

# KLAMATH FALLS GEOTHERMAL DISTRICT HEATING SYSTEM FLOW AND ENERGY METERING

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## INTRODUCTION

The city of Klamath Falls (Oregon) geothermal district heating system currently supplies about 20 commercial building service connections, 12 residential connections, and more than 40 snowmelt connections. The total system load is about 13 million Btu/hr (3.8 MWt). Only three services are currently metered, but the plan is to eventually meter all the commercial connections. Additional details on the Klamath Falls district heating system can be found in Brown (1999).

## BACKGROUND

When the system was constructed in 1981, the original buildings were all metered, and the charge for service was based on the metered energy use. The metering consisted of a turbine flow meter with an electronic energy integrator and totalizer. Within a few years, the original meters all failed. Initially, the policy was to send the failed meters back to the factory for repair, and reinstall them. However, the repairs were expensive and the measured energy use didn't change much from year to year. Eventually, the policy became to use the metered energy use for billing until the meters failed, then bill based on historical usage.

When the city began a marketing effort in 1992 to add more customers to the system (Rafferty, 1993), the marketing decision was made to not include meters in the new installations. Instead, customers were offered a long-term (typically 10 years) flat-rate contract based on a study of historical heating energy cost. The city will install meters as those contracts expire, and the buildings will be switched to metered service.

Currently, the standard offer for new connections is the standard-metered service rate, with one year of free service to help defray the additional cost of connecting to the geothermal system.

## GEOTHERMAL SERVICE RATES

The proposed standard-metered service rate includes charges for both energy and flow. The flow charge was implemented to encourage efficient flow control, which is required to maintain a high system delta-T. At an average delta-T of 40°F, the total of the energy and flow charges is 90% of the price of natural gas. At the current natural gas price, the geothermal charge is \$0.474 per therm (10<sup>5</sup> Btu) (\$0.0162/kWh). Since geothermal heating is more efficient than combustion of natural gas, the cost of heating with geothermal energy will be 50 to 80% of natural gas, depending on the efficiency of the gas appliance.

Snowmelt systems that are supplied off a metered-building heating system are covered by the building charge. Unmetered snowmelt systems are billed at an annual flat rate of \$0.25 per sq ft.

Residential connections on the Michigan Street, a low-income housing area, geothermal system are currently billed at 75% of the calculated cost of natural gas based on building size and calculated energy use.

## METERS

The Klamath County Library and the Klamath County Government Center buildings are both metered with Emco magnetic flow meters. These meters offer excellent turn-down capability and reliability, and are easily connected to the building energy management system. The meter at the library was installed in 1996 and has offered no problems. The disadvantage of the magnetic flow meters for general system-wide application is the high cost and the requirement for utility power.

The Klamath County Courthouse is metered by a Hersey/Aaliant turbine flow meter. These turbine meters are somewhat less accurate than the magnetic flow meters and are harder to interface with a building energy management system. However, the meters offer adequate accuracy, are available in a battery-powered configuration, and are considerably less expensive than magnetic flow meters. The meters at the courthouse has operated for one season, without any problems. We expect that with the magnetic coupling drive on the Aaliant meters, that they will be more reliable than the original turbine flow meters.

The intent at this time is to standardize on the Aaliant flow meters for service connections. Two or more installations are scheduled for this summer.

Magnetic flow meters are planned for the heat exchanger building to measure total geothermal production and closed loop circulation.

## REFERENCES

- Brown, Brian, 1999/ "Klamath Falls Geothermal District Heating System." *Geo-Heat Center Quarterly Bulletin*, Vol. 20, No. 1, Klamath Falls, OR, pp. 5-9.
- Rafferty, Kevin, 1993. "Marketing the Klamath Falls Geothermal District Heating System." *Geo-Heat Center*, Klamath Falls, OR, 30 p.



*Original turbine meter (no longer functional).*



*Klamath County Library.*



*Magnetic flow meter in Library.*



*Klamath County Government Center.*



*Energy and flow totalizer in Government Center.*



*Magnetic flow meter in Government Center.*



*Klamath County Courthouse.*



*Energy and flow totalizer in Courthouse.*



*Turbine flow meter in Courthouse.*