

## **BACKGROUND**

### **Drake Landing Solar Community**

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Solar-heating systems work well in Canada because of the significant amount of solar radiation that the country receives. As a “top-ten” Canadian location in terms of sunny days each year, the area of Okotoks receives almost as much solar energy as Italy and Greece — making it an ideal location for solar-energy collection.

However, due to Canada’s geographic location and climatic conditions, the solar radiation is lower during the winter season — when energy demand for space heating is at a peak. Therefore, in order to make solar space-heating projects successful, there must be a storage system.

In such a system, thermal energy is collected through solar panels mounted on roofs and transferred to underground storage. The storage temperature increases over the summer months and then, during the winter season, the thermal energy is retrieved and distributed through a central district heating system to homes or businesses in a community.

Recent advances in solar seasonal-storage developments and cost reductions in solar collectors make such a project both economically and environmentally attractive. Although these projects are just beginning in North America, a number of solar seasonal-storage projects have been successfully demonstrated in Europe.

#### **Benefits**

Approximately 80 percent of residential greenhouse gas (GHG) emissions in Canada come from space and domestic hot-water heating. By using solar energy, the Drake Landing Solar Community project is estimated to reduce GHG emissions for each house by five tonnes per year. That translates into 260 tonnes per year.

The homeowners will be charged a favourable long-term fixed monthly fee. Although the system’s costs will not be competitive with today’s price for fossil fuels such as natural gas, the scale of the demonstration will be large enough to make it competitive with higher-priced conventional heating sources such as electricity. Moreover, as the size of these projects expand and fossil fuel prices increase, the costs of such systems become more competitive. The operating costs will be lower than those of a combustion furnace.

In addition, this project will provide invaluable information for future, larger-scale projects.

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## **System Description**

A large-scale solar-heating system capable of supplying more than 90 percent of the space-heating requirements for 52 new homes will be built for the Drake Landing Solar Community in Okotoks, Alberta. The homes will be heated by hot water from a district heating loop. As well, each home will include an independent two-panel solar thermal system to meet 60 percent of the domestic hot-water needs.

The homes will encompass numerous energy-efficient and environmentally friendly features, including superior insulation, low-flow plumbing fixtures, advanced appliances and low-impact landscaping. They will be certified to the R-2000 energy-efficiency standard — the first R-2000 subdivision in Alberta — and registered with the Built Green Alberta program at the Gold Level, its highest standard.

Approximately 800 solar collectors (more than 2,300 square metres in total area) will be mounted on roofs of interconnected garages and breezeways, generating up to 1.5 megawatts of thermal power. In the summer, solar energy will be collected and stored in a “borehole field” under the neighbourhood park. In the winter, heat will be extracted from the field and delivered to the homes as hot water through underground, insulated pipes. On sunny days, solar energy will be collected and delivered directly to the homes.

The borehole field will consist of 144 holes that will stretch 37 metres below the ground and will cover an area 35 metres in diameter. As the heated water travels through the pipework, heat will be transferred to the surrounding earth. The temperature of the earth will reach 80 degrees Celsius by the end of each summer. To improve the insulation properties of the earth, the borehole system will be covered with sand, high-density R-40 insulation, a waterproof membrane, clay and other landscaping materials.

A building in the park (called the energy centre) will house the mechanical equipment, controls, monitoring system and large water tanks for short-term heat storage.

Each home will have an “air handler” instead of a furnace. The home’s air will be heated from the water and distributed throughout the home using conventional forced-air ducts. The homeowners will set their thermostats for individual comfort, just like other homes.

After a feasibility study was completed in February 2004, site development began in August 2004. The borehole field and energy-centre construction, as well the interconnected garage construction, will begin in the spring of 2005. The solar collectors are expected to be installed by the summer of 2005, with the system in operation by the fall. The first homes are scheduled to be completed and occupied shortly after the system is commissioned.

## Partners

- **Natural Resources Canada (NRCan)** plays a pivotal role in helping shape the important contributions of the natural resources sector to the Canadian economy, society and environment. NRCan's CANMET Energy Technology Centre, one of the main research and development arms of the Government of Canada, initiated and leads this project.
- **Technology Early Action Measures (TEAM)** is a Government of Canada technology investment program. TEAM supports projects that are designed to develop technologies that mitigate greenhouse gas emissions nationally and internationally, and that sustain economic and social development.
- **Environment Canada's** Meteorological Services, Atlantic Region, represented Canada in the International Energy Agency's Implementing Agreement on Energy Conservation through Energy Storage and is Canada's expert in underground thermal storage technologies.
- **The Federation of Canadian Municipalities** received \$250 million from the Government of Canada to establish and manage the Green Municipal Funds (GMF). The GMF support partnerships and leveraging of both public and private sector funding to reach higher standards of air, water and soil quality, and climate protection. In Budget 2005, the Government of Canada committed a further \$300 million to the GMF.
- **The Government of Alberta's** \$33-million Innovation Program is a three-year initiative, managed by Alberta Innovation and Science, that provides seed funding to accelerate the innovation process. Proposals are developed by Alberta government departments, agencies, boards, commissions, Crown corporations and their partners.
- **United Communities** is the Calgary-based real estate developer for this project. It is committed to building theme communities that are well-planned and architecturally controlled. It also operates in Edmonton and British Columbia.
- **Sterling Homes**, the builder for this project, designed each home to optimize both R-2000 and Built Green Alberta programs. Sterling Homes is a member of the Sterling Group of Companies, a division of Qualico Developments West Ltd., one of Canada's largest builder/developer groups.
- **ATCO Gas**, Alberta's largest natural gas distribution company, will manage the construction, as well as operate and maintain the system. Following a commissioning period, it will take ownership of the system. ATCO Gas is part of the Alberta-based ATCO Group of Companies.
- **The Town of Okotoks** is a vibrant community of 14,000 that is nestled along the Sheep River Valley only 10 kilometres south of Calgary. Okotoks is one of the fastest-growing towns in Alberta and is a recognized leader in sustainability initiatives.

- **Climate Change Central** financially supported the pre-design site investigation and planning, and helped secure additional partners and funding for the project. It is a unique partnership among Alberta businesses, governments and the environmental community aimed at reducing greenhouse gases.
- **EnerWorks**, the solar partner for the project, develops and manufactures renewable energy appliances for residential and commercial markets. Based in London, Ontario, the company provides clean, competitive renewable energy solutions.

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