sound. Unalakleet has an estimated population of 725 residents. All fuel is first barged to Nome in a line-haul vessel and then transported to Unalakleet in a shallow draft lighterage vessel.

Gasoline retailed for $4.65 per gallon and fuel oil (DF #2) for $4.58 per gallon in November 2007. In January 2009, gasoline retailed for $6.64 per gallon and fuel oil (DF #2) for $6.81 per gallon. In January 2010, retail prices decreased to $5.07 per gallon for both gasoline and fuel oil (DF#2). The community has a 5% tax included in the price of fuel. Several things tend to add to or hold down those other costs:

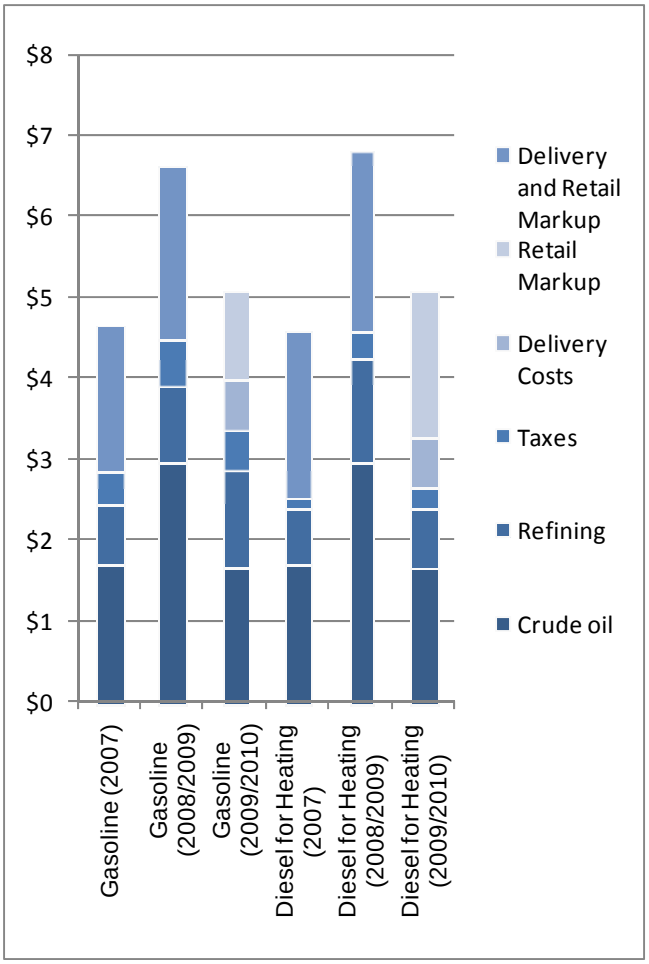
Increasing factors:

- Norton Sound freezes in winter; deliveries only during ice-free months.
- Barge is the only method of fuel delivery.
- Fuel is transported from Nome in a lighterage vessel and pumped directly to a storage facility.
- Community receives three or more shipments per year during ice-free months.
- Publicly-owned storage facility with a capacity of 420,000 gallons.

Ambivalent factors;

- Fuel is sold by Unalakleet Native Corporation.

Most recent delivery was September 2009. In June 2008, the crude oil component of fuel prices reached $2.96 per gallon as compared to $1.70 in fall 2007, a $1.26 or 74% increase. In August 2009, the crude oil price decreased $1.31 or 44% per gallon. Gasoline prices increased $1.99 or 43% per gallon between November 2007 and January 2009. The retail price of gasoline decreased $1.57 or 24% per gallon by January 2010. Diesel #2 increased $2.23 or 47% per gallon between November 2007 and January 2009; its price later decrease about $1.74 or 26% per gallon by January 2010.



Yakutat

Yakutat is in Southeast Alaska, on the Gulf of Alaska north of the capital city of Juneau. Yakutat has an estimated population of 608 residents. All fuel is barged to Yakutat by Delta Western, which also owns a 6.5 million gallon storage facility in the community.

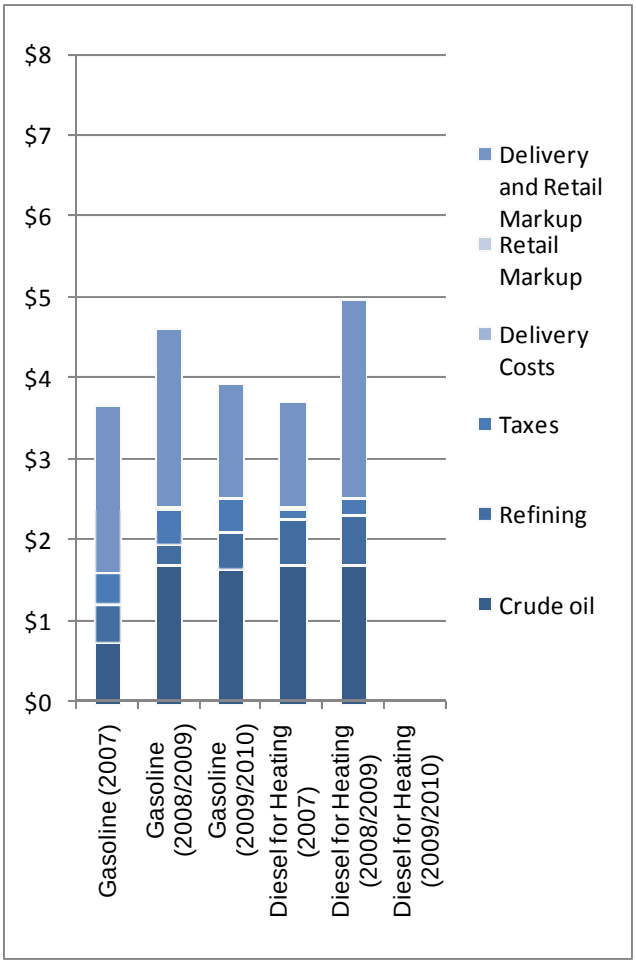
In November 2007, gasoline retailed for $3.67 per gallon and fuel for heating (DF #1) for $3.72 per gallon. In January 2009, gasoline retailed for $4.64 per gallon, diesel for heating (DF #1) for $4.98 per gallon and fuel oil (DF#2) was $4.85 per gallon. In January 2010, retail price for gasoline was $3.94 per gallon, and fuel oil (DF#2) was $4.29 per gallon. The community has a 4% tax included in the price of fuel. Aspects that influence the "other costs" of fuel prices are:

Ambivalent factors:

- Fuel is sold by the Village Council.

Decreasing factors:

- Fuel transportation method is by barge, but no river barging is required and Yakutat can receive shipments from either Anchorage or Seattle, allowing for more potential fuel sources and thus, competition.
- Ice-free port allows year-round fuel deliveries.
- Large storage facility maintained by one transportation company. Large volume of fuel throughput due to Alaska Airlines' twice daily service to the community.
- Deeper harbor accessible by larger shipments.



Yakutat's most recent fuel delivery was in October 2009. Crude oil prices accounted for $1.70 of the final retail refined product price as compared to $1.72 in December 2008. In August 2009, crude oil prices had decreased by $0.07 or 4% per gallon. From November 2007 to January 2009 retail prices for gasoline increased 0.97 or 26% per gallon, and by January 2010 prices decreased $0.70 or 15% per gallon. Between November 2007 and January 2009 heating fuel (DF#1) increased $1.26 or 34% per gallon. And between January 2009 and January 2010 the price for fuel oil (DF#2) increased $0.43 or 37% per gallon.

Method

Data on the price of fuel and the components of that price were collected for the ten communities in November 2007. In January 2009 a second update on fuel price data was collected for the ten communities that confirmed many of the characteristics of fuel purchases and sales remained the same as in fall 2007, and recorded any significant changes. In this third update, fuel price data was collected between the November 2009 and January 2010. The methods and questions about fuel prices used were the same for the November 2007 and January 2009 update. In this January 2010 update, in order to provide a more accurate portrayal of these communities part of the methodology has been refined but remained consistent with the previous reports. The first report on the components of delivered fuel costs in Alaska released in June 2008 can be viewed on the ISER webpage: (http://www.iser.uaa.alaska.edu/Publications/Finalfuelpricedelivered.pdf). And the second update released in January 2009 can be viewed at (http://www.iser.uaa.alaska.edu/Publications/fuelpricedeliveredupdate.pdf**).**A research summary with interactive maps and maps of fuel delivery to each study community can be viewed at: http://www.iser.uaa.alaska.edu/Home/ResearchAreas/fuelcosts2.html

In the November 2007 analysis, crude oil and refinery gate prices were relatively stable and communities had received their winter fuel supplies. As a result, we did not ask for specific fuel delivery dates for each community. Given the dramatic escalation of crude oil prices peaking in July 2008 (~$140/ barrel) and the crash in prices over the fall (~$34 in January 2009), the timing of when communities ordered and received fuel and how they priced remaining inventories most likely had a significant impact on retail prices. However, most of the survey respondents did not have sufficient information on these details. Given the variability in both delivery timings and rapidly changing prices, for the January 2009 update we recorded the most recent fuel delivery date and collected crude oil and refinery gate prices for that month. While we did not know community fuel tank inventories at the time of delivery or the lags between orders and deliveries among the communities, this simple approach attempts to determine the extent to which rapidly changing crude oil and refinery gate prices affect delivered retail fuel prices. For this January 2010 update, we used the same methodology of recording the disclosed most recent delivery and arbitrarily lagged crude oil and refining cost one month to allow for differences in pricing between delivery and ordering and transportation. Angoon and Yakutat were lagged two months as supported by our findings.

We also used different data sources for crude oil and refinery rack wholesale prices. In the initial report, we used Refiner Acquisition Cost of Crude Oil for PADD 5 (West Coast), and Refiner Petroleum Product Prices by Sales Type, Sales for Resale, Alaska, both from the U.S. Energy Information Administration. However, these data series at the time of writing for the January 2009 were complete only through October, 2008. Therefore, we used the best available data available through January 2009: weekly spot prices for U.S. crude oil from EIA, and wholesale rack prices for Anchorage from the Oil Price Information Service. For consistency, we changed the 2007 numbers in the matrix and charts to use the same datasets. We believe this approach allows for a fair comparison of figures for 2007 to the same data for 2008/2009. In this update we continued to use the same methodology: weekly spot prices for U.S. crude oil from EIA, and wholesale rack prices for Anchorage and Anacortes from the Oil Price

Information Service. A notable change is that because Angoon and Yakutat have the unique ability to purchase fuel from Anacortes, for this report we use the Anacortes ultra low sulfur #1 and #2 refining cost estimates from the Oil Price Information Service (all three years have been updated to reflect this change).