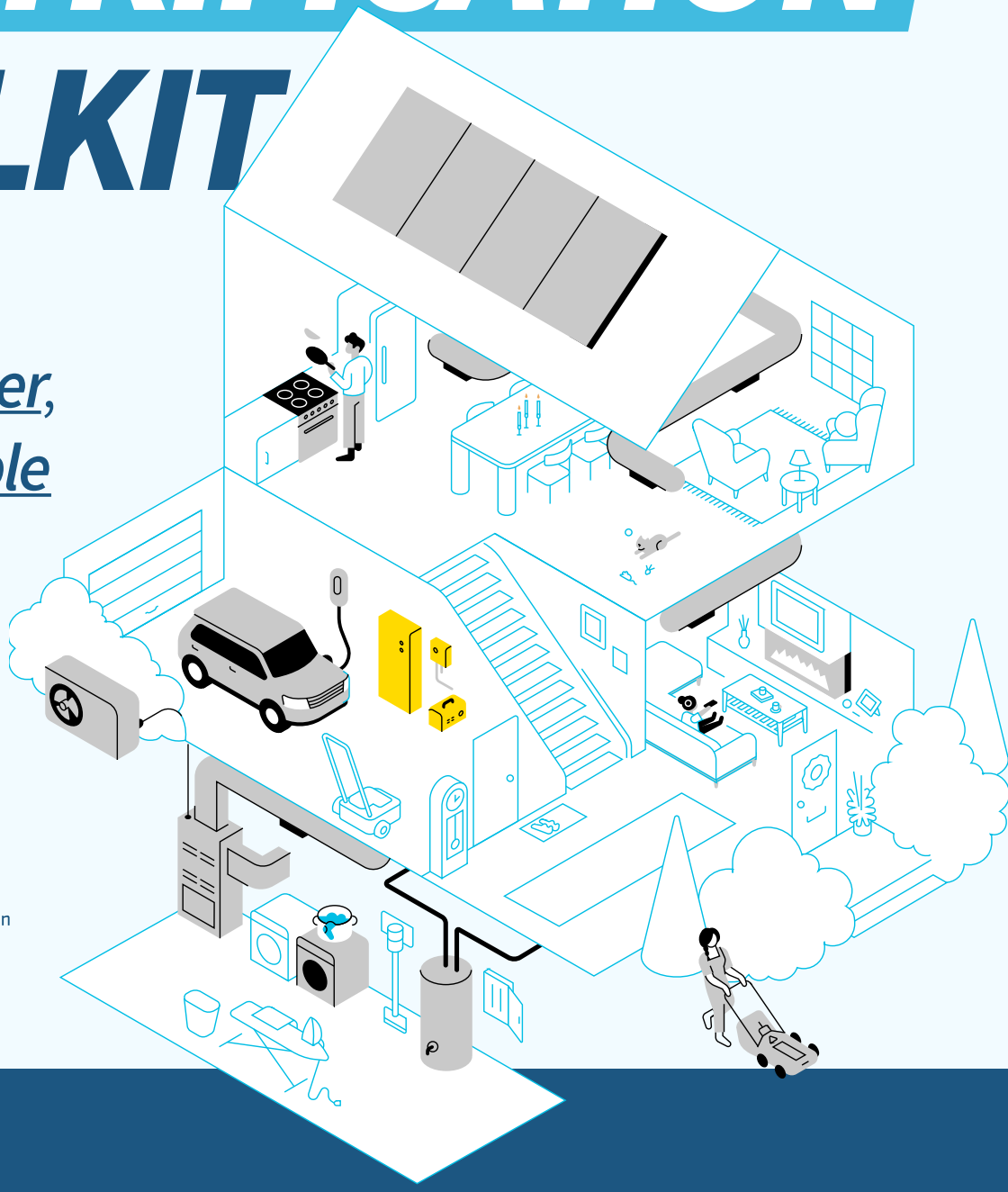
CANADA'S HOME ELECTRIFICATION TOOLKIT

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



Building Decarbonization Alliance
pour la décarbonation des bâtiments

ELECTRIFY YOUR:

HOME BATTERIES AND BACKUP GENERATORS

Home Batteries and Backup Generators at a glance

COST

Upfront costs:
$-$$$$

IMPLEMENTATION

Easy to difficult

EMISSIONS REDUCTION IMPACT

Low to medium

BONUS

No noise or fumes during operation

Home Batteries and Backup Generators

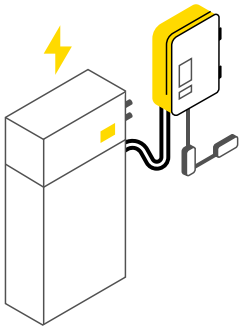
> **Always have a backup plan to the backup plan.**
>
> –
> Gillian Flynn

As climate change is expected to cause more power disruptions, home batteries and backup generators are an increasingly attractive investment. Rural homes in particular are more likely to experience prolonged power outages due to more remote and exposed power lines. Even if outages aren't a concern for you, home batteries can also help shift demand from the grid and take advantage of time-of-use electricity rates.

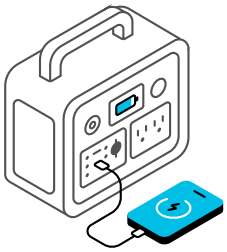
Alternatively, if you own an EV or are considering buying an EV, it's a good idea to explore whether it is equipped with V2G or V2L capabilities– they may be able to fulfill all your power needs (see 'EV Chargers' section).

OPTIONS

Home batteries:



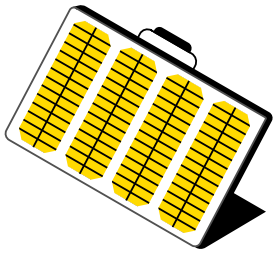
These are larger batteries that can be powered up with off-peak electricity or using excess solar energy, which can then be used during peak times when electricity from the grid can be more expensive. By adding a manual transfer switch, these batteries can power parts of your home during a power outage.



Portable power stations:

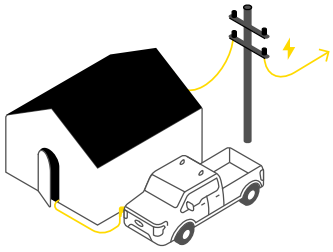
These are basically batteries with a built-in inverter. They can come with a variety of output ports such as conventional 120V outlets, USB ports, DC outlets and more. They are designed to operate one or more pieces of equipment such as a fridge or freezer for hours or longer, depending on the power draw. Some can be charged using solar panels (see below) or even a car's cigarette lighter (slow).

Solar generators:

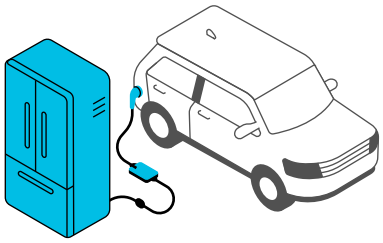


Solar generators are portable power stations that can be charged using portable solar panels. The solar panels are often sold separately.

EVs with V2G capabilities:



With a bidirectional charger and energy management system these EVs can power your home using the vehicle's battery. A fully charged EV may be able to power the essentials in a home for several days.



EVs with V2L capabilities:

These EVs will either have electrical outlets built in, or you can buy a power strip with an adapter that plugs in to the vehicle's charging port. Using extension cords, you can directly power critical appliances such as fridges, freezers, hot plates, laptops or lights. You can also have an electrician install a manual transfer switch like those used with conventional generators to transfer power supply for the entire home from the grid to your EV battery (V2L capable EVs).

BENEFITS

Battery and solar backup power sources provide resiliency during extreme events and power outages. In some cases, they can even be used to support off-grid living in remote locations.

These electric power sources are quiet, do not generate air pollution, and do not require special storage of flammable fuels.

Unlike fuel generators, battery and solar backup power sources are relatively maintenance free, can be stored inside, and are suitable for use in apartments.

You can save money by charging these systems at off-peak time-of-use rates and using the stored energy to power equipment or even supply electricity to the grid when peak time-of-use rates apply.

Portable power systems can be a great addition to a camping trip or when working at remote sites.

CHALLENGES

- Large home battery systems that can be used to operate a home cost much more than gas generators upfront.
- Batteries have finite lifespans, typically measured in charging/recharging cycles.
- Unlike fuel generators, you cannot buy extra fuel for your batteries when they run out of power because they are recharged with electricity, usually from the grid. Fortunately, power outages are rare in Canada, and most last for only a few hours or less.[1]
- Check with your local utility about the maximum inverter size for home batteries and solar installations that can be connected to the grid without paying for a grid impact assessment. The cap is 100 kW in most provinces but in Ontario it is currently 10 kW.
- EVs with V2G capabilities require the installation of a bidirectional charger and a dedicated energy management system.
- Only vehicles designed for V2G and V2L applications should be used to power systems in a home. Using EVs that are not designed for this use can damage the electrical system in the vehicle and void the warranty.

OTHER CONSIDERATIONS

- For electrical work, you will generally require an electrical permit. Be sure to always use CSA certified electrical equipment and hire a licensed electrician when needed. For safety and durability, ask for commercial-rated 240V outlets, which reduce the risk of poor plug connections.
- When shopping for a backup power system, assess your requirements for power output (e.g. the peak power needs of the appliances, measured in watts), and power storage capacity (how long you want the system to run those appliances, measured in watt-hours).
- Some critical equipment such as refrigerators, heat pumps, air conditioners and sump pumps require more power to start up than to run. Make sure your system can handle your equipment start-up needs.
- Have a list of priority appliances that you want to power during an outage. If you are using V2L or a portable power system, make sure you have any necessary extension cords handy and that your system has enough outlets.
- If investing in home batteries, consider an energy management system that can optimize when energy is used to save money in areas with time-of-use rates. During an outage, smart panels can help to extend the power available from batteries by directing power to priority appliances only. See '[Energy Management Systems]' section.
- Consider battery systems designed to be charged with solar panels. This enables you to recharge your battery during longer power outages.

[1] Eaton (n.d.) Blackout tracker: **Canada annual report 2017**. Retrieved from https://www.eaton.com/content/dam/eaton/products/backup-power-ups-surge-it-power-distribution/backup-power-ups/blackout-tracker-/eaton-blackout-tracker-annual-report-canada-2017.pdf

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

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