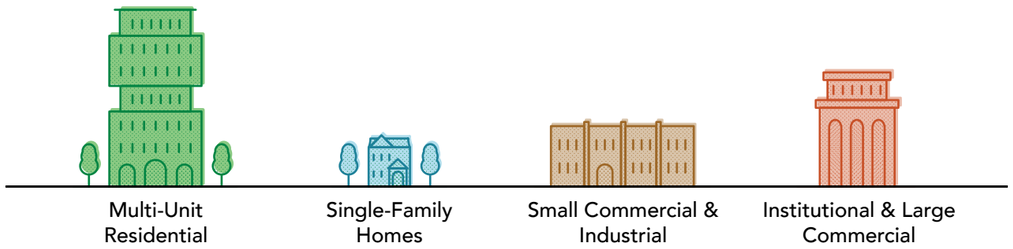
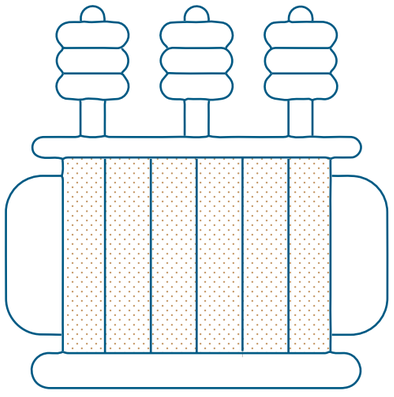
Net Zero Building Retrofit Guides

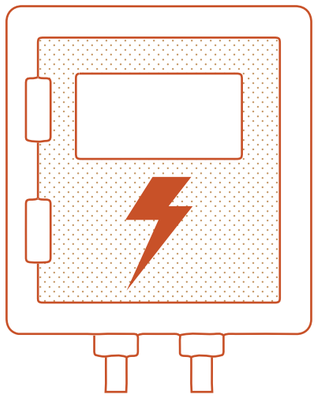
Electrical Capacity Upgrades

Technology Companion Guide

Applicable to:







Co-benefits

Resilience	Indoor Air Quality	Occupant Comfort	Property Value
■□□□	□□□□	□□□□	■□□□

Impacts

Emissions Reduction	Utility Savings	Capital Cost	Maintenance Requirements
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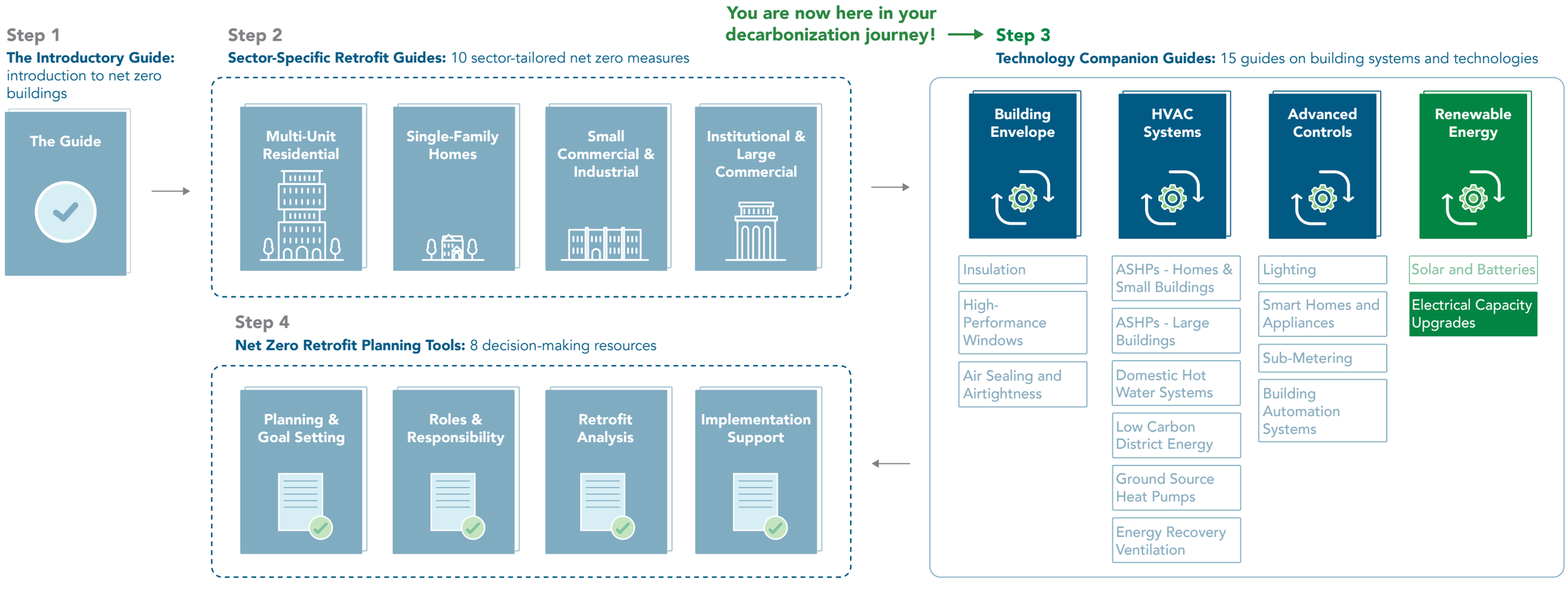
Navigating the Net Zero Building Retrofit Guides

Reducing Greenhouse Gas (GHG) emissions is a journey. It's also an opportunity to make your building more comfortable, healthier, valuable, and resilient to extreme weather events. Successfully arriving at your net zero destination requires careful planning and the right travel companions to ensure a smooth trip.

The City of Toronto's **Net Zero Building Retrofit Guides** include a range of documents designed to support home and building owners reduce GHG emissions from their buildings.

1. **The Introductory Guide** introduces the topic of "net zero buildings." The guide's goal is to familiarize all home and building owners with Toronto's net zero goals and concepts.
2. **The Sector-Specific Retrofit Guides** highlight net zero measures tailored to each building sector and type. These guides provide direction to plan and implement retrofit projects specific to your building.
3. **The Technology Companion Guides** provide technical information about building systems and technologies related to net zero measures and retrofits.
4. **The Net Zero Retrofit Planning Tools** provide decision-making resources to help home and building owners prioritize their retrofit projects. The tools include needs assessments, checklists, and support for contractor selection.



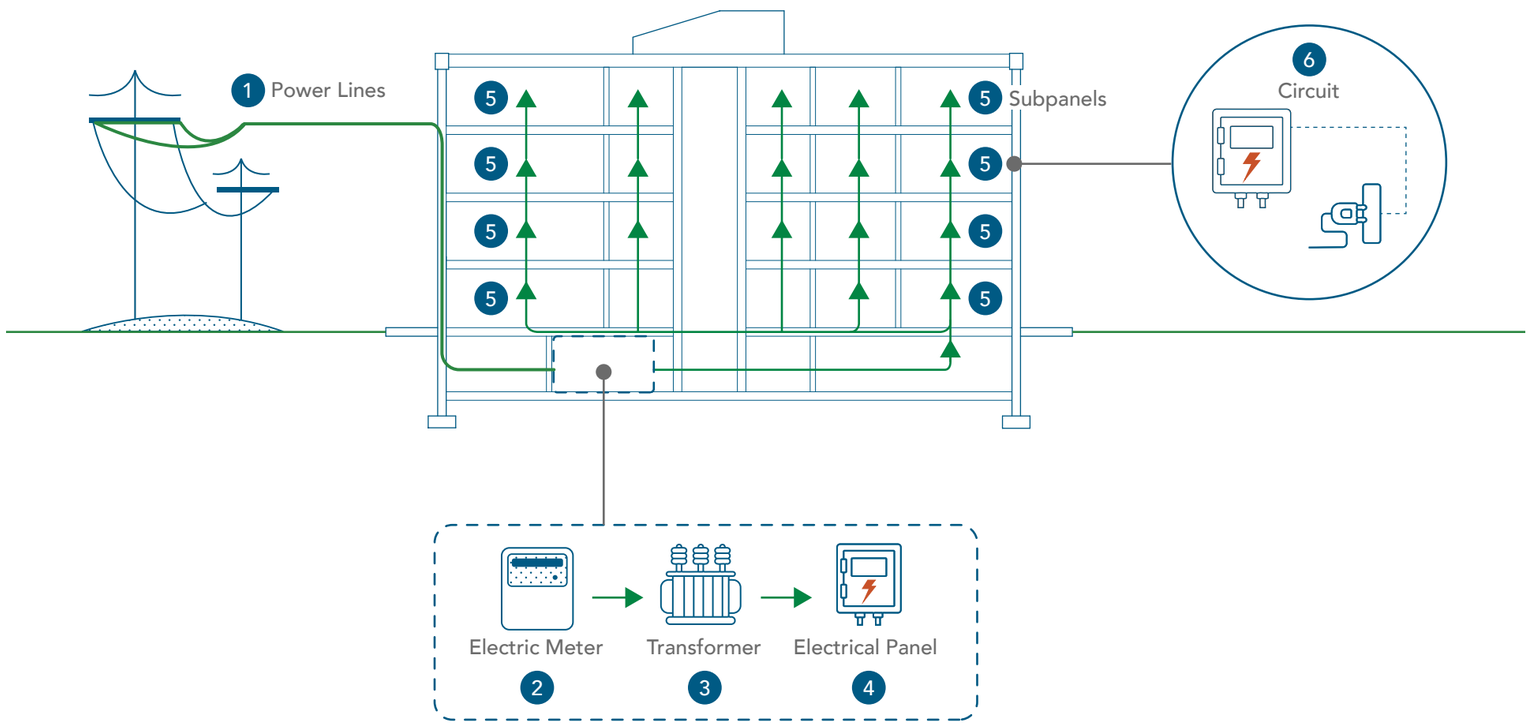
Net Zero Building Retrofit Guides Document Navigation

Electrical Capacity Upgrades

What Is This Technology

Electrical capacity is the maximum amount of electrical energy available to operate your building. Your building electrical system must be sized properly to supply required electricity from the utility to meet all of a building's HVAC, appliances, plug and other electrical loads. Your electrical system must also be in good condition and operate safely.

A building's electrical capacity can impact which energy retrofits are possible. Your building may require electrical capacity upgrades to provide additional electricity required for certain retrofits, including heat pumps and EV charging stations.



How Electrical Capacity Upgrades Work

Often buildings that electrify their heating through heat pumps and electric boilers require additional electrical capacity. A building's electrical supply may need to be upgraded to safely deliver the low carbon heating and hot water to occupants. Electrical capacity limitations can be found throughout the electrical system including:

1. Power lines, which bring electricity to your building.
2. Electrical meters, which measure the amount of electricity consumed by the building.
3. Transformers, which lower the voltage of the electricity so it can be used safely and efficiently within the building.
4. Electrical panels, which divide the electricity across the different circuits in the building.
5. Subpanels, which are panels that handle new circuits in building additions, or serve equipment far from the main electrical panel.
6. Circuits, which distribute electricity throughout the building, and power your outlets, lighting, and equipment.

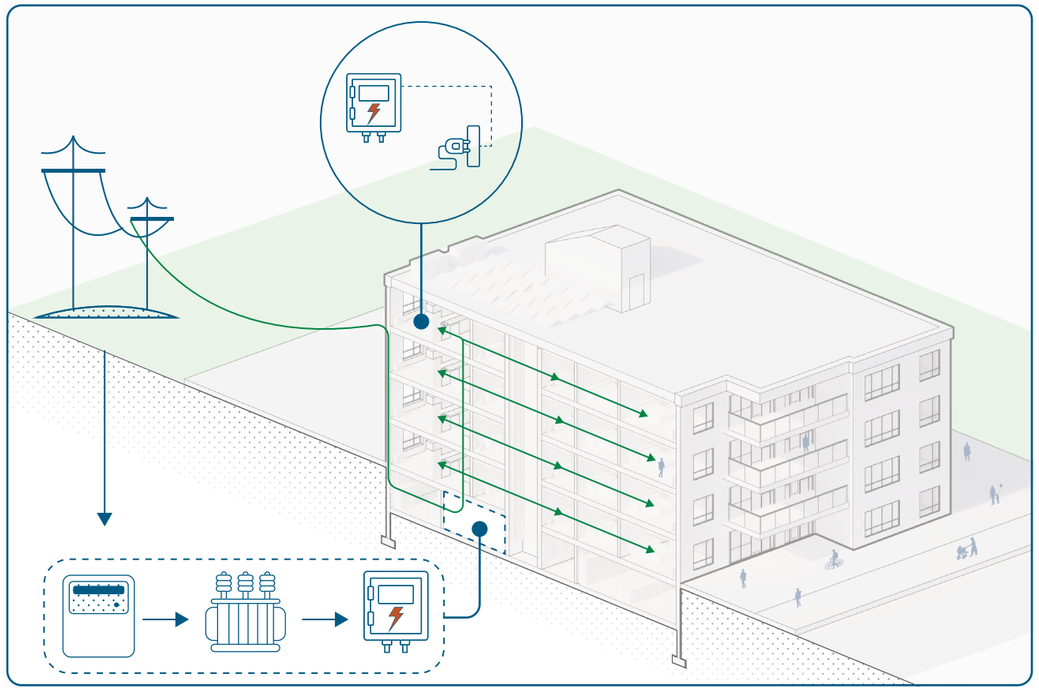
Retrofit technology explained

When to Retrofit This System

When planning retrofits that involve fuel switching, it is important to consider if you have enough electrical capacity, and to check whether your electrical equipment is rated for the additional capacity. Equipment ratings refer to the amount of electricity your equipment (cables, transformers, and panel, HVAC equipment, electronic devices) need to function. Electrical capacity retrofits should be considered by default when your major building equipment reaches end of life.

Why Retrofit This System

Electrical capacity upgrades ensure that you can make retrofits to your building without exceeding the available electricity supply. Planning for projects carefully and proactively will enable a resilient electrical system for your building.



Typical locations of building electrical equipment

Below are co-benefits and impacts to help you better understand this technology.

Co-benefits

Resilience:
Updates to the electrical service means that your building is serviced by new infrastructure that is less likely to fail. Updating electrical capacity is often a necessary step before other resiliency measures can be implemented.

Indoor Air Quality:
Electrical service capacity upgrades do not directly impact indoor air quality.

Occupant Comfort:
Electrical service capacity upgrades do not directly impact occupant comfort.

Property Value:
Ensuring your building has the required electrical capacity will prepare your building for the future and will enable projects which may add value to your property.

Impacts

Emissions Reduction:
Upgrading your electrical service capacity does not lead to emissions reductions.

Utility Savings:
Upgrading your electrical service capacity does not impact utility savings.

Capital Cost:
Based on the age and condition of the current electrical equipment, it may be necessary to update some or all of the equipment, which could be costly.

Maintenance Requirements:
Renewed infrastructure will reduce future maintenance issues. Upgraded service capacity does not require additional maintenance.

Types of Systems and Retrofit Solutions

Different retrofits can either increase or decrease your required electrical capacity.

Retrofits that add new equipment might increase your electrical capacity needs. Similarly, energy efficiency retrofits may decrease your electrical capacity needs.

When considering any retrofit, it is important to consider how it will impact your electrical capacity requirements. You can plan retrofits that will help to balance your electrical needs, and reduce your peak demand.

Here are two scenarios that might lead to an upgrade of your electrical service:

Updating Heating System

You are planning to replace your old furnace or boiler with an electric heat pump and electric resistance heaters. Space heating that was supplied by natural gas equipment will now be supplied by electrical equipment. This means that your total electricity use will increase.

Speak to an expert who can advise if an upgrade is required or consider additional energy efficiency upgrades to reduce your electrical requirements.

Adding New Electrical Equipment

You plan on adding electrical vehicle chargers to your building. You also want to add cooling to your building if air conditioning wasn't previously provided. These new systems will require additional electrical service.

Speak to an expert who can advise if an upgrade is required or you can consider installing building controls to manage your vehicle charging.

Here are two scenarios that might lead to a reduction in your required electrical capacity:

LED Lighting Retrofit

Change your traditional lighting systems to efficient LED bulbs and fixtures to reduce your electricity demand. LED bulbs also run cooler and may slightly reduce the electricity required to cool your building. Upgraded lighting controls can also lower electrical demand and reduce your electrical capacity needs.

Envelope Improvements

An upgraded building envelope can help you maintain comfortable indoor temperatures with less cooling and heating requirements. Your building may be able to downsize your heating and air conditioning systems, reducing your electrical capacity needs.

How to Implement

Before starting, refer to the **seven-step roadmap to net zero** in the **Introductory Guide** and in your **Sector-Specific Retrofit Guide**, to ensure your retrofit aligns with your overall strategy and goals.

Here are a few steps to get you started with an electrical service capacity upgrade:

1. Hire experts, like electrical and civil engineers, to advise and support the implementation of electrical retrofits to your building and comply with electrical codes and standards. Your experts will guide you through the following steps.
    - Understand your current electrical system, including its age, condition, and capacity. This helps determine whether upgrades or replacements are necessary to meet modern standards.
    - Review utility bills to determine your annual peak demand.
    - Determine your power requirements and the additional demand that new equipment will add. Consider retrofits or renovations that will change the electrical requirements for your building, particularly if switching from natural gas to electric.
    - Consider challenges and synergies in your retrofit plan to optimize the systems, such as LED retrofits, smart lighting and controls, or solar and battery integrations.
2. Work with your technical expert to submit a service request to Toronto Hydro for them to review your service upgrade. This may take several months depending on the complexity.
3. Sign an agreement with Toronto Hydro outlining the project details, timelines, and applicable costs to upgrade your service.
4. Upgrade building equipment, such as electrical panels, to meet the new required electrical service.
5. Ensure compliance with the Electrical Safety Authority for all upgrades and installations.

What are Peak Demand Charges?

Your electrical peak depends on how many things are plugged in and using electricity at one time. Peak demand charges are extra fees that utility companies charge based on the highest amount of electricity you use at one time during a billing period.

By reducing your peak demand, you can save on electricity demand charges.

Opportunities

Evaluate how this retrofit can be integrated with the following building systems to maximize potential synergies and optimize overall performance.

Heating Systems

Domestic Hot Water

Gas Appliances

Electrical service capacity planning should be considered when doing retrofits or renovations that change your building's electrical needs, especially when switching from natural gas to electricity.

HVAC Systems

HVAC upgrades can increase electrical demand. When making updates to HVAC systems, the electrical capacity available to your building should be carefully considered.

Energy Generation

Energy Storage

Electrical service capacity planning can also help optimize energy generation and storage projects.

Envelope Upgrades

When updating building insulation, it may be a good opportunity to confirm if your wiring meets the updated code.

Challenges and Solutions

Upgrading the electrical capacity of your building can be challenging. Below are some common challenges you may face and how to solve them.

Challenge 1: Regulatory Compliance

Solution: When investigating your existing electrical system, look for any outdated or improperly installed components, and update equipment to current codes and standards.

Challenge 2: Service Interruptions

Solution: Since services will be disconnected during electrical work, plan for interruptions to minimize disruptions. Consider critical equipment, like IT, elevators, and fire protection systems.

Toronto's Climate Considerations

Due to Toronto's climate, there are a few things to consider when upgrading your electrical services:

Extreme Temperatures

Ensure your electrical equipment is not located near any heat sources or prone to overheating in extreme temperatures.

Snow and Ice Buildup

Ice buildup can weigh down tree branches and cause them to damage power lines. Ensure power lines are clear of branches that might cause damage.

Ready!

You should now have a better idea of what **Electrical Capacity Upgrades** are, their co-benefits and impacts, and how to implement them in your building given potential synergies and challenges!

Also check your building **Sector-Specific Retrofit Guide** for steps to achieve net zero visit the other **Technology Companion Guides** to learn more about retrofit measures.

Other guides in the Renewable Energy Technology Companion Guides:

- Solar and Batteries

Other resources in the Net Zero Building Retrofit Guides:

- The Introductory Guide
- Sector-Specific Retrofit Guides
- Net Zero Retrofit Planning Tools

For more information, please refer to these other City of Toronto resources:

- Net Zero Existing Building Strategy
- Transform TO Net Zero Strategy
- Toronto Green Standard
- Better Buildings Partnership
- Better Homes: Green Resources for Residents
- Energy & Water Reporting for Buildings

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Prepared by:

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