

## Partners for Climate Protection

### Greenhouse Gas Reduction Initiative of the Month

#### Yellowknife's Biomass boiler district energy system



#### Municipal Profiles

Population: 19,234

PCP Member since: 1998

#### Background

In 2004, the City of Yellowknife completed its baseline inventories as part of its PCP Milestone work. Most electricity is generated by hydro; however, emissions from fossil fuel use for heating are almost twice that of the Canadian average, accounting for more than 70% of Yellowknife's emissions. The City used that data to inform its Community Energy Plan (CEP), adopted in 2006.

Among the plan's top 12 recommendations was to initiate a wood pellet heating pilot project in a city facility. As a first step, the city began monitoring the performance of two other commercial wood pellet boilers in the community, "to get a better idea of what the operational and maintenance costs would be, the efficiencies, and if the boilers were operating to the specifications advertised," recalls Rémi Gervais, Energy Coordinator, Engineering Division.

#### Implementation and Approach

In 2007, the city studied the feasibility of installing a wood pellet (biomass) boiler to heat the Ruth Inch Memorial Pool (pictured at right, photo courtesy of the City of Yellowknife), Yellowknife Community Arena, and Curling Rink.

The three buildings were already tied to a district heating system, powered by an oil boiler. The feasibility study estimated the cost savings to be about \$93,000 per year and annual GHG reductions to be about 770 tonnes, a 19% reduction of Yellowknife's total operations emissions. Council approved the project in January 2008 and issued an RFP.



Of the three firms that applied, the city chose Arctic Green Energy (AGE), a biomass supplier in Yellowknife, to connect and install the wood pellet boiler. "There used to be only one [district energy] connection between the arena and the curling rink," explains Gervais. "Those two buildings were tied together to an oil boiler. We had to add a connection to the pool to add the new biomass boiler."

Under the contract terms, AGE would provide a multi-year supply of wood pellets, maintain the system for one year, and train a city employee to maintain and operate the system after that.

The new boiler was designed to provide 90% of the heating load of the three facilities, and the city retained the existing oil boiler for back up heating on only the coldest days of the year.

Total project cost came to \$634,500. Infrastructure Canada and Municipal and Community Affairs provided \$240,000, the city's portion was \$297,500, and the remaining \$97,000 came from a budget carryover from the CEP.

## Results

Annual savings, at today's energy prices, are about \$200,000, giving the project a simple payback of just over three years. Oil consumption has dropped from about 270,000 litres of oil per year in 2007, to an average of about 20,000 litres. Annual GHG emission reductions are in the order of 810 tonnes.

In the almost five years since the biomass boiler was installed, the city has experienced no major issues with the system's equipment or operation, nor any difficulty in obtaining fuel (AGE continues to supply it, sourcing from a company in northern Alberta). "Our system has particulate matter emissions controls and a good combustion environment, so the fly ash is limited," says Gervais. Residual ash is removed from the boiler and treated at the landfill.



*Yellowknife's wood pellet boiler. Photo courtesy of the City of Yellowknife.*

Financial and GHG savings are the main benefits, but Gervais adds that "if you look at projects like this in terms of risk management, having a diversified source of energy reduces the city's exposure to oil price fluctuations."

He also says that he's noticed more interest and uptake of pellet boilers within the wider community. "We may not be able to attribute that to our project, but we've definitely contributed to developing the market in Yellowknife."

## Lessons Learned

Wood pellet boilers do require more maintenance than oil boilers, to check system performance and remove ash. "They're still cost-effective," says Gervais, "but you need someone to take care of them, either from a private firm or an in-house tradesperson." Gervais says that the city estimated maintenance costs at about \$30,000 a year, which includes parts and maintenance.

Planning ahead and choosing the right contractor helped avoid problems. "We had a supplier that was experienced in the installation and trained one of our staff to maintain the system," says Gervais. AGE also guaranteed a predictable fuel price and supply.

## Future Direction

Gervais says that, after a major geothermal project was put on a hold, the city is considering its options in terms of installing additional wood pellet boilers at other city facilities. A geothermal district energy system would have used waste heat from an abandoned mine, but the high capital cost prompted residents to defeat the project in a referendum.

On the waste management side, the city began a centralized composting pilot project in 2009 that focused on the commercial and institutional sectors. More than 20 local businesses participated in the pilot and, over a three-year period, Yellowknife has diverted more than 650 tonnes of organic waste and converted it into compost.

## Further Information

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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 1200 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.