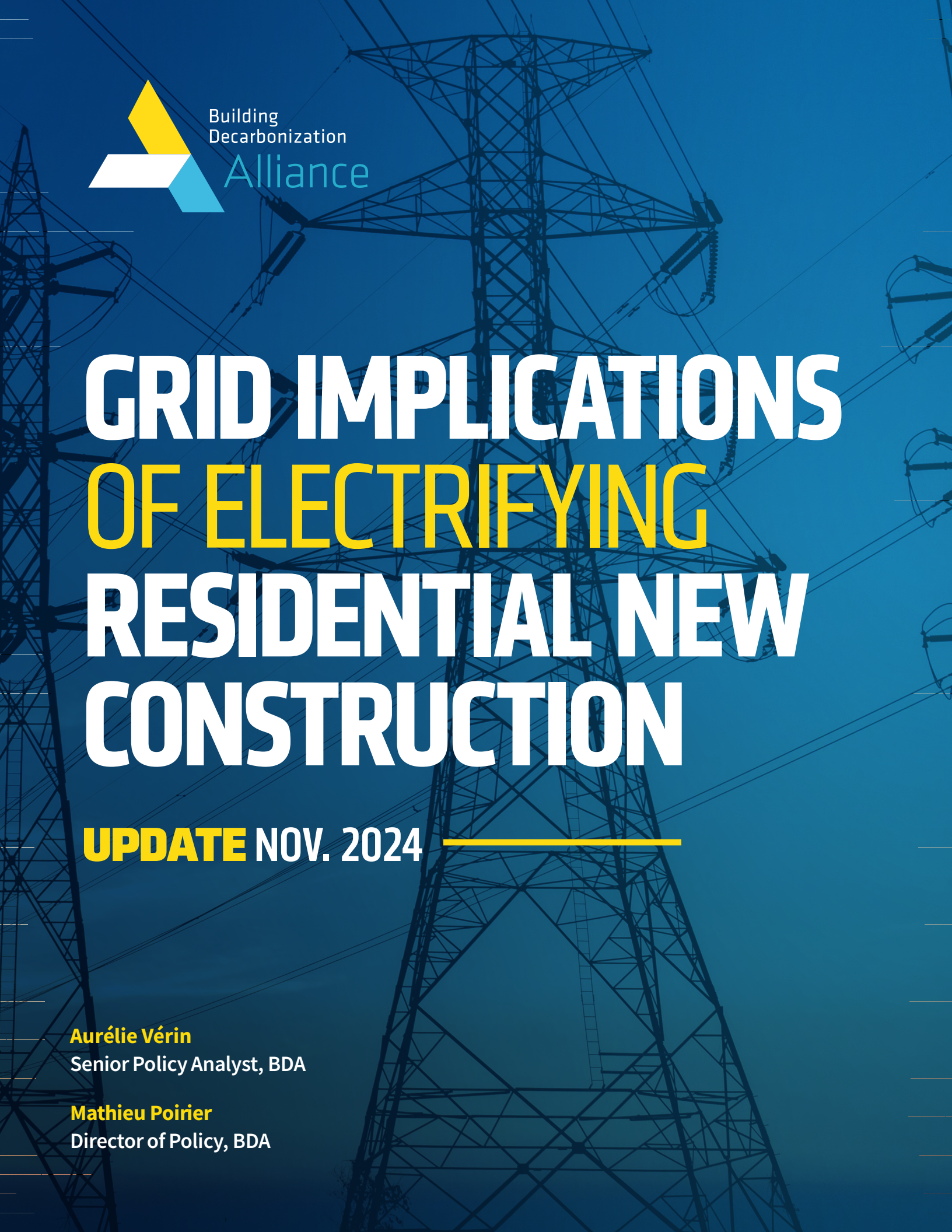

Building Decarbonization Alliance

GRID IMPLICATIONS OF ELECTRIFYING RESIDENTIAL NEW CONSTRUCTION

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Join Us!

The Building Decarbonization Alliance is a non-partisan and cross-sector coalition working to change the narrative on building heat, inspire and inform industry and government leadership, and accelerate market transformation. We reach beyond rhetoric to engage with evidence and science, helping put in place the conditions for effective policy, change the narrative, and increase awareness of the benefits of decarbonized all-electric buildings. We've convened over 260 Partner organizations. And as we move into 2025, we're working hard to expand the reach of our Alliance and proposing an exciting slate of research and initiatives to advance our mission and vision.

If you are interested in supporting our work, visit www.buildingdecarbonization.ca or reach out to us at info@buildingdecarbonization.ca to find out how you can help accelerate building electrification.

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Introduction

Canada's existing residential buildings account for 6% of the country's greenhouse gas (GHG) emissions.[1] These emissions mostly come from burning fossil fuels for heating. Each new home that is not fully decarbonized when built adds to the total. Electrifying key building systems (e.g., switching from fossil fuel-based heating systems to alternatives like heat pumps), especially in the more than 80% of homes that currently get their electricity from low-emitting grids,[2] helps ensure we don't increase the gap to achieving net-zero emissions in the sector.[3]

Building electrified residential new construction also provides other benefits:

1. It prevents the need for retrofits of these newly constructed homes in the medium term (i.e., before 2050), which would prove more difficult and more costly than building them to be decarbonized now.
2. It presents a unique opportunity to encourage market transformation at a manageable pace and scale (e.g., growing industry and encouraging supporting infrastructure investments for a portion of the buildings that will ultimately need to be decarbonized), and
3. It paves the way for the market to learn and grow to then take on the more complex challenge of decarbonizing existing buildings.

We believe this is a timely discussion as the decarbonization of new construction in the very near-term is critical to meet long-term building sector goals. While many are actively building or exploring all electric new construction, there are examples moving away from electrification. For example, Vancouver City Council's recent turnaround to repeal its prohibition of using natural gas to heat new homes (see call out box).[4]

Vancouver signals move away from all-electric heating in new residential construction.

On July 23, 2024, Vancouver's City Council proposed a motion to re-allow the use of natural gas for space and water heating in new residential construction. City staff are scheduled to present compliance pathways in November 2024, after which a council vote will take place. Previously, since 2022, the city required space and hot water heating equipment in new low-rise residential building to be zero emissions. While councillors cited several concerns, the one we will explore in this memo focuses on electricity demand challenges, particularly in maintaining capacity to meet growing needs.[5]

1 Canada Energy Regulator (2024). Canada's Energy Future.

2 We define low emitting as having an average emission intensity lower than 80 gCO2/kWh. Natural Resources Canada (2024). Comprehensive Energy Use Database. Residential Sector.

3 Grid needs to be non-emitting, but efforts are underway for that to occur.

4 The City of Vancouver's Council proposed a motion to restore the option for new home construction to use natural gas for heating and hot water. Accessed at: https://dailyhive.com/vancouver/city-of-vancouver-natural-gas-new-homes-heating.

5 Other concerns, which may be debated, focused on reliability during power outages, housing affordability, and the financial burden of upgrading electrical infrastructure.

Decarbonizing the building sector is a challenging task. No single stakeholder—whether government, utility, or developer—can lead this effort alone.[6] It requires the collective action of all parties to effectively resolve the challenges with constructing new electrified homes. Without collaboration, progress will stall. Coordinated activities, policies, incentives and regulations aligning the interests of all involved parties are essential to create the conditions necessary for full electrification.

In the fall of 2023, we published the Grid Implications of Electrifying Residential New Construction paper to address the concerns about the near-term viability of all-electric new residential construction. Our objective was to capture the utility sector's perspective on the interplay of electrifying new homes and the electricity grid. This updated memo builds on that work by incorporating the perspectives of other key stakeholders, especially developers and builders. Based on additional input from 22 residential developers, builders and electricians, we now provide our updated understanding of the challenges with broad-scale electrification of new residential construction and actionable recommendations for a variety of stakeholders to guide ongoing efforts to make decarbonized new residential construction the norm. For further insights, a detailed summary of developer and builder feedback can be found in Appendix A, along with the survey questions we asked of them in Appendix B.

Understanding the current state of all-electric residential construction

We're already building all-electric homes today

Developers are already building all-electric dwellings today. Numerous examples exist across Canada, including examples in Victoria (BC), Whistler (BC), Calgary (AB), and Kitchener (ON). While many projects were led by developers or homeowners wanting decarbonized buildings, others were spurred by local regulations that require it of them (e.g., as noted above, in Vancouver, developers have been constructing nothing but fully electric homes since 2022).[7] The developer survey responses we received confirmed the completion of many other all-electric residential projects without issue, demonstrating that it is possible to cost-effectively integrate electrification technologies that meet emissions reduction goals.

But challenges and barriers to allowing for more new homes to be all-electric persist

Despite the growing number of successful projects, challenges persist, which can lead to hesitation among developers. For instance, a developer noted beginning to pursue electrified projects but ultimately abandoning them, stating that: *"it is too hard to do this... I'm no longer going to try to electrify."* This example underscores the need to mitigate the real-world barriers that discourage developers

6 We have noted some progress in our Building Heating Decarbonization Jurisdictional Scan. Several jurisdictions have adopted advanced tiers of the model building code, while other provinces and municipalities have initiated fossil fuel phase-out policies. The Government of Canada is also introducing plans to phase out oil heating systems in new construction by 2028.

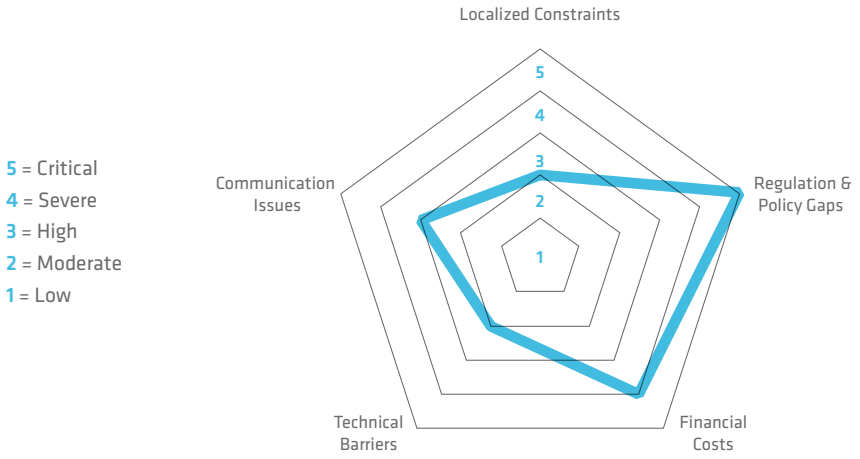
7 City of Vancouver (2024). Zero emissions buildings.

from supporting electrification when the market needs more of them doing so. It also highlights the importance of building momentum toward decarbonization. For Canada to meet national targets, it is crucial to address these frustrations early to allow more builders to be active in electrification efforts.

We engaged with key stakeholders (particularly with utilities, developers and builders) to gain deeper insights into the interplay of electrifying new residential construction and the connecting to the electricity grid. As a result, several critical challenges emerged, highlighting the complexity of advancing electrified construction. The primary barriers identified include:

- **Localized constraints,**
- **Regulation and policy gaps,**
- **Financial costs,**
- **Technical barriers, and**
- **Communication issues.**

The radar chart below visualizes these barriers, represented by a severity level based on stakeholder feedback. This chart highlights where targeted solutions are most needed and emphasizes the areas where stronger alignment among stakeholders can have the greatest impact in overcoming these obstacles. We touch on each of these barriers in turn below.



Localized constraints | While grid capacity overall is not the immediate challenge, distribution level bottlenecks can be (2/5 – Moderate): Generating enough electricity is not a barrier to electrifying residential new construction today. Utilities have confirmed that the current power supply can support the addition of electric vehicles, heat pumps, and solar systems, with no major capacity shortages. As one utility stated: *"there aren't really any capacity constraints between now and 2030...right now, there's more than enough power to connect electric vehicles, heat pumps, solar panels, and electric water heaters."*

However, distribution challenges can arise at the neighborhood level, where constraints such as limited transformer capacity and older infrastructure that can't easily meet higher than anticipated demand can create significant delays, going from months to over a year, according to developers' feedback. These localized constraints amplify the impact on both costs and timing uncertainty, leading to further complications for developers. While these challenges can exist, they are not the norm; half of the developers surveyed indicated they had successfully built all-electric projects

without needing to pause or cancel due to grid constraints. Distribution challenges can be the result of utilities being unable to pre-emptively invest in grid upgrades due to regulatory barriers imposed by their regulators and/or the provincial government, that typically arise from existing policies aimed at limiting energy costs.

Regulation and policy gaps | Hindering the ability for stakeholders to support electrification (5/5 – Critical): Regulatory barriers present significant challenges to advancing the electrification of residential new construction. Outdated building codes and permitting processes are not adequately considering the evolving needs of the market and new technologies like smart panels and load management systems, which can optimize power use to reduce the need for costly upgrades. For example, the Ontario Distribution System Code employs load calculations that often result in utilities requiring project proponents to fund expensive transformer upgrades in established communities. Additionally, electrical standards remain overly conservative, requiring larger service capacities than necessary, which increases overall cost and slows project implementation.

Utilities also face limitations from existing regulatory frameworks and do not have the leverage to upgrade infrastructure ahead of demand. This can lead to struggles meeting the needs of developers in a timely manner, contributing to project delays, as already mentioned. Additionally, misalignment between local governments, utilities, and developers results in inconsistent policy frameworks, making it difficult for builders to efficiently plan electrified projects (e.g., local governments can be keen on decarbonization and electrification, but the utility may not be adequately equipped to quickly handle increased demand). Furthermore, developers have expressed a desire to be more involved in the policy-making process, to ensure that policies better reflect the realities on the ground.

Financial costs | Higher upfront costs and limits on cost-sharing (4/5 – Severe): Developers can encounter substantial upfront costs when electrifying new construction, particularly when upgrading electrical services for multi-unit developments (e.g., a fourplex) from 200 amps to 400 amps. For example, a developer in Toronto reported that a 400-amp connection could cost $45,000, compared to $2,500 for a 200-amp overhead connection or $22,000 for an underground one. Current cost-sharing mechanisms for electric utilities exacerbate these financial challenges by placing most of the burden on the initial projects that connect to upgraded infrastructure. This situation contrasts with the cost-sharing practices of natural gas utilities, which tend to distribute expansion costs among all ratepayers, resulting in gas connections that are more affordable to developers. As a developer noted: *"Natural gas hook ups are practically free, why not electricity?"*

For instance, in British Columbia (BC), the costs associated with gas main extensions to the distribution system can be largely subsidized through FortisBC's System Extension Fund (SEF),[8] which is supported by contributions from all gas customers. Similarly, in Ontario, the *Keeping Energy Costs Down Act*, 2024 effectively reversed an Ontario Energy Board decision that would ask developers to pay the costs of new natural gas connections in full and upfront,[9] instead requiring homeowners to pay those costs on their monthly gas bills. In contrast, electrical infrastructure

8 The SEF applies when gas is not yet available in the neighbourhood. If gas is available, the fee to connect a home is based on the distance from the gas main to the home's gas meter (i.e., $15 for the first 25 meters and $125 for each extra meter). British Columbia Utilities Commission (2020). Application for Approval of the System Extension Fund on a Permanent Basis. FortisBC (2024). Getting gas: it's easier than you think.

9 Government of Ontario (2024). The Keeping Energy Costs Down Act.

upgrades typically require developers to cover a more significant portion of the costs. In this context, BC Hydro is currently seeking approval from the British Columbia Utilities Commission (BCUC) for amendments to its Electric Tariff Terms and Conditions that govern distribution extensions (see call out box below).[10] By implementing a more balanced approach, BC Hydro seeks to encourage electrification efforts while reducing the financial burden on developers, thereby promoting a smoother transition to all-electric construction. Ontario is also working on proposing changes to reduce upfront electric infrastructure costs that developers currently face, making it easier and more affordable to connect homes and businesses to the province's grid.[11]

BC Hydro looks to revise their fee structure

BC Hydro's proposed Distribution Extension Policy aims to address concerns around existing fee structures and costs distribution, which often place a disproportionate burden on the first customer ("pioneer customer") to connect to new infrastructure. When the policy was first established in 2007, higher capacity connections (>=500 kVA) were outside of the ordinary. These connections requests had to contribute to system improvement if the extension request triggered the need. The last decade has seen customers requiring larger and more complex new connections which require more system capacity. Under the current policy, these customers do not have visibility to what the system improvement costs will be until they apply for a connection and the system is studied (and costs can be considerable).[12]

This policy includes three main changes:

1. Instead of assigning costs to the first customer, BC Hydro is recommending that all new customers contribute to system upgrades costs proportionally based on their estimated load.

2. Currently, BC Hydro refunds part of the initial customer's Extension Fee if subsequent customers connect to the same extension within five years. Through this policy, BC Hydro plans to update its Extension Fee refund provisions to better reflect actual refunds from subsequent connections, thus streamlining the refund process, especially for larger, multi-phased developments where the current approach has become outdated and inequitable. This would ensure that costs are shared more equitably, reducing the financial burden on the first movers, by streamlining the refund process to an approach where the period ranges from five years to 15 years, depending on the Extension Fee amount.[13]

3. The proposal includes an adjustment of how system improvements are funded, ensuring that most of them, which benefit multiple users, are incorporated into the rate base applied to all new customers. This would provide better cost alignment over time, avoids the need to frequently update the BC Hydro Contribution calculations, and will reduce the likelihood of an individual customer needing to take a large, surprise, system improvement cost.
The adjustments aim to make connection costs more equitable for all new customers. The key benefits are that no customers will be charged system improvement costs, except for extraordinary cases; and BC Hydro will increase its contribution to a project.

10 British Columbia Utilities Commission (2024). BC Hydro Distribution Extension Policy.

11 Government of Ontario (2024). Ontario Reducing Costs for Future Homeowners.

12 BCUC, supra note 10. Section 2.5.1.

13 BCUC, supra note 10. Section 4.2.4.

Technical barriers | **Adopting advanced electrification technologies can be challenging (2/5 – Moderate):** Developers can encounter significant challenges in adopting more advanced electrification technologies, which can be due to limits in service capacity before needing to pay significantly higher costs of connection, to outdated electrical codes that fail to appropriately accommodate modern technologies, or unfamiliarity with technological offers entering the market.

Communication issues | **Communication issues can further delay electrification (3/5 – High):** Delays can arise due to service upgrade logistics. Developers have reported that these issues create potential uncertainty regarding the timing required to connect new developments. Developers needing higher loads to increase electrical services to support electrification, such as 400-amp service for a multiplex or an upgrade to the distribution network for a new residential complex, often encounter setbacks that can significantly impact project schedules and the ability to build all electric. Feedback from builders indicated that slow utility response times, permitting process, and misaligned planning between developers and utilities are often the primary contributors to these delays, particularly for new electric residential buildings that demand larger electrical loads.

Building more capacity, as well as instituting earlier communication, planning, and coordination between developers, utilities, and governments can mitigate electrification challenges, as seen in BC Hydro's initiative to streamline electrical service processes, reduce delays, and foster collaboration through dedicated liaisons and early engagement efforts (see case study for an example).

BC Hydro reduces time and cost of their electro-connection process for 400-amp service

Developers are facing additional barriers when requiring 400-amp or higher electrical service to new residential construction (e.g., this typically would cover multi-unit residential buildings ranging from three to eight dwellings in size). To mitigate against higher costs and longer lead times, BC Hydro and the City of Vancouver initiated a joint project to investigate and streamline 400A and 600A electrical connections for new residential infill developments. With buy-in from senior leadership, the city cross-appointed a staff member to BC Hydro on a part-time basis to support developers and their electrification projects.

Since formally launching in February 2024, the city now has developers engage BC Hydro much earlier in the development process (i.e., historically, developers would wait to bring on the electrical engineer until nearer to construction, only engaging with the utility after that point). The process now favours overhead transformers, as opposed to requiring undergrounding of electrical infrastructure (e.g., pad-mounted transformers), which was a historical requirement due to beautification requirements. This switch to pole mounted transformers typically reduces cost, complexity, and allows for more ground space (e.g., for an extra parking space on a private lot). The additional resource and changes in the process have helped:

- Expedite utility responses by reducing BC Hydro's review cycle from 16 to 5 weeks;
- Modify transformer sitting requirements to save developers time and costs; and
- Cut connection time once construction starts in half.

BC Hydro and City of Vancouver staff have been sharing their successful approach with other jurisdictions.

Recommendations for Advancing Residential Electrification

This section offers actionable recommendations to support large scale electrification of residential new construction, most of which were suggested by the organizations that provided feedback. The following table organizes these recommendations by regulatory, economic, technical, and social actions, providing practical steps for stakeholders to address the challenges associated with electrifying residential construction. It illustrates the shared responsibility across sectors, highlighting how everyone can be part of the solution, and the need for a collaborative and multi-faceted approach to accelerate electrification of residential construction.

	Federal & Provincial Government & Regulatory Bodies	Municipal Government	Utility	Developer / Builder
Regulatory and Policy Actions				
Rate Structures Reform	✔		✔	
Align Planning Processes with Environmental Goals	✔	✔	✔	
Encourage Builder Participation in Decision-Making	✔			✔
Update the Electrical Code	✔			
Economic and Financial Actions				
Provide Financial Incentives	✔	✔	✔	
Develop Cost-Planning Tools	✔		✔	
Technical Actions				
Process Standardization			✔	
Transparency in Service Options			✔	
Social Actions				
Foster Stronger Relationships and Collaboration		✔	✔	✔
Education	✔	✔	✔	✔

✔ = Responsible for the action ☐ = Benefits from the action

Regulatory and Policy Actions

Reform rate structures: Provincial governments, in collaboration with regulatory bodies and utilities, can implement more equitable rate structures to lessen the upfront cost barrier placed on developers looking to undertake all electric homes. This can range from exploring ratepayer funding structures (e.g., aligning electric cost-sharing structures with those used for natural gas expansion,

exploring tiered rate structures to have larger consumers contribute more to grid updates), taxpayer funding, and/or subsidies and tax credits to reduce the financial pressure on individual developers. Easing the financial burden on developers will incentivize broader adoption of electrification by removing an existing barrier.

Align environmental goals with other objectives: Stakeholders have objectives that are sometimes competing and should be taken into consideration. For example, to achieve decarbonization objectives, governments must harmonize environmental objectives with housing policies. Municipality and developer plans to increase electricity demand (e.g., via building electrification, demand response technologies, or electric vehicles chargers) should be integrated into the utility planning processes earlier to better assess capacity needs and infrastructure planning. In some jurisdictions, utilities may need to request regulatory approval to be able to initiate the planning phase earlier.

Engage builders in policy development: The builders who responded to our survey, many of whom are leaders on new construction electrification, noted an interest in being engaged through advisory committees and working groups to:

- Ensure that policies reflect real-world challenges, and
- Promote a shared understanding among stakeholders.

Update the electrical code: Regulators and standards bodies can update electrical code requirements to accommodate residential electrification by better recognizing the role of smart panels and other load-sharing and demand response technologies. These changes will encourage the adoption of load control measures and help optimize power use; potentially avoiding costly and timely service upgrades.

Economic and Financial Actions

Provide financial incentives: Governments and utilities (with the later typically requiring approvals from regulatory bodies) can expand financial incentives such as grants, rebates and tax credits to developers to support the implementation of load management measures, energy-efficient technologies, and electrification strategies (e.g., smart panels, load control devices, solar PV, battery storage).

Develop tools to simplify cost-planning: Utilities can provide developers with cost-estimator tools to improve infrastructure planning and budgeting. These tools can enhance transparency, reduce financial uncertainties, and promote easier planning and more effective project delivery by aligning costs with anticipated grid upgrades.

Technical Actions

Standardize processes: Utilities can streamline service upgrades (e.g., transformer installations) and permitting processes by establishing more predictable timelines and simplifying administrative procedures to reduce delays, decrease costs, and encourage project momentum.

Improve transparency of service option selection: Utilities can create publicly accessible grid capacity maps and provide detailed information on electrical service options, especially for lots. This will enable developers to plan electrical service capacity well in advance, helping them make informed decisions and avoid costly delays related to grid constraints. Additionally, utilities can establish clear guidelines on the cost structure for upgrades, recovery mechanisms for property owners, and faster turnaround times for cost estimates.

Optimizing grid asset utilization: Regulatory bodies can establish policies and incentives that promote efficient grid utilization, while utilities can focus on increasing loads on underutilized assets. These efforts can help infrastructure investments become more profitable in the long term.

Social Actions

Foster stronger relationships and collaboration: Successful electrification relies on close coordination between municipalities, utilities, and developers. Early-stage planning can be initiated between utilities and developers to go through the upstream design process proactively, preventing delays. Key measures to enhance collaboration can include:

- Developing liaisons between municipalities and utilities to coordinate projects, ensuring developers have a dedicated contact to address requests and resolve issues quickly.
- Establishing centralized communication channels for ongoing dialogue with developers.
- Increasing the number of staff in utility design departments to manage workloads efficiently.
- Creating and maintaining a centralized, publicly accessible database or grid capacity map to provide transparency on grid constraints.

Education: Governments and utilities can offer workshops, forums, and training programs to help developers, builders, and electrical professionals understand regional strategies for enhancing grid readiness. Topics could include load curtailment strategies, energy-efficient technologies, new electrification solutions, and the optimal timing for engaging with your utility on a new development.

Appendix A

Developer / Builder Survey Responses Summary

In November 2023, we released the Grid Implications of Electrifying Residential New Construction paper, informed by feedback from utilities in BC, Ontario, and Saskatchewan, and an electric utility trade association. Given the complexity of this issue and the additional comments received on the paper, we invited those working directly on these challenges — particularly developers and builders — to share their perspectives. While we identified our key takeaways on this file above, we value the input received from a variety of stakeholders and feel that it would be helpful to the discussion to summarize and share the insights largely received by developers, builders, and electricians in this Appendix. As such, along with those who submitted feedback on our initial paper, we would like to thank the 22 residential developers, builders and electricians, from BC (11), Ontario (8), Alberta (2) and Québec (1), who took the time to share their observations and recommendations with us.[14]

Based on additional stakeholder feedback, we provide the following summary observations:

1. **Electrification of residential new construction is feasible** and there are many opportunities to further electrification. For example, developers are using energy efficiency, load management, and smart technologies to minimize grid impacts, reduce peak loads (e.g., limiting service to 200-amps), and ensure reliability.
2. **Grid challenges remain localized.** The issues faced when electrifying new residential construction depend on factors such as economic implications, development type, and the extent of electrification. In addition to this, **stakeholders (i.e. utilities, developers, and local government) have different perspectives** on the magnitude of those issues, particularly regarding lead time, design time, and costs associated with grid connections for new residential construction projects, which can lead to planning and communication misalignment.
3. **Delays are primarily caused by upstream service upgrade planning**, rather than by grid capacity constraints, with developers citing issues like slow utility response times, permitting delays, and inefficient communication with utilities.
4. **There is a timing misalignment between key stakeholders due to coordination challenges and limited resources**. Building more capacity, as well as instituting earlier communication, planning, and coordination between developers, utilities, and governments can mitigate electrification challenges.
5. **More equitable cost-sharing mechanisms can help limit developers' financial burdens.** In some cases, developers face additional financial concerns that can include significant costs to upgrade the electrical service above 200-amps and grid expansion fees for multi-unit developments that are disproportionately borne by the first connectors.

14 These organizations include CHBA-SO, Doug Tarry Ltd., Ellenwood Homes Ltd., HuronCreek Developments, Innovation Building Group Ltd., K-Country Homes, Kemp Construction, Lanefab Design / Build, Riverside Energy Systems, Shuswap Lake Estates, SkyFire Energy Inc, Smithwood Builders Inc., STATE Building Group / Forest Hill Homes, Woodsmith Construction Inc., and Zu House Ltd.

6. **Regulatory barriers limit the ability to respond to the above challenges.** Outdated codes, building standards, permitting processes and regulations for electric utilities can create barriers to electrifying new construction. Conflicting policies across provinces make it difficult to standardize developer practices, and utilities are often economically regulated entities, so they may not have the required authority to upgrade the infrastructure. Updating regulatory frameworks (e.g. electrical code) to include revised requirements when using smart technologies and reinforcing stakeholder involvement in policy discussions can help reduce regulatory constraints.

Detailed descriptions of each above item, along with recommendations—most of which were suggested by the organizations that provided feedback—are outlined below.

Mechanisms exist to minimize the impact of electrification on the grid

Survey responses confirmed that electrification is feasible, although constraints remain. Developers noted that **restrictions in the distribution system** (rather than generation) lead to supply challenges for new homes.[15]

To address distribution level barriers, developers and builders are employing a range of strategies to minimize grid impacts, reduce peak loads, and ensure reliability:

- More than half of respondents identified **energy efficiency** as crucial for residential new construction;
- Five developers raised **load management** as a behind the meter (BTM) opportunity to consider, advocating for smart electric panels and battery storage;
- Two developers proposed **building either to Energy Step Code 4 or strive to achieve Energy Step Code 5 in BC**, and three other developers mentioned **building to net-zero ready standards**, though one noted that some net-zero initiatives involve excessive paperwork; and
- Four developers proposed strategies like **right-sizing the electrical panel** or **integrating solar power**.[16]

These approaches not only enhance grid reliability, but also enhance a homes resiliency by reducing the impact of potential grid failures. However, builders face additional upfront costs to achieve net-zero standards, and supply chain issues for necessary equipment like battery storage and smart panels further increase these challenges. Clearer guidelines on power consumption and financial incentives for builders regarding renewable energy and energy efficient technologies would encourage electrification. Incentivizing innovative solutions for infrastructure upgrades (e.g. smart grid technologies, load management devices, energy storage systems) could address developer concerns without compromising sustainability goals. Additionally, it is important to note that, in most cases, the long-term savings from electric heating systems, due to lower operating costs, can more than compensate the increased initial costs. Most Canadian households will spend less on

15 These challenges tend to arise from economic constraints on developers' ability to cover the costs of incremental service upgrades for user-pays distribution systems.

16 The impact of the solar panel to the upstream network will need to be studied and the expansion works identified.

energy in a highly electrified future.[17] These savings should be better reflected in the planning and budgeting phases through life cycle cost analysis, and the revenue potential from those electrified homes appropriately incentivized.

Recommendations

1. Provide education and knowledge sharing opportunities to help developers, construction professionals, and utilities understand the strategies that are being used in their regions to enhance grid readiness (e.g., energy efficiency, load flexibility strategies, newer technologies) and improve resiliency.

2. Governments can expand financial incentives for builders to support demand response and load management measures, the adoption of energy-efficient technologies, and electrification strategies (e.g., smart panels, load control devices, solar PV, battery storage).

Mechanisms exist to minimize the impact of electrification on the grid

Stakeholder feedback clearly states that **grid challenges are highly localized and development** specific. Electrifying new homes can range from having no negative development impacts, to experiencing significant delays in accessing sufficient grid connections and/or needing to pay significantly higher connection costs to increase electrical service capacities to support electrification. This is influenced by factors including:

- Local distribution network capacity (e.g., transformer capacity);
- Whether the nature of the development is infill (rededicating urban land to new construction, thus needing to determine if existing infrastructure is sufficient for the new project or if upgrades are required) or greenfield (previously undeveloped land that will likely require distribution network expansion and bares the costs associated with such);
- Electrical service sizing practices;
- The size of the development; and/or
- The extent of electrification (e.g., electric vehicles, electric building heating, electric appliances).

It is important to note that **perspectives on these challenges differ among utilities, developers, and local governments**, with varying views on the magnitude of the issues and the best strategies for addressing them. In our initial discussion paper, **utilities highlighted** that:

- **Time is the main limiting factor** to ensure adequately sized grid connections for new construction. As noted, “Electrifying new construction is not a question of physical impossibility, it’s a question of time.”

17 Natural Resources Canada (2024). Powering Canada: A blueprint for success.

- Planned new construction in certain areas in the near term could be affected by highly localized grid constraints within the transmission and distribution systems, which could be mitigated by **providing utilities with sufficient lead time** from developers and local government to allow utilities to better prepare for new developments.

Whereas in regions with grid constraints, the **feedback from developers is slightly different:**

- More than half of the respondents identified **the upstream design process (e.g. design time, approvals, coordination with utilities) as a primary factor contributing to the delays** in ensuring adequate grid connection, of which five developers expressed experiencing delays;
- Two developers mentioned electrical service size can contribute to the delays, leading contractors to request larger than necessary service capacity from utilities;
- Two developers noted that delays are also explained by **slow utility response times**; and
- Three developers indicated that **cost becomes a significant factor when additional load is required**, especially when moving from 200-amp to 400-amp services for multi-unit developments.

Delays can be due to grid constraints and permitting processes

Ten respondents indicated that they had to pause or cancel electrified new residential construction projects due to grid constraints. Several central issues were raised:

- Three developers from Ontario experienced significant delays due to the time required for detailed design and approvals (ranging from months to over a year);
- One developer from Ontario chose to revert to 100-amp services, instead of 200-amp services, for a nearly 100-unit residential development;
- One developer from BC works with clients in more remote parts of BC, where the availability of the utility service capacity is limited (e.g., 3-phase supply or service size greater than 125-amp was identified as not being available);
- One developer from Ontario was told it was a year delay to get pad-mounted transformers for a new residential development; and
- One developer from BC delayed their application for an electricity permit until a laneway was constructed, which allowed them to avoid making changes to the grid design.

Delays in residential new construction projects are more often due to the time required for design rather than grid capacity constraints. These are mostly explained by service upgrade logistics, supply chain bottlenecks and labour shortage, which results in slow response times from utilities in processing service upgrades, **particularly when new electric residential buildings require larger electrical loads** (e.g., exceeding 200-amp). This forces some developers to reduce service size due to grid limitations, which can impact the ability to build all electric. Potential new customers who are seeking connection to the distribution system are not necessarily aware of the processes and timelines required of utilities to comply with safety and reliability requirements in maintaining the distribution system.

The permitting process is also seen as problematic, further accentuating delays. In addition, inadequate grid infrastructure and insufficient coordination between utilities and developers, detailed further below, create other bottlenecks, while the lack of clear and early communication regarding grid capacity leads to project planning challenges. These factors can all slow electrification efforts.

Recommendations

3. Frequent and early-stage planning relationships must be encouraged between utilities, municipalities and developers to ensure that the costs and timelines associated with additional capacity are properly included in a project financial modelling and planning. Utility planning should also align with regulatory frameworks to assess electrification efforts, by accounting for long-term system benefits, cost impacts, and reliability.[18]

Electrification can benefit from improved planning, communication, and coordination

One critical issue identified in the feedback was the **absence of a high-level sense of urgency in addressing electrification and related changes**. One developer expressed disappointment over the lack of incentives from utilities and local government to move away from using gas. They also noted the challenge of promoting the phasing out of fossil fuels without having the infrastructure and processes in place to support the electrification transition.

Additionally, several developers pointed out the **need for improved communication among the parties**. Engaging in conversations can be extremely beneficial, as noted by one developer who insisted on the importance of "more people picking up the phone and making a difference." **Having an intermediary to facilitate coordination and establish partnerships between parties can be very helpful.**

Lastly, there is often a **fragmentation and misalignment of goals, mandates, and priorities** among utilities, distributors, developers, local governments, and electrical safety authorities. One developer stated that "a consensus has to be achieved between all involved parties as to what the path to the goal should look like so that everyone is aware of the goal, but no one seems to be stepping up to provide a way to get there". This lack of formal mechanisms to ensure alignment between the key interveners is challenging. More than half of the respondents noted that more dialogue and setting shared goals between utilities, regulators and municipalities could better align their efforts to meet ambitious climate targets.

18 Kolesar M. (2024). Regulatory Decision-Making in Evaluating Electrification Initiatives

Recommendations

4. Utilities can increase the transparency of electrical service options, especially for lots, to allow builders to plan for a 200-amp, 320-amp, or 400-amp service well in advance and build it into cost planning.

5. Utilities can improve their response times to developers by:

a. Developing liaisons between municipalities, utilities and developers to help coordinate projects to avoid developers struggling between parties, ensuring developers have a dedicated contact within those organizations (e.g., a champion) to address requests and avoid delays;

b. Establishing centralized communication channels with developers to facilitate early and ongoing communication;

c. Increasing staff in their design department; and

d. Creating and maintaining a centralized, publicly accessible grid capacity map and/or database of available capacity that identifies grid constraints.

6. Local governments can include utilities in their strategic energy and climate plans, which directly impact electrification demand (e.g., number of electric vehicles chargers, plans for demand response technologies) into the urban planning process, so that utilities are able to include the capacity for increased load in their asset planning and renewal programs, which are a key part of their rate filings (i.e., financing of key distribution infrastructure investments needed to accommodate load growth).

7. The City of Vancouver's "pre-permit" phase allows stakeholders to identify potential regulatory hurdles before formal agreements are established. Implementing a comparable process can help streamline utility planning.

8. Utilities, Electrical Safety Authorities, Canadian Standards Association (CSA) Canadian Electrical Code (CEC) working groups, provincial electrical trades training bodies, and builders/developers can establish more formal collaboration to comprehensively address the impacts of electrical service sizing on residential electrification across Canada. These efforts can focus on:

a. Aligning CEC service sizing terminology and acceptable behind-the-meter electrical service design practices with front-of-meter utility engineering standards to prevent overbuilding on either side of the meter;

b. Increasing awareness of load control and demand-mitigation technologies;

c. Encouraging the endorsement of these technologies by CEC writers and provincial electrical safety authorities;

d. Providing training for electrical designers, electrical trades students, and licensed electrical contractors to effectively incorporate these technologies into residential electrification projects; and

e. Emphasizing the significance of electrical design reviews during the integrated design process (IDP) to minimize service upgrade requirements and reduce cost barriers to electrification.

Revising the cost allocation process can alleviate development barriers

Electrifying new construction can lead to increased demand for electrical service capacity. While not always an issue, many respondents noted that larger service sizes have direct implications on the **costs of grid hookup fees and transformer upgrades**, which can significantly hinder project planning and budgeting and even impede a project. These fees can range from a few thousand to tens of thousands of dollars for multi-unit developments (e.g., a fourplex), depending on amperage requirements and infrastructure demands. For example, a developer in Toronto reported that a 400-amp connection could cost $45,000, compared to $2,500 for a 200-amp overhead connection or $22,000 for an underground one.

Fee structures tend to currently place a significant charge on the first customer to connect to new grid infrastructure. These customers support most of the costs, resulting in first movers shouldering a disproportionate share of the expenses. This has led to issues around cost predictability and distribution. One developer mentioned that "the cost uncertainty with [our utility] plays a huge role in new projects because it takes over a year to receive a cost estimate and the amounts are considerably higher than expected." In high-growth areas, particularly those with localized capacity constraints, requested capacity often comes at a high upfront cost, which is easier addressed collectively.

In some provinces, developers also face significant cost pressure due to regulatory requirements. In Alberta for example, a standard overhead service of only 100-amp is mandated. For any underground service or larger capacity (e.g. 200-amp and over), the financial burden falls entirely on the developer, which may prevent investment in electrified new residential projects.

To avoid burdening the first project in the line with excessive grid hookup fees, one developer emphasized that understanding these costs early in the project allows for better financial planning and cost distribution strategies. Another respondent suggested that for properties requiring more than 200-amps, they encourage homeowners to reduce their electrical loads or install electric vehicle management systems to offset demand.

Costs associated with service upgrades and grid expansion should be distributed fairly among all users rather than being concentrated on individual projects. As a developer mentioned: "I think it's up to the utilities to make it affordable. **Natural gas hook ups are practically free, why not electricity?"**[19] Across Canada, gas expansion is not usually paid for by developers, but the costs are instead shared among ratepayers, even those not directly impacted by the grid expansion.

19 The costs of natural gas infrastructure expansion are often distributed among ratepayers, rather than being borne by the developers, through cost-sharing mechanisms. In contrast, electrical infrastructure upgrades typically require developers to cover a more significant portion of the costs.

Recommendations

9. Provincial governments can explore alternative approaches to covering grid update costs, including taxpayer and ratepayer funding, financial incentives and tax credits for builders and developers.[20]

10. When applicable and when they have the authority to do so, either utilities or regulatory bodies can:

a. Explore spreading the cost of grid upgrades to reduce the financial pressure on individual developers. One such solution is implementing an equitable distribution of the costs through tiered rate structures where larger consumers would contribute more to grid upgrades.[21]

b. Establish clear and transparent guidelines on the cost structure for grid upgrades and the recovery mechanisms from property owners, as well as a faster turnaround time for cost estimates. Providing a cost estimator tool could also help developers to better plan for electrical infrastructure cost and manage project budgeting.

Opportunity to address regulatory barriers to electrification

More than two-thirds of the respondents identified distribution system codes, building standards, and permitting processes as significant regulatory barriers to electrifying new construction. Existing regulations and codes are excessively conservative, leading to oversized electrical service requirements and requiring costly upgrades to transformers, placing a significant financial burden on project proponents. In Ontario for example, the Distribution Systems Code does not adequately address the changing demands of the market. The existing load calculations often result in utilities requiring project proponents to fund expensive transformer upgrades in established communities. This can be too costly and disruptive to project implementation.

In addition to this, the current building standards and distribution system codes, particularly the electrical code, are not fully considering the evolving needs of the market and new technologies. Smart panels and load management systems can optimize power use and reduce the need for significant electric upgrades, but the electrical code does not fully consider their ability. At the same time, regulators are not incentivizing utilities to prioritize residential installations of zero-emission energy production or to expedite the installation of energy storage systems. It is essential that codes, utilities, and local governments align their policies, to ensure consistent policy frameworks that support efficient electrification and accommodate new technologies. One third of the developers agreed that federal and provincial governments should set clear standards and codes, while another third of the participants agreed that federal and provincial governments should be providing financial incentives, and three other developers highlighted the importance of facilitating stakeholder coordination to advance electrification in new construction.

20 Electrification and Energy Transition Panel (2023). Ontario's Clean Energy Opportunity.

21 In Ontario, subsequent customers contribute to load materialization, leading to the rebate of the expansion deposit back to the first mover who requested the expansion, as mandated by the Distribution System Code.

While attempts to mitigate these barriers do happen, builders and developers are not often included in the government decision-making process that promotes electrification, resulting in policies that do not address their concerns. Many of the respondents clearly expressed that developers are interested in being involved in policy discussions, stating they want to provide input and feedback based on their experiences. Regular workshops, working groups, and advisory committees were suggested as effective platforms where builders could actively participate.

Recommendations

11. Update the electrical code to allow smart panels and other load-sharing devices to mitigate service upgrade needs and to better reflect electrical consumption. Allowing technology to reduce power consumption would allow for electrification without increasing service size.

12. Create guides and resources with clear hierarchies and typologies to showcase the trade-offs of different technologies.

13. Involve more builders and developers in the government decision-making process to align policy with implementation, ensure a common understanding, and have policies reflect the challenges faced on the ground.

Appendix B

Developer / Builder Survey Questions

Survey Respondent Contact Information

1. Organization
2. Name
3. Title
4. Email address
5. Can we acknowledge your organization by name in our updated paper as having provided input?

Electrification Urgency

6. Have you had to pause or cancel an electrified new residential construction project due to grid constraints? If so, please describe.
7. In your experience, what are the main factors contributing to the delays in ensuring adequate grid connection for electrified new residential constructions?
8. What formal mechanisms could be established to improve coordination and communication among utilities, distributors, developers, and local governments in the early planning stages of electrification projects to reduce such delays?
9. What strategies do you use to minimize the impact of electrification on the grid in your new construction projects (e.g., demand response, energy efficiency, match with available capacity, other)?
10. What incentives or support would encourage greater adoption of these approaches and/or technologies?

Costs

11. How do grid hookup fees affect your project planning and budgeting?
12. What improvements would you suggest for better fee predictability and distribution?
13. What strategies could be developed to ensure that the costs associated with grid upgrades and expansion are equitably distributed among all users rather than concentrated on individual projects?

Stakeholder Alignment

14. How can municipalities, utilities, and regulators be encouraged to align their efforts more effectively to meet ambitious climate targets?
15. In your opinion, what should be the primary role of federal and provincial governments in promoting the electrification of new construction?
    - Setting clear standards and codes

- Providing financial incentives
- Facilitating stakeholder coordination
- Others (please specify)

16. What steps could be taken to improve the involvement of builders and developers in government decision-making processes related to new construction electrification?

Mitigating Barriers

17. What tools or resources would be most beneficial in helping you better manage system constraints to electrify new residential construction?

18. What are the most significant regulatory barriers you encounter when attempting to electrify new constructions?
    - Building standards
    - Distribution system codes
    - Permitting processes
    - Others (please specify)

19. How specifically can the existing regulatory framework be modified to align building standards, distribution system codes, permitting processes with the evolving needs of the electrification market?

Varia

20. Is there anything else you would like to share with us?

21. Can we reach out to you to follow-up on your responses?