Community Energy Association

A Policy Planning Companion for Local Governments

Power Efficient Design

Guide for Supporting Residents in Managing Home Electrical Capacity

June 2026

AT A GLANCE

When electrical loads are planned and managed thoughtfully, buildings can often accommodate new electrical equipment without electrical service upgrades—reducing costs, avoiding delays, and boosting confidence for residents, builders, and developers.

Power efficient design strategies, including efficiency improvements, load elimination, and the application of energy management systems (EMS), mean many BC homes already have enough electrical capacity with a standard 100 A service panel.

Local governments play a key role in ensuring residents understand their options, reducing surprise costs, smoothing the permitting process, and helping households make informed decisions. This guide supports those conversations.

KEY TAKEAWAYS

- Builders and homeowners should not assume that 100 A service needs to be upgraded to accommodate equipment such as heat pumps and EV chargers.
- Energy Management Systems (EMS) can monitor and control electrical loads in real time to manage demand. Currently, however, EMS can only be used for non-EV electrical loads by applying for a code variance.
- Local governments can encourage the building industry to pursue power efficient design by e.g. distributing resources, integrating into planning and development review, and clarifying permitting processes.

Contents

Introduction

How much electrical capacity is truly needed?

Residents, builders, and developers are being encouraged to improve energy efficiency and transition to using electric heating and hot water systems. As a result, questions about electrical capacity are becoming more common at permit counters and planning desks.

Power efficient design strategies are an important part of this transition. When electrical loads are planned and managed thoughtfully, homes and buildings can often accommodate new electrical equipment without costly and time-consuming electrical service upgrades. This can significantly reduce project costs, avoid delays, and improve confidence for residents, builders, and developers—whether they are upgrading an existing home or designing a new one.

WHAT IS POWER EFFICIENT DESIGN (PED)?

PED refers to strategies that limit a building's electricity demand, including some load reduction strategies and Energy Management Systems. PED specifically targets power—the rate of electricity at any moment—to avoid unnecessary service and panel upgrades.

Learn more: Consortium for Power Efficiency's Overview of Power Efficient Design Strategies.

It is commonly assumed that the installation of any new electric equipment requires a panel or service upgrade. In many cases, this is not true. The average size home service panel in BC is 100 or 200 A (100 A for homes built prior to the 1990s; 200 A for homes built more recently). Many of these homes already have enough electrical capacity for upgrades,[1] especially when power efficient design strategies are used, including efficiency improvements, load elimination, and the application of energy management systems (EMS).

Local government staff do not need to be experts in energy management, unless they are amongst the small subset of communities that issue their own electrical permits rather than going through Technical Safety BC (Burnaby, Maple Ridge, North Vancouver (City and District), Surrey, Victoria, Vancouver, and West Vancouver). However, local governments play a key role in improving community literacy: ensuring residents understand their options, reducing surprise costs, smoothing the permitting process, and helping households make informed decisions. This guide supports those conversations.

---

[1] There is currently no Canadian dataset that quantifies how much of their electrical panel capacity typical single-family homes actually use. However, the Building Decarbonization Alliance notes that most homes with 100 A panels or larger can electrify space and water heating without requiring a panel upgrade, suggesting substantial unused capacity in many dwellings. United States-based studies using smart-meter data have found that the vast majority of homes have peak loads under 50 A, but these results are not directly transferable to Canada due to differences in climate and housing stock.

THE BIG PICTURE

When existing buildings increase their electrical capacity and new homes are built with excess energy capacity, this not only adds costs to developers and homeowners, but it also increases the need for utilities to upgrade or add distribution infrastructure (i.e., the transformers, feeders, substations, and control equipment that deliver electricity to consumers). It is in everyone's best interest to reduce the need for unnecessary infrastructure primarily to keep electricity rates as low as possible for customers while also reducing construction costs.

Uncertainty can lead to delayed or derailed projects

Confusion can lead to surprise costs, frustration, and missed opportunities to improve energy efficiency and electrify buildings. Key challenges include:

1. **Assuming panel upgrades are necessary**
   Panel or service upgrades are frequently treated as the default solution, even when alternatives may exist. Residents and builders may not be aware of the opportunity to use power efficient design strategies (defined below), leading to unexpected costs late in the project.
2. **Contractors providing conflicting advice to property owners**
   Electrical contractors and HVAC installers vary in how they calculate loads, whether they consider energy management options, and how they interpret Canadian Electrical Code requirements. This results in conflicting guidance for residents.
3. **Varied acceptance of Energy Management Systems (EMS) for full building load management across different jurisdictions**
   EMS systems are not consistently regulated for EV and non-EV uses or accepted across jurisdictions. Different local interpretations of the Canadian Electrical Code and varying pathways create uncertainty for builders and developers.
4. **Local government staff are not resourced to answer questions**
   Local staff are often asked whether a panel upgrade is required, whether new equipment can operate on existing service, or whether EMS are code-accepted, without having clear, accessible reference material to rely on.

As a result, costs increase for residents and developers and some projects may be delayed or even cancelled, permitting processes grow more frustrating, and opportunities are missed to build efficient, well-designed energy systems.

THE ELECTRICAL PANEL is the central connection between the electrical service and all the circuits inside the building. Breakers or fuses control every circuit inside the building.

THE ELECTRICAL SERVICE is the power lines carrying electricity, either overheard or underground, from the hydro pole to the building. Typically electrical service is provided at 100 A for houses, but newer or larger homes need 200 A service.

Purpose of This Resource

This guide is designed to support local government staff in helping residents, builders, and developers navigate electrical capacity and energy management decisions. Specifically, it helps staff to:

1. Clarify what “power efficient design” is and how it benefits residents and businesses.
2. Build understanding of how and when power efficient design solutions can be used to avoid electrical panel upgrades.
3. Provide consistent messaging to contractors, permitting staff, and residents about power efficiency across local governments.
4. Clarify interactions with the Canadian Electrical Code, including limitations, variance pathways, and the role of qualified professionals.
5. Identify opportunities for local training and collaboration with electricians, HVAC installers, energy advisors, industry associations, and economic development organizations.

Power Efficient Design (PED)

Approaches and technologies

For existing buildings, power efficient design is about planning and optimizing how electrical loads operate so the electrical service can safely and effectively meet occupants' needs, often without requiring a panel or service upgrade.

In new buildings, power efficient design means lowering the electrical service size by using efficient heating, cooling and appliances, designing with energy management systems, and even considering energy storage to minimize energy use.

At its core, power efficient design focuses on:

Optimizing Load Calculations

Using accurate historical data and load calculations to better estimate electrical capacity requirements in electrical codes, thereby avoiding oversized electrical systems.

Building Efficiency and Right-Sizing Loads

Designing buildings with efficient heating, cooling, lighting, and appliances to minimize peak power use.

Energy Management Systems

Smart monitoring and control of electrical loads to avoid exceeding capacity limits.

Energy Storage

Using batteries or thermal storage to supplement peak power needs and avoid service upgrades.

Adapted from the Consortium for Power Efficiency, https://powerefficiency.ca

Which buildings benefit most from power efficient design?

Power efficient design is most valuable where electrical capacity is limited and multiple loads are competing. Buildings that benefit most include:

- Older single-family homes (pre-1990s) with 60–100 A panels switching from fossil fuel-based systems to electric systems.
- Townhomes and small MURBs (multi-unit residential buildings) adding significant electrical loads (e.g., from EV chargers or heat pumps).
- Apartment buildings and large MURBs which have typically been built to accommodate large simultaneous peak loads.
- In-fill multiplex housing where there had previously only been single-family homes.
- Any construction where the area's electrical transformer's capacity is constrained.

UNDERSTANDING PEAK DEMAND

Peak demand is the highest amount of electricity a building uses at one moment, not the total energy used over a day or month. Electrical panels are sized to handle this peak. As a result, even efficient homes could be overloaded by multiple large loads operating at the same time. Energy management helps reduce or shift these peaks, allowing existing panels to safely meet a home's needs without costly upgrades.

Load Reduction and Elimination Strategies

As a first step, residents and builders may be able to reduce electrical demand through efficiency and load elimination. These measures can significantly lower peak electrical loads, which are often what trigger panel upgrade requirements.

- Designing or upgrading the building envelope with improved insulation, air sealing, and high-performance windows
- Right-sizing mechanical systems based on actual loads, rather than default or peak assumptions, and completing building envelope upgrades before sizing space and water heating.
- Selecting high-efficiency appliances and space and water heating equipment
- Choosing appropriately sized or lower-capacity EV charging equipment
- Using a cold-climate heat pump as the primary heating system, rather than adding supplemental electric heat

Energy Management Systems

When reducing loads through energy efficiency is not enough, energy management systems (EMS) may be an option. EMS are technologies that monitor and control electrical loads in real time to keep demand within specified limits. They help prevent electrical panels from being overloaded by delaying, pausing, or prioritizing certain equipment.

There is a growing range of EMS technologies. Common examples include:

Branch Circuit Switching

These devices allow two large electrical loads to share a single circuit by ensuring they do not operate at the same time. One load is given priority, while the second only receives power when the first is off.

Load Pausing (or Load Control) Devices

These devices monitor total demand across the entire electrical panel. If demand exceeds a set threshold, the device temporarily pauses power to connected equipment until overall demand drops.

EMS can help reduce the size of required service panels, avoid or defer costly electrical upgrades, and safely manage peak electricity demand.

Limitations

However, EMS are one tool among many, and they are not a guaranteed solution in every situation. Important limitations to be aware of:

- Not all EMS are approved for every use (more on this below).
- EMS technologies and standards are evolving.
- Contractor familiarity and experience with EMS vary.
- Code acceptance depends on the specific application and local jurisdiction.
- EMS typically require installation by a qualified electrician.

When Are Panel Upgrades Needed?

Even with power efficient design strategies in place, panel upgrades may still be required when:

- The electrical service or panel is very small to begin with (e.g., 60 A panel).
- Multiple large electrical loads are being added at the same time eg. switching from a gas furnace to an electric heat pump *and* installing an EV charger.
- Efficiency and load reduction strategies are practically or financially infeasible.
- The EMS solutions required are not acceptable under applicable electrical codes.

Additionally, in colder BC climate zones (5 and higher), homes and buildings often require supplemental heating[2], even with high-efficiency heat pumps. This increases peak electrical demand, which can trigger panel or service upgrades even when energy efficiency and load management strategies are applied.

Power efficient design strategies can reduce peak demand, but cold climate homes may still need panel upgrades for simultaneous high-load equipment.

Climate Zone	Implications for Energy Management	EMS / PED Considerations
Zone 4	Peak loads are lower; EMS may defer upgrades	Standard EMS is often sufficient
Zone 5	Electric supplementary heating increases peak demand	EMS and other PED strategies are recommended
Zone 6	High simultaneous demand for electric space and water heating	EMS and other PED strategies are essential, and panel upgrades are more likely
Zone 7–8	High peak demand from cold-climate heating loads	Early planning is critical and variance is likely

KEY TAKEAWAYS FOR LG STAFF

Residents and builders can often avoid electrical service or panel upgrades through early planning and power efficient design strategies. However, upgrades are sometimes unavoidable. Local government staff play an important role in helping residents understand available pathways and encouraging early coordination with qualified professionals.

[2] Supplemental heat is an additional heat source used alongside the home's primary heating system to provide extra heat during extreme cold conditions.

The current reality of EMS

While builders and developers are aware of energy management systems, many rely on traditional solutions such as panel or service upgrades to manage power demand—even in cases where energy management systems would be more cost-effective.

Why is this happening?

As of May 2026, the Canadian Electrical Code approves and standardizes EMS—*but only for electric vehicle charging.* Unfortunately, there is not yet an approved standard for managing electrical loads from heat pumps.

That means the current reality for EMS is:

- **No standard permits:** Local governments will not accept EMS for non-EV loads through a standardized electrical permitting process.
- **Variances are required**: EMS can only be used for non-EV electrical loads by applying for a variance or special permission from the local permitting authority.
- **Inconsistent interpretations**: Different inspectors and communities give varying interpretations of whether an EMS is safe and meets CEC requirements, creating inconsistency for contractors and builders.

Without an approved standard for non-EV electrical loads, and with inconsistency for permit applicants, many builders and developers choose the straightforward solution of a panel or service upgrade, despite the potential for increased costs.

STAFF TIP

BC Hydro is leading a task group to eventually provide consistency across the province. For now, check with your local permitting authority to confirm whether EMS-based solutions are currently being accepted and under what conditions.

Variance process for new construction

- Developers should engage early with electrical contractors, engineers, utilities, and permitting staff to define what is feasible and acceptable.
- Developers can then pursue an Alternative Solutions Plan as part of the building permit application, creating a pathway to request a CEC variance.[3]
- A variance or special permission under the CEC is then sought independently of the Alternative Solutions Plan.

[3] Whether a municipality will accept this depends on local policy, the inspector, and the exact design.

Variance process for existing buildings

Part 3 Buildings

- An engineer typically designs the EMS strategy, confirms safety, and signs off.
- The engineer applies for an electrical variance and takes full responsibility for system performance and risk.

Part 9 Buildings

- Electrical contractors may recommend EMS solutions.
- Installation requires an electrical variance through the local permitting authority.

Despite the outline above, most local permitting authorities in BC are requesting engineering oversight for EMS solutions, regardless of whether a building is classified as a Part 3 or Part 9 building. Single family detached homes are generally the exception to this engineering oversight and usually left to the electrical contractor for special permission, all dependent on the scope and complexity of the design.

Approval process

For communities relying on Technical Safety BC (TSBC) to issue electrical permits, TSBC will review all variances for safety and compliance. Installation proceeds once approved.

For communities that issue their own electrical permits,[4] the local government will receive an Alternative Solutions Plan or variance request and staff will coordinate with engineers or qualified professionals to confirm compliance. Installation proceeds once approved.

STAFF TIP

Encourage early conversations— before designs are finalized—between developers, energy advisors, electricians, engineers, utilities, and permitting staff. This can clarify the conditions under which EMS is feasible and ensures the variance pathway remains open. Ultimately, this leads to a more efficient building with a right-sized electrical service.

[4] Burnaby, Maple Ridge, North Vancouver (City and District), Surrey, Victoria, Vancouver, West Vancouver.

Applying PED Strategies

Energy management strategies, including load elimination strategies and EMS, can be applied to both new construction and renovations.

New Construction

New buildings offer the greatest opportunity to manage electrical demand effectively and reduce the electrical panel size needed. Designing projects from the outset to have energy management systems will save developers and future homeowners money. This is especially true for multi-family or larger buildings.

Key points to share with developers and builders:

- **Consider energy management early**
  Plan for energy efficiency and load management during the design phase, before permits are submitted.
- **Coordinate with experts and permitting staff**
  Work with an Energy Advisor, the building permit office, and BC Hydro (for larger development) to explore energy management strategies.
- **Use variance pathways when needed**
  Where EMS is proposed for non-EV loads, developers may submit an Alternative Solutions Variance and later a CEC variance. Planning this pre-permit helps reduce electrical panel sizing and ensures compliance.

Existing Buildings

Understanding and managing electrical demand before performing home energy retrofits can avoid the need for costly panel upgrades. Careful planning and awareness of energy management strategies can avoid surprise costs, reduce peak demand, and improve safety and comfort.

Key points to share with developers and builders:

- Energy management in renovations can reduce or delay panel upgrades when installing electric equipment.
- Strategies include load reduction and installing EMS where allowed.

Raising Awareness of PED

Local government staff are well-positioned to increase understanding and awareness of opportunities for power efficient design amongst residents and the building community. The following are some ways to increase awareness.

1. Build and Share Practical Resources

Provide residents and local building community with clear, accessible guides on energy efficiency, electrical load awareness, and energy management options.

Local governments can help normalize right-sizing of electrical systems, compact building design, and the role of load management by sharing trusted, plain-language information.

Example resources include:

- The Homeowner's Guide to Electrical Load Management (BC Housing)
- Briefing: Avoiding Electrical Upgrades with Power Efficient Design (Consortium for Power Efficiency)
- Canada's Home Electrification Toolkit (The Building Decarbonization Alliance)
- EV Power Management Devices | How It Works - YouTube (BC Hydro)

2. Strengthen Contractor Communication and Training

Support better coordination across trades by partnering with local economic development organizations, industry associations, and training providers. Local governments could also collaborate with neighbouring jurisdictions to offer education opportunities for the building community about energy management strategies. These events could include networking opportunities between trades, as well.

Encourage earlier and clearer communication between electricians, HVAC installers, energy advisors, and designers to reduce late-stage design conflicts and unnecessary upgrades.

3. Encourage Early, Cross-Disciplinary Conversations

Promote pre-application or early design discussions for projects with significant electrical loads, such as heat pumps, EV charging, or multifamily buildings.

Early conversations help clarify electrical constraints, identify whether EMS or alternative solutions may be viable, and reduce redesign and delays later in the process.

4. Lead by Example in Municipal Projects

Apply power efficient design principles in municipal buildings and retrofits. Demonstrating best practices builds internal staff knowledge, supports market confidence, and provides real-world examples for the local building community.

Where possible, share case studies and stories through your local government channels to further build awareness of the benefits, such as cost savings of power efficiency.

5. Integrate Energy and Load Awareness into Planning and Permitting

Use planning, development review, and permitting processes to encourage early consideration of energy efficiency and electrical loads.

Clear expectations and early conversations can support right-sized systems, smoother approvals, and better coordination among developers, builders, designers, utilities, and inspectors.

6. Clarify Roles, Referrals, and Expectations

Clearly communicate what local government staff can advise on, and where applicants should be referred for technical or code-related guidance (e.g., TSBC, utilities, engineers).

Clear referral pathways can reduce the burden on staff and avoid mixed or inconsistent messages.

7. Use Incentives and Consistent Messaging

Where possible, promote incentive programs that support power efficient design, such as BC Hydro's rebates for EV power management devices.

Reinforce consistent public messaging that "right-sized systems" are efficient, cost-effective, and possible. This can bust myths about costly panel upgrades and make energy efficient and low carbon retrofits more appealing to the public.

Conclusion

Supporting energy-efficient upgrades and effective electrical planning is a key lever for accelerating adoption of low carbon buildings and reducing emissions. There are benefits to be gained by all parties—homeowners, builders, developers, local governments, and utility customers broadly.

By promoting thoughtful consideration of power efficient design and communicating clearly and consistently with residents and businesses, local governments can reduce project timelines, prevent surprise costs, and strengthen confidence in electrification projects and high-performance building upgrades.

Key Takeaways for Local Government Staff

- **Early planning matters:** encourage residents, builders, and developers to consider power efficient design strategies before submitting permits or starting upgrades.
- **Panel and service upgrades are not always needed:** many homes and buildings can accommodate new electrical equipment without panel or service upgrades when peak demand is managed effectively.
- **Peak demand drives decisions:** panels are sized for the highest instantaneous electrical loads, not total energy use. Power efficiency measures can help avoid unnecessary upgrades.
- **Clear guidance reduces confusion:** provide consistent, plain-language information and referral pathways to TSBC, qualified engineers, or energy advisors when needed.
- **Cold climates and MURBs need extra attention:** homes in zones 5–8, and multi-unit residential buildings with multiple high-demand systems, may still require panel upgrades despite efficiency and EMS strategies.
- **Collaboration is key:** early conversations between developers, builders, contractors, energy advisors, inspectors, and utilities improve project outcomes, reduce costs, and build community confidence in electrification and high-performance building initiatives.

RESOURCES

Guidance from Technical Safety BC for applying for a variance

The Homeowner's Guide to Electrical Load Management

Briefing: Avoiding Electrical Upgrades with Power Efficient Design

Canada's Home Electrification Toolkit: Avoiding an Electrical Panel Upgrade