

Partners for Climate Protection

Greenhouse Gas Reduction Initiative of the Month



Gibsons' Geoexchange District Energy Utility:
Reducing homeowners' energy costs and GHG emissions

Municipal Profile

Population: 4,182

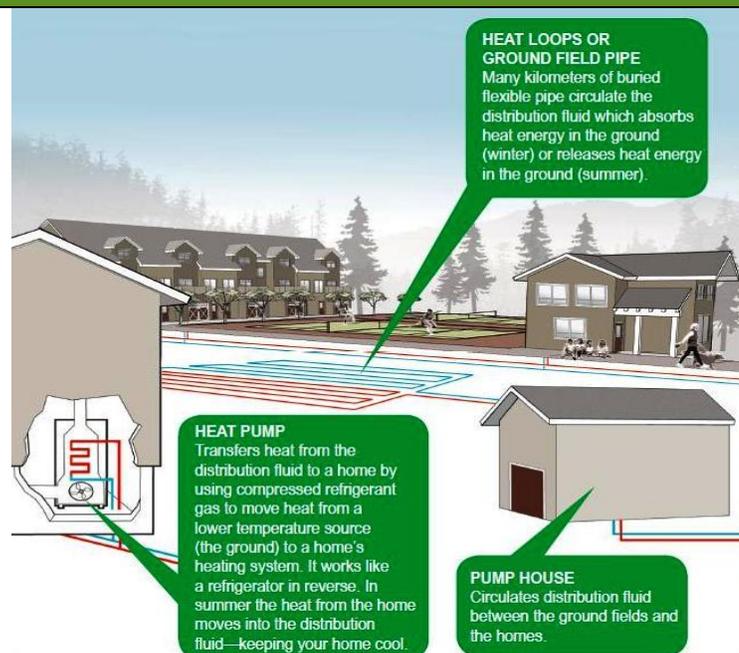
PCP Member since: 2007

Background

In 2010, the Town of Gibsons, British Columbia, established a geoexchange district energy utility system to heat and cool a new housing development. The first phase of the system, now complete, provides heating and cooling to 27 residential lots in the Parkland development area of Gibsons.

Gibsons' geoexchange system uses a series of underground piping to capture heat from the earth. Pipes filled with a water and ethanol solution are connected from a pumphouse to each house. The energy is then extracted through a heat pump installed in each residence.

The geoexchange system has reduced Gibsons' carbon footprint and provides the town with long-term, stable revenue. It is the first municipally-owned district energy utility of its kind in North America.



Pictured at right: A schematic of Gibsons' geoexchange system. Graphic courtesy of the Town of Gibsons.

Implementation and approach

Phase I of the project began in 2009 and involved constructing the main pumphouse and laying the piping. The town hired an outside engineer to design and construct the geoexchange system. Gibsons' system used a horizontal "slinky" configuration (pictured at right. Photo courtesy of the Town of Gibsons) for its piping field, rather than vertical piping (which some other systems use.) Three slinky fields were constructed, each with 5,700 metres of circuit pipe. Distribution pipes that carry the water-ethanol solution were then installed in the road and are connected to the pumphouse and each residence.

Each home has its own service line connected to the distribution pipes,



which are in turn connected to a heat pump inside the house. The heat pumps are similar to conventional ones. However, rather than draw off heat from the air, these pumps draw off heat from the fluid-filled pipes.

Michael Epp, Gibsons' municipal planner, says each homeowner pays a \$150 fee to connect to the system (a \$50 connection fee and a \$100 inspection fee). The cost of the heat pump is estimated to be about 30 per cent more than a conventional heating and cooling system. "The savings on heating and cooling offset that price, plus there are a number of grants available to homeowners to pay for heat pumps," says Epp.

Gibsons' geexchange system is run by the municipality and is operated like a utility, with the municipality charging homes for the energy provided. Municipal staff, contractors or consultants inspect the connections, issue bills and collect heat loss calculations.

Phase I was completed at the end of 2010. The total project cost was \$1.4 million and was financed through a combination of municipal capital, gas tax monies allocated by the province, general taxation, and two grants totaling \$569,000 from the province's Innovative Clean Energy Fund and the Island Coastal Economic Trust. The housing developer paid for the distribution piping lines, while Gibsons paid for the pumphouse and fields.

Results

Greenhouse gas (GHG) reductions due to the geexchange system are in the order of about 335 tonnes annually. However, Epp notes that, at full build-out of the housing development, the system will serve 700 buildings, resulting in about 1,768 tonnes of GHG emissions reductions per year.

Homes connected to the system enjoy an approximately 15 per cent reduction in costs compared to natural gas. "As far as the homeowner is concerned, it's cheaper, and the system provides a higher range of temperature," says David Newman, Gibsons' director of engineering. "The heat pump works like any other standard heat pump, so there's no learning curve for the homeowner." Epp says that for a typical 1,500 square-foot home, the heating bill is about \$500 annually. This equates with roughly a \$200 savings per year, per home. "Each home is charged \$34.50 every three months, plus \$22.32 per kilowatt of calculated heat loss," says Epp, "so the more energy efficient the home, the lower the heat loss calculation and the lower the bill."

Lessons learned

Newman says the biggest challenge Gibsons faced was in designing the geexchange system itself. "It had to be economical, and we needed enough land around the development to lay the fields," he explains. "We had some growing pains. Our initial design had two runs of piping, one above the other, but we ended up with the slinky configuration." He adds that they used high-density polyethylene pipes but discovered, afterwards, that there were less-expensive alternatives that would have worked just as well. "Even though the system is fairly simple, for others wanting to do this, having someone with field expertise in geothermal is a must to get at those types of cost savings."

That said, Gibsons was able to secure a deal on heat pumps with a local supplier and offered those to the builder. "We also saved some money by using a water-ethanol mix in the pipes instead of glycol," says Newman.

Future direction

Epp says the town’s challenge is to determine, as the geexchange system grows, whether there are more-appropriate management models than the one currently used – which is owned and operated by Gibsons. “We’re looking at a variety of models; an arm’s-length corporation; selling the utility to a third party; or contracting out some aspects, like billing and maintenance.”

Gibsons’ next step is to develop a master plan and business plan for the system’s subsequent phases, where additional buildings, such as schools, the local RCMP detachment, the town’s recreation centre (which would provide additional waste heat into the system) and other new housing developments, could be tied in. “We’re also looking at ocean energy,” says Newman. “The idea would be to draw on the fairly constant heat from the ocean, and we’ve sought a couple of grants to study that.”

Further information

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A summary presentation is available on the [Geoexchange District Energy Utility](#).

The Partners for Climate Protection (PCP) program is a network of Canadian municipal governments that have committed to reducing greenhouse gases and acting on climate change. PCP is the Canadian component of ICLEI's Cities for Climate Protection (CCP) network, which involves more than 900 communities worldwide. PCP is a partnership between the Federation of Canadian Municipalities (FCM) and ICLEI – Local Governments for Sustainability. PCP receives financial support from FCM's Green Municipal Fund.