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### **Can I use solar to heat my house?**

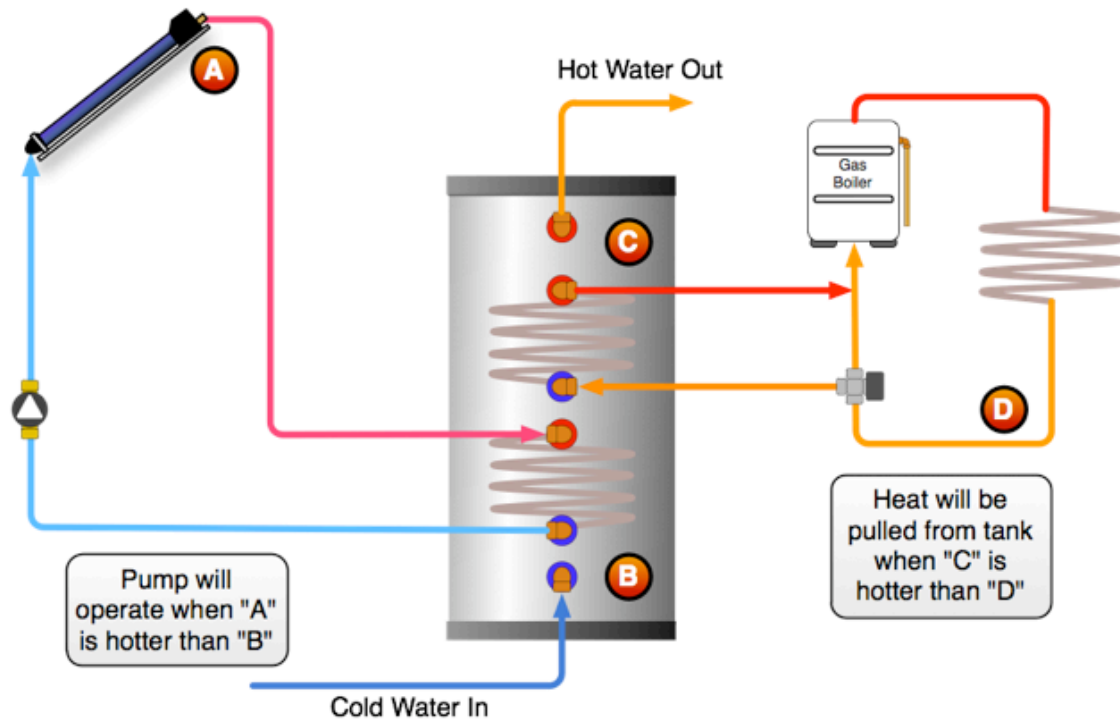
In many cases the answer is YES. Although the most popular (and typically easiest) application for solar hot water is to pre-heat domestic hot water. This involves usually just one heat exchanger and one pump (sometimes two). Apricus collectors produce the most amount of heat in the winter compared to any technology and this comes in handy when designing a system to supplement space heating.

Here are a few things we think you should consider.

### **What is the current method you heat your house?**

If you use a "lower temp" method like "*In-floor radiant hydronic heat*" then congratulations because you have one of the most comfortable, and energy efficient ways to heat your home. Below is a diagram which shows how an Apricus solar hot water system could tie into your existing in-floor heating setup. Please note that in this system the solar only contributes to the space heating when the tank is hotter than the returning fluid from the floor. This way it doesn't cool it down anymore before going back to the boiler.

## Frequently Asked Questions about Solar Hot Water



Basic Pre-heat System with Infloor Heating Support

Basic concept drawing only - Not all components are shown

### Other heating methods:

**Forced air:** Apricus systems may be able to supplement forced space heat by installing a coil into the plenum of the furnace which heats the air and reduces the need for fuel. Please check and make sure you are not voiding any furnace manufacturer warranty when installing such a system.

**Radiators:** A.K.A "Rads" were, and are still very common in homes and larger buildings. Radiators are designed to emit heat by radiation and convection. Radiators which have fin's welded to the rear of the radiator panel emit most of their heat via convection, with a small amount radiating direct from the steel panel. This leads to greater efficiency and a more even heat distribution throughout the room. Standard steel panel radiators which do not have fin's rely on radiant heat, this leads to less efficient localised heating and potential cold spots within the room. All types of radiators typically work \*better\* with higher temperatures which may or may not be available in the solar tank depending how much

sunlight is available. This gives the upper hand (more solar contribution) to "lower temp" space heating like radiant floor systems (mentioned above).

In summary Apricus can be used to supplement several different space heating but typically the best (ie. most contribution, less cost) integration happens with a radiant floor (including "staple up") system.

To learn more about convection, conduction, and radiation [click here](#).

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### **What is Solar?**

Solar energy is the cleanest and most inexhaustible of all known energy sources. Solar radiation is the heat, light and other radiation that is emitted from the sun. Solar radiation contains huge amounts of energy and is responsible for almost all the natural processes on earth. The sun's energy, although plentiful, has been hard to directly harness until recently.

Solar Energy can be classified into two categories, Thermal and Light. Photo-voltaic cells (PV) use semiconductor-based technology to convert light energy directly into an electric current that can either be used immediately, or stored in a battery, for later use. PV panels are now becoming widely used as they are very versatile, and can be easily mounted on buildings and other structures. They can provide a clean, renewable energy source which can supplement and thus minimize the use of mains electricity supply. In regions without main electricity supply such as remote communities, emergency phones etc, PV energy can provide a reliable supply of electricity. The disadvantage of PV panels is their high cost and relatively low energy conversion rate (only 13–15%). Thermal solar on the other hand has average efficiency levels 4–5 times that of PV, and is therefore much cheaper per unit of energy produced.

Thermal energy can be used to passively heat buildings through the use of certain building materials and architectural design, or used directly to heat water for household use. In many regions, solar water heaters are now a viable supplement or alternative to electric or gas hot water production.

Thermal energy obtained from the sun can be used for a number of applications including producing hot water, space heating and even cooling via use of absorption chilling technology.

Using solar and other forms of renewable energy reduces reliance on fossil fuels for energy production, thus directly reducing CO2 emissions. CO2 emissions contribute to global warming, an environmental issue which is now of great concern. The average household can reduce CO2 emissions by as much as 20% by installing an Apricus solar collector.

Flat plate thermal solar collectors have been in use for several decades, but only in relatively small numbers, particularly in Western countries. Evacuated tubes have also been in use for more than 20 years, but have been much more expensive than flat plate, and therefore only chosen for high temperature applications or by those with money.

In recent years the production volume of evacuated tubes has exploded, resulting in greatly lower manufacturing and material costs. The result is that evacuated tubes are now similar in price to flat plate, but with the insulating benefits of the evacuated tube, they are set to become the default choice for thermal solar applications worldwide.

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### **How does using solar help the environment?**

Currently Apricus solar collectors are reducing CO2 emissions by more than 13,000 tonnes / 28.6million pounds per year, with collectors installed in the UK, USA, New Zealand, Germany, France, Sweden, Italy, Hungary, Portugal, Jordan, Lebanon, Australia, Canada, Mexico and many other locations.

(One metric tonne = 2200 pounds)

There has been a great deal of information in the media over the past few years about global warming and the role of CO2 emissions. 2003 saw extreme weather conditions and a heat-wave throughout Europe, clear evidence of the realism of this problem, commonly referred to as the "green house effect." Burning fossil fuels such as coal for electricity production, and gas for water heating both release large amounts of CO2 into the atmosphere, thus contributing to this environmentally harmful phenomenon.

By using renewable energy sources such as Solar Thermal, Solar PV, Wind, Hydro and Geothermal, reliance on fossil fuels can be minimised, thus directly reducing CO2 emissions. On average for every 1kWh of energy produced by a coal power station, 1kg (2.2pound) of CO2 is produced. Burning natural gas for electricity production or water heating produces about 450grams of CO2 for every kWh of energy produced.

In the average household, water heating accounts for around 30% of CO2 emissions. By installing a solar water heater, which can provide between 50-70% of your hot water heating energy needs, you can reduce your total CO2 emissions by more than 20%.

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### **What is an Evacuated Tube?**

## Frequently Asked Questions about Solar Hot Water



Evacuated tubes are the absorber of the solar water heater. They absorb solar energy converting it into heat for use in water heating. Evacuated tubes have already been used for years in Germany, Canada, China and the UK. There are several types of evacuated tubes in use in the solar industry. Apricus collectors use the most common "twin-glass tube". This type of tube is chosen for its reliability, performance and low manufacturing cost.

Each evacuated tube consists of two glass tubes made from extremely strong borosilicate glass. The outer tube is transparent allowing light rays to pass through with minimal reflection. The inner tube is coated with a special selective coating (Al-N/Al) which features excellent solar radiation absorption and minimal reflection properties. The top of the two tubes are fused together and the air contained in the space between the two layers of glass is pumped out while exposing the tube to high temperatures. This "evacuation" of the gasses forms a vacuum, which is an important factor in the performance of the evacuated tubes.



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Why a vacuum? As you would know if you have used a glass lined thermos flask, a vacuum is an excellent insulator. This is important because once the evacuated tube absorbs the radiation from the sun and converts it to heat, we don't want to lose it!! The vacuum helps to achieve this. The insulation properties are so good that while the inside of the tube may be 150oC / 304oF , the outer tube is cold to touch. This means that evacuated tube water heaters can perform well even in cold weather when flat plate collectors perform poorly due to heat loss (during high Delta-T conditions).



In order to maintain the vacuum between the two glass layers, a barium getter is used (the same as in television tubes). During manufacture of the evacuated tube this getter is exposed to high temperatures which causes the bottom of the evacuated tube to be coated with a pure layer of barium. This barium layer actively absorbs any CO, CO<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub>, H<sub>2</sub>O and H<sub>2</sub> out-gassed from the evacuated tube during storage and operation, thus helping to maintaining the vacuum. The barium layer also provides a clear visual indicator of the vacuum status. The silver coloured barium layer will turn white if the vacuum is ever lost. This makes it easy to determine whether or not a tube is in good condition. See picture below.

Evacuated tubes are aligned in parallel, the angle of mounting depends upon the latitude of your location. In a North South orientation the tubes can passively track heat from the sun all day. In an East West orientation they can track the sun all year round.

### **How much does it cost to heat my house?**

This question is asked of us everyday and to be honest there is no simple answer because everyone has different needs. With that said we don't want to leave you in the dark and having a ball park figure can help you understand the upfront financial requirement for installing a quality Apricus hot water system.

#### **Disclaimer:**

This is not to be considered a price list or firm quote. Rather, the information supplied below is derived from actual installation costs across the country by qualified installers. This would be a good range to budget for when considering a straightforward, relatively basic installation. Multiple levels or steep roofs, and tight mechanical rooms might affect the price.

A system for 1–2 people would consist of an AP–22 collector as well as a single coil solar tank, pump station glycol, and related piping/insulation. With a basic installation this could cost between \$6–8,000.

A system for 2–4 people would consist of an AP–30 collector as well as a single coil solar tank, pump station glycol, and related piping/insulation. With a basic installation this could cost between \$7–9,000.

A system for 4–5 people would consist of two AP–22 collectors as well as a single coil solar tank, pump station glycol, and related piping/insulation. With a basic installation this could cost between \$8–9,500.

A system for 5–6 people would consist of two AP–30 collectors as well as a single coil solar tank, pump station glycol, and related piping/insulation. With a basic installation this could cost between \$11–12,000.

Dealers may sell for less, or more depending on what equipment is required and what actual product is used.

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### **Can I install an Apricus System myself?**

We do not recommend homeowners installing a solar hot water system their self for several reasons.

- **Fall protection** – In most instances solar collectors are located on roofs which are dangerous to work on and require special training and equipment. Certified Canadian Solar Installers have to undergo Fall Protection training courses to reduce the risk of

accidents while working on any elevated structures. Installing and Apricus system on a roof involves carrying not just your own body but also tools, manifolds, tubes, frames, etc to the roof. Leave this to trained installers.

- **Risk of burns or scalding** – The Apricus collector can reach extremely high temperatures that will instantly turn water into steam when left unconnected or stagnating. This can seriously injure a person who is not trained or expecting those types of temperatures. Also most systems require soldering which involves torches – these can easily burn the operator if not training on how to use the equipment properly. Leave this to trained installers.

- **Code requirements** – Certain municipalities require additional safety equipment for use with solar hot water systems. A trained installer is able to reference and understand these additional requirements, without creating an unsafe or unapproved environment.

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