City of Kingston
Report to Council
Report Number 25-033

To:	**Mayor and Members of Council**
From:	**Lanie Hurdle, Chief Administrative Officer**
Resource Staff:	**Corporate Management Team**
Date of Meeting:	**January 14, 2025**
Subject:	**Energy Transition and Electrical Capacity**

Council Strategic Plan Alignment:

Theme: Corporate business

Goal: See above

Executive Summary:

The purpose of this report is to provide information for both City Council and the broader Kingston community on the challenges facing the province and the region as demand for energy, particularly electricity, continues to rapidly grow. In October 2024, the Hon. Sam Oosterhoff, Associate Minister of Energy-Intensive Industries notified energy stakeholders that: "Ontario's energy demand is expected to increase by 75% per cent by 2050, as a result of economic development, housing for its growing population and electrification," and the province announced that it would release its first-ever Integrated Energy Plan with a 2050 horizon to ensure the entire energy sector is aligned in planning for growth while planning to reduce costs and emissions.

The City of Kingston and Utilities Kingston have been assessing the challenges and opportunities with electrical capacity measured alongside strategic initiatives that the City has committed to as part of electrification, emissions reductions and planning for growth.

As noted in Report Number 24-256 (2023 Community Greenhouse Gas Emission Inventory), the Province has increased its reliance on natural gas to meet growing demand for energy which is triggered by significant population growth, electrification and business growth, especially in the electric vehicle business sector.

Kingston Hydro, which serves the former City of Kingston area, is fed electricity through two Hydro One transmission stations and it has been identified that the Frontenac electrical transmission station which serves the central and downtown area of Kingston has very limited capacity left. This means that current electrical capacity could be a limitation for residential development without the construction of an additional transmission station.

Hydro One provides energy to the former areas of Kingston Township and Pittsburgh Township and Hydro One has identified very limited capacity to service growth in the former area of Pittsburgh Township which is also dependent on electrical capacity from the same Frontenac transmission station. The former Kingston Township area is served through the other Hydro One transmission station that also provides power to Kingston Hydro, and Gardiners Road station has more capacity but more development/growth pressures.

The City, Kingston Hydro and key partners have been working with Hydro One and the Independent Electricity System Operator (IESO) to develop an accelerated regional plan to ensure that medium and long-term energy needs can be met.

City staff understand that various forms of energy supply such as electricity and natural gas are critical to meet short and medium energy needs of the growing population and businesses. City staff also recognize the importance of prioritizing electrical capacity for homes and businesses and are implementing steps to slow down the pace of general electrification until additional electrical capacity is confirmed.

Recommendation:

This report is for information only.

Authorizing Signatures:

ORIGINAL SIGNED BY PRESIDENT

& CEO, UTILITIES KINGSTON

David Fell, President & CEO,
Utilities Kingston

ORIGINAL SIGNED BY CHIEF

ADMINISTRATIVE OFFICER

Lanie Hurdle, Chief
Administrative Officer

Consultation with the following Members of the Corporate Management Team:

Paige Agnew, Commissioner, Growth & Development Services

Jennifer Campbell, Commissioner, Community Services

Neil Carbone, Commissioner, Corporate Services

Brad Joyce, Commissioner, Infrastructure, Transportation
& Emergency Services

Desirée Kennedy, Chief Financial Officer & City Treasurer

Options/Discussion:

Electrification and Demand Growth

As the world moves towards more sustainable energy sources, both in industry and society, to combat climate change and transition to clean energy options, the demand on electrical grid capacity and supply challenges are becoming the focus of both the region and the province.

Several factors are driving the increased demand on the electrical grid capacity, including:

- the increased adoption of electric vehicles, heat pumps, and green manufacturing
- population and employment growth
- decarbonization and the transition from natural gas to electric heating (a transition to renewable natural gas and hydrogen is also underway)

With this increased demand comes supply chain challenges, regulatory uncertainties, and consumer cost burdens.

Provincial Energy Supply Challenges

The growing electricity demand in Ontario is creating supply challenges, largely driven by aging infrastructure and distribution networks. Ontario is heavily reliant on nuclear power, and refurbishing this technology takes time. Meeting emissions targets is also placing challenging pressures on the baseload power supply. New investment is required in technology and grid automation will also be required to expand the supply and distribution, all while balancing affordability for consumers with investment in infrastructure and clean energy.

Electrification and the transformation of Ontario's economy to clean energy sources is unprecedented in pace and scale and will be a multi-decade social, economic, and political process that will affect every sector and community in Ontario.

Structure of Ontario Electricity Regulation

Ontario's electricity regulation is structured around a mix of agencies and organizations, governed by legislation, regulations, and market rules.

1. Government Oversight

Ministry of Energy: Sets overall energy policy, including renewable energy targets, system planning, and directives to agencies.

Ontario Energy Board (OEB): Regulates electricity and natural gas utilities, sets rates, and ensures consumer protection.

2. Electricity Market Operator

Independent Electricity System Operator (IESO): Manages Ontario's electricity grid, oversees the wholesale electricity market, and leads long-term system planning.

3. Generators

Public and private companies generate electricity using various sources, including hydro, nuclear, natural gas, wind, and solar. Key players include: Ontario Power Generation (OPG) (publicly owned), and private and independent generators.

4. Transmission and Distribution

Local Distribution Companies (LDCs) distribute electricity to consumers. Key LDCs for the Kingston region include:

- **Hydro One**: Operates most of the province's transmission lines and some distribution networks.
- **Kingston Hydro:** Owns the wires, poles, transformers and meters that bring electricity from the provincial electricity transmission grid to 28,000 homes and businesses in Central Kingston, Canadian Forces Base Kingston, and parts of Barriefield Village.

Local Distribution Companies (LDCs): Approximately 56 utilities distribute electricity to consumers (e.g. Toronto Hydro, Alectra).

5. Market Rules and Regulations

The IESO oversees the wholesale electricity market rules, including pricing and energy procurement.

The OEB ensures fair distribution and transmission rates and enforces consumer protections.

Increasing Demand – IESO Supply Challenges

The IESO Pathways to Decarbonization report, released in December 2022, forecasts in one scenario that Ontario's electricity capacity needs could double by 2050, increasing its capacity from 42,000 MW to 88,000 MW. The expansion of electricity grid infrastructure to accommodate load growth, while modernizing the grid to maintain reliability and affordability is estimated to cost approximately $450B in Ontario. Local Distribution Companies are under immense pressure to maintain safe, reliable systems while addressing consumer demand.

Bridging the work of today with the needs of a decarbonized world will be challenging and complex. Ontario's electricity system is well positioned to make the transition but will need to address a series of challenges to achieve decarbonization. There is increasing demand due to deep decarbonization efforts in various sectors undergoing electrification such as building heating, and the transportation and industrial sectors. Ontario's forecasted electricity demand under a decarbonization scenario will increase the peak electricity demand from just under 25 GW to more than 33 GW over the next 20 years. This is unprecedented and equates to adding approximately two Torontos to Ontario's grid.

The provincial energy supply gaps are critical, but at the same time, Distributed Energy Resources (DERs) are creating choices consumers have never had (e.g., solar, storage, electric vehicles, smart-home automation) for cleaner and renewable energy supply options to meet demands. Customers are generating and storing their own electricity and electrification is changing consumption patterns. The province is growing distribution-connected generation in commercial operations, consisting of bioenergy, gas, hydro, solar, waste, and wind.

Local Electrical Capacity in the Municipal Context

On December 20, 2024, the Peterborough to Kingston Technical Working Group (including Kingston Hydro) reported to the IESO that the Gardiner TS DESN 1 Station "has projected significant load growth in 2026, driven by an industrial development project, and again in 2032, due to a customer transitioning from a conventional gas heating system to geothermal heating. These new contributions will lead the new transformer to exceed its capacity by 2028. It is recommended that a solution for this additional capacity be identified in the next phase of the regional planning cycle."

The report also identified that: "Frontenac transmission station located in Kingston area is supplied by two 115kV B5QK and Q3K lines and supplies Hydro One Distribution, Utilities Kingston, and Eastern Ontario Power Inc. load through its two 50/67/83 MVA, 230/44kV, T3/T4 stepdown transformers. As recommended in second cycle RIP, Hydro One Transmission is working with Utilities Kingston to plan a new station in the area in the near term, which may be built by the Transmitter or the LDC. The Frontenac station capacity need should be further assessed in the next phases of this Regional Planning cycle."

With the anticipated increase in regional electrical load due to electrification of buildings, electrification of fleet and transit, as well as new electrical load due to housing and economic growth, the two transmission stations supplying the city of Kingston could well exceed electrical capacity by the late 2020's or early 2030's. New transmission facilities take on average between 5 to 10 years to build, and the misalignment of increased load with limited capacity may force the City to prioritize between housing growth, electrification and economic development. One large economic development or public development project of 50 MW or more could trigger a triage scenario until a new transformer can be built.

Housing and Economic Growth - In 2023, City Council endorsed long term growth projections for the City of Kingston. The approved growth targets include an expected annual increase of 1.3% in permanent housing and an annual increase of 1.2% in employment. The permanent population is forecasted to grow from 136,000 to 197,000 between 2021 and 2051. Permanent households are expected to increase from 57,800 to 84,800 and employment by approximately 33,400 jobs between 2023 and 2051. The City's growth demands are in the process of being addressed through the development of the City's new Official Plan, which must demonstrate how and where new residential and employment growth will be established and serviced city-wide. Since Council's endorsement of growth targets, in late 2023, the City has continued to experience significant housing growth with the issuance of 1,335 residential building units in 2023 and 1,243 residential building units in 2024. Continued planning applications and a low

vacancy rate demonstrate that there is still strong interest in residential development city-wide. The City is also being tracked against annual provincial and federal housing targets.

There has continued to be a lot of demand for new employment land sites. The City has now sold most parcels within the St. Lawrence Business Park and Cataraqui Business Park and is entertaining potential offers for Clogg's Road Business Park which has not yet been fully serviced. Based on demand and need, the City is working on expanding its employment land in the east end prior to the new Official Plan update. Furthermore, the City has experienced an increase in green tech businesses which require more electrical capacity.

Electrification of Fleet - To date the City has transitioned 46 of its municipal fleet vehicles to electric, with two more currently on order (EV Refuse trucks), and is projected to transition another 72 light and medium-duty vehicles to electric upon their replacement lifespan by 2030. Expansion of the EV fleet has and will continue to require additional investment in electrical charging infrastructure including potential need for service upgrades which may be limited by grid capacity.

Transit Expansion - The City has been introducing battery electric buses (BEBs) in its fleet with two BEBs currently operating since 2021, one which has been received and is currently being outfitted for service, and another four BEBs on order which are anticipated to be delivered in 2025. The manufacturing and delivery of electric buses take about two years from the time of order because of demand and supply chain issues. With these seven BEBs in operation, the City of Kingston will have one of the highest ratios of battery electric buses to conventional diesel buses in Ontario. A snapshot of electric buses across Ontario municipalities is included as Exhibit A.

However, the City will need to make significant financial investments in infrastructure ($30M) in order to add new battery electric buses, beyond the seven that are expected to be operational before the end of this year ($12M initially for up to 32 BEBs, and an additional $18M for expansion to 105). This level of infrastructure investment does not include the unit cost premium for each BEB.

Facility and Overall GHGe Reductions - The City has made great strides in recent years in reducing greenhouse gas emissions (GHGe) across City facilities with per square foot emissions decreasing by 9.5% from 2018 to 2023, despite an increase in total square footage of 21% in the same period. This represents a decline of 20.3% in energy use per square foot overall, emphasizing the progression of energy efficiency and decarbonization within City facilities.

Continued emissions reductions will be limited by electrical grid capacity in the near-term as lower emission technologies require more electricity and, in many cases, electrical service upgrades. Importantly, building system replacement schedules can only be altered so much before incurring additional risk and/or higher maintenance and other costs, which means there are specific windows when investment in the most impactful emissions-reducing technologies can be made. The City will be prioritizing those most impactful investments but may still face grid capacity constraints at the time upgrades are required.

Based on the limited local electrical capacity and the need to ensure that the City can support the development of new homes and businesses, staff are slowing down the transition to electrification until additional electrical capacity is confirmed through the approval and construction of a new transmission station.

Ultimately, the deferral of electrification across the City's Transit, Fleet, and Facilities will have an impact on the City's ability to reach its current GHGe reduction targets overall. These impacts will be considered in a report to Council in Q2 2025 regarding the feasibility of accelerating those GHGe reduction targets.

Climate Risk Considerations

Limited local electrical capacity will have impacts on the City's electrification plans and its ability to achieve its GHG reduction goals.

Existing Policy/By-Law

Not applicable

Financial Considerations

The updated 15-year capital plans reflect a projected deferral of electrification investment, particularly in the areas of transit fleet and facilities, based on the assumption that a new transmission station will be built in the next seven to eight years. Further details will be provided as part of the budget presentations later this month.

Contacts:

Lanie Hurdle, Chief Administrative Officer, 613-546-4291 extension 1245

David Fell, President & CEO, Utilities Kingston, 613-546-1181 extension 2319

Other City of Kingston Staff Consulted:

Brent Fowler, Director, Corporate Asset Management & Fleet

Russell Horne, Manager, Energy & Asset Management

Julie Salter-Keane, Manager, Climate Leadership

Exhibits Attached:

Exhibit A – Electric Buses (2024 Ontario Snapshot)

Electric Buses (2024 Ontario Snapshot*)

Exhibit A to Report Number 25-033

	Kingston**	Durham	Brampton	York Region	Ottawa	Guelph	Grand River	Barrie	Peterbor-ough
Electric Buses in Operation	2	6	8	14	4	11	11	0	0
Total Fleet	82	158	473	565	851	80	277	49	70
% Electric of Total Fleet	2.4%	3.8%	1.7%	2.5%	0.5%	13.8%	4.0%	0.0%	0.0%

	Belleville	Thunder Bay	Sudbury	Burling-ton	London	Oakville	Windsor	Brant-ford	Toronto (TTC)
Electric Buses in Operation	0	0	0	0	0	30	0	0	75
Total Fleet	19	46	59	68	231	115	117	31	2085
% Electric of Total Fleet	0.0%	0.0%	0.0%	0.0%	0.0%	26.1%	0.0%	0.0%	3.6%

* 2024 point-in-time data exclusive of buses on order not yet in service and commitments planned.

** For Kingston, two buses have been in service since August 2021, one has been delivered and is currently being outfitted for service, and another four are on order and anticipated to be delivered in 2025, which will then represent 8.5% of Kingston’s base public transit fleet (7/82).

Source: CUTA Canadian Conventional Transit Statistics 2023 Operating Data Report, City of Kingston staff discussions with Fleet Contacts from Zero Emission Bus Committee and press releases.