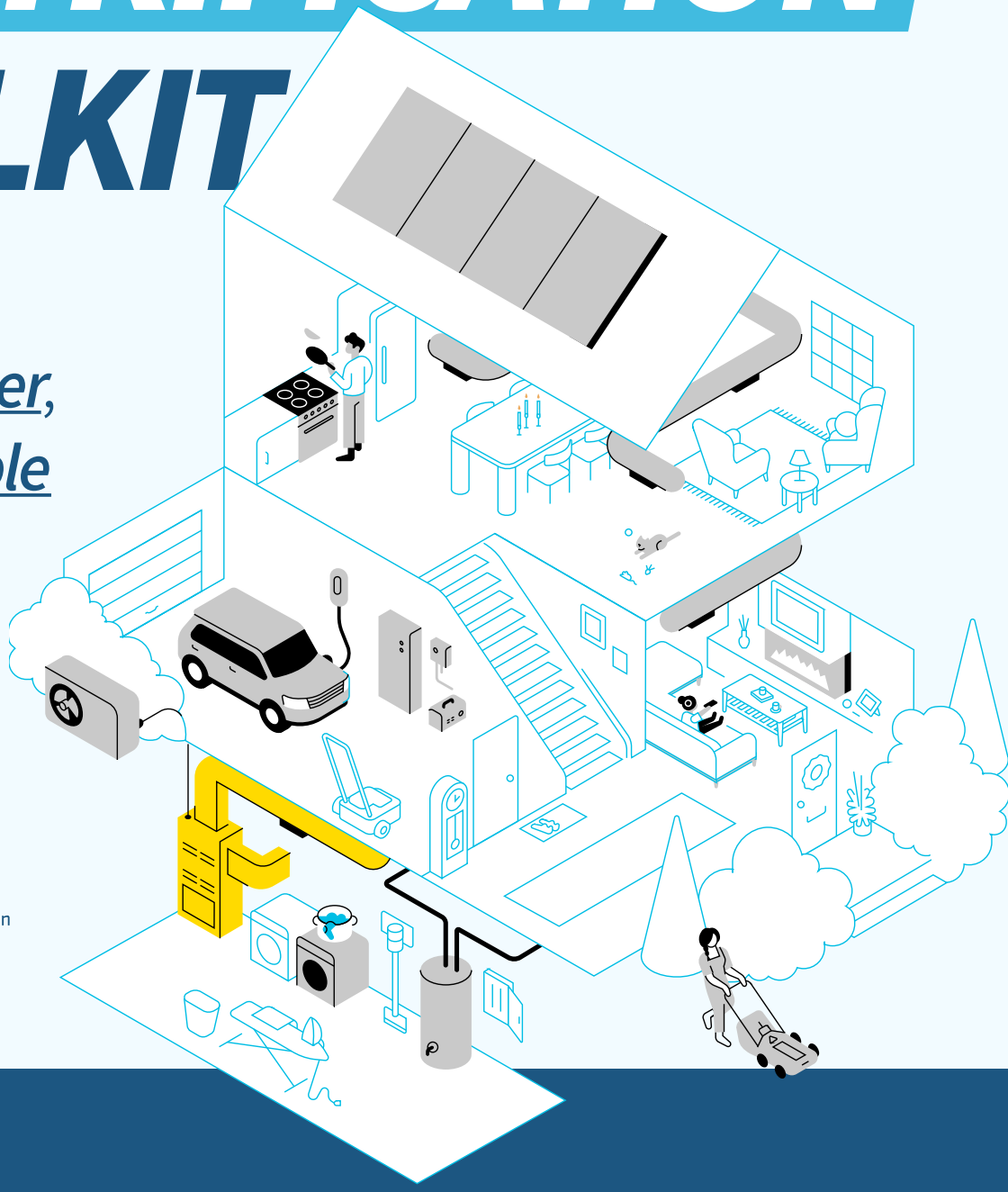
CANADA'S HOME ELECTRIFICATION TOOLKIT

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



Building Decarbonization Alliance
pour la décarbonation des bâtiments

ELECTRIFY YOUR:

ELECTRIC THERMAL STORAGE

Electric Thermal Storage at a glance

COST

Upfront costs:
$$$-$$$$

Annual operating costs:
$$-$$$

EFFICIENCY

100% or more

ELECTRICAL NEEDS

Varies by size and design

EQUIPMENT LIFESPAN

15-20 years

IMPLEMENTATION

Medium to difficult

EMISSIONS REDUCTION IMPACT

Varies by provincial electricity generation mix

BONUS

Opportunity to maximize use of low off-peak rates

Electric Thermal Storage (ETS)

Thermal storage systems can be thought of as rechargeable batteries that store heat for later use. They can be charged using electricity during off-peak times so that the useful heat can be released during peak demand times.

In provinces with time-of-use or dynamic rates and incentives for adoption, this can lead to savings on electricity bills. Tank water heaters are a common example of thermal storage devices, and thermal storage systems designed to work alongside heat pumps are becoming more readily available.growing rapidly.

WHY IS THERMAL STORAGE IMPORTANT?

Our provincial power systems always need to be able to provide enough electricity to meet demand. That means power system operators need to plan their generation capacity based on the highest electricity demand they expect to see—plus a buffer for good measure—even though that level of demand is only reached a few times a year.

Because it leads to generation capacity that goes unused for much of the year, building for peak demand results in inefficiencies and increased costs. In most cases, it is more efficient and cost-effective to reduce the electricity demand during those rare peak demand events.

Thermal storage systems are a reliable way to reduce peak power demand in homes that have electrified their space and water heating. Many provinces and territories provide grants that cover most of the cost of installing thermal storage systems alongside heat pumps, because they are a cost-effective alternative to building out new generation capacity to meet peak power demand and stabilizing electricity prices.

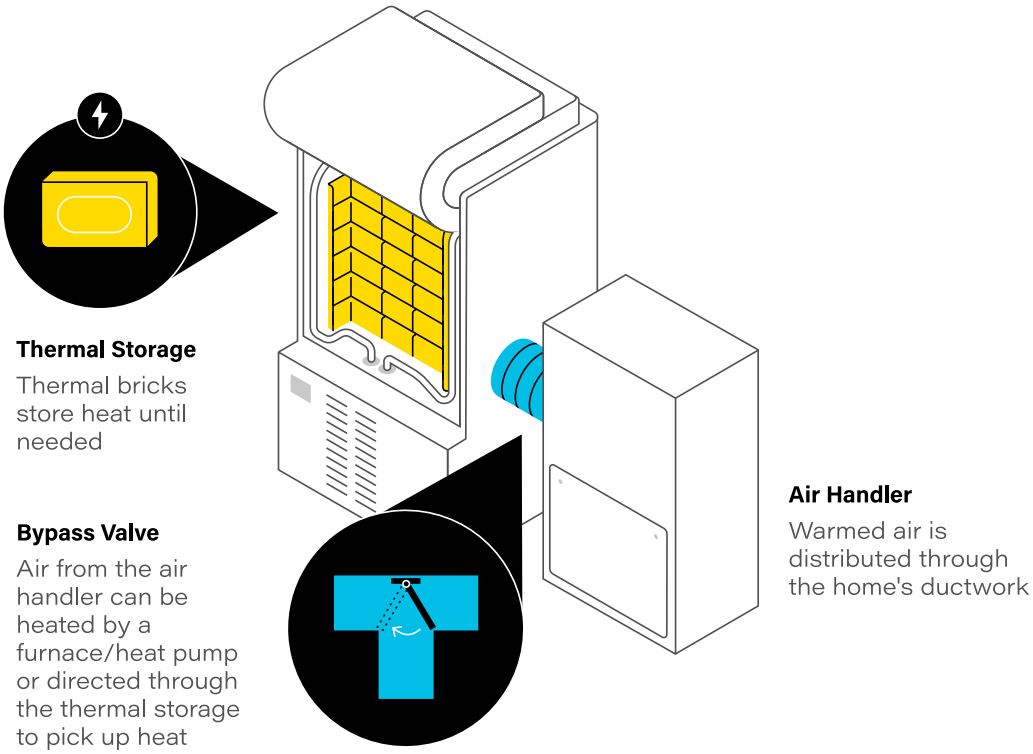
OPTIONS

Thermal bricks are commonly used for electric thermal storage. Electric resistance heaters heat up high-density bricks in an insulated container when electricity prices are low. When electricity prices are high, air is blown over the bricks to pick up heat, which is then blown into the room. These can be installed as part of a central air system, or they can be installed as room units that look like panel radiators.

Phase change materials can be used for thermal storage. These systems take advantage of the heat that is absorbed by a material as it transitions from solid to liquid, which is then released when it changes back to a solid. Phase change materials can store more heat in a smaller area than thermal bricks and can store the heat almost indefinitely without losses. These systems can also be more energy efficient, since they can be "charged" using heat from a heat pump rather than a more energy-intensive electric resistance heater.

Some mini-split heat pumps use phase change thermal storage to reduce operating costs and minimize peak power demand. Phase change thermal storage systems can also heat water for use in hydronic space heaters (radiators) or to generate domestic hot water.

Water heaters are a form of thermal storage. If you have an electric tank water heater and use time-of-use pricing, it may be worth investing in a device that prioritizes recharging when rates are low. In addition, some utilities have "demand response" programs where a homeowner is offered incentives to allow the utility to shift the water heater's electricity use to manage peak events, while ensuring hot water is available when needed. The water heater Section has more information on electric water heater options (see 'Water Heaters' section).



ELECTRIC THERMAL STORAGE

BENEFITS

ETS systems generate no toxic carbon monoxide or climate-altering carbon dioxide emissions.

In provinces where off-peak rates are many times lower than peak rates, operating a thermal storage system will reduce electricity bills, even compared to operating a heat pump.

Charging thermal storage during off-peaks hours can reduce carbon emissions. Off-peak electricity is typically generated from low-emission sources, while electricity from peak hours is more likely to include generation from fossil fuels.

ETS systems can also be charged up with zero-emission electricity from solar panels for use during times when solar power is not available and grid electricity is reliant on fossil fuels.

Thermal storage systems are quiet—you will typically only hear the fans running.

Thermal storage systems can be paired with other heating systems, such as electric heat pumps, or they can be used on their own as the primary heating source.

Thermal storage systems with thermal bricks are very simple systems with no moving parts. They do not require maintenance and are expected to last a long time.

During a power outage, an ETS system draws less energy from a battery or backup generator than a heat pump, since it only needs to operate the fan and release the stored heat. This can provide hours or even days of heat, depending how much heat is stored and how much is used.

CHALLENGES

- Thermal bricks and water heaters will lose heat to the surroundings over time. Thermal bricks are designed to release their heat within hours of being charged and are not suitable for storing heat over multiple days.
- Thermal storage units must typically be installed at the same time as a heat pump if they are being used together.
- Thermal bricks require additional space and are very heavy. Be sure to ask your installer if there is enough room for the unit you are considering.
- Thermal bricks are charged up using electric resistance heaters, which may require electrical upgrades to a home.
- Room units require adequate clearance and should not be obstructed by furniture or other items. Though they are well insulated, it is best to keep small children and pets away from the units.
- There are currently no thermal storage systems designed to cool homes in summer.
- Thermal storage systems with phase change materials are not yet widely available in Canada, although they are becoming popular in Europe.

OTHER CONSIDERATIONS

- Making large ice blocks in your freezer to cool your home might seem like a good idea, but it's counterproductive. The freezer pulls heat out of the water to make ice and expels it back in your home, which requires energy that generates additional indoor heat. Once the ice melts, your home may be slightly warmer than before.
- Do not store items or try to dry clothes on room units or thermal bricks.
- Some units come with smart technologies that can forecast the heat storage needed for the following day. If the stored heat falls short, the heat pump or the thermal storage system can be activated.

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:

- Space Heating
- Water Heaters
- Cooking
- Dryers
- Fireplaces
- Outdoor Equipment
- EV Chargers
- Home Batteries and Backup Generators
- Solar Power
- Avoiding an Electrical Panel Upgrade
- Energy Management Systems
- Options for Renters
- Electrification Incentives
- Amplifying the Impact Through Conversations
- Ways Community Groups Can Help
- Appendices

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

Building Decarbonization Alliance
pour la décarbonation des bâtiments

CREDITS AND COPYRIGHT

By Heather McDiarmid, Building Decarbonization Alliance
Illustrations by Saje Damen

Version 1.2, released June 2025

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

All reasonable precautions have been taken by the Building Decarbonization Alliance to verify the information in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the Building Decarbonization Alliance be liable for damages arising from its use.

buildingdecarbonization.ca