

# Michigan District Energy Facility Case Studies

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The Mariner North  
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The **Mariner North** is a resort/restaurant in downtown Copper Harbor, at the tip of the Keweenaw Peninsula. Their district heating micro-grid serves the restaurant and five modern cabins, an area of about 11,000 square feet. There is also a two-story motel that is independently heated with propane.

The system burns about 40 cords of firewood during the extended cold season. That is equivalent to about 8600 gallons of propane or 4500 gallons of heating oil.

The 250,000 btu outdoor Central Boiler is a conventional, 400 gallon water-jacketed unit that burns firewood. The micro-grid consists of one-inch insulated hot water lines with a centralized heat exchanger close to the boiler. Neither a water accumulator tank nor computer controls are used. The ground was excavated to the near-surface bedrock and then about two feet of overburden was added. Deep snows assist with hot water line insulation.

The boiler is fueled and controlled manually. Computer controls were not needed, because room temperatures varied frequently as cabin patrons often keep doors open to load and unload belongings, and as customers enter and leave the restaurant.



*The Mariner North consists of a restaurant, five cabins, and a small two-story motel, located in the center of Copper Harbor, Michigan.*

The Mariner North does not use a liquid thermal storage tank. However, each of the five cabins have in-floor heating that stores heat in concrete slabs. The system has been operating since 2012. The district energy system is backed-up with propane heat. Domestic hot water is from electricity.

Firewood is harvested by facility personnel from the heavily-forested vicinity using a pick-up truck. The Central Boiler unit produces about six



*The Mariner North wood-fired district heating micro-grid is powered by a single conventional outdoor boiler, with propane back-up.*

50-gallon drums of ash per year, which is utilized by a local gardener for compost amendment.

The Keweenaw Peninsula is a fairly remote area with low human population densities and limited utility services. The county has only about 2200 residents, characterized by independence and self-reliance. Main employment sectors are logging and tourism. The peninsula is heavily wooded, largely by second-growth hardwood forest, with convenient access to firewood acquisition. Many residents and small businesses have deployed firewood combustion systems to avoid costs associated with propane, electricity, and fuel oil. Some residents use pellet stoves, although bulk delivery is not available.

Winters are long with heating seasons typically running from September and into May. Temperatures are strongly influenced by Lake Superior and the degree to which ice covers the lake. Typical winters have several feet of snow on the ground, with temperatures commonly dropping below zero, Fahrenheit.

