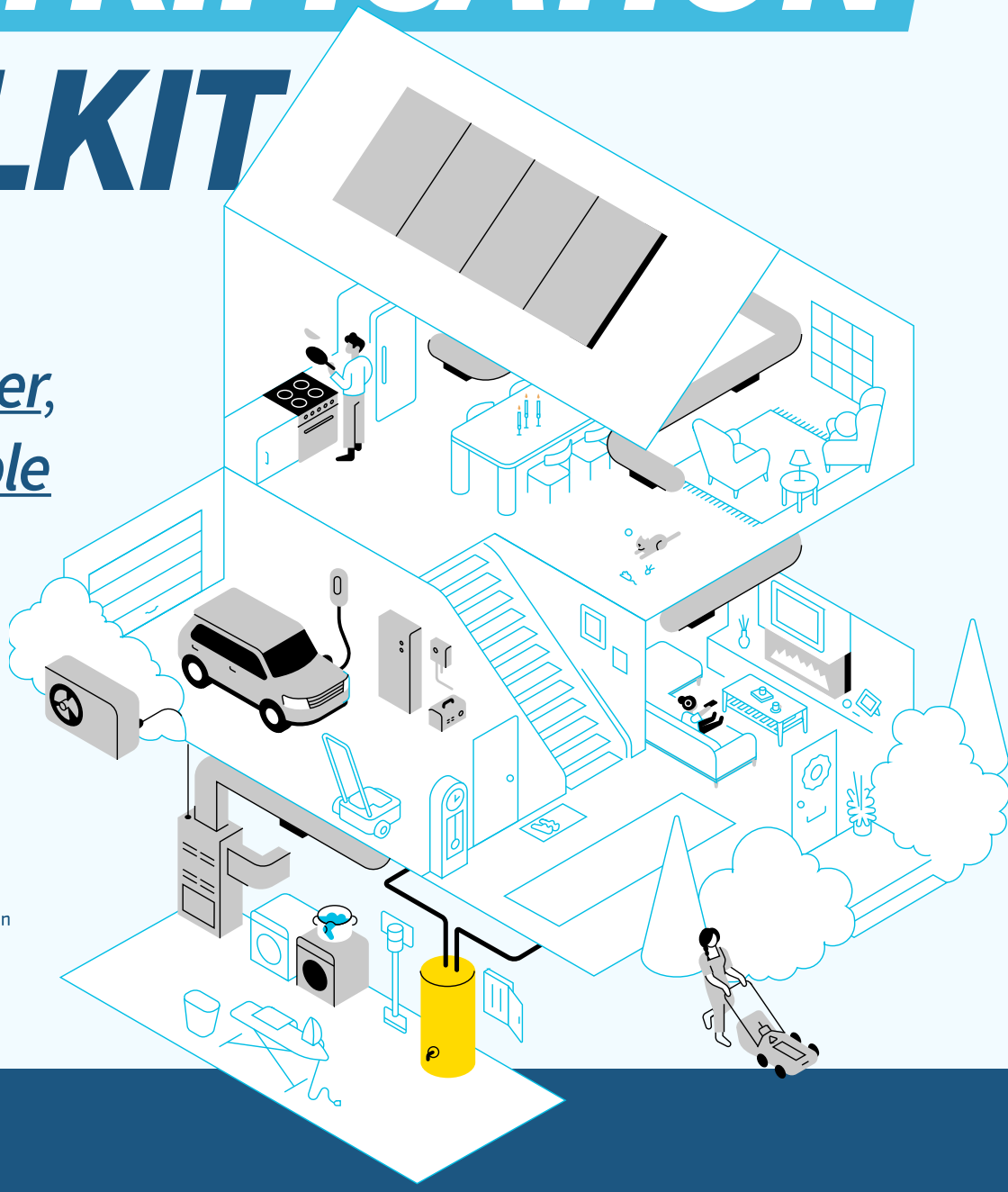
CANADA'S HOME ELECTRIFICATION TOOLKIT

Your guide to a ***cleaner, smarter, more affordable*** home



Building Decarbonization Alliance
pour la décarbonation des bâtiments

ELECTRIFY YOUR:

WATER HEATERS

Water Heaters at a glance

COST

Upfront costs:
$$-$$$

EQUIPMENT LIFESPAN

10-20 years

EMISSIONS REDUCTION IMPACT

High

ELECTRICAL NEEDS

120V 15-20amp
to 240V 20-30amp

IMPLEMENTATION

Medium to difficult

BONUS

Heat pump water heaters are many times more efficient than alternatives

Links to further resources:

- Selecting a new water heater resource
- Natural Resources Canada water heater guide
- Heat pump water heater buyer's guide

Water Heaters

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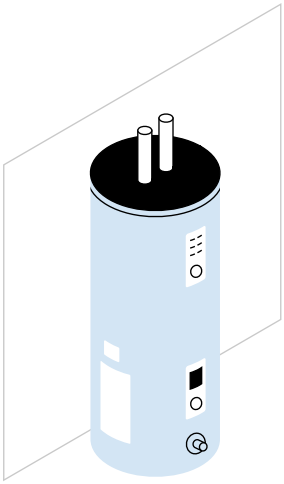
Taking a shower is awesome, it makes you feel nice and clean, makes you sound like a great singer, and helps you make all of life’s decisions.

–
author unknown

Heating water for showers, laundry and other uses is the second largest use of energy in your home, and can also be the second largest source of emissions. For homes that use fossil fuels to heat water, switching to electric water heaters may be the simplest and most affordable way to make a significant reduction in your energy use and GHG emissions. Even homes that already have electric water heaters can make improvements by adopting a heat pump water heater or solar water heater. As a bonus, electric tank and heat pump water heaters are ideal thermal batteries, using energy during off-peak hours to heat water for later use during peak hours.

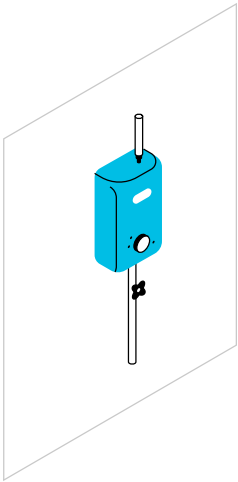
OPTIONS

Electric tank water heater:



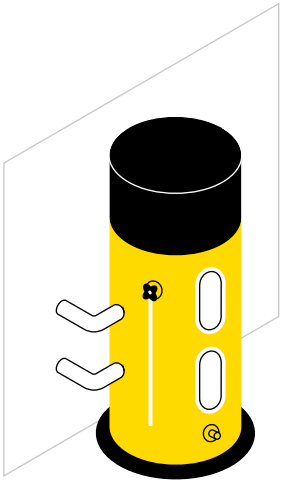
These water heaters have a large tank where water is heated and stored until you need it. They are more efficient than gas tank water heaters because virtually all the electrical energy goes to heating the water. If switching from a gas water heater, you may need an electrician to add a 240V 20-30 amp outlet for the heater. To avoid that upgrade, consider using a 120V heat pump water heater that plugs into a regular outlet—but be aware that 120V heat pump water heaters may not be available in all areas.

Electric tankless water heater:



Tankless or on-demand water heaters use an electrical element to heat the water as you need it. They take up very little space and can be installed close to where the water is used, so your hot water doesn't have to travel long distances through cold pipes. They are also more efficient than electric tank water heaters because there is no heat loss during storage, and they may have longer lifespans in areas that do not have hard water. Electric tankless water heaters have lower flow rates than gas ones and will require a dedicated 30–60-amp 240V circuit.

Heat pump water heaters and hybrid heat pump water heaters:

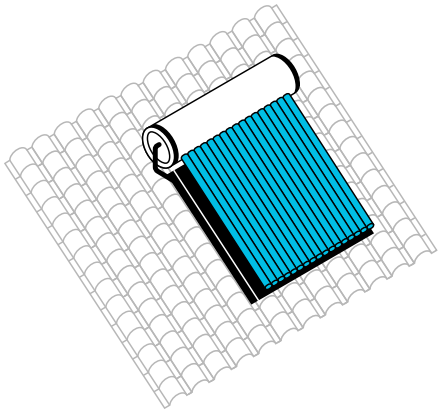


A heat pump water heater can be many times more efficient than a gas or electric tank or tankless system. Look for a larger capacity model than the water heater you are replacing to compensate for slower heating or be prepared for the backup resistance heater in a hybrid to engage if hot water demand is high. Heat pump water heaters pull heat from surrounding air to concentrate it in the water stored in the tank, and usually must be installed in heated indoor spaces with good air circulation, although an outdoor heat pump may be appropriate in milder climates. This does mean a slight increase in overall home heating to compensate for the heat used by the water heater in winter, but this is balanced by a decrease in home cooling in summer.

Although most use a dedicated 30 amp 240V circuit, models are now available that plug into a regular 15 amp, 120V outlet—but these are best suited to homes with lower hot water demand, as they can take hours to recharge.

Solar water heaters:

You can heat your water using free energy from the sun with a solar collector and storage tank. The system can be very simple and reliant on passive movement of the heated water, or they may be more complex with fancy collectors and pumps to move water. In colder climates, fluids circulate between the collector and the water tank where the heat is transferred to the water in the tank using an exchanger. Because the sun doesn't always shine, these systems require an integrated backup water heater.



Ground source heat pump with a desuperheater:

If you are installing a ground source heat pump, ask about including a desuperheater. The desuperheater will very efficiently preheat your water using some of the heat extracted from the ground in winter or heat extracted from your home in summer. The heated water is then stored in a tank that will supply a regular water heater with pre-heated water, reducing the total energy needed.

ELECTRIC WATER HEATER FEATURES COMPARED TO GAS EQUIPMENT:

Equipment	Outlet (amp requirements vary)	Demand-response capable?	Upfront cost	Operating cost*	Emissions*
Gas tank WH	N/A	No			
Gas tankless WH	120V 15 amp	No			
Electric tank WH	240V 20-30 amp	Yes	▽	▲	▽
Electric tankless WH	240V 30-60 amp	No	=	▲	▽
Heat pump WH	240V 15-30 amp	Yes	▲	▽	▼
Heat pump WH	120V 15-20 amp	Yes	▲	△	▼
Solar WH	N/A	No	▲	=	▼
GSHP desuperheater	N/A	No	N/A	▽	▼

**Updated April 2025, see appendix for breakdown of cost and emissions outcomes by province and territory*

WATER HEATERS

BENEFITS

Electric water heaters are safer than gas ones for people and the planet, because they do not generate any hazardous carbon monoxide or climate-damaging carbon dioxide during operation.

Unlike gas water heaters, electric ones do not require a venting system. Sealing up the gas vent after installing an electric water heater is another way to reduce air leaks and heat loss from your home.

Some electric tank water heaters can be programmed to take advantage of lower time-of-use electricity rates or electricity generated from onsite solar arrays.

Many electric tank water heaters have built-in technology that allows them to act as a thermal battery and participate in utility demand response programs. When enabled by the homeowner, water heaters are programmed to provide hot water as needed, but the utility can control when it does the heating. The utility pays the homeowner for this access, which helps manage grid-scale peak power demands and respond to grid destabilization events.

A tankless water heater may be the best option when working in small spaces. Some will even fit under the counter.

Heat pump water heaters will help to cool and dehumidify your home in summer as they pull heat and humidity from the air. The water extracted from the air will be pumped to a drain or empty into the drain by gravity.

CHALLENGES

- It is important to properly size water heaters to ensure you always have hot water when needed. For tankless water heaters, have your installer estimate the maximum volume of hot water needed per minute in your home to ensure the system can meet your needs. For heat pump water heaters, consider using a larger tank to compensate for slower heating, and using a higher tank temperature with a mixing valve that mixes in cooler water to prevent scalding.

- Tankless water heaters require more electrical panel capacity than other electric alternatives and are discouraged in some jurisdictions for this reason. Consider future electrification plans, panel capacity, and local requirements when choosing an electric water heater.

- 120V heat pump water heaters take extra time to recharge and are best used in homes where hot water demand is minimal or spread out over the day.

- With a heat pump water heater, there will be a small heating penalty in winter because the space heating system must replace the heat that the water heater extracts from the air.

- A heat pump water heater must be carefully sited. The room must be at least 100 sq ft with good ventilation to allow it to extract enough heat from the surrounding air, and it should ideally be separate from living spaces as the compressor will make more noise than a conventional water heater (though most are still pretty quiet). For most of Canada, situating the heat pump outside is not an option because of the cold winters.

- Electric water heaters will not heat water during a power outage (and neither will high efficiency gas water heaters), but you will continue to enjoy hot water without electricity until the hot water in your tank is used up.

OTHER CONSIDERATIONS

- Water heater efficiency is reported as uniform energy factor (UEF, similar to COP), with typical gas and electric tank water heaters having a UEF of 0.63 to 0.95. Heat pump water heaters have a higher efficiency with UEF values of 2.3 to 3.3 or more. ENERGY STAR models are among the most efficient.
- Replacing the anode rod that protects the tank from corrosion every 3-4 years can extend the life of a tank water heater.
- Tankless water heaters will have shorter lifespans in areas with hard water. To increase their lifespan, be sure to flush out any mineral deposits regularly.
- Heat pump water heater air filters should be cleaned regularly. Check the manual for a schedule.
- A leak detection system can be added and will alert you to leaks and shut off the water supply to protect your home from water damage if the tank fails.
- To avoid interruptions, consider replacing a water heater before it fails. Most tank water heaters last for 10-15 years.
- It is generally lower cost overall to buy a water heater instead of renting, but buyers don't enjoy the benefits of servicing if issues arise.
- If you are going away for an extended period, save money by programming your water heater to shut off until shortly before your return.
- Add a mixing valve to your water heater to protect your health and safety. With a mixing valve, you can set your water heater temperature high enough to prevent the growth of harmful bacteria (60°C, 140°F) while ensuring water leaving the tank is cooled enough to prevent scalding (49°C, 120°F).
- You can save money and install a smaller water heater tank if you reduce your hot water use. Tips for reducing hot water use include:
  - » Install low-flow showerheads and faucets
  - » Choose efficient appliances such as washing machines and dishwashers
  - » Wash clothes in cold water
  - » Fix water leaks
  - » Insulate hot water pipes
  - » Set your tank's thermostat at 60°C (140°F) and use a mixing valve

QUESTIONS FOR INSTALLERS

- ☐ Which model and size do you recommend for my household?
- ☐ Will any electrical panel and/or wiring upgrades be needed? Are there options for avoiding an electrical panel upgrade? Will the cost of this electrical work be included in your estimate?
- ☐ Will you be installing a mixing valve?
- ☐ Do I qualify for any incentives?
- ☐ What is the warranty?

If it is a heat pump water heater:

- ☐ How many heat pump water heaters have you installed?
- ☐ Where will the condensate drain go?
- ☐ Will there be enough air circulation to supply the heat pump water heater?
- ☐ How do I operate the heat pump water heater to maximize energy savings?
- ☐ How do you size the heat pump water heater?
- ☐ Will I require any electrical upgrade and if so, are they included in your quote?

Building envelope upgrade:

Tim and his family really wanted their new home to be comfortable and energy efficient.

Built in 1971, their Vancouver home was due for upgrades. During the pandemic, Tim and family added insulation to the walls, put in new windows, improved the air se aling, replaced the exterior siding, and installed a metal roof.

A new heat pump and heat pump water heater rounded out the deep energy efficiency upgrade. Their new home looks modern and is far more comfortable, especially on hot days.

More details can be found at Green Communities Canada.

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Right now, even though we’re in a spring heatwave, our heat pump will go on the cooling cycle for an hour or two and it will keep the whole house cool for the rest of the day because our home is so well-insulated, and its building envelope is so tight and efficient

–
Tim

This section is part of the Canada's Home Electrification Toolkit. The Toolkit provides clear, concise, and up-to-date information on space heating, cooking, fireplaces, home batteries and backup options, and other household equipment. It also includes tips for renters, strategies for avoiding potentially costly electrical panel upgrades, and case studies from satisfied homeowners.

ADDITIONAL SECTIONS ARE AVAILABLE FOR DOWNLOAD BELOW:

Symbols and terms in this publication:

Upfront or operating cost (no incentives applied)

Symbol	Description
$	Up to $99
$$	$100-$999
$$$	$1,000-$9,999
$$$$	$10,000 and above

Implementation

Term	Description
Easy	Can be implemented by yourself if no electrical upgrade is required
Medium	Can be implemented by someone with DIY skills
Difficult	Generally requires a qualified electrician or other contractor

Emissions reduction potential (onsite emissions reductions using Canadian averages)

Term	Description
Low	1-9 kg CO2 per year
Medium	10-99 kg CO2 per year
High	100-999 kg CO2 per year
Very high	> 1,000 kg CO2 per year

When comparing electric to gas equipment on upfront costs, operating costs and emissions

Symbol	Description
=	Values differ by 10% or less
▽	Electric version is 10-50% lower
▼	Electric version is more than 50% lower
△	Electric version is 10-100% higher
▲	Electric version is more than 100% higher

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Version 1.2, released June 2025

Visit buildingdecarbonization.ca/canadas-home-electrification-toolkit for digital downloads, updates, and other information about home electrification.

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