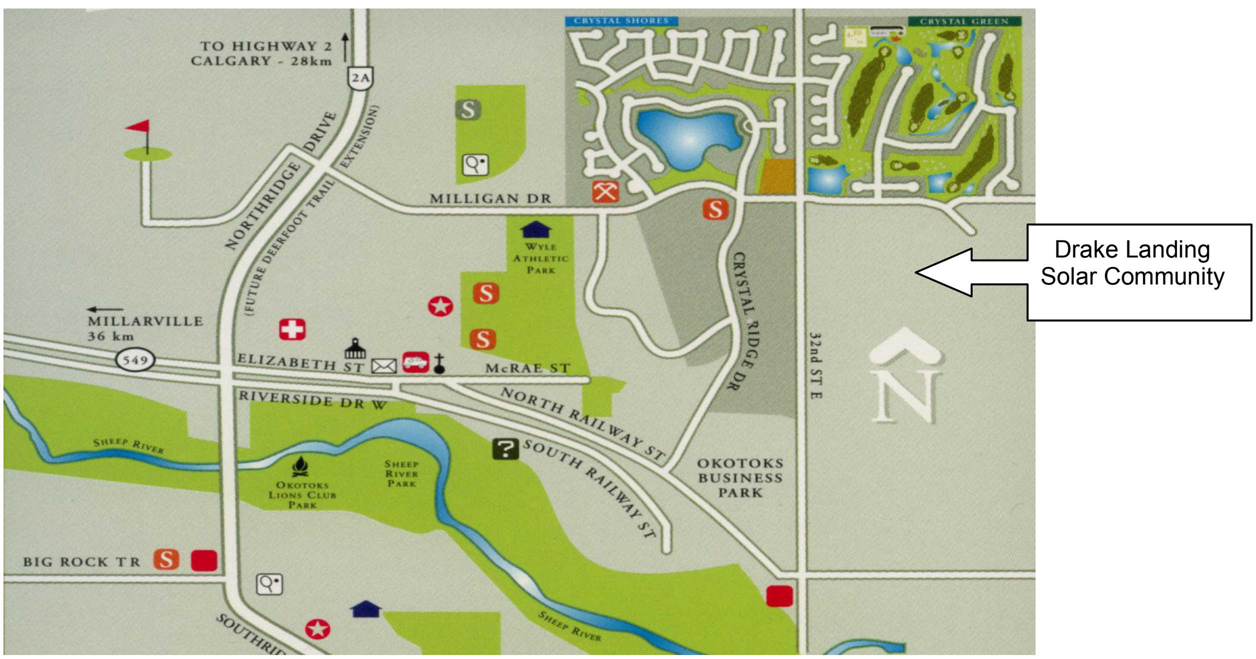
Sterling HOMES

In - Drake Landing Solar Community

North America's First in Okotoks, Alberta

The Drake Landing Solar Community is nestled inside the Drake Landing housing development by United Communities in the north east corner of Okotoks, Alberta, 15 minutes south of Calgary. 52 houses by Sterling Homes are being built without standard natural gas furnaces and will be heated solely by warm water circulating through insulated, underground pipes of a district heating system. As unique as district heating systems are in Canada, what is even more unprecedented about the Okotoks system is the source of the warm water – the sun.

The Drake Landing Solar Community's district heating system is the first major implementation in North America of a proven European technology known as "solar seasonal storage". Solar thermal energy is collected in the summer, stored underground, and then returned to the homes as heat during the winter.



Seasonal solar energy storage is modern man's way of coping with an ancient conundrum – the sun provides more than enough energy to keep us comfortably warm in the summer, but not enough in the winter. The Drake Landing Solar Community development in Okotoks collects excess solar thermal energy during the summer, storing it as heated rock/soil under the community park. During the cold winter months, the heat is retrieved from the rock/soil and delivered to the homes. Solar seasonal energy storage systems of this scale are relatively unique.

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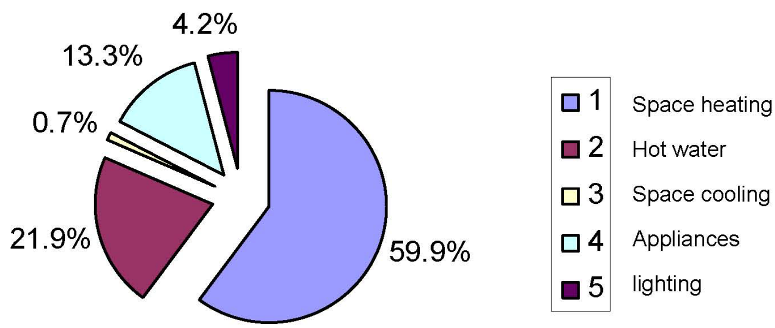
Residential Energy End-Use



End-use Energy Data Handbook 1990 – 2000 NRCan, June 2002

A typical Canadian home's energy requirement, breaks down to 60% for space heating, 20% for domestic hot water heating and the final 20% for appliances, lights etc. For the Drake Landing Solar Community, pre-construction estimates indicate that, in a typical year, well over 90% of the energy used for the homes space heating will come from solar energy. Even in an unusually cold winter and spring, 80% of the required heat is expected to come from the sun.

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Energy System Elements

Visually, three elements will be the focus at the Drake Landing Solar Community site. The four rows of interconnected garages with their 800 – 4'x8' solar collectors mounted on their roofs, the Energy Centre building in the north east corner of the solar community and the 2 – 4'x8' solar panels on each home. However, two of the most important elements of the energy system won't draw attention to themselves: the homes will have numerous energy-related upgrades, and the thermal storage field will be completely buried beneath the park.

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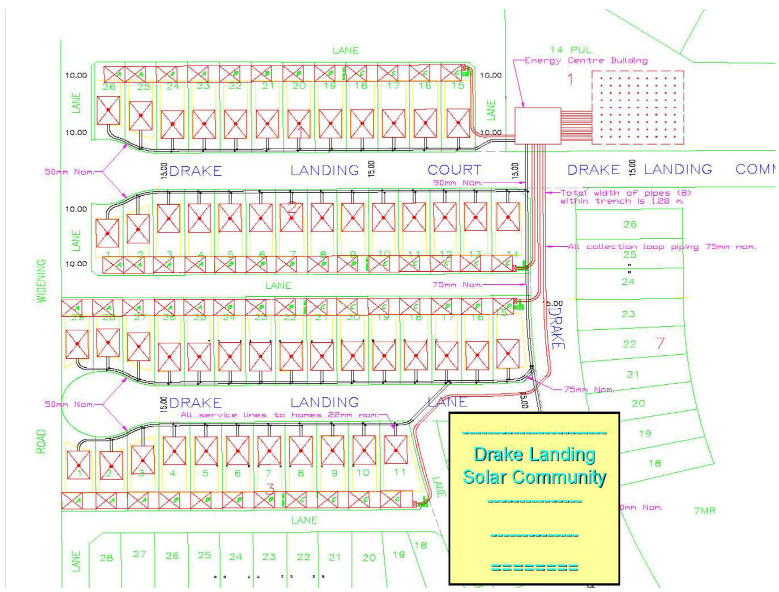
Energy Delivery

High temperature, insulated underground pipe is used to transport the heat from the garage solar collectors and bring it to the Energy Centre. Plastic, flexible, insulated shallow buried underground pipe is used to distribute heat from the Energy Centre back to the homes. The heating water circulating through these distribution pipes will typically be 40 - 50°C. The distribution temperature will vary through the year based on the current day's outside air temperature and the flow regulated to match demands by the homeowners.



Because Drake Landing Solar Community is using a lower water temperature than most district heating systems, it was necessary to more carefully engineer the in-home heating system. For instance, domestic hot requires a minimum of 60 degrees Celsius and space heating requirements are lower. The economics and engineering indicated we should install independent solar hot water systems in each home.

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User experience

If this heating system in Drake Landing Solar Community is so innovative and so different, one might ask whether it is a good idea to live in one of these homes. Will the home be comfortable to live in? Will the heating system be too complex to operate? Will it cost too much to operate?

The simple answer is that the homeowners will barely notice the difference. The only task that the homeowners need to do is set the (standard) thermostat as they like, to provide the level of comfort they desire. The homeowner may notice that the interior air is never stale, due to the continuous ventilation common to all R-2000 homes, and they may notice that they are setting the thermostat slightly lower than they did in former homes, because the multiple speed blower tends to provide a more even, more comfortable heat throughout the home.

Project Benefits

The most immediate benefit of this project will be a decrease in greenhouse gas (GHG) emissions. An average Canadian home produces approx. 6 - 7 tonnes of GHG per year. Estimates for Drake Landing Solar Community indicate the savings of approximately 5 tonnes per home per year. This reduction well exceeds the Government of Canada's One-Tonne Challenge goal and, over the life of the system, should reduce GHG gas emissions by about 13,000 tonnes – while providing comfortable homes with excellent indoor air quality for 52 families.

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Project Participants

- Natural Resources Canada – CETC Ottawa (lead project developer and technical support)
- Science Application International Corporation (SAIC Canada) (project coordinator)
- Town of Okotoks (municipal authority)
- United Communities (developer)
- Sterling Homes Ltd. (home and garage builder)
- ATCO Gas (utility operator)
- Enermodal Engineering Ltd. (solar and heating system design)
- Sunbow Consulting Ltd. (subdivision design)
- Hurst Construction Management Inc. (energy building and system construction)
- EnerWorks Inc. (solar collector supplier)
- Nu-Air (airhandler and HRV supplier)

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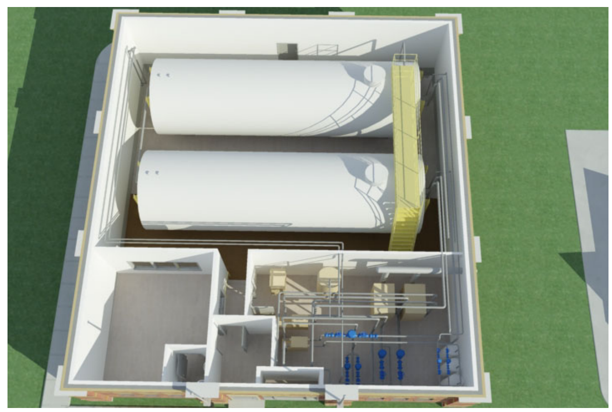
Energy Centre Building

The 2,500 ft² Energy Centre building for Drake Landing Solar Community is located in the corner of the community park, and houses the short term heat storage tanks, as well as most of the mechanical equipment (pumps, heat exchanger, controls, etc.).

In the front of the Energy Centre is a display window, showing how the system works, and providing actual, realtime data on system performance. This same performance data will be available openly on the internet, allowing researchers, homeowners and the merely curious to observe the system.



Approximately 70% of the floor space is filled with two large, insulated water tanks, each 12' diameter and 10' tall. The water temperatures within these tanks are "stratified", that is tank 1 holds the warmest water, and tank 2 the coolest. This allows the system controls to pull just the right temperature water that is needed, or to return heated water to the best location.

The front room of the Energy Centre contains the pumps, valves, heat exchangers, expansion tanks, and other equipment necessary to operate and control the energy system.

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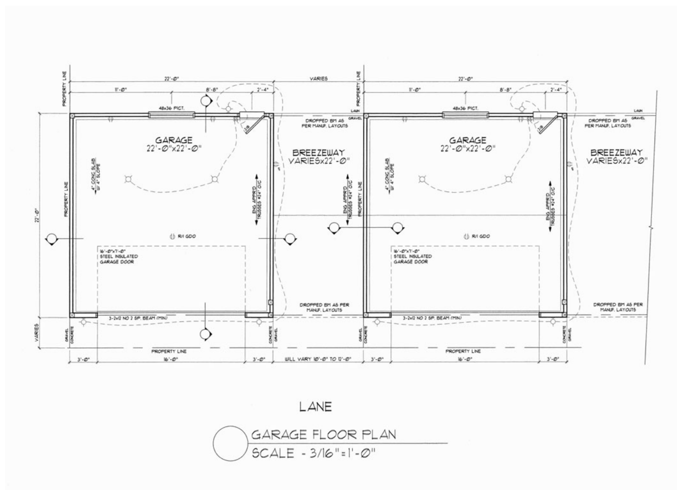
Garages

Garages in the Drake Landing Solar Community will be a spacious 22' x 22', a nice size in today's standards. Interconnecting the garages with breezeway structures provides a very large sloped surface for mounting solar collectors, leaving the homebuilder with complete freedom to design attractive homes in several styles.



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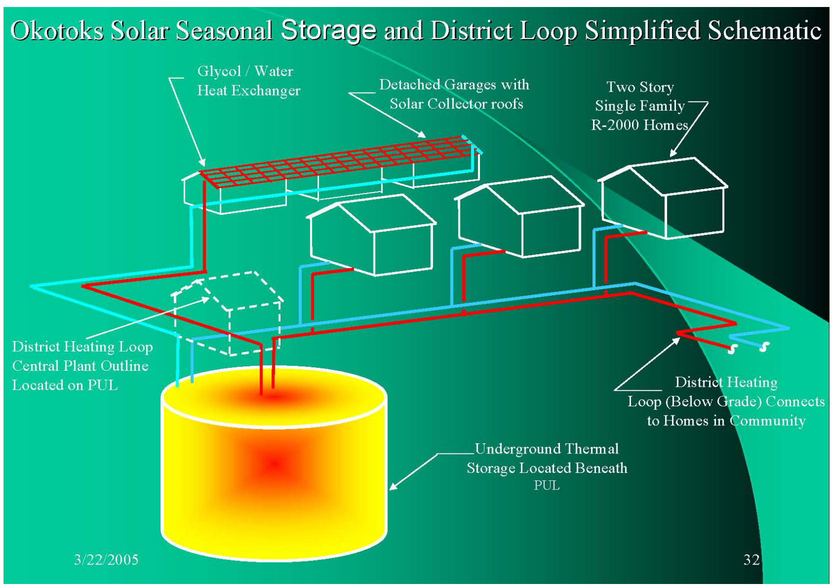
Energy Flow

The 800 solar collectors in the Drake Landing Solar Community act as the primary energy source, sending collected energy into the short term thermal storage (STTS) tanks, via a glycol/water heat exchanger. The collection of solar energy occurs whenever the sunlight is strong enough to produce useful heat. On a typical summer day the collection system is capable of producing 1.5 megawatts of thermal power. From the STTS, the thermal energy will be sent through the district loop, to be utilized by homes as needed. If there is more solar heat available than is currently needed by the homes (which is always the case during summer, when little or no heat is required), energy will be transferred from the STTS tanks to seasonal storage in the borehole field.



Alternatively, if the homes require more energy than is currently being collected, the temperature of the STTS will fall, triggering a call to transfer heat from the borehole thermal energy storage (BTES) field into the STTS, for delivery to the homes. Only if the BTES field cannot deliver the required energy to the STTS will the backup natural gas boiler located in the subdivision's Energy Building operate, delivering heat directly into the district loop, for immediate transfer to the homes. Use of the backup boiler is most likely late in the heating season, when the BTES has been discharged.

Inside each home a standard thermostat controls an automatic valve. When heat is required, the valve is opened, and the heated water flows through the water/air heat exchanger in the air handler unit (replacing furnace). The blower distributes the warmed air throughout the home, similar to conventional forced air delivery. The warm water in the district loop is flowing at all times during the heating season, to ensure that heat is instantly available whenever needed.

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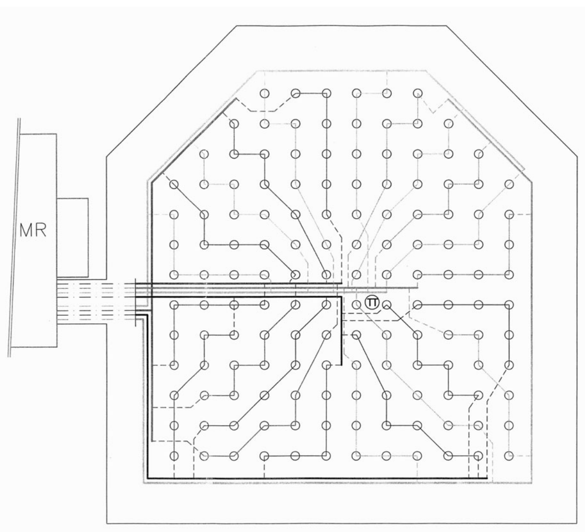
Borehole Thermal Energy Storage (BTES)

Borehole thermal energy storage (BTES) is an underground “structure” for storing large quantities of solar heat collected in summer, and utilizing it in winter, that is, seasonal storage. The concept of solar seasonal storage has been around since the mid-1970’s; with the earliest demonstration plant completed that same decade, in Sweden. The International Energy Agency (IEA) formed a task group to investigate solar seasonal storage in 1979. Even so, few solar seasonal storage systems were built until recent years. Building from the European successes the technology has been brought to Okotoks, Canada for the first time in North America.


Project Groningen (1983)



Netherlands

A borehole storage field is an array of boreholes, initially identical to standard drilled wells. After drilling, a plastic pipe with a “U” bend at the bottom is inserted down the borehole (think of pushing the middle of a garden hose down the hole, leaving both ends at the surface). To keep everything stable, the borehole is then filled with a high thermal conductivity grouting material. In Okotoks, 144 of these holes, each to a depth of 35 meters, are planned in a grid, with 2.25 meters between them. At the surface, the U-pipes are joined together in groups of 6 (called a series) that radiate from the center to the outer edge, and then connected back to the Energy Centre building.

Once the drilling and plumbing is complete, the entire borehole field is covered in a layer of insulation and then soil – with a landscaped park built on top.

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The operation of the BTES is very simple: when solar heated water is available, it is pumped into the centre of the BTES field, through the U-pipe series, transferring the heat to the soil and rock, and gradually cooling as it reaches the outer edge. Conversely, when the homes require heat, cooler water is pumped into the edges of the BTES field and as the water flows to the centre it picks up heat. The heated water is then circulated to the homes through the district distribution loop. The BTES field is ensured a long life through the selection of durable materials, and because it contains no moving parts (other than flowing water). All pumps and control valves are housed in the neighboring Energy Centre building.

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Homes, R-2000, Built Green Alberta™

The Drake Landing Solar Community has six distinct two-story home designs from 1492 – 1664 sq ft to choose from. These will look similar to other new homes across Canada, but there will be subtle differences.

The solar heated homes are enhanced with stringent energy requirements. Each of the 52 homes will be certified to Natural resources Canada's R-2000 standard for energy efficiency. Although widely recognized for excellent results, the voluntary, made-in-Canada R-2000 Standard is employed on only a very small fraction of new homes – although many features first introduced in R-2000 homes are now commonplace. When completed, the 52 homes will be one of the largest collections of R-2000 homes in Canada.

All homes in Drake Landing Solar Community will also be certified in the Built Green™ Alberta program. The program is managed by the Non-profit, Built Green™ Society and is modeled on both the R-2000 and NRCan's EnerGuide for New Houses Program. The program has three distinct levels builders can aspire to for flexibility of price ranges, Bronze, Silver and Gold. The Drake Landing solar homes will have the Gold certification.

Both R-2000 and Built Green™ Alberta programs advocate quality, comfort, energy efficiency and responsible resource use, yet they are different enough for each builder to have a unique specification for the consumer.

Water Conservation

All homes in the Drake Landing development, even those that are not solar heated are required to abide by The Town of Okotoks water stewardship measures. All homes will have (6L/flush) low consumption toilets, ultra low flow (7.5 L/min) showerheads, (4 L/min) bathroom faucets, and (6 L/min) kitchen faucets. All hot and most cold water lines will be insulated. Larger homes where the distance from the hot water tank to the furthest hot water tap exceeds 36 feet will be required to have a recirculation pump. Homebuilders are even required to supply an Energy Star®, low water consumption clothes washer and dishwasher. Exterior water conservation is augmented with a rain barrel, supplied for plant watering, incorporated into the one eavestrough downspout. Extra topsoil depth will be supplied to maintain moisture longer for landscaping needs and an outdoor tap timer in place to help forgetful users.

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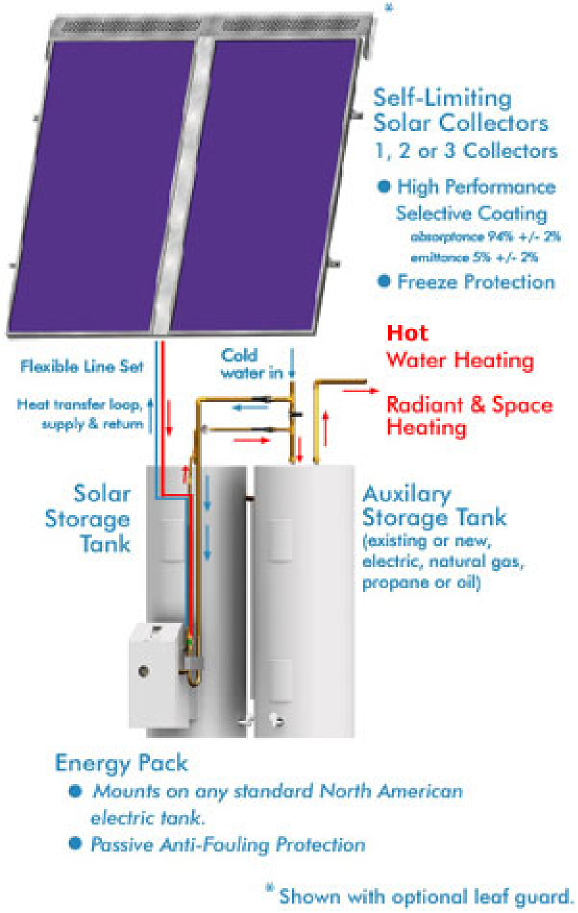
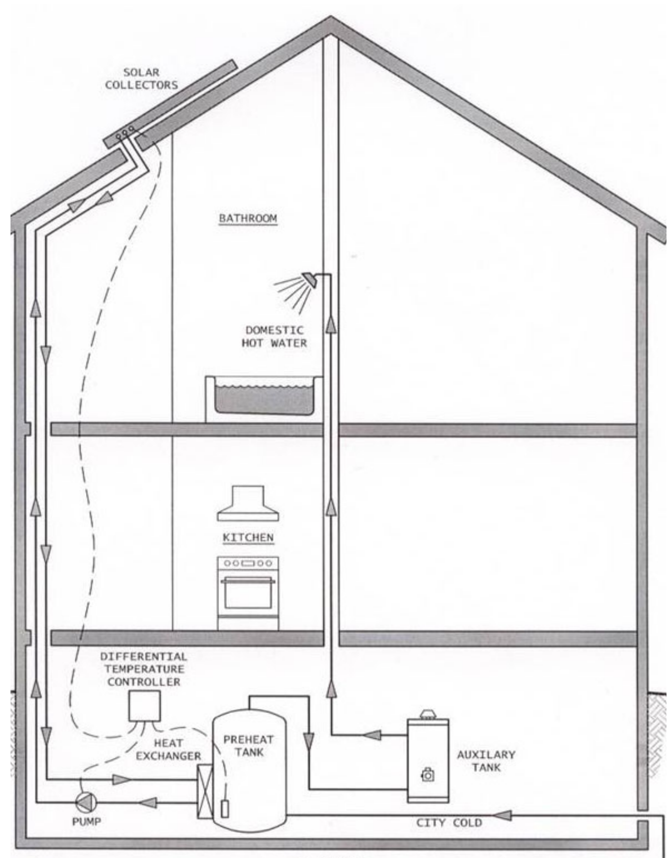
Solar Domestic Hot Water (SDHW)

All 52 homes of the Drake Landing Solar Community will be equipped with a solar domestic hot water (SDHW) appliance coupled to a power-vent, natural gas water heater. In order for the SDHW unit to meet the requirements of the Built Green™ Alberta program, on an annual basis, it must produce a minimum of 50% of the hot water used in the homes on an annual basis. The SDHW unit for Drake Landing Solar Community should reach up to 60%. Combined with the higher efficiency power-vent, natural gas water heater and the low water consumption devices in the homes, the 52 solar homes in the subdivision are expected to use 65 – 70% less natural gas to heat water as typical new homes. This alone will save more than one tone of greenhouse gas emissions each year per home.





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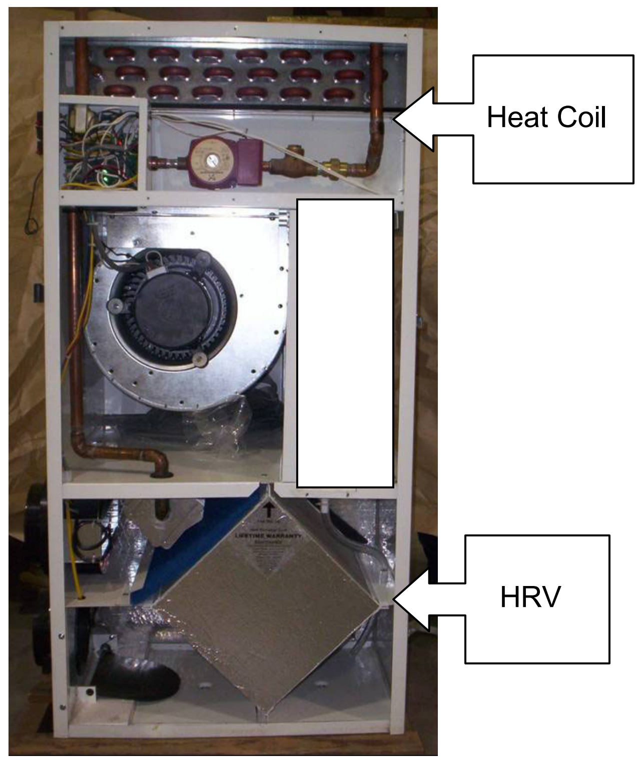
Airhandler Unit (replaces conventional furnace)

The air-handler selected for use in the Drake Landing solar homes has a larger heat exchanger surface, an integrated heat recovery ventilator (HRV) to efficiently bring in fresh, outdoor air, and uses high efficiency, variable speed motors (ECM™ – electronically commutated motor – from General Electric) to drive both the main blower and the ventilator. The ability to automatically vary the blower speed as heating conditions change is required to achieve resident comfort.



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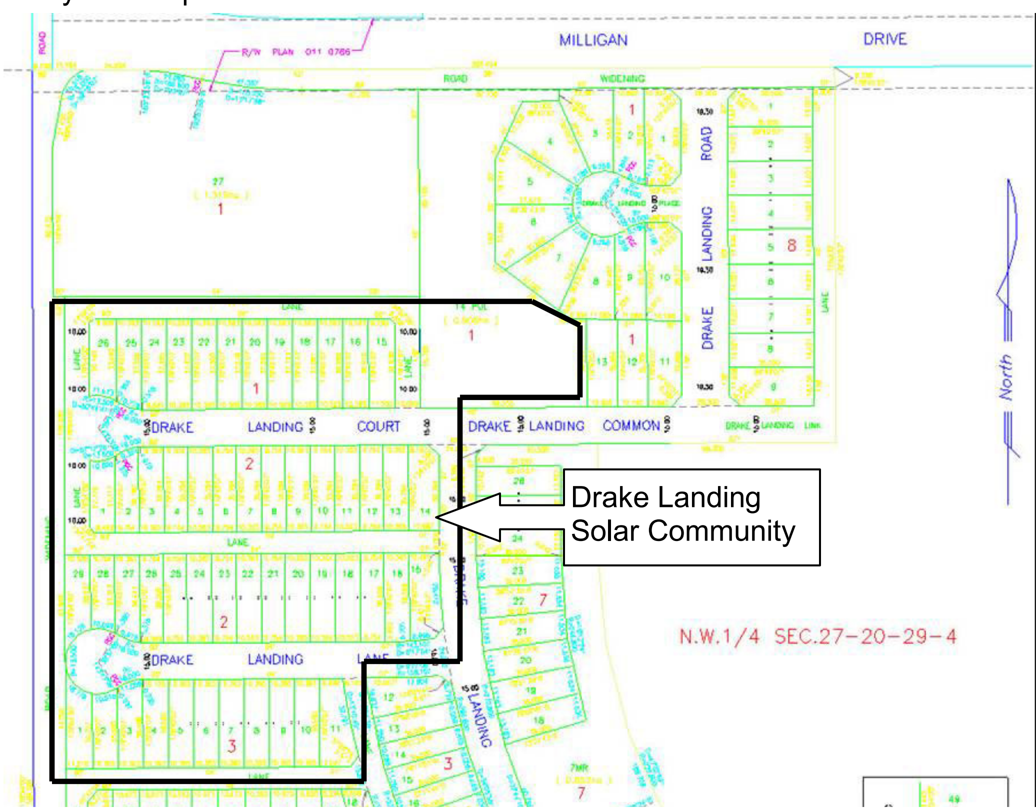
Home Sales

Watch our web site for updated sales information. www.sterlinghomesgroup.com

Register now to be on the advance information list.

Six models to choose from based on Sterling Homes "Preferred Specification"

> **Azimuth** – two story, 3 bedroom, 2-1/2 baths, fireplace, basement laundry, available with or without front veranda, 1602 sq ft
> **Celestial** - two story, 3 bedroom, 2-1/2 baths (jack and jill for bed 2-3), fireplace (free-standing gas stove), main floor laundry, 1492 sq ft
> **Nebula** - two story, 3 bedroom, 2-1/2 baths, fireplace, main floor laundry, 1555 sq ft
> **Solaris** - two story, 3 bedroom, 2-1/2 baths, fireplace, main floor laundry, small front veranda, 1506 sq ft
> **Solstice** - two story, 2 bedroom, 2-1/2 baths, loft, 3-way fireplace, main floor laundry, 1593 sq ft
> Available as well as two story, 3 bedroom, 2-1/2 baths, (no loft), 3-way fireplace, main floor laundry, 1664 sq ft
> **Umbra** - two story, main floor flex room, 3 bedroom, 2-1/2 baths, fireplace, basement laundry 1631 sq ft



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Thank You For Your Interest

Imagine living in a community specifically created to preserve precious natural resources and provide greater energy efficiency in your home.

A community designed to provide healthier air inside your home, to conserve water usage and reduce pollution in your neighbourhood and beyond.

Imagine what an impact this would have – on your life, your well being, our environment and on the future of generations to come.

We at Sterling Homes Ltd., a division of The Sterling Group of Companies, thank you for your interest in the Drake Landing Solar Community.

The Sterling Group of Companies has been building homes for over 50 years. We have earned the trust of families, building one house at a time and work hard to keep that trust. One of the founding members of the Alberta New Home Warranty Program, Sterling Homes has been awarded the "Leadership in Excellence Award" for 27 consecutive years for outstanding service to homeowners.

Bill Bobyk
General Manager
Sterling Group of Companies

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