



2006 | Energy
Town of Okotoks
Alberta
 Population: 11,664



Harnessing the Sun — Okotoks' Solar Initiatives

Summary

The solar rays that fall on Alberta every day equal the energy from all fossil fuels extracted each year in the province. So, it's easy to see why Okotoks chose to harness the sun in many of its projects. From a solar-powered ice resurfacing system and district solar heating systems to a solar wall, Okotoks is Canada's leading municipal user of solar energy.

Drake Landing is the town's latest project. This 52-home subdivision will meet 90 percent of its space and water heating needs with solar energy, thus reducing annual greenhouse gas emissions by five tonnes per home. The energy will be stored in underground boreholes during warmer months for reuse in winter. This is the first time such technology has been used in North America.

Background

In the late 1990s, Okotoks was at a crossroads. Due to its close proximity to Calgary, rapid population growth was exerting pressure on both its infrastructure and local environment.

In 1998, Okotoks adopted a new municipal plan. It included a policy framework called "Sustainable Okotoks" that allows the town to consider risk and long-term investment in its environmental decision making. Since adopting the new plan and framework, more than 70 initiatives have been completed, including building retrofits, alternative energy installations, and waste management and water conservation measures.

Many of these initiatives are funded through the Eco-Efficiency Revolving Fund, established in 1999. "In the early 1990s, we received a rebate from our electrical distribution provider and used that money as seed dollars for the fund," explains Rick Quail, Okotoks' municipal manager. The fund invests in energy-efficiency initiatives and the resulting cost savings are reinvested in other projects. "It's worked very well," says Mr. Quail. "There have been no tax increases and we have a sustained funding source to pay for the projects."

Project Development

Although certain solar energy technologies can be cost-prohibitive, Okotoks Council believed that by positioning the town as a solar user now, it would be able to leverage the technology as its cost-effectiveness improved.

SAIC Canada, which partnered with Okotoks on the solar housing community, Drake Landing, has recently completed a survey of the solar industry in Canada. The survey found that the industry grew by about 40 percent in 2004. "Photovoltaics [to create electricity] is the most expensive type of system," explains Bill Wong, manager with SAIC. "Solar thermal systems, however, can have payback periods of under 10 years, while solar walls have paybacks of about three years, so the economics are really improving."

Installing Okotoks' solar energy systems required extensive research. Two feasibility studies, funded by GMF, were conducted. Mr. Quail also participated in two of FCM's annual energy missions where he toured several solar thermal systems.

"I focused on talking to end users," he recalls. "In Europe, they had to work on customer expectations and education and that brought home the importance of the studies we conducted earlier in the process. You can build the greatest thing in the world but the market has to be ready for it."

Bill Wong agrees. A 2003 market research survey to gauge consumer interest in solar-powered housing found that there was a lack of understanding about the technology. "But once people learned about it, there was overwhelming support," he says.

In the case of Drake Landing, the project team also organized a study tour of seasonal solar storage technology in Sweden, Germany and the Netherlands. "Between my good fortune of being on two FCM energy missions and then our technical tour, we came away with a really good appreciation for the technology," says Mr. Quail.

Project Implementation

Okotoks has completed five solar projects. Four of them use solar energy in municipal facilities. The fifth, Drake Landing, is a residential development heated almost entirely by solar energy.

In its municipal projects, two types of solar technology systems were used: solar liquid and solar air heating.

In a liquid heating system, the sun heats a liquid (usually a water and glycol solution) that circulates through a "loop" composed of tubes embedded in a solar panel. The loop then transfers the thermal energy from collectors to a water storage tank. Solar air heating systems preheat outdoor air and then draw that heat inside.

The Okotoks Recycling Centre, the Murray and Piper Arena, and the Swindells' Swimming Pool use different solar liquid heating systems.

At the Recycling Centre, eight horizontal loops are embedded into the building's concrete slab foundation. Solar panels sit atop the centre's roof, collecting the sun's energy. As the heat from the solar panels circulates to the slab, heat radiates through the concrete and warms the building. Two high-efficiency natural gas boilers provide backup space heating.

At the Murray and Piper Arena, 10 rooftop solar collector panels provide the energy to heat water used to resurface the ice rink. As in the Recycling Centre, a natural gas boiler provides backup heating.

At the Swindells' Swimming Pool, part of the Recreation Centre, the solar heating system ensures that water temperature in the pool stays at a comfortable 29°C. Sixty-six rooftop solar collector panels are connected to a piping system that leads to a heat exchanger inside the building.

A solar air heating system called a SolarWall™ heats the town's Operations Building. A dark-coloured metal panel along one wall of the building creates an air cavity between the building and the panel. Tiny perforations in the panel allow air to flow through. As the sun's rays hit the panel, air in the cavity warms. A ventilation fan then draws the heated air to the top of the cavity and into the building's ventilation system.

Perhaps the star of Okotoks' solar initiatives is the 52-home Drake Landing Solar Community. It has received international recognition as the first seasonal solar storage system in North America.

Eight hundred solar collector panels capture solar energy throughout the year and store it in an underground water piping system. Separate garage buildings were built behind the homes and collector panels were installed on the garage roofs. In winter, the stored thermal energy is pumped back into homes for space heating, while two solar panels on the roof of each home provide energy for domestic hot water uses, such as showers and laundry.

"Okotoks has its sights set on being a centre of excellence for solar energy in Canada," says Mr. Quail. "We're looking forward to the economic development spin-offs from that and we think it's realistic to think that there could be solar manufacturing facilities in our area in the future."

Results

- Reduced energy consumption can be directly attributed to the use of solar energy in all four municipal buildings. Savings range from 15 to 80 percent.
- Collectively, the four municipal buildings have cut annual carbon dioxide (CO₂) emissions by 124 tonnes.
- The Recycling Centre consumes 13 percent of the natural gas consumed by the conventionally heated Recycling Depot next door.
- Before the solar heating system was installed in 2002, Swindells' Swimming Pool was retrofitted for energy efficiency. Compared to 1998, the pool uses 10 percent less natural gas and 13 percent less electricity, despite increased use of the facility. The saving amounts to \$20,000 per year.

- Each Drake Landing home was built to R-2000 standards and derives approximately 90 percent of its space heating and 60 percent of its water heating from solar energy. Greenhouse gas emissions will be cut by five tonnes for each home.
- Okotoks has gained substantial local expertise in solar energy and energy efficiency. “We now have local framing crews who know how to incorporate solar panels onto homes and many who are now experts in R-2000 building,” says Mr. Quail. “We are now seeing other homes in the area built to the R-2000 standard.”

Lessons Learned

- **HAVE A COMMITTED MUNICIPAL STAFF.** “You have to have a committed team of staff because it is an extra workload on the administration,” explains Mr. Quail. He notes that Town Council has also strongly supported development of Sustainable Okotoks and the various solar projects.
- **EDUCATE THE PUBLIC.** Okotoks took a proactive approach to informing residents about solar energy. It ensured that all its dealings with the public were transparent, thus building trust and understanding.
- **START SMALL.** Sustainable Okotoks began with small energy-efficiency projects and worked its way up. “We invested wisely in major energy gains and then captured those gains for reinvestment,” says Mr. Quail.
- **FINANCIAL CHAMPIONS.** Okotoks obtained financing from many different sources, including Natural Resources Canada’s Renewable Energy Deployment Initiative, GMF and the province of Alberta’s Municipal Sponsorship Program. “Without that funding and leadership from the federal and provincial governments, none of these projects would have been possible,” says Mr. Quail.
- **HAVE A CONTINGENCY PLAN.** “Solar energy is powerful and sometimes you have too much,” says Mr. Quail. “If your end-use demand isn’t there, it’ll be wasted.” He explained that, by altering the Swindells’ Swimming Pool’s solar energy system, the town was able to use the excess energy to heat hot water for showers at the facility.

Related and Future Initiatives

A second SolarWall will be installed at the Recreation Centre in late 2006 and solar upgrades are planned for the Recycling Depot.

Okotoks is also designing a new municipal centre, which will house the town’s administrative staff. “We are examining a variety of solar applications,” says Mr. Quail. “We’re also looking at solar PV [photovoltaics] for the first time because Alberta is undertaking a municipal initiative to put in PV installations and pump the surplus power back to the grid.” Currently, Okotoks derives 60 percent of its electricity from certified green energy sources.

Sustainable Okotoks continues to be involved in a number of other projects. Most recently, Okotoks began to upgrade its wastewater treatment plant to include biological treatment and UV disinfection. This work was to be completed in 2006. Prior to the upgrade, Okotoks was the first municipality in Canada to use integrated wastewater treatment to remove solids at the beginning of the process and compost them for reuse.

The town has been a member of FCM’s PCP program since 2000.

Partners and Collaboration

Internal

Town of Okotoks

Financial

FCM’s Green Municipal Fund

Natural Resources Canada, Renewable Energy Deployment Initiative

Technology Early Action Measures (TEAM)

Climate Change Central

Province of Alberta, Municipal Sponsorship Program (provided funding for the municipal solar energy installations)

Province of Alberta, Innovation & Science Program and Alberta Environment

Sustainable Development Technology Canada

Project Partners

Natural Resources Canada

Climate Change Central

SAIC Canada

EnerWorks

Nu-Air
ATCO Gas
Sterling Homes
United Communities

The Town of Okotoks, ATCO Gas, Sterling Homes and United Communities created a non-profit organization to oversee installation of the heating storage system at Drake Landing. Once the system is fully commissioned, ATCO Gas will fully own the system.

Promotional Activities

Okotoks set up a permanent display at its recreation centre as part of its public education campaign. "People can find out how much solar energy is generated in the last hour, day or month and see the savings in terms of natural gas." The display is also on the town's website, along with a host of other information on the town's sustainable projects.

Drake Landing has its own website, which provides detailed information about the storage system, its technical components, and the homes' features.

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