# ENERGY AND ECONOMIC IMPACTS OF COAL IN INTERIOR ALASKA

**FINAL REPORT | JANUARY 2022**

**PREPARED FOR:**
**Usibelli Coal Mine**

USIBELLI COAL MINE

McKINLEY RESEARCH GROUP, LLC
*Formerly McDowell Group*

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# Executive Summary

Usibelli Coal Mine (UCM) contracted with McKinley Research Group (formerly McDowell Group) to profile the role of coal in Interior Alaska's energy infrastructure and assess the economic impact of coal in the region. UCM is the state's only operating coal mine, producing approximately one million tons of coal annually, all of which is used to power Interior Alaska. The mine is near Healy, Alaska, about 115 miles south of Fairbanks and 10 miles north of the entrance to Denali National Park.

Several key factors make coal well-positioned to continue meeting the energy needs of Interior Alaska:

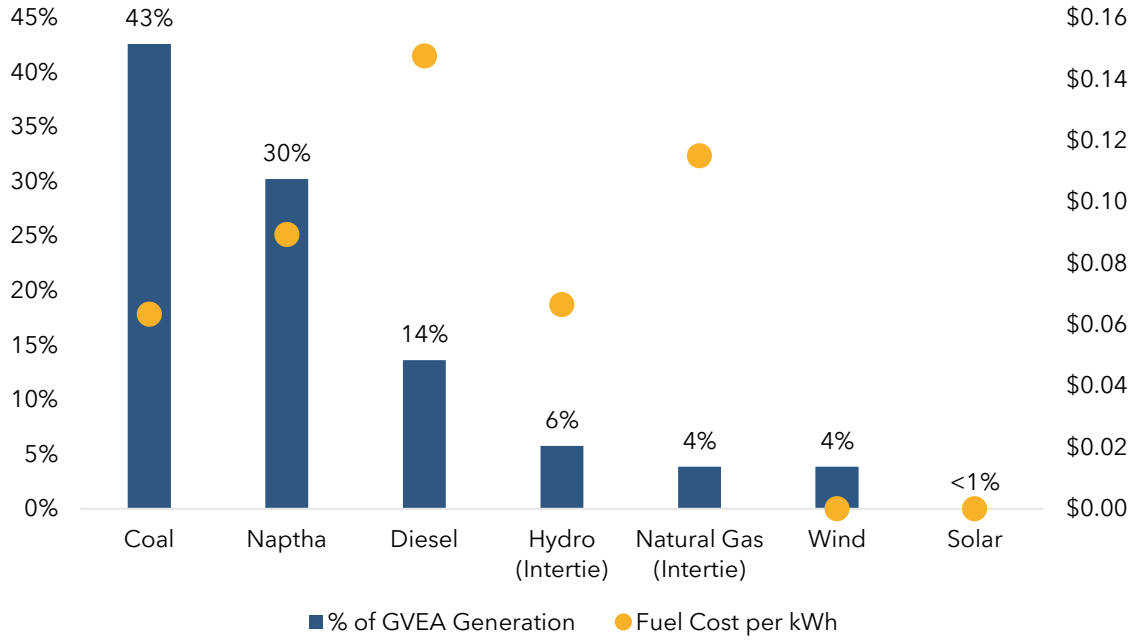
- Coal is Interior Alaska's **lowest-cost source of energy**. Further, as a reliable and low-cost source of energy, coal supports stable consumer prices relative to heating oil, naphtha, or natural gas. With hundreds of years of coal resources available and established infrastructure, coal prices in the Interior are likely to **remain stable** into the future.
- Close proximity of Golden Valley Electric Association's (GVEA's) plants to the mine and other power plants' ability to stockpile coal are important to the region's **energy security**.
- The Interior has the advantage of access to high-quality, **ultra-low sulfur coal** and **improvements in coal technology** now offer more efficient, cost-effective ways to use the resource.

## Coal in Interior Alaska

Coal-fired plants are a backbone of energy generation in Interior Alaska. In 2020, all coal-fired plants (GVEA, Fort Wainwright, Eielson Air Force Base, UAF, and Aurora Energy) accounted for 50% of electricity generation in the region, followed by naphtha (26%), and diesel (12%) fuel sources. Interior communities are connected to Southcentral Alaska via one 75-megawatt (MW) electric transmission line and availability of power over the line is not guaranteed.

The price advantage of coal over other fuels helps to stabilize energy rates in the region. In 2020, fuel costs averaged $0.06 per kilowatt hour (kWh) at GVEA's coal-fired plants, compared to $0.15/kWh for diesel. The following graph shows the percentage of electricity generated by GVEA by fuel source.

### Percentage of GVEA Electricity Generation and Fuel Cost per kWh, 2020, By Energy Source

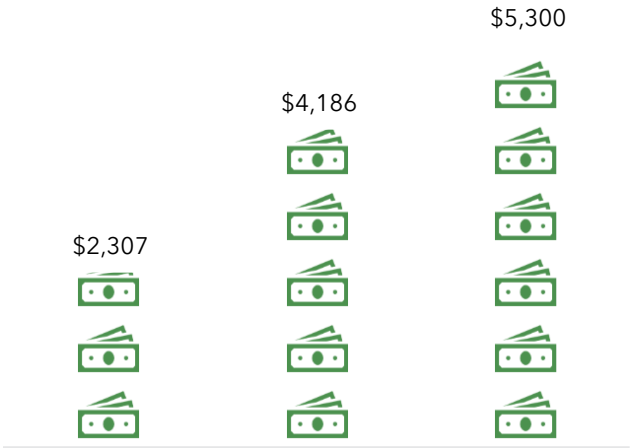



Source: GVEA's *2020 Annual Report* to the Regulatory Commission of Alaska.
Notes: Fuel cost per kWh equals the purchase price per kWh for hydro- and natural gas-generated electricity purchased from Southcentral Alaska; coal fuel cost per kWh based on generation at Healy Units 1 and 2.

Cogeneration plants using coal also provide lower-cost heat for the region's military installations (Eielson Air Force Base and Fort Wainwright Army Post), University of Alaska Fairbanks (UAF), and about 200 homes and businesses in downtown Fairbanks.

Interior Alaska's cold climate and remote location drive high energy demands and costs in the region. Residents face annual energy costs double the national average, $5,300 annually for Fairbanks North Star Borough residents compared to the U.S. average of $2,307.

**Average Annual Single-Family Home Energy Cost**




Source: Alaska Housing Finance Corporation, 2018.

Given coal's price advantage over other fuels in Interior Alaska, the absence of coal from the region's energy mix would significantly increase costs, which would likely be passed on to consumers. In the short-term, replacing coal with alternate fuels (i.e., naphtha and heating oil/diesel) would increase costs by more than $242 million in fuel alone each year. Additionally, investments in heat and electricity-generation infrastructure would be necessary in the absence of coal, especially at the region's military installations including Fort Wainwright, which has no alternative source of heat.

Although natural gas prices have declined in recent years, switching from coal to natural gas would require hundreds of millions of dollars in additional investments to bring the necessary fuel supply to the Interior. The impact on energy costs of constructing an LNG pipeline to the Interior is difficult to forecast but piped natural gas would likely be cheaper than diesel, naphtha, or trucked natural gas, yet still more expensive than coal or district heat. Natural gas use for residential heat has expanded in recent years, yet household costs to convert from heating oil to natural gas remain a barrier to adoption of this fuel source in Interior Alaska.

## Economic Impacts of Usibelli Coal Mine

In business since 1943, UCM has long generated economic activity in Interior Alaska. With volatile oil prices and a depressed tourism season, the recent effects of the COVID-19 pandemic highlighted the economic stability resulting from mine operations and coal-fired power production in the region.

UCM creates a range of *upstream* economic impacts as they hire locally and spend money in the Alaska economy to buy goods and services. The mine's *multipliers* (indirect and induced impacts) are high relative to many other sectors in Alaska mainly because of UCM's high level of in-state spending on goods and services relative to direct jobs at the mine and the mine's high average wages.

- In 2020, UCM directly employed an average 102 workers who earned $13.4 million in wages. Average wages of UCM employees are among the highest in Interior Alaska and were 90% above the average statewide wage in 2020.
- The mine employs a 100% Alaskan workforce and UCM jobs are especially important in Healy where mine employees represent nearly 10% of the community's population.
- In 2020, the mine spent $28.4 million with more than 285 Alaska vendors to purchase goods and services. About 90% of in-state spending was with companies or organizations based in the Interior or Anchorage area.
- Shipping coal from the mine to power producers is an important part of the Alaska Railroad Corporation's (ARRC's) freight business. In 2020, 690,000 tons were shipped via rail, 27% of total tonnage moved by ARRC.
- As UCM pays employees and spends money in the Alaska economy, the mine creates indirect and induced economic impacts. Including all direct, indirect, and induced employment in 2020, UCM accounted for about 232 jobs and $20.6 million in annual wages in Interior Alaska. Statewide, the mine's impact included a total 322 jobs and $26.4 million in wages.
- UCM's economic impact includes financial support of nonprofit organizations through The Usibelli Foundation (TUF), which contributed $120,000 to more than 100 nonprofits in 2020.

Production of coal in Interior Alaska comes with important *downstream* economic impacts as power producers use the fuel to generate heat and electricity.

- In 2020, 232 jobs were associated with coal-fired power generation in the Interior related to power plants operated by GVEA, UAF, military bases, and the Aurora Power Plant.
- These power plant employees earned an estimated $22.2 million in annual wages in 2020.

(*See summary table on next page.*)

### Summary of UCM Economic Impacts, 2020

| | Interior Alaska | Statewide |
|---|---|---|
| **Upstream Impacts** | | |
| **Jobs** | | |
| Direct | 102 | 102 |
| Indirect & induced | 130 | 220 |
| **Total Upstream Jobs** | **232** | **322** |
| **Wages ($ millions)** | | |
| Direct | $13.4 | $13.4 |
| Indirect & induced | $7.2 | $13.0 |
| **Total Upstream Wages** | **$20.6** | **$26.4** |
| **Downstream Impacts** | | |
| Coal-fired power plant employment | 232 | 232 |
| Coal-fired power plant wages ($ millions) | $22.2 | $22.2 |
| **Total UCM-related Impacts** | | |
| Upstream and downstream jobs | 464 | 554 |
| Upstream and downstream wages ($ millions) | $42.8 | $48.6 |

# Introduction

This report profiles the role of coal in meeting Interior Alaska's electricity needs and explores the impact of a scenario in which coal is replaced within the region's energy system by alternative fuels, including diesel and natural gas. The study also examines the economic impacts of coal mining in the region.

The Interior Alaska region – including the Denali Borough, Fairbanks North Star Borough (FNSB) and nearby areas along the Parks and Richardson Highways – faces a paradoxical energy situation. While more than 500,000 barrels of crude oil run through the nearby Trans-Alaska Pipeline System every day, businesses and residents struggle with some of the highest costs of energy in the nation as a result of heavy reliance on costly petroleum products.

Residential rates for electricity in the region are $0.23 per kilowatt hour (kWh), compared to $0.20 in Anchorage, $0.12 in Juneau, and a U.S. average of $0.14.[1] With comparatively low prices, coal-fired generation helps to stabilize the region's high electricity rates. Fuel oil is the predominant fuel used in residential space heat in the region. At $2.34 per gallon, the price of fuel oil is volatile and can spike considerably when oil prices are high.[2] Unlike other fuels, coal has provided a steady, low-cost source of energy for Interior Alaska.

## Overview of Usibelli Coal Mine

In operation since 1943, Usibelli Coal Mine (UCM) is the state's only active coal mine and supplies 100% of the coal used to generate electricity and heat in Interior Alaska. The mine is in Healy, 115 miles south of Fairbanks and 10 miles north of Denali National Park.


Annual production has ranged from 1 to 2 million tons, with production declines in recent years directly related to changes in the export market. About one

[1] Based on residential utility rates per kWh from Golden Valley Electric Association (June 2021), Chugach Electric South District (July 2021), Alaska Electric Light & Power (July 2021), and U.S. Energy Information Administration (May 2021).
[2] Alaska Department of Commerce, Community, and Economic Development, Division of Community and Regional Affairs. *Alaska Fuel Price Report: Current Community Conditions – July 2020*. Based on Fairbanks price.

million tons of coal are produced annually for use in Interior Alaska – with about 30% consumed at a power plant near the mine and the remainder shipped to Fairbanks-area power plants via the Alaska Railroad Corporation (ARRC).

Historically, the mine has exported coal via the ARRC's coal-loading facility in Seward to mostly Asian markets. Since August 2016, the coal loading facility in Seward has remained idle and is expected to remain so until a viable export market returns.

**Table 1. Alaska Coal Production and Transportation, 2011-2020 (thousand short tons)**

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Alaska Coal Production** | | | | | | | | | | |
| UCM | 2,220 | 2,019 | 1,600 | 1,500 | 1,177 | 930 | 873 | 934 | 983 | 1,021 |
| **Coal Shipped by Alaska Railroad** | | | | | | | | | | |
| In-state (Healy-Fairbanks area) | 836 | 838 | 793 | 766 | 796 | 698 | 696 | 647 | 669 | 690 |
| Export (Healy-Seward) | 1,195 | 961 | 634 | 513 | 137 | 72 | 0 | 0 | 0 | 0 |

Sources: Usibelli Coal Mine; Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys.

## Methods and Sources

This study uses data from a variety of sources. UCM provided data on direct employment, wages, benefits, goods and services purchases, and tax payments. Other secondary data sources include the U.S. Energy Information Administration; U.S. Bureau of Economic Analysis; the Alaska departments of Labor and Workforce Development, Natural Resources, and Commerce, Community, and Economic Development; and the Regulatory Commission of Alaska. McKinley Research Group conducted interviews with energy producers in Interior Alaska and other stakeholders. IMPLAN, an industry-standard input-output economic modeling tool, was used to assess the mine's multiplier effect on Alaska and the local economy.

Special thanks to the following organizations interviewed for this research:

- Doyon Utilities, LLC (DU)
- United States Air Force – Eielson Air Force Base (EAFB)
- Golden Valley Electric Association (GVEA)
- University of Alaska Fairbanks (UAF)

# Chapter 1: Interior Alaska's Existing Energy Infrastructure and Supply

Interior Alaska relies on a complex blend of fuel sources and energy products. GVEA provides electricity to most residences and commercial buildings in the region, using a mix of coal, naphtha, diesel, wind, and solar resources.

Fuel oil sold by a network of local distributors is the primary source of residential heating. A limited amount of wood, natural gas, electricity, and other sources are used for heating homes as well as small commercial buildings. A few large energy users in the region, including the military and UAF, produce their own heat and electricity with coal cogeneration plants.

The following sections describe the utilities and fuel sources serving Interior Alaska.

***What is a cogeneration plant?***

A cogeneration plant captures heat produced during electricity generation and distributes that heat to buildings and other consumers in the surrounding area. Cogeneration plants are often referred to as Combined Heat and Power Plants (CHPP).

## Utilities

Four main power producers serve Interior Alaska with electricity, including GVEA, Doyon Utilities (DU), the U.S. Air Force, Aurora Energy LLC, and UAF.

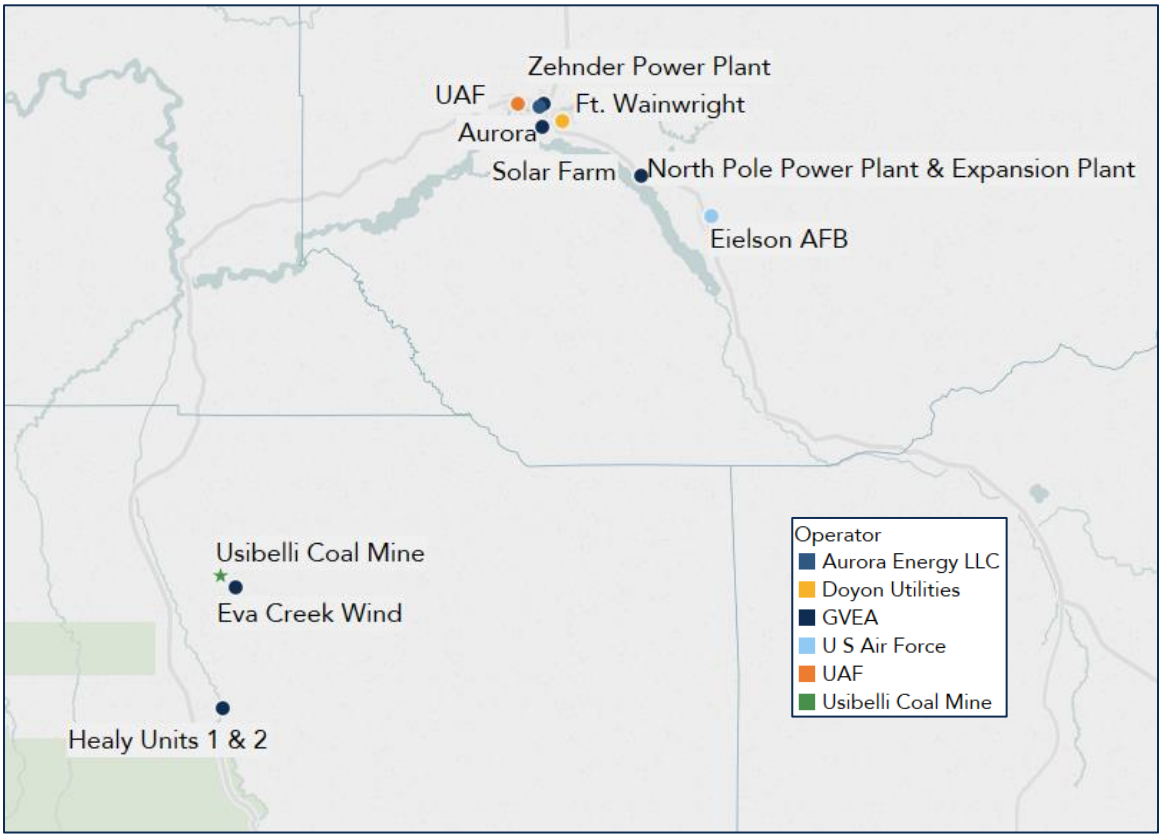
- GVEA – a member-owned, not-for-profit electric cooperative – provides electricity to more than 36,000 residential member accounts, 6,400 small commercial accounts, and 500 large commercial accounts in the Fairbanks area. GVEA's largest industrial customer is the Fort Knox gold mine operated by Kinross Alaska, which accounts for roughly 15% of GVEA's annual electricity sales.[3] The utility maintains roughly 3,300 miles of transmission line over a service area of nearly 6,000 square miles.
- Aurora Energy LLC operates a coal-fired cogeneration plant that sells wholesale electricity to GVEA and supplies heat (as steam or hot water) to roughly 200 residential and commercial customers in the downtown Fairbanks area.
- DU owns and operates a coal-fired cogeneration plant that produces electricity and heat for use at Fort Wainwright Army Base. DU also owns and operates a diesel-fired plant that fulfills the heating needs of Fort Greely, in addition to providing a source of supplemental and

[3] McDowell Group. *Socioeconomic Impacts of the Fort Knox Mine*. April 2020.

backup electricity. DU has 50-year contracts set to expire in 2057 with the U.S. Department of Defense for three army posts (Fort Wainwright, Fort Greely, and Joint Base Elmendorf and Fort Richardson (JBER) in Anchorage).

- The U.S. Air Force operates a coal-fired cogeneration plant that produces electricity and heat for use at Eielson Air Force Base (EAFB).
- UAF operates a coal-fired heat and power cogeneration plant to service its large campus with reliable energy. In addition to coal, UAF's plant also relies on heating fuel and trucked natural gas to fuel two auxiliary boilers.
- Interior Gas Utility (IGU) is the region's only regulated natural gas utility. Operating as a public corporation, IGU was developed to accelerate the conversion of heating systems to natural gas in the Fairbanks North Star Borough (FNSB). The utility serves about 1,400 residential and commercial customers. In 2021, IGU completed construction of a 5.25 million gallon liquified natural gas (LNG) storage tank in North Pole and entered a five-year supply contract with Hilcorp Alaska, which supplies natural gas from Southcentral Alaska.

**Figure 1. Energy Generation Infrastructure in Interior Alaska**




Source: McKinley Research Group.

# Fuels for Electricity Generation

Electricity used in the Interior is produced mainly from fossil fuels. Coal, diesel, naphtha, and natural gas power 90% of the electricity sold by GVEA. Hydroelectric-generated electricity transmitted from Southcentral and wind and solar resources complete the portfolio.

Despite having just under 100,000 residents, the region has 12 major facilities that produce electricity. Compared to other population centers, this ratio is unusually high – a result of the unique needs of the region's military installations as well as the economics of cogeneration facilities in a subarctic climate.

Various fuel sources used for electricity generation are describe below.

## Coal

- EAFB's cogeneration plant has a capacity of 25 megawatts (MW). The plant burns about 170,000 tons of coal annually.[4] The installation's energy demand and coal consumption have increased over the last year due to EAFB's expansion to accommodate two squadrons of F-35s.
- DU's 20-MW cogeneration plant produces heat and electricity for Fort Wainwright. The facility's four coal units came online in 1955 and use about 250,000 tons of coal annually. In 2020, the U.S. Department of the Army released a draft environmental impact statement (DEIS) outlining several alternatives to address heat and power plant upgrades at Fort Wainwright.
- UAF's 17-MW cogeneration plant used about 80,000 tons of coal in 2020 to provide heat and electricity for the university. Fully operational in February 2020, the new plant uses newer, more efficient technology compared to the decommissioned plant, which came online in 1964.
- Located in downtown Fairbanks, the privately-owned Aurora Energy cogeneration plant provides space heating for buildings in downtown Fairbanks and electricity, which is sold to GVEA. The 28-MW plant burns about 220,000 tons of coal annually.
- GVEA operates two coal plants near UCM. Operating since 1967, the 25-MW Healy Unit 1 plant used about 180,000 tons of coal in 2020. Following upgrades, the 50-MW Healy Unit 2 plant resumed operations in late 2018. Healy Unit 2 burned about 170,000 tons of coal in 2020.

[4] U.S. Energy Information Administration.

## Diesel

GVEA is the primary utility-scale diesel fuel user in Interior Alaska.

- Built in 1976, GVEA's diesel-fired North Pole Power Plant has capacity to generate about 120 MW of electricity.
- GVEA operates the 41-MW diesel-powered Zehnder Power Plant, located in downtown Fairbanks.
- GVEA's Delta Power Plant provides diesel-generated electricity to the Delta Junction area when the area experiences transmission outages.
- Including all diesel plants, GVEA burned about 17.1 million gallons of diesel in 2020, up from about 10.0 million in 2019.

## Naphtha

- GVEA's 60-MW North Pole Expansion Power Plant runs on naphtha, a petroleum fraction, supplied by a 600-foot pipeline from the neighboring Petro Star refinery. GVEA and Petro Star entered into a 12-year naphtha supply agreement in 2016. The plant used about 28.1 million gallons of naphtha in 2020, up slightly from 25.7 million in 2019.
- Another turbine can be added to double generation at the North Pole Expansion Plant in the event of increased demand. The plant can also be retrofitted to burn natural gas if a steady supply becomes available.

## Natural Gas and Hydroelectric

In 2020, about 10% of GVEA's electricity was purchased from Southcentral utilities that rely on Cook Inlet natural gas and hydroelectric resources. Two interties facilitate this transmission. Completed in the 1980s, the Railbelt Intertie runs from Wasilla to Healy and provides 70 MW of transmission capacity. Completed in 2003, the Northern Intertie provides a second transmission route from Healy to Fairbanks. Combined, the transmission lines provide about 140 MW of capacity between Healy and Fairbanks.

In addition to natural gas, GVEA also purchases hydroelectric-generated electricity from the 120-MW Bradley Lake Project. Located near Homer, the project is owned by the Alaska Energy Authority (AEA) and generates power for six utilities. GVEA is allocated 17% (20 MW) of the dam's output, which is transmitted via the Intertie connecting Southcentral and Interior Alaska. In 2020, AEA completed the West Fork Upper Battle Creek Diversion project, which diverts runoff into Bradley Lake, increasing the dam's energy production capacity by about 10%.

### Renewable Energy

GVEA has integrated generation from variable, renewable energy sources into the utility's energy mix.

- The GVEA-owned Eva Creek Wind Farm is Alaska's largest, with 25 MW of generation capacity. Located North of Healy, the 12-turbine wind farm was completed in 2012.
- GVEA completed construction of a 563-kW solar farm in Fall 2018.
- Through GVEA's Sustainable Natural Alternative Power (SNAP) program, members who own small-scale renewable energy systems such as solar panels or wind turbines can sell excess power to the grid. As of January 2021, 476 members with a combined capacity of 2,509 kW participated in this "net metering" program.[5]

**Table 2. Summary of Utility-Scale Interior Electricity Generation Infrastructure, 2020**

| Fuel | Number of Plants | Capacity (MW) | Percent of Total Capacity | Percent of Total Generation |
|---|---|---|---|---|
| Diesel | 4 | 196 | 37% | 12% |
| Coal | 6 | 177 | 33% | 50% |
| Intertie | - | 70 | 13% | 9% |
| Naphtha | 1 | 60 | 11% | 26% |
| Wind | 1 | 25 | 5% | 3% |
| Solar | 1 | 0.5 | <1% | <1% |
| **Total** | **13** | **529** | **100%** | **100%** |

Source: McKinley Research Group estimates based on data from U.S. Energy Information Administration, GVEA, and other power producers.
Note: Intertie capacity refers to transmission system capacity from Southcentral to Interior Alaska, which includes hydroelectric and natural gas-generated purchases.

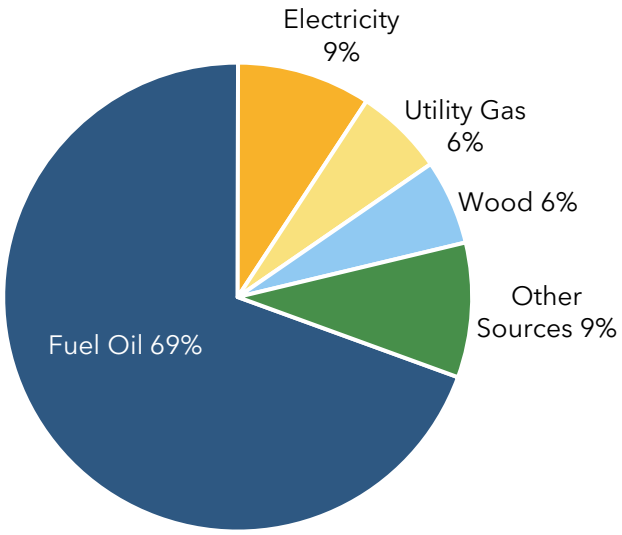
## Fuels for Generating Heat

Interior Alaska's cold climate drives intense heating energy needs. The amount of heat required in a region can be expressed in terms of heating degree days (HDD). This is a measurement of the amount of energy required to maintain a comfortable temperature (65˚F) inside a building relative to outside temperatures. A region like Hawaii requires 0 HDD, because the average daily temperature is above 65˚F, while Seattle requires 5,000 HDD. Across Alaska, annual HDD range from lows of 7,000 in Southeast Alaska up to 20,000 on the North Slope.[6] With Interior Alaska at 14,000 HDD each year, a building in Fairbanks would require almost three times the heat to maintain a comfortable temperature compared to a similar building in Seattle.

[5] Golden Valley Electric Association. *SNAP: GVEA's Renewable Energy and Net Metering Program*. Accessed September 2021.
[6] Alaska Housing Finance Corporation. *Alaska Housing Assessment*. 2018.

Fuel oil is the main fuel source used to meet residential space heat demand in Interior Alaska. Across the region, coal and natural gas also contribute to nonresidential space heat.

**Figure 2. Home Heating Fuel, Percentage of Homes, Fairbanks North Star Borough, 2019**




Source: U.S. Census Bureau, American Community Survey, 2015-2019 5-Year Estimates.

## Fuel Oil

About 70% of FNSB homes use fuel oil as a primary source for home heating.[7] Households purchase fuel oil through local distributors. While no specific data are available for public and commercial buildings – such as schools, stores, and office buildings – the percentage relying on fuel oil is likely to be lower than that for homes. A significant number of commercial buildings are clustered in areas that have alternative sources of heat available, such as natural gas (available in parts of downtown Fairbanks) or district steam/hot water heat from coal cogeneration facilities. Additionally, because the average commercial building requires more heat than the average residential structure, the economics of alternative fuel sources can be more favorable.

DU operates three boilers at Fort Greely, supplying heat to the base through a steam heat distribution system. The boilers were installed in 1954 and run on Jet A-50 fuel. They can produce a combined total of 150,000 pounds of 120-pounds per square inch (psi) steam per hour. The heat distribution system is also used for freeze protection for water and sewer lines in utility corridors.

[7] U.S. Census Bureau, American Community Survey. 2015-2019 5-Year estimates.

## Natural Gas

About 1,400 residential and commercial customers are currently using natural gas for heating in the Fairbanks area.[8] Access to natural gas has expanded over the last several years as IGU continues to build distribution infrastructure.

Natural gas must be liquified and trucked to the Interior from Southcentral Alaska. Declines in Cook Inlet natural gas supply continue to constrain the fuel's availability in Interior Alaska. In 2021, IGU signed a new natural gas supply contract with Hilcorp Alaska LLC, the largest gas producer in Cook Inlet. The utility also holds a new contract with Cryopeak, a company operating a Canadian LNG plant, to secure a back-up natural gas supply.[9]

## Coal

Except for GVEA's Healy plants, the coal-fired plants in Interior Alaska are cogeneration plants producing electricity and heat. Cogeneration plants produce steam that is run through a turbine to generate electricity and distributed via underground pipes to heat nearby buildings. Local building owners find district heating attractive because of its affordability and reduced maintenance requirements.

Coal cogeneration technology provides heat for several large Interior energy consumers, including Eielson Air Force Base and Fort Wainwright military installations. The Aurora Energy plant sells steam and hot water for heating to roughly 200 homes and commercial establishments in the core of Fairbanks.

## Other Sources

Many residential buildings augment oil use with wood or pellets. A small number of residential and light commercial customers are using outdoor boilers that burn coal and/or wood. A total of 17 No Other Adequate Source of Heat (NOASH) waivers, were issued in the Fairbanks North Star Borough in 2020/2021. These waivers exempt residents with only coal and/or wood boilers from burn bans and indicate the number of residents or commercial users reliant solely on coal and/or wood boilers.[10] Other fuel sources, such as electricity, solar thermal, and propane, complete the types of fuel that are used for heating in the Interior.

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[8] Interior Gas Utility. *Quarterly Report to the Alaska State Legislature*. July 2021.
[9] Ibid.
[10] A total 48 NOASH waivers were issued in 2019/2020. Additional waiver requirements were added in 2020/2021 which may account for differences in the number of issued waivers. Based on communications with the Alaska Department of Environmental Conversation.

# Chapter 2: The Cost of Energy in Interior Alaska Today

Interior Alaska's remote geography, limited energy infrastructure, and harsh climate contribute to the region's high energy costs, which are among the nation's highest. FNSB single-family households pay an average $5,300 in energy costs each year, around 25% higher compared to the statewide average ($4,186) and 130% higher than the national average ($2,307).[11]

This chapter describes electric and home heating energy costs in the region.

## Electricity Costs

Electricity rates across Alaska are generally high. In Interior Alaska, residential rates have regularly been more than 1.5 times the average national rate.

**Table 3. Average Residential Electricity Rate per kWh, Selected Areas, 2021**

| Location | Cost per kWh | % Difference from National Average |
|---|---|---|
| Hawaii | $0.33 | +139% |
| Alaska statewide average | $0.23 | +68% |
| **Interior Alaska** | **$0.23** | **+65%** |
| Anchorage (North District/South District) | $0.17/$0.20 | +24%/+48% |
| U.S. Average | $0.14 | - |
| Juneau (Nov.-May Peak/June-Oct. Off-Peak) | $0.12/$0.10 | -16%/-31% |
| Washington State | $0.10 | -26% |

Sources: GVEA, June 2021; Chugach Electric, July 2021; AEL&P, July 2021; U.S. EIA, May 2021.
Note: EIA data on Alaska, Hawaii, Washington, and U.S. Average based on May 2021 cost per kWh.

GVEA actively manages its generation and power purchase options to meet demand while minimizing costs. Fuel price (or purchased power price in the case of the Intertie) is the driving factor in these decisions, as other fixed costs will be incurred regardless. Cheaper fuel sources, such as coal and naphtha, are used first, followed by more expensive fuel sources, such as diesel, as demand increases. Some diesel power is required to facilitate integration of variable power sources (wind, solar) into GVEA's grid.[12]

[11] Alaska Housing Finance Corporation. *Alaska Housing Assessment*. 2018.
[12] Other GVEA electricity sources are too slow to adjust to fluctuations in wind or solar production, as coal plants take longer to ramp up and power purchases via the Intertie must be scheduled a day in advance.

With the addition of generation from the Healy 2 plant, coal increased as a percentage of GVEA's generation mix between 2018 and 2019. Availability of generation from Healy 2 has also impacted GVEA's demand for electricity transmitted from Southcentral, declining from 15% (combined natural gas and hydro) in 2019 to 10% in 2020.

**Table 4. Percentage of GVEA Total Generation, by Energy Source, 2017 to 2020**

| Energy Source | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|
| Coal | 26% | 34% | 43% | 43% |
| Naphtha | 25% | 21% | 28% | 30% |
| Natural Gas (Intertie) | 29% | 27% | 12% | 4% |
| Diesel | 9% | 7% | 8% | 14% |
| Wind | 4% | 5% | 5% | 4% |
| Hydro (Intertie) | 6% | 4% | 3% | 6% |
| Solar | 0% | <1% | <1% | <1% |

Sources: Various GVEA annual reports.

Coal is a substantially lower-cost source of electrical energy compared to other non-variable sources of power in Interior Alaska. Hydroelectric energy is the only steady source of energy with a comparable price, yet supply is limited by the capacity of transmission infrastructure linking Interior and Southcentral Alaska. While variable energy sources such as wind and solar come with no fuel costs, these sources cannot supply the level of stable energy required in the region.

In contrast to oil prices, coal prices have been relatively steady over the past decade. In 2020, significant oil price shocks reduced the cost of diesel and naphtha. These short-term price declines are not expected to permanently reduce the cost of these fuel sources for utilities such as GVEA. The following table describes the fuel cost per kWh incurred by GVEA when the utility generates electricity and the purchase price per kWh paid by GVEA to other producers. In both 2019 and 2020, coal was the least expensive fuel source per kWh among non-variable fuel sources.

**Table 5. GVEA Average Fuel and Purchase Cost per kWh by Fuel Type, 2019 and 2020**

| Energy Source | Fuel Cost per kWh for Electricity Generated by GVEA | | Purchase Cost per kWh for Electricity Purchased by GVEA | |
|---|---|---|---|---|
| | 2019 | 2020 | 2019 | 2020 |
| Coal | $0.07 | $0.06 | $0.09 | $0.09 |
| Naphtha | $0.11 | $0.09 | - | - |
| Natural Gas (Intertie) | - | - | $0.10 | $0.12 |
| Diesel | $0.23 | $0.15 | - | - |
| Wind | $0.00 | $0.00 | - | - |
| Hydro (Intertie) | - | - | $0.09 | $0.07 |
| Solar | $0.00 | $0.00 | - | - |

Sources: GVEA Annual Reports 2019 and 2020.

# Heating Costs

Fuel oil has long been the most common form of residential space heat in the FNSB, with about 70% of homes using this heat source.[13] Electricity (9%), wood (6%), and natural gas (6%) fuel most of the remaining homes. About 2% of borough homes are heated using a coal-burning appliance.

Fuel oil is the cheapest source of widely available, convenient heat in the region. While cheaper, fuels such as coal and wood require more handling. Other less expensive sources, such as district steam and natural gas, are available only in limited areas. In general, home heating conversion from heating oil also requires homeowner investment and can be cost-prohibitive without specialized programs or incentives.

### Table 6. Residential Heating Costs by Fuel Type, Fairbanks North Star Borough, Fall 2020

| Fuel | Cost per Unit | Heat Content per Unit (Btu) | Appliance Efficiency (Percent) | Cost per Million Btu | Estimated Annual Cost |
|---|---|---|---|---|---|
| Electricity | $0.22/kWh | 3,413 | 100% | $65.37 | $12,224 |
| Propane | $3.91/gallon | 91,333 | 85% | $50.37 | $9,419 |
| Cordwood, Spruce | $294/cord | 15,000,000 | 70% | $27.98 | $5,232 |
| Natural Gas | $20.81/mcf | 1,010,000 | 85% | $24.24 | $4,533 |
| Fuel Oil | $2.62/gallon | 135,000 | 85% | $22.86 | $4,275 |
| District Hot Water (Coal-generated) | $22.49/MMBtu | 1,000,000 | 100% | $22.49 | $4,206 |
| Wood Pellets | $278/ton | 16,000,000 | 85% | $20.42 | $3,819 |
| Cordwood, Birch | $281/cord | 20,500,000 | 70% | $19.60 | $3,665 |
| District Heat/Steam (Coal-generated) | 19.59/1,000lbs | 1,066,000 | 100% | $18.38 | $3,437 |
| **Coal (Retail)** | **$130/ton** | **15,200,000** | **55%** | **$15.55** | **$2,908** |

Sources: *Fairbanks North Star Borough Community Research Quarterly, Fall 2020*; AHFC *2018 Housing Assessment*.
Note: Based on average single-family home heating use of 187MMBtu/year.

[13] US Census Bureau, American Community Survey 2015-2019 5-Year estimates.

# Chapter 3: Interior Energy in the Future

High, variable home heating costs and fuel supply considerations have long driven interest in developing or expanding less expensive sources of energy in Interior Alaska. The future of coal in the region's infrastructure should be considered within the context of energy development projects.

## Generation

If completed, the following projects could impact the energy generation mix in Interior Alaska.

### Interior Energy Project

The Interior Energy Project (IEP) is a state-backed effort to address high energy costs in Interior Alaska, supported by state legislation and appropriations passed in 2013 and 2015. The project is focused on expanding the availability of natural gas in the Fairbanks area and bringing down the fuel's cost through economies of scale. The project has required extensive state involvement and subsidies.

**Figure 3. Interior Gas Utility's Fairbanks LNG Storage Facility**

Source: Interior Gas Utility.

In 2018, the sale of Pentex Alaska Natural Gas Company and its assets, including Fairbanks Natural Gas (FNG), to the Interior Gas Utility (IGU) consolidated the region's two service areas into a unified, municipally owned gas utility. Following consolidation in 2019, IGU completed construction of a 5.25 million gallon LNG storage tank in Fairbanks. IGU also relocated two 75,000 gallon tanks from Fairbanks to North Pole. The addition of the North Pole storage capacity enables IGU to provide natural gas service to North Pole for the first time in the community's history.

Declining oil prices and resulting decreases in heating oil costs in recent years, have impacted assumptions regarding household heating conversion to natural gas. Household costs to convert to natural gas are a barrier to the adoption of this fuel in Interior Alaska. In 2020, FNSB

provided grant funding to offset the cost of converting from heating oil and wood to natural gas. All funding for the Oil-to-Gas Changeout program was expended in 2020 and no further funding is available as of September 2021.[14] Programs that provide low-cost financing options for heat conversion, such as Property Assessed Clean Energy (PACE) and on-bill financing, are being explored.

## Fort Wainwright

Fort Wainwright installation's energy needs have long been served by a coal-fired cogeneration plant constructed in 1955. In 2020, the U.S. Army published a draft environmental impact statement (DEIS) describing several alternatives to replace the existing plant. Proposed alternatives that met the Army's viability criteria include:

- *Alternative 1:* Construction of a new coal-fired cogeneration plant with additional electricity purchased from GVEA.
- *Alternative 2:* Construction of a dual-fuel plant using natural gas and diesel.
- *Alternative 3:* Transitioning to decentralized energy generation in which electricity would be purchased from GVEA and heat would be provided through a series of distributed natural gas boilers.

The DEIS did not identify a preferred alternative and the Army is currently responding to comments received on the DEIS. The DEIS identifies a "long-term, significant, localized adverse impact on coal demand" related to each of the noncoal alternatives.[15] The DEIS describes the fuel consumption required under each alternative but does not quantify the fuel cost differential between current coal costs and fuel costs under the viable alternatives.

**Table 7. Fort Wainwright Heat and Electrical Generation Upgrade Alternatives Based on Draft Environmental Impact Statement**

| Alternative | Coal (tons) | Natural Gas (mcf) | Low-Sulfur Diesel (gallons) | Purchased Electricity (MWh) |
|---|---|---|---|---|
| Existing plant | 222,000 | - | - | - |
| *Alternative 1*: Build New Coal CHPP | 161,147 | - | - | 66,000 |
| *Alternative 2*: New Dual-Fuel Combustion Turbine Generator CHPP | - | 2,620,699 | 732,000 | |
| *Alternative 3*: Distributed Natural Gas Boilers | - | 1,555,389 | 326,000 | 102,000 |

Source: U.S. Army Garrison Alaska, U.S. Army Corps of Engineers.

[14] Fairbanks North Star Borough. *Change Out Programs*. Accessed September 2021.
[15] U.S. Army Garrison Alaska, Fort Wainwright. *Draft Environmental Impact Statement Addressing Heat and Electrical Upgrades at Fort Wainwright, Alaska*. June 2020.

### Susitna-Watana Hydroelectric Project

The proposed Susitna-Watana Hydroelectric Project would create a 600-MW dam across the Susitna River. Estimated to cost $5.2 billion, the dam would provide about 50% of the Railbelt's electricity needs. While difficult to project, the wholesale rate of electricity coming from the dam was estimated to start at $0.12/ kWh dropping to a 50-year average of $0.05/kWh (in 2012 dollars).[16]

Spending on the Susitna-Watana Hydroelectric Project was halted in December 2014 by Gov. Bill Walker, citing budgetary constraints due to low oil prices and a large state budget deficit.

## Transmission

The transmission system connecting Interior to Southcentral Alaska has limited capacity, restricting opportunities for utilities such as GVEA to purchase electricity.

The Alaska Railbelt Cooperative Transmission & Electric Company (ARCTEC) – a cooperative of the six Railbelt utilities formed in 2011 – developed a list of priority projects to be completed over a decade to upgrade the Railbelt's current electrical transmission system. Projects include upgrades to assets in Southcentral ("Southern Projects"), bringing north additional capacity from Bradley Lake and projects moving north to the Interior ("Northern Projects").

***What are "firm" power sales?***

Firm power sales refer to the sale of generation capacity that is available at all times (not interruptible).

Nonfirm power sales are those that occur only when energy is available for sale from Southcentral producers to the Interior. These sales are interruptible.

ARCTEC's priorities largely align with those identified in Alaska Energy Authority's (AEA's) 2017 Railbelt Transmission Plan.[17] The priorities in common include upgrading the transmission line to Bradley Lake, adding an Intertie across Cook Inlet between Soldotna and Beluga, upgrading the transmission lines from Southcentral to Healy to 230 kV, and various other improvements.

A point of difference between the two plans regards the need for a second 171-mile power line between Southcentral Alaska and Healy. Addition of the line would increase transfer capacity from 69 MW of non-firm to more than 189 MW of firm power sales; it would cost $246 million. AEA's plan describes the benefits as follows:

[16]http://www.susitna-watanahydro.org/alaska-energy-authority-confident-susitna-watana-hydro-will-provide-long-term-stable-and-affordable-energy/.
[17] Alaska Energy Authority and Electric Power Systems, Inc., 2017. *Alaska Energy Authority Railbelt Transmission Plan. Project #15-0481*.

> *The second transmission line spanning the 171 miles between Healy and Anchorage will prevent loss of load in Fairbanks for single line outages and will allow GVEA to access electrical and gas markets in the Southcentral system. It will also allow GVEA to evaluate the most economic solution for replacement generation capacity as its power production fleet continues to age or if coal resources are retired.*

This second power line is not among ARCTEC's priority projects. Additionally, as Healy Unit 2 has come online, GVEA has reduced power purchases from Southcentral Alaska (about 35% of generation in 2017 compared to about 10% in 2020).

## Fuel Supply

For the past 50 years, multiple pipeline projects have been proposed that would bring Alaska's abundant North Slope natural gas resources to market. Interconnections would be built into any such pipeline, allowing Interior Alaska access to potentially low-cost natural gas. The impact on energy costs within the Interior is difficult to forecast but, if constructed, pipeline natural gas would likely be cheaper than diesel, naphtha, or trucked natural gas, but still more expensive than coal or district heat.

Two separate but related projects are currently being pursued by the Alaska Gasline Development Corporation (AGDC), a public corporation owned by the State of Alaska – Alaska LNG and the Alaska Stand Alone Pipeline (ASAP). According to AGDC, "while AGDC has been advancing both projects at different stages, the corporation is primarily focused on the Alaska LNG Project. ASAP remains the State's back-up project."[18]

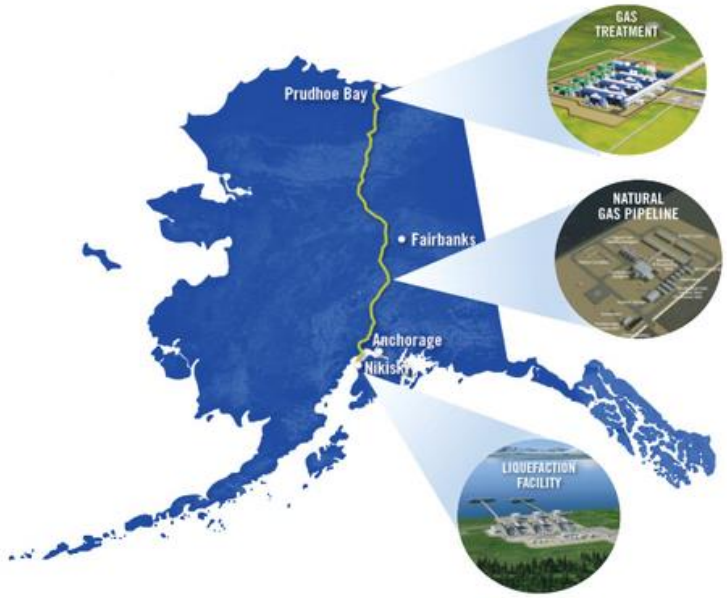
### Alaska LNG

The Alaska LNG Project proposes an 800-mile, 42-inch diameter pipeline from the North Slope to a terminal in Nikiski, where the gas would undergo liquefaction for export to international LNG markets. The project would have an estimated daily throughput of 3.3 billion cubic feet. Spurs along the main pipeline would provide natural gas for in-state consumption. In 2020, the U.S. Federal Energy Regulatory Commission (FERC) issued the final environmental impact statement (EIS) for the Alaska LNG Project and issued an authorization to AGDC for construction and operation of the pipeline. Construction costs for the entire system are currently estimated at $38.7 billion.

[18] https://agdc.us/about-us/alaska-stand-alone-pipeline-asap-project/.

A nonbinding joint development agreement signed in 2017 between AGDC and three nationalized Chinese firms for purchase of up to 75% of the LNG produced has not been renewed.[19]

### Figure 4. Alaska LNG Project Map




Source: Alaska Gasline Development Corporation.

## Alaska Stand Alone Pipeline (ASAP)

Under the ASAP Project, a 733-mile pipeline, running from the North Slope to Point MacKenzie, would bring natural gas to Interior and Southcentral Alaska. A 35-mile spur off the main line would provide natural gas to Fairbanks. The pipeline project was conceived as a means to alleviate the shortfall in Cook Inlet natural gas supply. Recent investments in Cook Inlet natural gas production have reduced the urgency of bringing North Slope natural gas to Southcentral. The project is currently on hold.[20]

[19] Elwood Brehmer, Alaska Journal of Commerce. *AGDC president outlines path forward; China deal is dead*. July 24, 2019.
[20] U.S. Energy Information Administration. *U.S. Natural Gas Pipeline Projects.* July 28, 2021.

# Chapter 4: Coal's Role in Present and Future Interior Energy Production

Coal is a vital component of Interior Alaska's heat and power generation mix. The region's energy producers rely on coal due to its affordable and stable pricing, well-developed local production and supply chain, and the ability to stockpile the quantity needed to ensure reliable energy supply. Without coal production in the Interior, energy costs would be substantially higher. The following factors are important when considering the future of energy infrastructure in the Interior:

- Coal is well-situated to continue meeting the near- and mid-term electrical generation and heating needs of the Interior and provide cost-effective energy at **stable, affordable rates**. This stability is an asset to GVEA and the military bases as price certainty resulting from long-term contracts lowers risk. With hundreds of years of coal resources available at current production levels and established infrastructure (both mining and transportation), coal prices in the Interior are likely to remain stable into the future.

- Coal technology has improved in the last 30 years and now offers more efficient and cost-effective ways to use coal. **Advanced coal technologies**, including High Efficiency, Low Emissions (HELE) and carbon capture, use, and storage (CCUS) technologies, will impact the future of coal-fired generation across the U.S. In Interior Alaska, innovative design such as that implemented at UAF's new coal-fired plant offer **improved efficiency and significant emissions reductions**, with recent particulate testing showing opacity measurements well below UAF's EPA-designated limit.

- Power producers in the region have **existing robust coal storage capacity**. For example, GVEA has capacity to store a 30-day supply of coal and military installations can have up to a 90-day supply, compared to storage for a one-week supply of diesel. The robust stockpiling capacity provides strong **energy security** to Interior Alaska.

As public debate about energy-related development occurs, especially around the role of coal, it is critical to consider the financial implications of an increase or decrease in the use of coal.

# Impact of Coal on Energy Costs

The following sections describe the short-term cost impacts of a hypothetical scenario in which coal was no longer available in Interior Alaska. These scenarios assume that, in the absence of coal, power producers would shift fuel consumption to another source already in use. In reality, the short-term impacts of a 'no coal' scenario are complex and dependent on the availability of power from Southcentral Alaska, natural gas availability and prices, and other factors. Despite this complexity, the scenarios below offer insight into the magnitude of variable cost differences between coal and other fuels.

The degree to which fuel costs would increase in the absence of coal in the Interior depends on petroleum product prices which are highly variable year to year. Prevailing fuel rates paid by Interior power producers in spring 2021 were used to estimate the costs associated with removing coal from the region's fuel mix. Where spring 2021 prices were not available from power producers, average 2020 fuel prices were adjusted to reflect the national escalation in petroleum product prices between the two years.

Delivered petroleum product prices have increased in 2021. For example, UAF purchased diesel fuel for $2.71/gallon in June 2021, a 27% increase over average 2019 prices and a 51% increase over the exceptionally low prices seen in 2020. Natural gas prices have also increased in 2021, with the University paying $17.84/Btu in July 2021, up 8% from the average of $16.50/Btu in 2019 and 2020. If the following analysis were based on average 2019 fuel prices, replacing coal with other fuel sources in Interior Alaska would result in at least $203 million in additional energy expenditures. Using more current pricing from 2021, the estimated cost of replacing coal increases to $242 million. These increases illustrate the relative volatility of petroleum-based product prices compared to coal in Interior Alaska.

Other costs – including capital, debt service, and non-fuel production/administration/other costs – are considered fixed costs for purposes of this analysis. In the longer-term, new infrastructure projects would likely be required to meet the level of energy demand required to replace coal generation. These investments could include new in-region generation capacity, Railbelt transmission line upgrades or enhancements, or new generation capacity in Southcentral.

## Golden Valley Electric Association Fuel Costs

In the absence of coal in the Interior, three coal-fired plants providing electricity for GVEA would be idled: Healy Units 1 and 2, and the Aurora Power Plant. A reduction of this magnitude would represent more than 40% of 2020 electricity production.

Under this scenario, GVEA may increase power purchases from Southcentral Alaska, transmitted via the 75-MW line linking the two regions. The level of energy needed would far outstrip the amount of energy available for purchase due to the transmission line's limited capacity alone.

The uncertain availability of purchased power due to Cook Inlet natural gas supply constraints would also impact GVEA's ability to supplant coal-fired generation with purchased power from Southcentral Alaska.

Given the uncertain availability of purchased power, it is assumed coal-fired generation would be shifted to other available GVEA capacity, mainly the North Pole Expansion Plant and the North Pole Power Plant; these facilities generated electricity at $0.09 and $0.14 cents per kWh, respectively.[21] Assuming increased costs are passed on to consumers, GVEA ratepayers would collectively pay about $131 million more annually for electricity under this hypothetical scenario.

In practice, a "no coal" scenario in Interior Alaska may result in higher demand for electricity generated by GVEA from lost Healy Units 1 and 2, Aurora Energy, university and military installation capacity, further impacting GVEA's energy mix.

## University Energy Costs

UAF consumes about 80,000 tons of coal each year to heat and power campus buildings and facilities. UAF currently spends about $4.8 million annually on coal purchases. Coal is delivered to UAF via the Alaska Railroad, incurring additional transportation expense.

If UAF was able to generate this level of energy with only heating oil, energy costs would triple. Based on spring 2021 prices paid ($2.69/gallon), UAF would pay $25.0 million to replace coal with diesel under this hypothetical scenario – an increase of $20.0 million.

## Military Energy Costs

Coal is central to energy generation at Fort Wainwright and Eielson Air Force Base. Combined, these installations use about 393,000 tons of coal annually, equivalent to about 5.9 million MMBtu of energy. The bases currently spend an estimated $23.6 million annually on coal purchases.

The loss of coal for these bases would have profound effects. While both bases could generate electricity using another fuel source or purchase power from GVEA, Fort Wainwright has no means of alternative heat generation and Eielson's diesel-fired auxiliary heating plant is not sized to heat the entire installation.[22] In a hypothetical scenario in which the bases could switch from coal to diesel, energy costs would more than triple. Based on prices paid by UAF ($2.69 per gallon), the bases would pay $115 million – an increase of $91 million.

[21] Prices are based on 2020 fuel costs as reported in the GVEA *2020 Annual Report*, filed with the Regulatory Commission of Alaska.
[22] Based on interviews with Doyon Utilities and Eielson Air Force Base personnel.

### Overall Fuel Cost Increase without Coal

More than one million tons of coal are consumed annually by Interior heat and power plants. If replacing this energy with other fuel sources were possible, energy costs in the Interior would increase by at least $242 million, based on fuel costs alone.

Again, these calculations consider only the amount of coal consumed based on 2020 energy demand and the difference between the price of coal and the price of fuel oil and naphtha in spring 2021, reflecting price disruptions due to the COVID-19 pandemic. If pre-pandemic fuel prices from 2019 were used in this analysis, the additional energy costs associated with replacing coal in the Interior would still be at least $203 million.

This analysis surely simplifies the changes that would occur in the Interior's fuel mix in the absence of coal. Replacement would include a combination of power purchases and fuel sources not modeled in detail here. The ability of Interior power plants to replace all current generation with alternative fuel sources given existing infrastructure is not certain, and the cost of constructing new infrastructure, where necessary, is not included.

**Table 8. Cost Implications of Alternative Fuel Substitutes for Coal in Interior Alaska**

| Plant | Tons of Coal Consumed | Million Btus | Cost of Coal | Alternative Fuel Source and Price | Additional Fuel Cost |
|---|---|---|---|---|---|
| UAF | 80,000 | 1,216,000 | $4.8 million | Fuel Oil ($2.69/gallon) | $20 million |
| Military Bases | 393,000 | 5,912,000 | $23.6 million | Fuel Oil ($2.69/gallon) | $91 million |
| GVEA & Aurora Energy | 569,000 | 8,270,000 | $34.7 million | Naphtha ($1.75/gallon) Fuel Oil ($2.25/gallon) | $131 million |
| **Total** | **1,042,000** | **15,398,000** | **$63.1 million** | **-** | **$242 million** |

Source: McKinley Research Group, GVEA annual report, US Energy Information Administration, and personal communications with UAF, Doyon Utilities, and Eielson AFB personnel.
Notes: Estimates based on:
a) Average coal, fuel oil, and naphtha prices paid by GVEA in 2020 (from GVEA's *2020 Annual Report* to the Regulatory Commission of Alaska), 2% coal price escalation based on communications with UCM, and fuel oil and naphtha price escalations based on national fuel price escalation between 2020 and spring 2021.
b) Average coal and fuel oil prices paid by UAF in 2021 (for UAF and military bases).
c) GVEA's alternative fuel cost estimate includes maximizing capacity at the naphtha plant and shifting the additional capacity to available diesel generation.

## Natural Gas

Natural gas is another fuel source that could potentially replace coal-fired energy generation in the Interior with additional infrastructure investments. Outside of residential use, natural gas-fired generation capacity in Interior Alaska is very limited. UAF has one dual-fuel boiler which can burn fuel oil or natural gas, although fuel oil has traditionally been preferred due to fuel

costs.[23] UAF also uses a limited amount of natural gas for startup of other boilers. As previously stated, the aging of Cook Inlet's oil and gas fields and demand in Southcentral Alaska also limit available natural gas supply to be used in Interior Alaska.[24]

Natural gas prices paid by UAF declined in recent years, down to an average of about $16.50/mcf in 2019 compared to $19.00/mcf in early 2018.[25] Price declines at times have put natural gas prices per MMBtu in parity with heating oil costs. Like other petroleum-based fuels, natural gas prices are more volatile compared to coal in Interior Alaska. The following table uses spring 2021 prices to represent just one point-in-time snapshot of how natural gas and heating oil prices compare, indicating that replacing coal-fired energy generation at UAF, Fort Wainwright, and Eielson Air Force Base with natural gas would also result in more than $92 million in additional fuel costs alone.

The level of natural gas supply required to replace this generation is not guaranteed to be available to these power producers. Switching from coal to natural gas would require significant infrastructure development to bring natural gas supply to Interior Alaska and in new or modified generation capacity.

**Table 9. Average Fuel Price, University of Alaska Fairbanks, Spring 2021**

| Fuel | Price per Unit | Heat Content per Unit (Btu) | Price per MMBtu |
|---|---|---|---|
| Heating oil | $2.69 | 127,000 | $21.21 |
| Natural gas | $17.00 | 1,000,000 | $17.00 |

Source: University of Alaska Fairbanks and McKinley Research Group estimates.
Note: Heat content per unit based on 2020 UAF performance as reported on US EIA Form EIA-923.

## Environmental Considerations

Environmental considerations regarding coal use are an important part of the discussion around the future of Interior Alaska energy supply. Current coal-fired energy technology (often referred to as HELE) offers cleaner, more efficient, and more cost-effective coal-burning equipment and processes than in the recent past. This high efficiency technology was recently implemented by UAF, whose new coal-fired cogeneration plant's innovative design and efficiency allows UAF to use 21% less coal while having the lowest fine particulate (PM2.5) emissions rate of any coal plant in the U.S.[26] Based on emissions testing in September 2021, the UAF coal plant opacity, a measure of the particulates released, averaged 0.6236%, well below UAF's EPA-designated permit limit of 20%.[27]

[23] Based on communications with UAF Facilities personnel.
[24] Alaska Department of Natural Resources, Division of Oil and Gas. *Cook Inlet Natural Gas Availability.* March 2018.
[25] Based on communications with UAF Facilities personnel.
[26] Darrell Proctor for *Power* magazine. *A Powerful Investment in Education, and the Community*. August 1, 2019.
[27] University of Alaska Fairbanks.

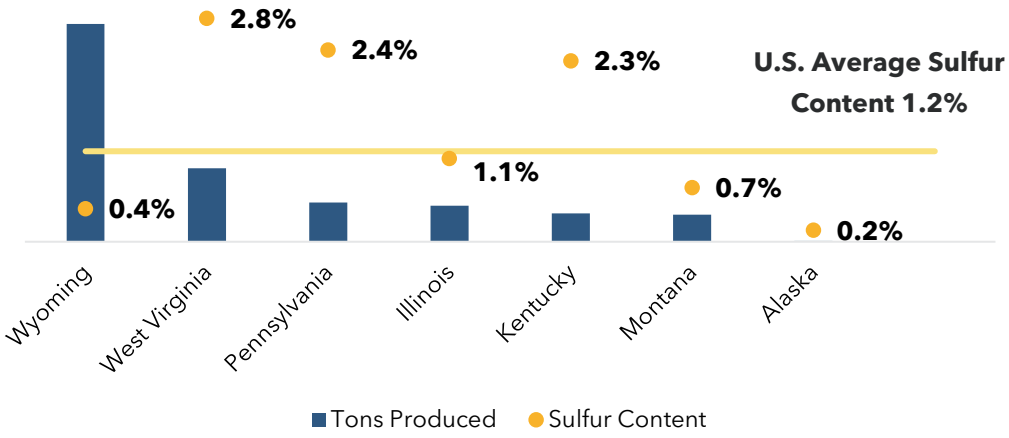
The inclusion of a new, high efficiency coal-fired central heat and power plant among the alternatives under consideration for energy upgrades at Fort Wainwright illustrate the opportunity to further implement HELE technology in Interior Alaska.

## Ultra-Low Sulfur Coal

Interior Alaska has the advantage of access to high-quality coal resources. Coal can be classified into four ranks based on the amount of energy within the fuel. Lignite has the lowest amount of energy per unit, followed by sub-bituminous, bituminous, ad anthracite with the highest energy content. The composition of coal, such as the amount of sulfur and mercury, ranges as well depending on where it is mined.

Healy coal used in Interior Alaska is sub-bituminous with ultra-low sulfur content of 0.15%.[28] In comparison, coal from the top producing states in the eastern and western U.S. average about 2.4% and 0.4% sulfur, respectively.

**Figure 5. Coal Production and Average Sulfur Content, 2019, Alaska and Select States**




Source: U.S. Energy Information Administration.
Note: Alaska represents <1% of total U.S. coal production.

Another environmental consideration related to Interior Alaska is configuration of coal-fired cogeneration facilities built with tall flue-gas stacks that release exhaust gases at higher elevations compared to other heating options. The availability of coal heat can eliminate the need for hundreds of heating units in individual buildings, primarily oil boilers, that release exhaust gases at ground level.

[28] U.S. Energy Information Administration. *Coal Data Browser*. 2019.

# Chapter 5: Economic Impact of Coal in Interior Alaska

This chapter examines the employment and wage impacts of UCM. In addition to jobs at the mine, there are a range of multiplier effects associated with mine operations. Jobs are created throughout the economy as the mine purchases supplies and services in support of its operations and mine employees spend their earnings in the region. UCM's contribution to supporting jobs at Interior coal-fired heat and power plants is also discussed.

## Direct Impacts

### Jobs

UCM employed an average 102 workers in 2020, the latest year for which data were available. Employment at UCM is stable over the year, ranging from a May peak of 105 to a February low of 99. About 85% of UCM jobs are based in Healy, with remaining jobs at UCM offices in Fairbanks and Palmer. The mine is Healy's largest year-round employer, located within the Denali Borough which generally has high seasonal employment fluctuations. In the visitor industry-dominated Denali Borough, stable UCM employment was especially important to the region as the COVID-19 pandemic disrupted tourism operations and drastically reduced job opportunities in the borough. Generally, UCM employment directly accounts for 5% of jobs in the Denali Borough.[29] In 2020, that number rose to 10%.[30]

### Wages

UCM wages totaled $13.4 million in 2020. Mining jobs are some of the highest paying jobs in the state, with estimated annual wages averaging $118,000 in 2020.[31] UCM's average wages are nearly double the average annual wages in Alaska overall ($61,100), in FNSB ($56,900), and in Denali Borough ($65,300). In addition to wages, UCM paid for $2.7 million in employee benefits. Wage comparisons help illustrate the role of UCM in the local economy, where most employment is in relatively low-paying, service sector jobs due to the highly seasonal nature of other employment opportunities in the borough.

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[29] Alaska Department of Labor and Workforce Development, Research and Analysis. *Quarterly Census of Employment and Wages*. 2016, and Direct Employment from UCM.
[30] Alaska Department of Labor and Workforce Development, Research and Analysis. *Quarterly Census of Employment and Wages*. 2020.
[31] Ibid.

### WORKFORCE RESIDENCY

All UCM employees are Alaska residents, a sharp contrast to employment in the Denali Borough where only 33% of workers are Alaska residents, and only 15% are Borough residents.[32]

## Measuring Indirect and Induced Impacts

The employment and wage impacts of UCM go beyond the direct jobs at the mine. UCM-generated employment and wage impacts also include:

- *Indirect impacts* – the jobs and income supported by UCM's spending on the wide variety of goods and services that are required to operate the mine and move coal to customers.
- *Induced impacts* – the jobs and income created because of UCM employees spending their wages in the local and regional economies.

Indirect and induced jobs and wages are estimated using IMPLAN – an input-output model of local and state economies that is widely used across the country to measure the economic impact of industries and industrial/commercial development.[33] IMPLAN uses borough and statewide level employment and wages data to measure linkages between industries and produce multipliers that estimate the total impact of an economic stimulus. For Alaska, IMPLAN typically requires modification to account for nonresident labor and/or supply constraints.

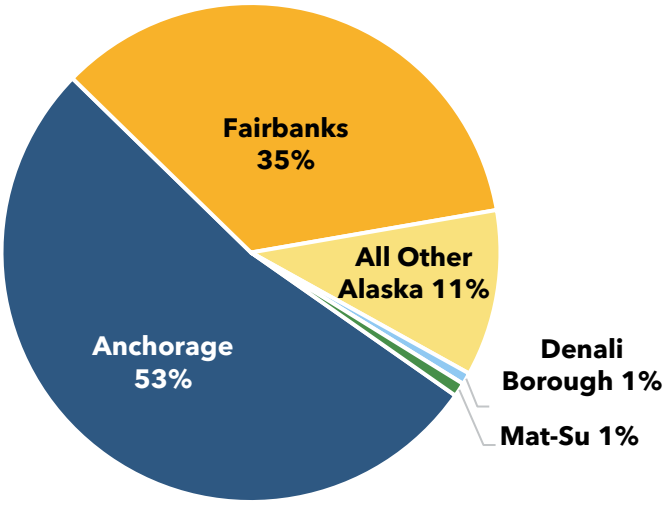
IMPLAN only captures economic impacts resulting from purchases made by UCM and its employees. It does not capture the jobs or income at power plants that rely on UCM coal (discussed separately below).

## Indirect Impacts

In 2020, UCM spent nearly $40 million on goods and services in support of the mine's operation. About 71% of this spending ($28 million) went to 285 Alaska-based businesses and organizations. Most in-state spending was captured by Anchorage and Fairbanks vendors.

[32] Alaska Department of Labor and Workforce Development, Research and Analysis. *Nonresidents Working in Alaska; Quarterly Census of Employment and Wages*. 2019.
[33] http://www.implan.com/company/.

**Figure 6. UCM Spending with Alaska Vendors by Community, 2020**




Source: Usibelli Coal Mine.

## Alaska Railroad Impacts

UCM's single largest vendor is the ARRC, headquartered in Anchorage. UCM's customers contract with the mine for delivered coal and UCM subcontracts with ARRC to make those deliveries. As of 2020, ARRC had about 589 year-round employees and 97 seasonal employees, more than 90% of which are Alaska residents.[34] In 2020, ARRC paid about $60 million to employees and $34 million to suppliers. Payments to employees were roughly flat from 2019; however, payments to suppliers were down from 2019 totals of roughly $51 million.[35]

The majority of ARRC's revenue comes from freight, including coal, gravel, petroleum products, and other commodities. Coal accounted for 27% of total freight tonnage in 2020, equating to about 14% of total operating revenues earned by ARRC (up from 8% in 2019 due to reduced passenger counts in 2020). As an important customer for ARRC, UCM plays a key role in supporting the nearly 700 Alaskans employed by the railroad.

[34] https://www.alaskarailroad.com/sites/default/files/Communications/2021_FCTSHT_ARRC_Quick_Facts_or.pdf.

[35] https://www.alaskarailroad.com/sites/default/files/Communications/2020_Annual_Report_Front_Narrative_Section_FINAL_REDCED-SIZE.pdf.

Though a detailed accounting of ARRC personnel that are dependent on coal (from an operational or revenue perspective) is not available, an estimated 30 ARRC employees are directly or indirectly supported by the movement of coal. This is a conservative estimate of the ARRC personnel that would no longer be employed if UCM and its coal were absent from ARRC's customer mix.

The employment implications of running a railroad without coal as a source of freight revenue may be much greater than the jobs that are directly and indirectly connected to coal. Coal plays a critical role in generating operating revenue for ARRC and, therefore, in the railroad's continued viability. This impact was on display in 2020, as the railroad saw a dramatic, 96% decrease in passengers due to COVID-19. Passenger revenue in turn saw a dramatic decrease in 2020, adding to freight revenue losses. ARRC operated at a net loss of nearly $8 million in 2020, down from a net income of $21 million in 2019.[36]

## Jobs and Wages at Interior Coal Plants

Coal production has significant downstream economic impacts in Alaska because it fuels energy production in-state. Downstream economic impacts occur when buyers of a product (such as crude oil, coal, or fish) add value through some form of processing. While most of the oil, seafood, and metallic mineral resources extracted in Alaska are sold to out-of-state buyers with limited downstream impacts, all UCM's coal production was sold and consumed in Alaska.

Downstream jobs, referred to as forward linkages, related with UCM include jobs at power plants using UCM coal. Employment at these power plants totaled 232 in 2020.[37] Based on statewide average wages in the power generation sector ($96,000), these employees earned an estimated $22.2 million in annual wages in 2020.[38]

**Table 10. Alaska Coal-Fired Power Plant Jobs, 2020**

| Facility | Estimated Number of Jobs |
|---|---|
| GVEA Healy Unit 1 | 20 |
| GVEA Healy Unit 2 | 33 |
| UAF | 35 |
| Aurora Energy | 30 |
| Fort Wainwright (operated by Doyon Utilities) | 45 |
| Eielson AFB | 69 |
| **Total** | **232** |

Source: GVEA, Aurora Energy, Doyon Utilities, Eielson AFB, and UAF.

[36] Alaska Railroad Corporation. *Corporate Annual Report*. 2020.
[37] Based on GVEA FERC Form 1 data and interviews conducted with plant managers.
[38] Alaska Department of Labor and Workforce Development, Research and Analysis. *Quarterly Census of Employment and Wages*. 2020.

Unlike the upstream jobs supported by UCM, not all power plant jobs would be foregone in the absence of an in-state coal supply. Jobs would be supported by generation using alternative fuel sources (natural gas, diesel, and others). As previously demonstrated, replacing coal with other fuel sources for power generation in Interior Alaska would come at a steep cost to power producers, which would likely result in higher costs to end-users of energy. In addition to these higher costs, other fuel sources are less labor-intensive and therefore would account for far fewer jobs in the region.

## Induced Impacts

UCM employment averaged 102 in 2020, and a count of 115 individuals worked for UCM during the year, earning $13.4 million in wages. These workers and their families spend money through local and regional economies, in stores, gas stations, recreational facilities, and a range of other places. The families supported by UCM operations also create numerous jobs in the local economy, including teaching, government administration, public safety, public service, retail, and service-sector positions.

## Total Direct, Indirect and Induced Impacts

With stable, year-round employment and high-wage jobs, UCM is the foundation of the Healy economy. The mine employed nearly one in 10 Healy residents in 2020. Without the jobs provided by UCM, the local economy would be significantly smaller. Beyond the immediate local impacts, the mine's economic impacts extend to Interior Alaska and statewide. Based on a multiplier analysis conducted with data from UCM, mine spending on wages, goods, and services supported 232 jobs in Interior Alaska and 322 jobs statewide in 2020. The combined annual wages of these UCM-generated jobs totaled $20.6 million in Interior Alaska, and $26.4 million statewide.

*(See table on next page)*

### Table 11. Direct and Upstream Employment and Wage Impact of Usibelli Coal Mine, 2020

| Impact | Interior Alaska | Statewide |
|---|---|---|
| **Upstream Impacts** | | |
| **Jobs** | | |
| Direct | 102[a] | 102 |
| Indirect/Induced | 130 | 220 |
| **Total Upstream Jobs** | **232** | **322** |
| **Wages ($ millions)** | | |
| Direct | $13.4[a] | $13.4 |
| Indirect/Induced | $7.2 | $13.0 |
| **Total Wages ($millions)** | **$20.6** | **$26.4** |
| **Downstream Impacts** | | |
| Coal-fired power plant employment | 232 | 232 |
| Coal-fired power plant wages ($ millions) | $22.2[b] | $22.2 |
| **Total UCM-related Impacts** | | |
| Upstream and downstream jobs | 464 | 554 |
| Upstream and downstream wages | $42.8 | $48.6 |

Source: Usibelli Coal Mine and McKinley Research Group estimate.
Notes:

a. Four UCM jobs are based in Anchorage/Matanuska-Susitna Borough but are included in the Interior Alaska category for confidentiality reasons.
b. Downstream wage impacts are estimated based on employment at coal-fired power plants and average annual statewide power sector wages in 2020.

UCM's statewide employment multiplier is about three – meaning, for every job created at the mine, there are two indirect and induced jobs created elsewhere in the Alaska economy. These multipliers do not include jobs at power plants that use UCM coal and are instead described separately below.

In Alaska, multipliers are rarely above 2.0. For example, 100 direct jobs would typically be linked to no more than 100 indirect and induced jobs, equaling a total employment impact of 200. UCM's multiplier is high for several reasons, but mainly because of a high level of in-state spending on goods and services relative to the number of direct jobs at the mine. In 2020, UCM's in-state spending on goods and services was $28.4 million. The mine's high average wages also place more money into the economy compared to lower wage jobs, increasing UCM's multiplier impact.

# UCM Charitable Giving

UCM's economic impact includes support of more than 100 nonprofit organizations through contributions by UCM and The Usibelli Foundation (TUF). Founded in 1991, TUF has distributed more than $2.5 million over its 30-year history of supporting local charitable organizations, including $120,000 in 2020. TUF provides grants in the areas of nonprofit education, health and social services, youth programs, the arts, and civic organizations and activities. TUF also matches employee donations to United Way of the Tanana Valley, as well as several other community organizations in Healy.

**The goals of The Usibelli Foundation are to provide funds to:**

- **Facilitate** learning by supporting education.
- **Preserve** Alaska's uniqueness by supporting its heritage.
- **Strengthen** our communities.

UCM is a long-time supporter of the University of Alaska system, donating more than $5.2 million to UAF over the mine's history.[39] In 2017, UAF named the Usibelli family "Philanthropist of the Century". In 2020, UCM provided major support to the UAF's first annual Giving Day and established scholarship programs within the Homeland Security and Emergency Management and Bachelor of Applied Management programs, and the Usibelli Coal Mine Nanook Athlete endowed scholarship fund.[40]

[39] University of Alaska Fairbanks, School of Management. *Usibelli Coal Mine: Generations of Support Inspires Others to Give*. December 2020.

[40] University of Alaska Fairbanks, School of Management. https://givingday.alaska.edu/giving-day/29792/department/30538.

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