

Choosing a Tankless or Solar Hot Water Heater: A Proposal for your Home

Sample

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Executive Summary

Rising costs of heat and hydro, and the environmental impact of using traditional energy sources such as oil and natural gas, leave homeowners in cold climates like Ontario exploring more energy efficient alternatives. One of these options is the use of a tankless water heater to provide hot water in our homes.

I conducted a survey of family and friends which showed that most people have limited or no knowledge of tankless water heaters and that many would be interested in this alternative, if it could save them money and benefit the environment. Some also expressed interest in knowing more about solar water heaters.

The evidence highlighted in this proposal shows that, when compared to traditional water heaters with tanks, tankless water heaters provide at least five main benefits to the homeowner.

Tankless Water Heaters:

1. Are cost effective
2. Are environmentally friendly
3. Provide an endless supply of instant hot water
4. Require less storage space
5. Add resale value to your home

For homeowners in Ontario who have natural gas heating, installing a tankless water heater will save you money and contribute to a greener world. For those who don't have access to natural gas, solar water heaters may be a more viable option for long term financial and environmental benefits. However, initial costs are higher and the home must meet specific requirements for a solar panel to work properly (full southern exposure to the sun).

Solar Water Heaters:

1. Are cost effective over the long term
2. Are the most environmentally friendly
3. Add resale value to your home

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Introduction

This proposal shows that by investing in a tankless water heater in your home, you can save money and help the environment. An alternative system, a solar water heater, will be proposed for those who don't have access to natural gas.

Many people are concerned with the impact of fossil fuels on our environment. Our use of conventional energy sources, like oil and natural gas, is on the rise and evidence shows that the resulting greenhouse gas emissions are greatly contributing to global warming.

Some evidence suggests that the annual total Carbon Dioxide (CO₂) produced by residential water heaters throughout North America is roughly equal to the amount produced by cars and light trucks combined.¹

It is also becoming increasingly clear that traditional energy sources are finite and are becoming more difficult (and expensive) to extract from the earth. We need to explore more energy efficient, sustainable heating alternatives for our homes and communities.

On its website, the Canadian Mortgage and Housing Corporation (CMHC) states that hot water energy consumption is the second largest energy draw (after space heating) in the home.

According to a local Ottawa company, Francis Fuels, going tankless can save 2 pounds of carbon per day. This translates to over 8 tons of carbon over the life of your tankless water heating system.

This proposal will begin with a focus on the audience profile. First we'll look at the **Survey Results** of a brief survey conducted with family and friends about their water heating systems and their knowledge of tankless water heaters. Then the three main **Types of Water Heaters** will be described: water heaters with tanks, tankless water heaters, and solar water heaters.

In the **Evaluation of Options** section, a comparative analysis of costs, heater life span, and potential energy savings, will be shown— then a list of other advantages and disadvantages of tankless and solar water heaters. Further evidence will be highlighted

¹ http://environment.about.com/od/renewableenergy/a/solar_water_he.htm

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by summarizing a CMHC study which shows actual results for 25 homeowners who went tankless. Then information on [Buying a Tankless or Solar Water Heater](#) will be provided and the proposal will close with [Recommendations and Conclusions](#).

Survey Results

Before examining all the evidence on tankless water heaters, I wanted to find out more about the target audience for this proposal: my family and friends. I conducted a survey with 10 homeowners to establish what type of water heater they currently use, their knowledge about tankless water heaters, and their level of interest in switching to more cost and energy efficient water heating appliances (see [Appendix A](#) for the full survey questions and answers).

Survey Results

People are concerned with the rising costs of energy and the environmental impacts.

90% know very little or nothing about tankless water heaters.

70% would consider using a tankless water heater if it could save them money.

I also discovered that a number of people have electric water heaters which are not conducive to conversion to a tankless heater because the energy required to run an electric tankless water heater in cold climates requires an additional 200 AMPs and would not result in any savings. For these homeowners, a more viable alternative is the solar powered water heater (see [Appendix B](#) for a summary of survey results).

Survey Results

Five of the respondents have electric water heaters and five have natural gas heaters.

Six respondents own their water heaters while four rent.

The information gleaned from this survey helped me to tailor this proposal to better meet the needs of my audience (e.g. provide basic information). I decided to find out

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and explain what the various water heater options are and how they work. I also decided to include more detailed information on solar powered water heaters, since half of respondents could not use a natural gas tankless water heater.

Types of Water Heaters

All homeowners require an appliance to heat their water for various uses, such as bathing, washing dishes and laundering clothes. In North America, three main water heating options are currently available: 1) traditional hot water tank heaters, 2) tankless water heaters and 3) solar water heaters. The information below provides a description of each of these types of water heaters.

Water Heater with Tank

The traditional water heater is an appliance which uses gas or electricity to heat water stored in a large tank, (approx. 230 litres/60 U.S. gallons) (see **Figure 1** below). When a hot water tap is opened, heated water is drawn off the top of the tank. Cold water is fed into the tank to replace the outgoing hot water. The incoming cold water triggers the tank's electric or gas heating system. The water is heated until it reaches the pre-set water temperature.

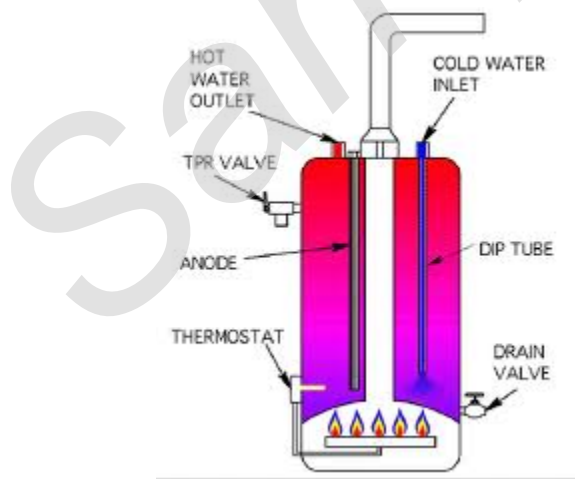


Figure 1: Gas Water Heater with Tank, Source: <http://www.chilipepperapp.com/gwh.htm>

Stored hot water loses heat through the tank walls and up the flue pipe (if it's a gas heater). As the water temperature drops, the heater continues to reheat the stored water all day long, 24 hours a day. This means that even if you are not using hot water, energy is still being consumed. As well, the hot water supply is

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limited to the tank's capacity, so if you use a lot of hot water, you may run out and have to wait 3 or 4 hours for the water to reheat.

A local heating company, Francis Fuels, states that the best Energy Star rated new hot water tank is only 64% efficient, mainly due to this constant need for fuel to keep the water hot and ready to use. A natural-gas-powered heater does better, but it still accounts for about \$400 and about 2 tonnes of CO₂ per year.²

Tankless Water Heater

A tankless water heater is an appliance that heats the water immediately as it goes through the unit, so no storage tank is necessary (See **Figure 2** below). It is sometimes referred to as an “on-demand” or “instantaneous” water heater.

The Process:

1. A hot water tap is turned on
2. Water enters the heater
3. The water flow sensor detects the water flow
4. The computer automatically ignites the burner
5. Water circulates through the heat exchanger
6. The heat exchanger heats the water to the designated temperature you selected
7. When the tap is turned off, the unit shuts down

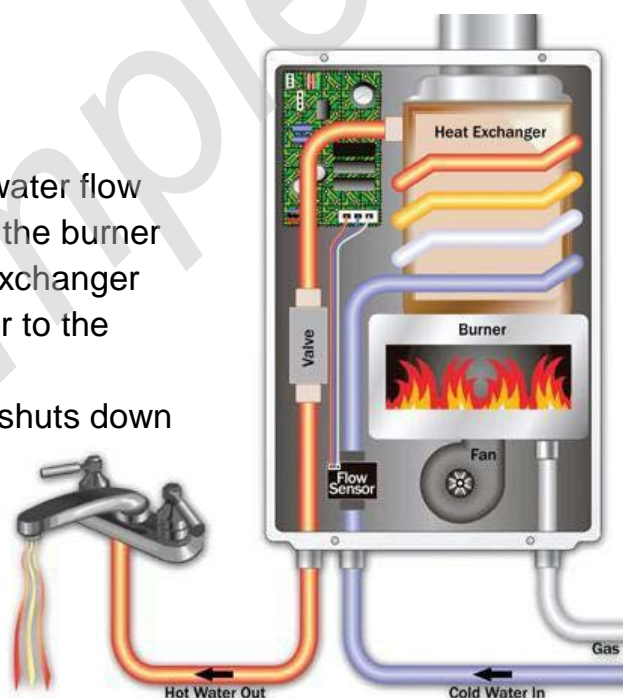


Figure 2: Inside a Tankless Water Heater

Source: <http://www.gaswaterheater.co.za/types.html>

Common in Europe and Asia, where energy costs are higher, the tankless water heater can provide endless amounts of hot water.

² Francis Plumbing and Heating Publication, p. 6.

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Tankless heaters with flow-based Power Modulation/Thermostatic Control are recommended by Francis Fuels. These more sophisticated tankless water heaters measure the flow rate of water and will modulate overall power output to compensate for the flow rate change to maintain a more precise temperature level (as opposed to Full ON/Full OFF types). When hot water is not being used, the tankless heater consumes absolutely no gas at all, resulting in substantial energy savings.³

According to Francis Fuels, the standard tankless water heating system is 82% efficient. Some tankless water heaters also have features that condense moisture from the combustion gases to increase energy efficiency up to 97%.

Please Note: Whole home **electric** tankless heating systems require more electrical power than is standard for most Canadian homes. Due to lower ground water temperatures in winter, only **gas** tankless heating systems are recommended for whole home water heating in Canada.

Solar Water Heater

Solar water heaters use energy from the sun to heat water in your home. They consist of panels or solar collectors and water storage tanks. Water moves through the solar collectors and into a storage tank with the help of electrical pumps and controls.

³ Francis Plumbing and Heating p. 11

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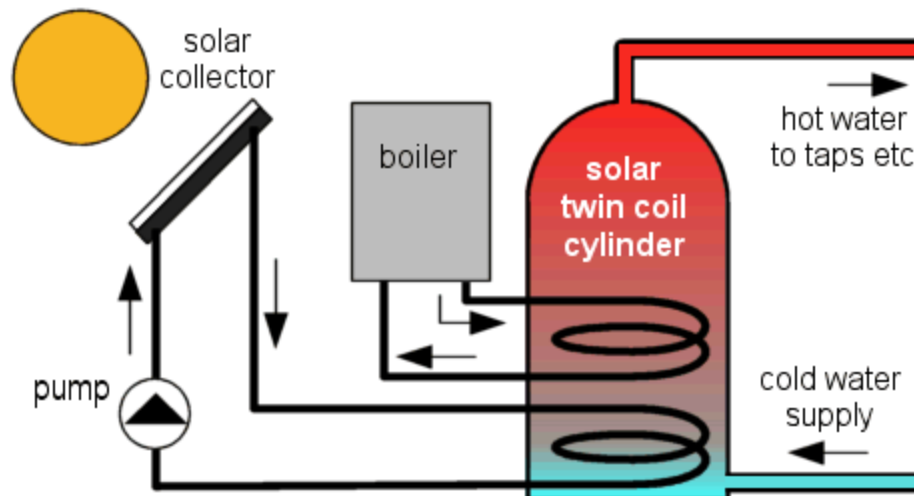


Figure 3: Solar water heater system

Source: <http://www.keepbanderabeautiful.org/sunheatswater.html>

In cold countries like Canada, solar water heaters circulate an antifreeze fluid through the collectors and transfer the heat to hot water using a heat exchanger. However, solar energy is not always available (on rainy or snowy days), so to be effective in our climate, it must be stored and integrated with other energy sources, such as gas or electricity.

A solar system pre-heats cold water before it enters the hot water tank; your existing water heater then functions as an auxiliary source. To install a solar panel you need unobstructed access to the sun's path in all four seasons with a south-facing flat surface on which to mount the panel.

According to Natural Resources Canada adding a solar water heater to a water-heating system can reduce energy bills and corresponding gas emissions by 40 to 50 percent and sometimes even more, depending on where you live.⁴

The Government of Ontario says that heating water with a solar water heater can save a typical 4-person household approximately 2,700 kWh or \$325 per year if supplementing an electric water heater, or \$200 per year if supplementing a gas water heater.⁵

⁴ Natural Resources Canada, p. 3

⁵ Go Solar Clean Air Foundation, p. 9

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Evaluation of Options

This section compares options by focusing specifically on the costs and benefits of going tankless or solar and examines some other advantages and disadvantages of a tankless unit. The results of a recent study conducted by Canada Mortgage and Housing Corporation (CMHC) are also provided for review.

Comparative Analysis

Table 1 provides a comparison of the standard gas water heater with tankless and solar water heaters.

	Gas Tank Water Heater	Gas Tankless Water Heater	Solar Water Heater
Estimated Cost	\$1,000 (buy) \$15/mo. (rental)	\$2,600-\$3,200 (buy) \$40/mo. (rental)	*\$4,000-\$8,000 (buy)
Lifespan	10-15 years	20-25 years	20 years
Average Payback time period	n/a	16-20 years	8 to 12 yrs (with electrical backup) 12 to 20 yrs (with gas backup)
Savings and Benefits	n/a	45%-50% less gas used save \$70-\$100/yr endless supply of instant hot water	save \$250/yr (with electrical backup) save \$190/yr (with gas backup) eliminate up to 2 tonnes of CO ₂ emis/yr

*the least expensive system may be seasonal

Table 1: A Comparison of Water Heater Types

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Advantages of Tankless System

Advantages of using a tankless water heater are:

- You don't heat hot water when it's not needed
- You have an endless capacity for hot water
- There is no standby heat loss as there is in water tanks
- The wall-mounted unit is more compact requiring less floor space
- The unit components are almost entirely recyclable
- It maintains its efficiency throughout its lifetime unlike storage tank water heaters which decrease in efficiency over time due to mineral build-up inside the tank
- It eliminates the risk of stored water heater bacteria growth (one of the causes of Legionnaires' disease) commonly associated with standard hot water tanks⁶

Disadvantages of Tankless System

Potential disadvantages of using a tankless water heater are:

- A small delay in hot water arriving at the tap may occur if the unit allows water to flow through it for a short period of time before the sensor kicks in to start heating the water
- An endless capacity of hot water may lead to greater hot water consumption (longer showers) and higher water bills
- The tankless system is not capable of "trickling" hot water, it cannot drip hot water – it must have sufficient water running through it to produce hot water without overheating
- Jacuzzi style bathtubs and hot tubs have a larger than normal spout that dumps water faster than the tankless system can provide, however, if you don't open the hot water tap fully, it will still work
- Not all homes are equipped to hold gas fired tankless units and even if your home is approved, the units must be installed to code and mounted in very specific places⁷

⁶ Frances Plumbing and Heating, pp. 6-8

⁷ Ibid, pp. 8,9

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Cost Benefit Analysis

The initial cost of a tankless water heater is greater than that of a conventional storage water heater, but tankless water heaters will typically last longer and have lower operating and energy costs to offset the higher purchase price.

ENERGY STAR® estimates that a typical family can save \$100 or more per year with an ENERGY STAR qualified tankless water heater.⁸

A CMHC study of 25 Ontario homeowners who switched to gas tankless water heaters showed average savings of \$70 per year.⁹

According to Francis Fuels, a good quality whole house gas tankless water heater typically costs between \$1,000 to \$2,000 excluding installation and additional materials.¹⁰

Francis Fuels says, at their special discount rates, you can expect a quality gas tankless water heating system fully installed with all the mandatory requirements to cost somewhere between \$2,600.00 and \$3,200.00 (plus taxes).¹¹

The average fee to rent a gas tankless water heating system is approximately \$40 per month for a standard tankless unit, \$45 for a condensing tankless unit (compared to \$15 to \$25 per month rental fee for standard gas hot water tanks).

However, if you measure the rental costs over the life span of a tankless water heater they are far more (over \$10,000) than the initial purchase price (\$3,000).¹²

⁸ EnergyStar website page, Water Heater, Whole Home Gas Tankless

⁹ CMHC, p. 8

¹⁰ Francis Plumbing and Heating, p. 18

¹¹ Ibid

¹² Ibid

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Most tankless water heaters have a life expectancy of more than 20 years. They also have easily replaceable parts that extend their life by many more years.

In contrast, storage water heaters last 10–15 years.

Solar water heating systems are more expensive but over their life span will save you money.

The cost of a solar water heater ranges anywhere between \$4,000 and \$8,000 depending on the specific climate and site requirements.¹³

With savings of approximately \$200 (with gas supplementary heater) it can take up to 20 years to pay for itself. However, a solar water heating system is the most environmentally friendly choice.¹⁴

CMHC Study Results

Enbridge Gas and CMHC recently collaborated on a project to investigate the impact that replacing conventional gas-fired water heaters with gas-fired tankless water heaters had on gas and water consumption and homeowner perceptions of performance (see **Figure 4** on next page).

After converting to a tankless water heating system the average gas consumption was 46% less with an average increase of 2% in water usage.¹⁵

Fourteen of the 25 CMHC survey respondents said that the “endless” hot water was something they liked about the tankless system, while 10 respondents indicated that they enjoyed the energy savings.

¹³ Go Solar Clean Air Foundation, p. 11

¹⁴ Ibid, p. 9

¹⁵ CMHC, p. 8

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Fourteen respondents expressed a dislike for the increased time it took to get hot water to the tap with the tankless heaters. The average increase in time delay to get hot water at the tap was reported to be around 20 seconds, although this didn't seem to have a significant impact on hot water consumption. The average savings was approximately \$70 per year.¹⁶

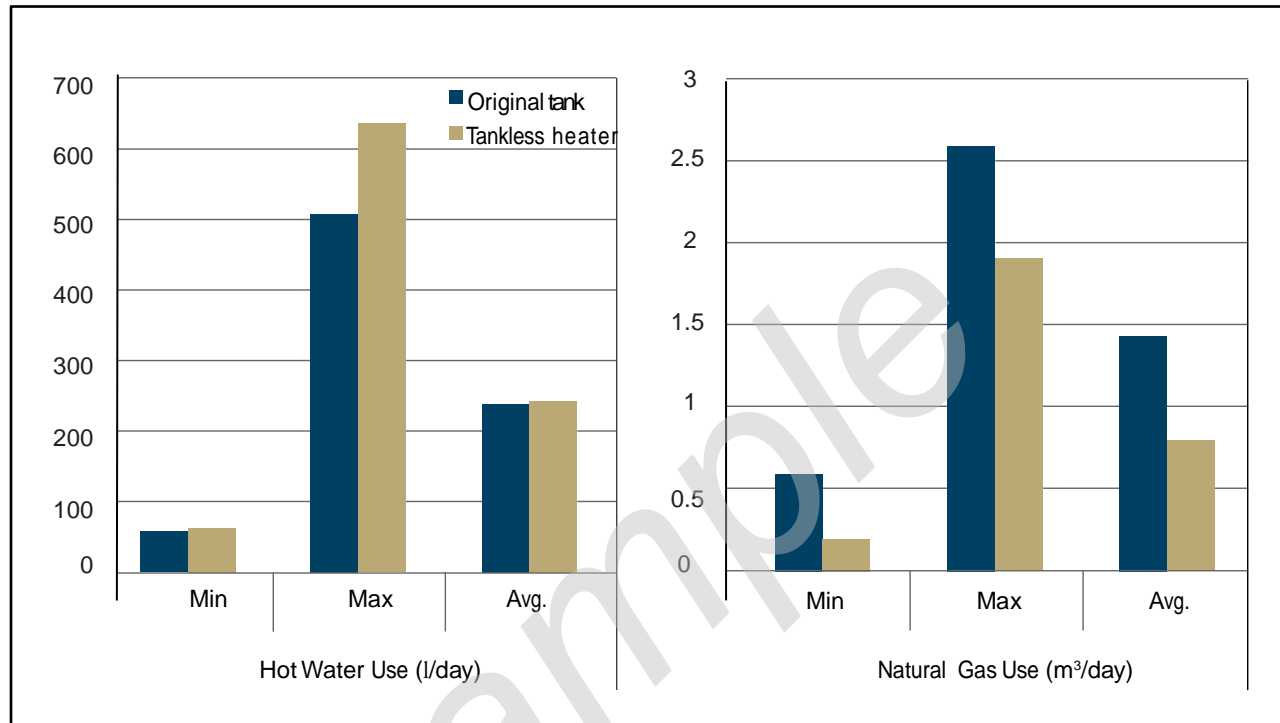


Figure 4: Pre- and post-retrofit hot water and natural gas consumption
Source: Canada Mortgage and Housing Corporation, p 4.

¹⁶ CMHC, p. 8