S O U T H E A S T E N E R G Y
C L U S T E R I N I T I A T I V E

JUNEAU ECONOMIC DEVELOPMENT COUNCIL

Juneau District Heating Initiative

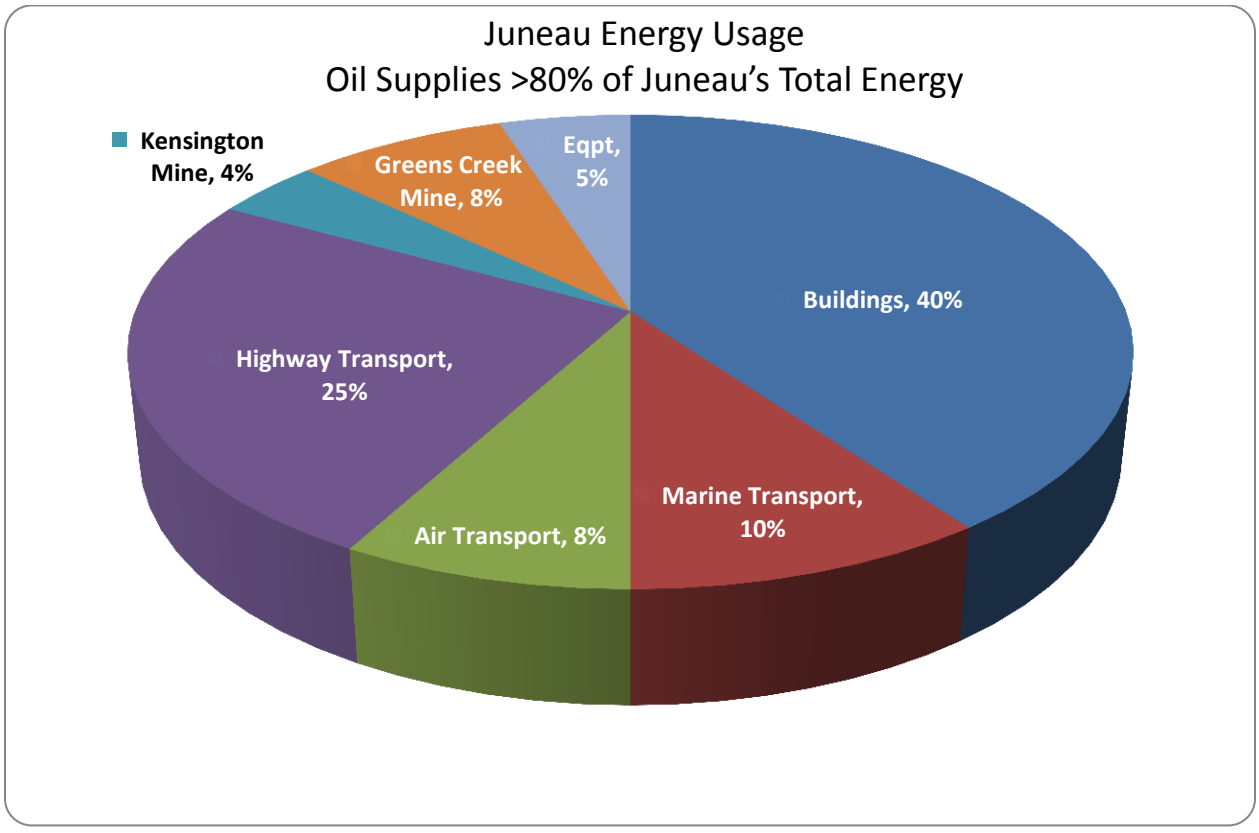
RENEWABLE ENERGY

Project Overview

EASIER, LOWER COST, CLEAN HEAT SOLUTION FOR DOWNTOWN JUNEAU (AND OTHER ALASKA DISTRICTS)

BACKGROUND

Heating represents a very significant expense for facility owners in Juneau. Juneau uses 40% of its total energy to heat buildings. Most of Juneau's buildings and residences are heated with diesel home heating fuel. Fuel cost inflation predicated on the continued rise of home heating oil has created a market demand for alternative solutions. Federal, State, Municipal and School District budgets are all facing severe pressure, with no expected letup in sight. A district heating system serving all of these customers, as well as private sector customers, with low-cost thermal energy, would be a sound and prudent response to long-term budget challenges. As the capital city, Juneau would be an excellent showcase for district energy for the rest of the state. District energy systems are established and are heavily used in Europe and other locations in the United States. Juneau possesses some unique advantages that would make Energy District creation and operation desirable for our community.



Source CBJ Climate Action and Implementation Plan November 2011

WHAT IS A DISTRICT ENERGY SYSTEM, (DES)

A District Energy System (DES) distributes thermal energy from a central heating source(s) to multiple facilities located within an existing geographic district through a network of insulated piping using steam or heated water. Different energy systems use different levels of temperature to transfer heat from its source to satellite locations. The thermal energy is used for facility heating, domestic hot water, and other onsite processes requiring thermal energy (i.e. sterilization procedures in a hospital). A wide range of fuel sources such as natural gas, coal, oil, heat pumps (geothermal, air or seawater), biomass, or heat recovery from waste water can fuel the central heating plant(s). For example, the city of Drammen, Norway utilizes a seawater heat pump/ammonia district heating system to supply hot water at 90°C (194° Fahrenheit) to 60,000 residents. The capital city of Vermont, Montpelier, has just completed a district heat installation and will be heating its capital district with a biomass-fed system. In some cases the thermal energy results as a byproduct of electrical power generation, known as cogeneration. Overall, district energy provides heat for an entire district more efficiently than individualized systems, and at an overall lower marginal cost of production.

OPPORTUNITY FOR JUNEAU

Downtown Juneau presents an excellent opportunity for a district energy system. It contains number of significant and strategically located heating loads such as the Juneau Douglas High School, Augustus Brown Swimming Pool, Harborview Elementary School, the AHFC Senior Housing Center, the GSA Federal Building, the State Office Building, the State Courthouse, the State Capitol, Centennial Hall, the Elizabeth Peratrovich Hall, the State Library Archive & Museum currently under construction, and numerous other privately owned hotels and retail buildings in the closely confined downtown district. Stretching the district further to the north could, at some point, encompass the Hospital complex, Juneau's largest heating load.

VIABILITY FOR JUNEAU

A pre-feasibility study conducted by the U.S. Dept. of Energy's National Renewable Energy Lab

(NREL) found that an Alaska Capital District Energy project was very viable, both technically and financially. A review of the site and the NREL analysis by an experienced district energy management organization concluded the same thing: Juneau is an excellent candidate for a District Energy System.

DISTRICT ENERGY QUICK FACTS

District energy systems offer many advantages over individual heating systems.

- Larger boilers, as used in a DES, are often *more efficient*, and feature more sophisticated control and management systems not typically seen on small boiler systems.
- A central plant will have dedicated maintenance staff and will receive regular maintenance and monitoring, ensuring top performance and reliability
- A central plant will usually have redundant and tertiary backup systems, something most single facilities cannot afford
- Central plants often employ comprehensive air emissions controls systems while individual builds typically have none, so the air quality of a district served by a central heating plant will often be superior to the same area served by aggregate distributed plants.
- A central heating plant is often of a large enough scale to effectively utilize energy sources which are unfeasible for smaller systems.
- Central plants are often excellent opportunities for cogeneration with the local utility, while individual facilities rarely offer that opportunity.
- By providing thermal energy through a district 'connection', the receiving facility owner is relieved of the capital and operating expense of owning a dedicated system, which can be a substantial portion of the total ownership cost of the building.
- The risk associated with operating an individual heating system, whether it be a risk of system failure, fire, or fuel spill is substantial, and may be reflected in insurance rates. An adjacent heating district would be expected to make future development of a property more attractive and heated at a lower expected cost.
- Heating districts more efficiently utilize capacity by spreading out peak loads. Individual buildings must size their heating systems to meet the maximum potential load, a relatively rare event, which leads to significant unused capacity and inefficiency during the rest of the heating season. A district heating system is sized for the peak system load, which is typically much lower than the sum of each building's peak load.
- A heating district provides a low-risk and controlled platform for experimentation with emerging heating technologies such as deep rock geothermal or seawater heat pumps – a real-life laboratory of sorts.
- A heating district provides a sink for excess thermal energy for excess hydropower that would otherwise be lost to spilling over the dams during periods of high inflow.

OTHER EXAMPLES

Seattle Steam Company:
http://www.seattlesteam.com/

Montpelier, VT District Heat project:
http://www.montpelier-vt.org/group/99.html

Minneapolis, MN NRG Minneapolis:
http://www.nrgthermal.com/centers/mpls/

Saint Paul, MN District Energy ST. Paul:
http://www.districtenergy.com/

Oslo Norway, Oslo Airport District Heat Pump:
http://www.fjvu.dk/sites/default/files/heat_pump_for_district_cooling_and_heating_at_oslo_airport_gardermoen.pdf

CBJ Climate Action and Implementation Plan:
http://www.juneau.org/manager/documents/CAP_Final_Nov_14.pdf