Powering Large Mines in Alaska

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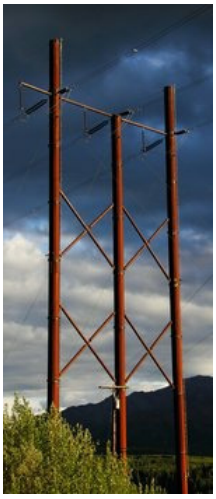
Last Modified: 10th October 2014

Power in AK



Electrical intertie near Healy, AK

Background: Powering Mines

Mines are enormous consumers of power, and are often a driving force for adding new electrical generation capacity and fuel-transportation infrastructure to their local areas.

Mining energy demand stems largely from the need to excavate and move rock, crush ore, and transport mud slurry, according to a **2007 Department of Energy study** . **Metal mines** in particular often need an extraordinary amount of electricity, if their **mining method** relies on grinding or "milling" the rock to separate out **tailings** (**heap-leach operations** recover less metal, but require less power).

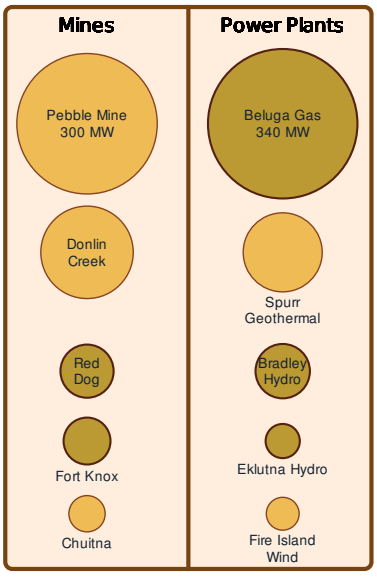
Grinding and pulverization exceed all other energy demands of the industry, combined. It is followed in importance by movement of material, usually by diesel-powered machinery. Metal ore grinding, specifically, is the largest single energy load of the industry, followed by the pulverization of coal into powder for combustion. Over the whole industry, the relative energy demands vary between coal, metal, and minerals mining. For instance, ventilation is a major energy consumer for underground coal mines, and minerals mines have unusually high drilling and crushing energy requirements, but almost no grinding demand.

Adding a new mine to an electrical grid can be a huge burden on existing infrastructure, but can also ensure a long-term steady demand. Frequently, local transmission systems and electrical generation capacity are upgraded to service the new mine. For example, mines and mining guarantees **were responsible** for most of the **hydropower plants that now provide** Juneau with relatively low-cost electricity.

As with all large energy projects, mine-related energy projects can be massive, and have "external" benefits and costs which are not directly intended by the mine company - such as the availability of lower-cost electricity and fuel to local residents, and the disruption of natural river flow. The **true cost (and benefits) of electricity generation** are often not captured in the sticker price.

Existing Mines in Alaska

The power needs of Alaska's current mines are summarized in the table below. Electrical demands of existing and proposed mines and powerplants are compared at right.



Pogo Mine and **Fort Knox Mine** draw power from the Railbelt electrical grid, as does the **Usibelli coal mine**. This electricity is provided by the **Golden Valley Electrical Association (GVEA)** . Diesel fuels the majority of GVEA's power plants, but the company also uses **naphtha** and coal. If the **Susitina-Watana dam** or other renewable energy projects displace the burning of fossil fuel on Alaska's grid, these mines may someday run their electrified operations on renewable energy. Notably, Usibelli's giant **"Ace in the Hole"** dragline shovel imposed such sharp peak load demands on the local grid that it caused lights to flicker in Fairbanks, until a 40-ton flywheel damping system (named "Peak Shaver") was installed between the bucket and the grid to equalize the load.

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Greens Creek Mine generated power primarily from diesel until around 2006, when they began to draw on the Juneau electrical grid. Currently Greens Creek draws 95% of their electricity from the **Alaska Electric Light and Power Company** , which generates most of its supply from hydropower, although low water levels forced Greens Creek them back to on-site diesel generation in summer 2011.

Kensington Mine and **Red Dog** mines are entirely off-grid, and relies on diesel for nearly all their power needs. Red Dog is by far the larger of the two, and in recent years, Red Dog **has annually consumed** roughly 17 million gallons of fuel onsite, and an additional 150,000 gallons of jet fuel for transportation needs.

The recently re-opened and temporarily re-closed **Nixon Fork Mine** uses airlifted diesel for power generation.

Alaska Mines: Estimated Energy & Emissions						
	Energy Demand			*Carbon Dioxide Emissions (Metric Tons)*		
Mine	**Electrical Grid**	**Grid Load**	**Annual Fuel Use**	**Fuel CO2**	**Grid CO2**	**Total CO2 Emissions**
Fort Knox	Railbelt	33.5 MW	10.5 M gallons	107,000	184,000	290,000
Red Dog	None	N/A	17.5 M gallons	174,000	N/A	174,000
Pogo	Railbelt	10 MW	3 M gallons	30,000	55,000	85,000
Kensington	None	N/A	3 M gallons	30,000	N/A	30,000
Greens Creek	Juneau	7.5 MW	1.4 M gallons	14,000	< 1,000	15,000
Usibelli Coal: information not located.						
Calculations assumed 24 hour per day, 365 day per year operation at the identified grid load, converting MW capacity into MWh (an actual quantity of energy). However, electrical demand at a given mine will vary based on what activities are taking place on-site. It is also possible that actual peak loads exceed the published grid loads of mines, which may be median or average loads. CO2 emissions from grid electrification are based on total grid mix.						

Proposed Mines in Alaska

Major mine proposals include **Pebble** (Copper & Gold), **Donlin Creek** (Gold), **Livengood** (Gold), **Chuitna** (Coal), and the **Niblack** (Gold) prospect.

The **proposed massive Pebble Mine** anticipates a need for **300-400 MW** of electrical generation capacity, which is more than the **total capacity of GVEA** (277 MW, supplying Fairbanks, Delta Junction, Healy and Nenana), and would give it the largest powerplant in the Alaska. Several options have been **considered** to bring natural gas to an onsite turbine powerplant: installing generation capacity across Cook Inlet and running transmission to the mine, building a spur pipe from the Kenai's **proposed natural gas pipeline** , or importing liquefied natural gas (LNG) directly to the mine's harbor via ship. The **most recent statements** from Pebble suggest that ship-supplied LNG is the front runner. Much of Pebble's mobile equipment would run on diesel fuel, which would be delivered to the site in a separate pipeline from the port.

The **proposed Donlin Creek Mine** is in a much more remote area, and the owners have considered and discarded energy options, ranging from coal to biomass to wind. Currently the mining company **is considering building** a 320-mile natural gas pipeline from Cook Inlet to the mine site. Donlin Creek anticipates a need for around 130 MW of electrical capacity.

The **Livengood project**, near Fairbanks, would **most likely** draw power from GVEA, although the mining company has said that it would consider onsite generation. The Livengood project will require 10-15MW of electrical capacity if it is a "**heap-leach**" only operation, and 70-80MW if it installs a grinding mill.

The **proposed Chuitna Coal Mine**, located near Cook Inlet near Chugach Electric transmission lines, would not require as much electricity as a large hardrock metal mine since no mill would be needed. Although coal must eventually be pulverized before burning, this would probably not take place at the mine itself. The mine **would require** only 20 MW of capacity.

The **Niblack prospect** is in southeast Alaska, an area rich in hydropower potential. This prospect is still many years from possible development but the owners have suggested that **around 11.5 MW** would be required. In addition, the owners of the prospect **have been in discussion** with the manager of the **Reynolds Creek hydropower** , a project under construction on Prince of Wales Island as of spring 2011.

Date Created: 24th April 2011