March 2012

Partners for Climate Protection

Greenhouse Gas Reduction Initiative of the Month

Town of Okotoks: Drake Landing Solar-powered Community District Heating System

Municipal Profile

Population: 23,981

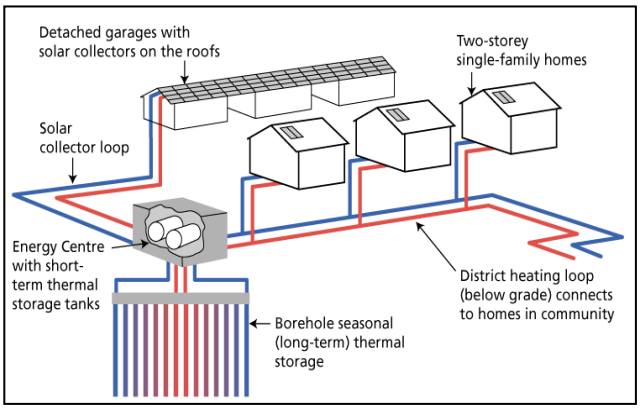
PCP Member since: 2000

Background

In 1998, the Town of Okotoks, AB, adopted a sustainable community plan focusing on initiatives that would reduce energy and save money. “Town council decided early on that it should live within its means,” recalls Richard Quail, Okotoks’ Municipal Manager. The town embarked on a series of initiatives including building retrofits, and waste and water projects. The town also embraced the use of renewable energy – particularly solar energy – and it was that decision that led directly to the development of Drake Landing.

Implementation and Approach

Drake Landing, a 52-house development, is Canada’s first solar-powered community district heating system. As shown in the adjacent graphic (*courtesy of Drake Landing),* an array of 800 solar panels, installed atop the development’s stand-alone garages, captures solar energy in spring, summer and fall. “We built the garages first so that we could start the solar storage system as we built each home,” explains Keith Paget of Sterling Homes, Drake Landing’s housing developer.



On a typical summer day, the complete solar array generates 1.5 megawatts of thermal energy, which heats a glycol-water solution that runs through an insulated piping system, or collector loop, throughout the array. The glycol then travels along the garage roof overhangs, down the ends of each garage row, and underground through a shallow buried trench until it arrives at the Energy Centre, a separate building that houses two storage tanks and a heat exchanger.

Excess heat (usually produced during the warmer months) is pumped from the storage tanks (dubbed “mini-submarines” by the project team) into a borehole thermal energy storage system through a series of pipes. The pipes run through a collection of 144 boreholes that stretch 37 metres below ground. As the heated water travels through the pipes, heat is transferred to the surrounding earth, reaching 80°C by the end of each summer. In winter, the heat is returned to the storage tanks and the hot water is then piped to each home for space heating.

The Town of Okotoks, ATCO Gas, Sterling Homes and United Communities (a real estate development company) created the Drake Landing Company, a non-profit organization to oversee the installation of the solar thermal system. Funding was provided by FCM's Green Municipal Fund (GMF) and Natural Resources Canada. Sterling Homes was responsible for building the homes and garages and marketing the site; ATCO Gas would take full ownership of the utility portion of the system once it was complete.

The project required extensive research. Two feasibility studies were conducted, both funded by the GMF. In addition, Quail participated in two of FCM's energy missions where he toured solar thermal systems in Denmark and the Netherlands. The project team also organized and participated in a separate technical tour of similar systems in Germany and Sweden.

Construction began in the fall of 2004 and was completed in September 2007. All of the houses were built to R2000 and Alberta Built Green® "Gold" standards, which reduce average energy consumption by about 30 per cent from standard construction, but Paget of Sterling Homes says that the goal of this project "wasn't to build energy-wise homes but to showcase that solar energy can be used to heat single-family dwellings."

Results

Each home derives about 90 per cent of its space heating and 60 per cent of its domestic water heating from solar energy. Per home, per year, greenhouse gas emissions are five tonnes less than a conventionally constructed home. Homeowners pay the Drake Landing Company a flat fee of $60/month for space heating – just slightly less than the cost would be for natural gas heating. The flat fee covers day-to-day system maintenance costs. "The fee was not meant to cover lifecycle costs or the original infrastructure," says Paget, "but this was a demonstration project to prove that the technology works."

Sterling Homes built several different models of homes for prospective homeowners to choose from. Two of the model homes are pictured here. Photo by Sharon Boddy.

Drake Landing has won numerous domestic awards, as well as international acclaim. It took the Gold Award at the 2005 International Awards for Liveable Communities, a program endorsed by the United Nations, and most recently was honoured with the 2011 Energy Globe World Award.

The homeowners' perspective

Victor H., who moved to Drake Landing in 2007 from Prince George, BC to be closer to family members, says "the fact that the homes were advertised as energy efficient got me in the door." Each prospective homeowner was provided with information on the solar thermal system, which requires no specialized knowledge or skills to operate the home's heating or water systems. "The only difference is that I don't set back the thermostat quite as far in the evening because the airhandler doesn't give as quick a turnaround time in the morning as a regular furnace." He applauds Sterling Homes for choosing to build the homes to such a high energy-efficiency standard. "That's the biggest gain. The place is built tight with more insulation."

Robert P. was one of the first homeowners to settle in Drake Landing in 2005. “I moved from Calgary specifically because of Drake Landing,” he recalls. “I had heard about it on the news and since I’m an engineer, I have an interest in this type of renewable energy technology.” Robert did his homework, touring the development ahead of time and reading the feasibility studies. Like Victor, Robert says that, although there is no learning curve for new homeowners, the space heating system is slower to heat up than a regular gas furnace. “I’ve done some calculations [based on his previous, similarly sized home in Calgary] and there aren’t a lot of savings on space heating,” he says. “But I didn’t move here to save money, and you have to remember that gas prices have been very cheap for the last few years. If gas prices go higher, it’ll be a different story.”

Robert also says he noticed a difference in comfort right away. “The homes are very well built and insulated so you get a cool house in summer that doesn’t need air conditioning, while in winter the rooms are an even temperature, which is far superior to my previous home that had a similar layout,” he says.

“A lot of people moved in for the solar aspect and we’ve grown to be a tight-knit community,” he adds. “The neighbourhood is quite mixed and the developer made the homes really attractive. That’s a win because if you build something energy efficient that’s too unique or strange looking, it will only appeal to a small number of people.”

Lessons Learned

Quail says that without GMF and other funding sources, Drake Landing would not have come to fruition. “We were able to find that critical consortium of partners,” says Okotoks’ Municipal Manager. “Without all those vital links, this wouldn’t have happened.” He also says that the time to research solar thermal systems was time well spent. “Between my good fortune of being on two FCM energy missions, and the separate tour that we arranged for the project team, we came away with a really good appreciation for the technology.”

Paget says that, although they were using a new technology and control strategies for the heating system, the project team used many off-the-shelf products in the development of Drake Landing. “Most everything at Drake Landing is off-the-shelf and that made our life as a builder using the new solar thermal technology easier.” His advice for other municipalities that may be considering a similar project is “to ensure that all project partners are willing to see things through to the end and share equally in the good and the bad, if any.”

Future Direction

The Drake Landing Company is now studying how it can reproduce a similar development, but on a larger scale.

Further Information

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Drake Landing Solar Community:
http://www.dlsc.ca/

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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 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.

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