Utilities Kingston

CLIMATE ACTION

LEADERSHIP PLAN

Supporting the City of Kingston's vision for a carbon-neutral community by 2040

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Land acknowledgement

Utilities Kingston acknowledges that we are situated on the ancestral and continuing unceded territory of the Huron-Wendat, Anishinaabe and Haudenosaunee peoples. We thank these peoples for their stewardship of the land. As we preserve and protect the land and water, we commit to delivering our services with care for the Earth.

A Message from the President & CEO

Introducing Our Climate Action Leadership Plan

I am proud to introduce Utilities Kingston's Climate Action Leadership Plan, a bold and practical step forward in our continued commitment to a more sustainable Kingston.

As your local multi-utility provider, we manage the systems that power your homes, deliver clean water, and protect the essential services you depend on every day. That gives us a unique opportunity to lead on climate action in ways that are real, meaningful, and grounded in everyday life. Climate change is already affecting our city, from hotter summers to more frequent and intense storms. The choices we make now will shape the kind of community we leave for future generations.

This plan provides a clear direction for how we will meet that challenge. It focuses on four core areas that guide our efforts and translate our commitment into practical action. We're reducing emissions from our own operations, helping customers conserve energy and water, investigating opportunities to deliver new services such as electric vehicle charging and heat pump programs, and investing in infrastructure built to withstand the impacts of a changing climate.

Much of this work is already underway. It is reflected in programs that encourage water conservation, in tools like MyUtilities that help customers track their energy use, and in infrastructure upgrades that strengthen system reliability. These practical, people-focused solutions deliver value today and support our vision of building better communities. Our next steps will focus on bringing this Climate Action Leadership Plan to life, turning commitment into meaningful progress for our community.

This work also aligns closely with broader climate goals. We are proud to support the City of Kingston's Climate Leadership Plan and its target of becoming carbon neutral by 2040. Our plan builds on progress already being made and provides a clear path forward that supports both environmental leadership and service excellence.

At the same time, we know that meaningful progress comes from working together. Whether it is preparing for extreme weather, helping residents and businesses use less energy, or investing in cleaner technologies, we are ready to do our part. And we hope this plan encourages and empowers others to take action too.

Thank you for your continued trust as we take this important next step toward a more climate-resilient Kingston.

David Fell, President and CEO of Utilities Kingston

Recognizing contributions

Utilities Kingston acknowledges the contributions of a wide range of stakeholders whose willingness to share knowledge, experience, and insight helped ensure that this Climate Action and Leadership Plan (CALP) remains forward-looking, actionable, and aligned with both operational and regulatory realities.

We are grateful to our consultants, Geosyntec Consultants, J.L. Richards & Associates Limited, and Pettis Consulting Group, who provided professional expertise and contributed to various sections of the CALP.

We extend a thank you to the City of Peterborough, Envari Energy Solutions Inc., the Federation of Canadian Municipalities, FLO, GEI Consultants Inc., Greenscale, Halifax Water, Kitchener Utilities, Leading Ahead Energy, Nova Scotia Power, Oakville Enterprises Corporation, and the Smith School of Business at Queen's University for their valuable input.

We also acknowledge the many climate leaders whose publicly available plans and strategies served as inspiration during the development of this CALP, including Washington Gas, Énergir, New Jersey Natural Gas, Con Edison, Saint John Energy, PG&E, Nova Scotia Power, Halifax Water, Enbridge, Toronto Hydro, Xcel Energy, Alectra, the Town of Halton Hills, and the City of Ottawa, among others.

A special thank you to the City of Kingston, whose Climate Leadership Plan provided foundational goals upon which the CALP was built. We also appreciate the interest and feedback from several City departments, including Asset Management & Fleet, Business, Real Estate & Environment, Climate Leadership, and Facilities Management and Construction Services.

Finally, we offer our sincere thanks to all Utilities Kingston employees who contributed input, support, and engagement throughout the planning process, including participation in workshops and internal discussions.

Key terms

Carbon neutrality: The outcome of a person, business, or community avoiding or offsetting as many greenhouse gas emissions from the environment as it produces.

Carbon reduction measure (CRM): An action or strategy that can be taken to reduce greenhouse gas emissions.

Conservation and demand management (CDM): Any conservation program or action which reduces the amount of electricity consumed or reduces the amount of power drawn from the electricity grid.

Decarbonization: The reduction of greenhouse gas emissions from a company, industry or community in the interests of limiting global warming.

Demand response: A strategy that enables electricity, and in some instances, natural gas consumers to adjust their energy usage in response to supply conditions, such as high demand periods or distribution system constraints.

Demand side management (DSM): Any conservation program or action which reduces the amount of natural gas consumed. This can include reducing energy-consuming activities or increasing the efficiency of natural gas devices.

Distributed energy resources (DERs): Resources that generate energy, store energy, or control load and are directly connected to the distribution system or located behind a customer's meter.

Electrification: The action or process of transitioning from a machine or system traditionally powered with a fuel such as natural gas, oil, propane, or gasoline to be powered with electricity.

Energy transition: Refers to the global shift from fossil fuel-based energy systems to low-carbon and renewable energy sources.

Greenhouse gas (GHG): Any of the various gaseous compounds (such as carbon dioxide or methane) that absorb infrared radiation, trap heat in the atmosphere, and contribute to the greenhouse effect.

Independent Electricity System Operator (IESO): The provincial entity that delivers key services across the electricity sector, including managing the power system in real-time, planning for the province's future energy needs, enabling conservation and designing a more efficient electricity marketplace to support sector evolution.

Ontario Energy Board (OEB): The independent agency that regulates Ontario's electricity and natural gas sectors in the public interest.

Renewable energy: A form of energy that is never exhausted because it is renewed by nature within short time scales (e.g., wind, solar radiation, hydro power, biomass).

Executive summary

Utilities Kingston's Climate Action Leadership Plan (CALP) represents a pivotal step in addressing the climate emergency and supporting the City of Kingston's Climate Leadership Plan (CLP) vision of becoming a carbon-neutral community by 2040. As a trusted multi-utility provider, Utilities Kingston is uniquely positioned to support this effort, leveraging its expertise to deliver safe, reliable, and affordable utility services while responding to the challenges of climate change and opportunities presented by the transition to a low-carbon economy.

The CALP is organized into four pillars aligned with Utilities Kingston's 2021-2025 Strategic Plan:

- **Pillar 1 - Reducing Operational Greenhouse Gas (GHG) Emissions:** Addressing operational emissions through energy efficiency, conservation, renewable energy adoption, and process improvements.
- **Pillar 2 - Supporting Climate Action:** Empowering customers through education, incentives, and support programs to encourage sustainable choices.
- **Pillar 3 - Exploring Low-Carbon Business Ventures:** Identifying innovative opportunities with potential economic and environmental value that align with Utilities Kingston's role in the energy transition.
- **Pillar 4 - Climate-Informed Planning:** Integrating climate resilience into infrastructure and strategic decision-making.

Developed amid economic and political uncertainty, the CALP is designed to remain flexible as data, priorities, and opportunities evolve. It establishes a foundation for moving from planning to implementation by:

- Identifying high-impact, practical opportunities for climate action that respond to customer needs and align with local energy transition challenges.
- Advancing Utilities Kingston's strategic objectives while supporting the City's climate goals, where possible.
- Establishing a framework to transition from planning to implementation.
- Guiding future investment decisions to deliver maximum climate impact while balancing resource constraints.
- Integrating customer-centric approaches into stakeholder engagement strategies.
- Presenting example performance metrics to support future tracking.

As a municipally-owned, ratepayer-funded utility, Utilities Kingston must balance climate ambition with its core mandate of delivering essential services. The CALP provides a focused, practical approach for aligning climate objectives with core utility operations, supporting the City's carbon-neutral goals where possible, while maintaining safe, reliable, and affordable service delivery.

Introduction

Utilities Kingston: A trusted service provider

Utilities Kingston is a multi-utility service provider and asset management company wholly owned by the City of Kingston (City). With a singular shareholder and a commitment to delivering safe, reliable, and affordable services, the organization plays a critical role in supporting the City's infrastructure and community needs. Serving over 120,000 customers, Utilities Kingston has a long-standing history of innovative and responsible utility management.

As a municipally-owned corporation, Utilities Kingston's strategic planning, major capital investments, including climate-related initiatives, are subject to approval by the City, which serves as its sole shareholder. This governance structure ensures that Utilities Kingston's operations are aligned with broader municipal goals, budget processes, and community priorities, while enabling integrated and efficient service delivery across utility divisions.

The City retains ownership of most utility infrastructure, while Utilities Kingston manages, operates, and maintains these assets on the City's behalf. This includes electricity, water, wastewater, natural gas, streetlighting and traffic signals, and appliance rentals. Telecommunications infrastructure is the only utility asset owned directly by Utilities Kingston. Figure 1 illustrates the relationship between the City and Utilities Kingston in terms of ownership and operational responsibilities.

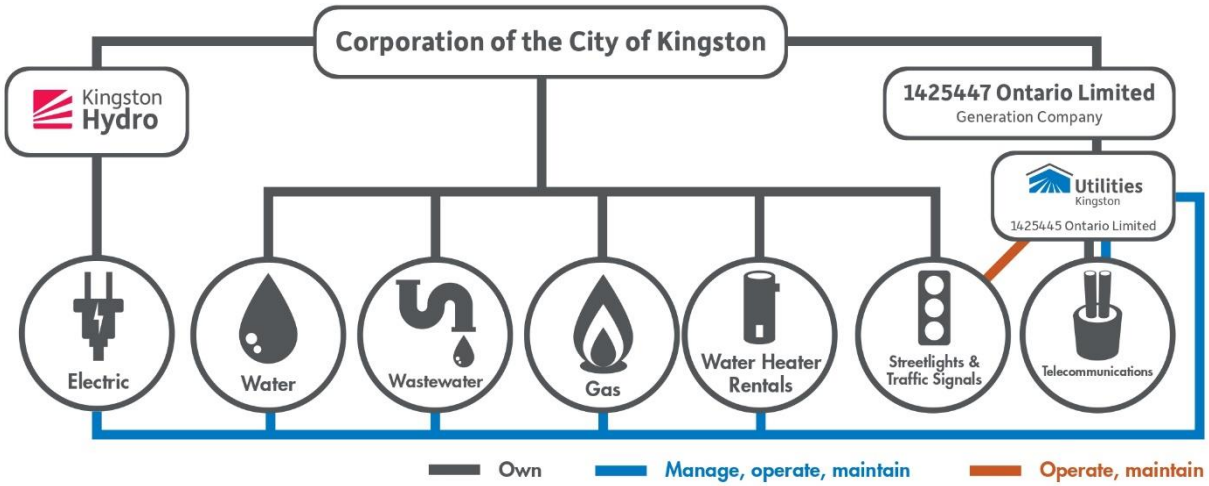

Figure 1: Utilities Kingston corporate organizational chart

Climate action leadership: a long-standing commitment

For decades, Utilities Kingston has been a champion of environmental sustainability. Well before sustainability became a widespread priority, the utility has been pioneering approaches to environmental sustainability, infrastructure resilience, and community service.

The organization's climate leadership can be traced back to critical events like the 1998 ice storm, which became a watershed moment in understanding infrastructure vulnerability. Those experiences taught Utilities Kingston fundamental lessons about system resilience, emergency preparedness, and the critical importance of adaptable infrastructure. Over subsequent decades, the utility has consistently integrated these learnings into its operational philosophy, viewing environmental challenges not as obstacles but as opportunities for innovation.

On the ground, this commitment has translated into tangible work. Since 2003, Utilities Kingston's hot water tank appliance rental business has contributed between $250,000 to $1 million annually to the City’s Environmental Reserve Fund, totalling more than $13 million to date. Alongside these investments, Utilities Kingston has been upgrading infrastructure to be more resilient, helping customers save energy and money, and working closely with the City to find innovative solutions to environmental challenges. These efforts include a decade of sustained investment in conservation and demand management (CDM) programs, helping customers reduce their energy use and carbon footprint. Each initiative, whether large or small, reflects a deep commitment to sustainable community service.

Responding to climate change

The impacts of climate change are intensifying globally and locally, with rising temperatures, more frequent extreme weather events, and growing risks to infrastructure, economies, and communities. In Kingston, these effects are already evident, with hotter summer days, milder winters, and more intense precipitation events increasing the risks of flooding and infrastructure stress. The Intergovernmental Panel on Climate Change (IPCC) underscores the need for immediate, sustained action to limit the worst effects of climate change, as every fraction of a degree of warming avoided reduces risks to people and ecosystems.

In March 2019, the City became the first municipality in Canada to declare a climate emergency, signalling a commitment to comprehensive and coordinated climate action. As the City developed its CLP, Utilities Kingston became a critical partner, participating on both the CLP Steering Committee and technical advisory teams.

Utilities Kingston's commitment to support the City's climate goals is formally embedded in its 2021-2025 Strategic Plan under Theme 6: Climate Action Leadership. As a

municipally-owned utility accountable to its sole shareholder, Utilities Kingston is committed to supporting the City's carbon neutrality goals, where possible. This commitment, which also supports the organization's Environmental, Social, and Governance (ESG) Position Statement priorities, underlines Utilities Kingston's role in advancing a sustainable future for Kingston while delivering safe, reliable, and affordable services to ratepayers.

Current initiatives

Guided by its core values of safety, integrity, innovation, and reliability, Utilities Kingston has actively contributed to the City's climate goals through a range of collaborative and forward-looking initiatives. These efforts demonstrate a sustained commitment to climate action and lay the foundation for the comprehensive approach detailed in the CALP.

Some key examples of Utilities Kingston's climate support for its customers and sole shareholder, the City, include:

Infrastructure and system modernization

- Upgrading electrical capacity to support increased electrification and energy transition through 13.8kV distribution development.
- Creating an integrated Energy Services Department to coordinate natural gas and electricity planning.
- Implementing a smart meter replacement program over the next 5 to 10 years to enhance grid management and support data-driven energy solutions.
- Reducing operational emissions through renewable energy investments, electric fleet vehicles, and energy efficiency and conservation improvements at facilities.
- Supporting the City's sewer separation plan to eliminate combined sewers, reducing overflows and improving environmental performance.

Customer programs and support

- Providing energy management tools through the MyUtilities platform, including Green Button integration.
- Supporting water conservation through the Water Conservation Garden, Rain Barrel Program, preventative plumbing initiatives, and water efficiency retrofit incentives and rebate programs.
- Delivering energy efficiency programs to help customers reduce electricity and natural gas consumption and utility costs.

Strategic partnerships

- Collaborating with the City on electrification studies, solar feasibility, and tree planting.
- Supporting community environmental projects through appliance rental business proceeds directed to the City's Environmental Reserve Fund.
- Participating in industry leadership through working groups with Ontario's Independent Electricity System Operator (IESO), water sector networks, and research partnerships.
- Advancing continuous operational energy improvements by participating in Ontario's Strategic Energy Management (SEM) program, which promotes monitoring, capacity building, and cross-sector collaboration.
- Partnering with the IESO to deliver new enduring Demand Side Management (eDSM) programs starting in 2025, part of a $90 million province-wide investment over three years to reduce peak demand and support climate goals through customer engagement and local program development.

Asset Management and Climate Action Branch

In 2024, Utilities Kingston took a transformative step by establishing the Asset Management and Climate Action Branch. This innovative structure is more than an administrative reorganization; it fundamentally reimagines how climate considerations are integrated into core utility operations.

By bringing asset management and climate action together under unified leadership, the utility ensures that climate resilience is a key focus within strategic decision-making. This approach supports a holistic perspective that addresses both immediate operational needs and long-term sustainability goals.

As a forward-thinking asset management company, Utilities Kingston has positioned this branch to oversee its award-winning conservation and demand management programs and to lead the development and implementation of the CALP, setting the stage for comprehensive and successful climate action.

Methodology

The CALP builds on the City's CLP, incorporating research and stakeholder engagement to ensure a practical, well-informed strategy. Key elements include:

- Over 30 interviews with Utilities Kingston and City staff.
- Review of customer satisfaction surveys and feedback sessions.

- Two dedicated workshops with Utilities Kingston and City teams.
- Collaboration with the Smith School of Business for strategic refinement.
- Literature, policy reviews, and jurisdictional scans of leading utility climate action.
- Engagement with municipal, utility, and industry leaders.

This integrated approach ensures the CALP reflects community priorities while remaining forward-looking, actionable, and aligned with operational and regulatory realities.

Key stakeholder insights

Feedback from stakeholder engagement and customer surveys revealed several key themes that directly influenced the CALP's strategic direction:

- **Financial barriers:** Upfront costs and limited incentives can hinder participation in energy efficiency and electrification programs.
- **Knowledge gaps:** Many customers and contractors lack awareness of available energy programs and low-carbon technologies, underscoring the need for expanded education and outreach.
- **Infrastructure challenges:** Grid capacity limits, and access to renewable energy and alternative fuels present obstacles that require investments in system modernization and expansion.
- **Implementation barriers:** Skilled contractor shortages and regulatory gaps slow adoption of emerging climate solutions, emphasizing the importance of workforce development and policy engagement.

The CALP’s four pillars and associated strategic opportunities are shaped by these challenges. This positions Utilities Kingston to leverage its service delivery expertise and drive impactful solutions for customers while supporting the City's climate goals.

Climate Action Leadership Plan overview

The following sections detail how the CALP is organized, how it was developed, and how it will be implemented to support Kingston's climate goals.

Framework and strategic pillars

The CALP is organized into four strategic pillars aligned with Utilities Kingston's 2021-2025 Strategic Plan and aimed at supporting the City's highest-priority climate objectives while reinforcing the utility's mission, vision, and values.

Together, these pillars provide a comprehensive approach to addressing climate challenges and opportunities while upholding the utility's commitment to safe, reliable, and affordable services:

- **Pillar 1 - Reducing Operational GHG Emissions:** Addressing operational emissions through energy efficiency, conservation, renewable energy adoption, and process improvements.
- **Pillar 2 - Supporting Climate Action:** Empowering customers through education, incentives, and support programs to encourage sustainable choices.
- **Pillar 3 - Exploring Low-Carbon Business Ventures:** Identifying innovative opportunities with potential economic and environmental value that align with Utilities Kingston's role in the energy transition.
- **Pillar 4 - Climate-Informed Planning:** Integrating climate resilience into infrastructure and strategic decision-making.

Table 1 provides a closer look at each pillar, outlining its focus area, key strategic opportunities, and overall goal:

Table 1: Summary of pillar focus areas, strategic opportunities and goals

Pillar	Focus	Strategic opportunities	Goal
Pillar 1: Reducing Operational GHG Emissions	Reducing operational GHG emissions	· Reducing non-fugitive emissions through targeted carbon reduction measures (CRM) · Developing a fugitive emissions management strategy · Enhancing GHG inventory management and reporting	Achieve measurable operational GHG emissions reductions
Pillar 2: Supporting Climate Action	Empowering customer climate engagement	· Customer education programs · Financial incentives for sustainable choices · Energy management tools and resources	Accelerate customer-driven GHG emissions reductions
Pillar 3: Low-Carbon Business Ventures	Identifying innovative economic opportunities aligned with climate goals	· Developing new low-carbon service offerings · Exploring renewable energy technologies · Creating economic value through sustainability	Create viable low-carbon business opportunities

Pillar	Focus	Strategic opportunities	Goal
Pillar 4: Climate-Informed Planning	Integrating climate resilience into infrastructure and strategic decision-making	· Climate risk assessments for critical assets · Adaptive infrastructure planning · Applying a climate lens to infrastructure decisions	Ensure robust, future-ready utility systems

Community input and public engagement

The CALP builds on the extensive community engagement conducted through the City's CLP development process, where over 900 community members shared their vision and priorities for Kingston's climate future. As a key partner in developing the CLP, Utilities Kingston helped shape these discussions while gaining valuable insights into community expectations for climate action.

As a corporation accountable to its sole shareholder, Utilities Kingston is committed to supporting the City's climate goals established through this comprehensive public engagement process. As this plan supports the climate objectives already established through the CLP consultation process, Utilities Kingston did not undertake additional public engagement for the CALP.

This foundation of community-informed goals allows the CALP to translate the City's climate priorities into practical utility initiatives. This approach positions Utilities Kingston to deliver meaningful climate solutions that aim to support the goals Kingston residents helped shape through the CLP process.

From strategy to action

Utilities Kingston's CALP is one component of the utility's broader strategy for navigating climate change and the energy transition. While focused on supporting the climate action priorities identified in the City's CLP, its strategy must also align with Utilities Kingston's other strategic initiatives to ensure a balanced, forward-looking approach. This means supporting the City's carbon-neutral vision while ensuring that utility investments align with Utilities Kingston's mission, vision, values, and regulatory mandate.

The following sections describe the scope and limitations that will shape Utilities Kingston's approach to climate action and explain how the plan is organized to move from strategy to action.

Scope and limitations

As a multi-utility provider, Utilities Kingston is uniquely positioned to deliver integrated climate solutions across electricity, natural gas, water, wastewater, telecommunications, and appliance rental services. This multi-utility model enables coordinated planning and implementation that single-utility providers cannot achieve, creating opportunities for innovative approaches to electrification, conservation, energy efficiency, and infrastructure resilience. Combined with deep operational expertise and commitment to safe, reliable, and affordable services, this provides a strong foundation for advancing climate action initiatives.

At the same time, as a utility company funded by ratepayers, climate actions must be consistent with its core mandate to deliver safe, reliable, and affordable utility services to its customers. Several internal and external factors will shape the options and timelines for climate action:

- Utility sector regulations limit flexibility for innovation.
- Budget constraints and rate impacts require careful management.
- Infrastructure limitations and planning cycles affect project timing.
- Evolving market conditions create uncertainty around new models and technologies.
- Workforce and supply chain constraints can impact project delivery.

Successful implementation will require careful prioritization, as not all opportunities can be pursued immediately. Utilities Kingston will aim to support the City's CLP objectives wherever possible, while also considering organizational mandates, regulatory obligations, and its operational realities.

How the CALP works

The CALP provides Utilities Kingston's strategic direction on climate action through carefully developed opportunities and enabling actions that aim to support the City's climate goals while advancing the organization's strategic objectives.

Following CALP approval, Utilities Kingston staff will develop a comprehensive implementation plan that translates these strategic opportunities into specific projects, timelines, and resource commitments. Each pillar includes three key components to support this transition:

- **Strategic opportunities:** Each pillar identifies high-impact areas where Utilities Kingston can make meaningful progress toward the City's climate goals by leveraging its multi-utility strengths and operational expertise within its regulatory

mandate. While there are many potential areas for climate action, these opportunities were developed based on Utilities Kingston's unique capabilities, stakeholder input, and jurisdictional and industry research to focus efforts where the organization can contribute most effectively.

- **Enabling actions:** Within each strategic opportunity, specific enabling actions represent a flexible toolkit of proven approaches for making progress. These actions were selected based on industry best practices, jurisdictional research, stakeholder insights, and alignment with Utilities Kingston's operational context and capabilities. Recognizing that not all actions can be pursued simultaneously, these sections provide staff with evidence-based options from which to select and prioritize.
- **Getting started:** Each pillar concludes with a getting started section that outlines how Utilities Kingston staff can approach turning the desired opportunities and enabling actions into a detailed implementation plan for that specific pillar. These sections provide insight into Utilities Kingston's considerations for approach and prioritization as the organization moves from the toolkit of options to actionable project planning. They guide staff on which factors to consider first, how to sequence efforts, and what principles can shape implementation decisions, helping to bridge the gap between strategic opportunities and practical next steps.

Pillar 1: Reducing Operational GHG Emissions

Utilities Kingston is working to reduce the GHG emissions associated with delivering utility services to its customers. Pillar 1 of the CALP focuses on understanding these operational emissions, those generated through the day-to-day provision of water, wastewater, natural gas, electricity, and other essential services. This pillar also assesses what would be required, both financially and operationally, to achieve carbon-neutral operations by 2040. Refer to Appendix A for supporting details.

Building a reliable GHG emissions inventory

Utilities Kingston completed its first comprehensive GHG inventory in 2025, supported by a third-party consultant specializing in GHG accounting, J.L. Richards & Associates Ltd. (JLR). The inventory uses 2018 as the baseline year, selected because it aligns with the City’s GHG baseline and offered the most complete dataset available at the time.

This inventory presents the most comprehensive assessment of Utilities Kingston’s operational emissions to date. It forms the foundation for the consultant’s detailed evaluation of carbon reduction measures (CRMs) across all utility operations. JLR’s

resulting CRM strategy balances near-term actions with the long-term planning needed to support the City's climate goals.

Understanding emission scopes

Utilities Kingston has classified its GHG emissions using the internationally recognized GHG Protocol. "Operations" in this plan refers to all activities involved in delivering utility services, including water and wastewater systems, electricity and natural gas distribution, streetlight and traffic signal maintenance, telecommunications, and appliance rentals.

Emissions are classified as follows:

- **Scope 1:** Direct emissions from sources owned or controlled by Utilities Kingston. Examples include natural gas used in buildings and for process equipment, fuel for fleet vehicles, and fugitive emissions from process operations such as methane, nitrous oxide, and sulphur hexafluoride.
- **Scope 2:** Indirect emissions from purchased electricity, steam, heating, or cooling that is generated off-site but used in Utilities Kingston's operations. Examples included electricity consumed in facilities and processes, as well as line losses in the electricity distribution system.
- **Scope 3**: Other indirect emissions from upstream and downstream activities not owned or controlled by Utilities Kingston but connected to its value chain. These include customer use of utilities, purchased goods and services, contractor operations, and waste disposal.

Scope 3 sources are currently outside the boundary of the GHG inventory but remain under review. As Utilities Kingston enhances its data collection and monitoring practices, these sources may be incorporated into subsequent iterations of the GHG inventory.

Key emission categories

Based on the consultant's analysis, Utilities Kingston's operational emissions fall into two categories that require different strategic approaches:

- Non-fugitive emissions
- Fugitive emissions and line losses

Non-fugitive emissions

Non-fugitive emissions result from the energy used for routine operations, such as heating and cooling buildings, fueling vehicles, and powering process equipment. Unlike fugitive emissions, these are directly linked to measurable operational activities and

energy consumption, making them easier to monitor and manage using established technologies and reporting methods.

Non-fugitive emissions account for approximately 12% of Utilities Kingston's operational GHG footprint and offer clearer opportunities for reduction through commercially available technologies with measurable results and predictable costs.

Fugitive emissions and line losses

Fugitive emissions result from unintentional releases or operational processes that are difficult to detect and measure. They occur at various points within natural gas networks, electrical systems, and wastewater treatment facilities. These emissions are estimated using accepted engineering methodologies, but actual emissions will vary based on system-specific characteristics such as asset condition, material type, and maintenance practices.

For Utilities Kingston’s Pillar 1 GHG inventory, fugitive emissions include:

- Methane emissions from the natural gas distribution system.
- Methane emissions from biogas combustion at wastewater treatment facilities.
- Nitrous oxide emissions from wastewater treatment.
- Sulphur hexafluoride from high-voltage electrical equipment.

Other fugitive emissions sources, such as refrigerant leaks from HVAC systems, are not included in this inventory due to limited data. These sources may be incorporated in future inventory updates as Utilities Kingston expands its data collection and monitoring practices.

Fugitive emissions represent approximately 86% of operational emissions. While these estimates follow standardized methods used across the sector, they provide only a high-level view and do not reflect system-specific realities. Improvements in monitoring, data collection, and analysis will be needed before effective reduction strategies can be developed. Precise estimation methodologies and direct monitoring tools are still emerging, and further research is required to support targeted and costed mitigation efforts.

While not classified as fugitive emissions under the GHG Protocol, electrical line losses are included in this category because they require similar data analysis and strategy development before a costed reduction plan can be established. Line losses represent approximately 2% of Utilities Kingston's GHG inventory.

2018 baseline GHG emissions inventory

Tables 2, 3 and 4 summarize Utilities Kingston's 2018 baseline GHG emissions inventory. The inventory combines metered and measured utility data and fuel use with theoretical calculations based on industry-accepted methods.

Table 2 - Non-fugitive emissions - measured or metered data

Source	Emissions (tCO_2e)
Scope 1 – Natural gas use (buildings and process)	2,435
Scope 1 – Fleet fuel use	822
Scope 2 – Purchased electricity (buildings and process)	805
Sub-total	4,062

Table 3 - Fugitive emissions and line losses - engineered estimate

Source	Emissions (tCO_2e)
Scope 1 – Methane	29,382
Scope 1 – Nitrous oxide (N_2O)	2,312
Scope 1 – Sulphur hexafluoride (SF_6)	12
Scope 2 – Electricity line losses	879
Sub-total	32,585

Table 4 - Combined emissions

Source	Emissions (tCO_2e)
Non-fugitive emissions	4,062
Fugitive emissions and line losses	32,585
Total	**36,647**

Figure 2 illustrates the relative contribution of each emission category to Utilities Kingston's 2018 operational GHG emission inventory:

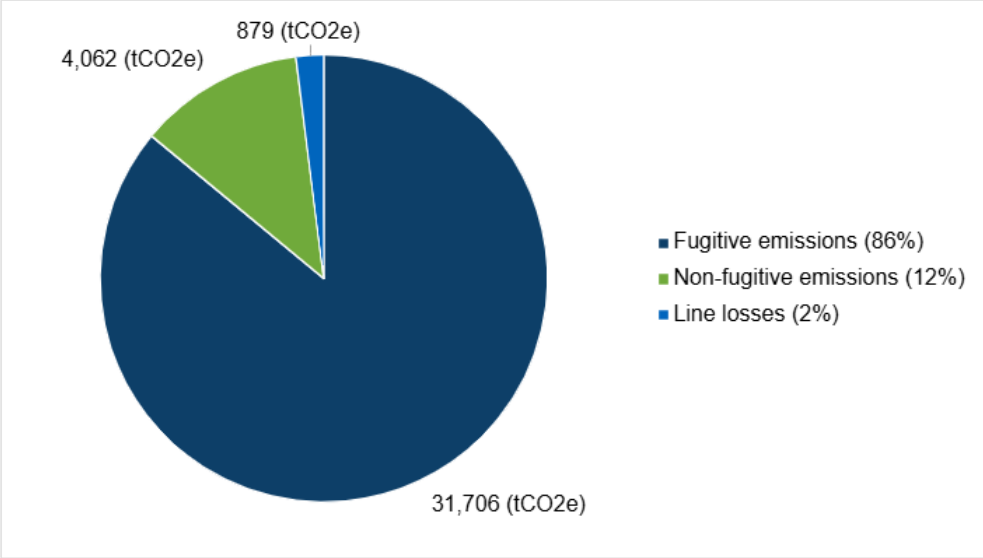

Figure 2: 2018 Baseline GHG emissions by category

Carbon reduction potential

To inform its GHG reduction strategy, Utilities Kingston's consultant conducted a high-level assessment applying a suite of potential CRMs to the Pillar 1 GHG inventory of non-fugitive and fugitive emissions. The analysis covered building upgrades, fleet electrification, operational process improvements, and renewable energy systems, assessing such factors as estimated emissions reductions, preliminary costs, and implementation readiness. A marginal abatement cost framework was used by JLR to prioritize opportunities based on cost-effectiveness and climate impact.

Non-fugitive emissions reduction potential

The consultant's analysis identified the potential to reduce up to 80% of Utilities Kingston's non-fugitive emissions by 2040 using commercially available solutions. This early estimate is subject to further detailed feasibility and cost-benefit analysis to confirm suitability for Utilities Kingston's operations. Achieving these reductions may require capital investments between $50 million and $100 million above business-as-usual spending by 2040. While substantial, many actions may improve energy performance and reduce long-term costs, supporting business cases for implementation.

Fugitive emissions and line losses assessment

The consultant's assessment identified fugitive emissions as the dominant source of Utilities Kingston's operational GHG emissions. These values are high-level estimates derived from general system inputs such as pipeline length, number of service connections, and treatment process characteristics. They do not reflect the specific

condition, material type, or performance of individual assets, which limits the ability to define precise or costed reduction strategies at this stage. Line losses, while a smaller contributor by volume, are included here because they share similar challenges around data availability, estimation methods, and reduction strategy development.

Recognizing this uncertainty, JLR recommends that Utilities Kingston develop a strategy focused on improving data quality and identifying future reduction opportunities. This includes enhanced monitoring and data collection, pilot projects to better understand system performance, and exploration of customer conservation programs that could help reduce emissions over time. Because many fugitive emissions and line losses scale with the volume of service delivered, supporting customer conservation efforts may offer a valuable opportunity to reduce these difficult-to-abate emissions.

While a costed reduction plan is not yet feasible, the consultant's recommendations provide a roadmap for Utilities Kingston to build the necessary data and operational foundation to support future mitigation efforts.

Table 5 provides a summary of JLR's assessment of carbon reduction potential and related actions.

Table 5: Non-fugitive and fugitive emissions carbon reduction potential and related actions summary

Emission category	Examples of potential CRMs	Percent reduction potential by 2040	Potential capital budget needed	Reduction plan status
Non-fugitive emissions	· Building envelope retrofits and HVAC electrification · Fleet electrification · Electrification of process equipment · On-site renewables (e.g., solar PV, energy storage) · Energy and process efficiency improvements	Up to 80% of non-fugitive emissions (emissions account for ~12% of 2018 baseline)	$50 million to $100 million over business-as-usual spending (range reflects high-level estimate with significant variability due to technology choices, project design, and long-term forecasting uncertainty)	High-level costed plan; detailed analysis and project prioritization required
Fugitive emissions & line losses	· Advanced methane detection programs · SF_6 leak tracking and mitigation · N_2O process monitoring improvements · Conservation and demand management programs for line loss reduction · Demand side management programs for methane loss reduction	Reduction potential to be determined (emissions account for ~88% of 2018 baseline)	To be determined	No costed plan; strategy development, data collection, and pilots required

Technical feasibility of carbon neutrality

Carbon neutrality refers to achieving a balance between GHGs emitted and those removed from the atmosphere. In practice, this involves reducing emissions as much as possible, then offsetting the remainder through verified activities that remove or prevent emissions elsewhere. Utilities Kingston's carbon neutrality assessment includes both non-fugitive and fugitive emissions, where estimation techniques and data are available, reflecting a commitment to accounting for the full scope of emissions associated with delivering utility services to its customers.

The consultant's assessment yielded three key findings regarding carbon neutrality by 2040:

1. Achieving carbon-neutral operations by 2040 is not technically feasible today without significant reliance on carbon offsets. This is largely due to current limitations in monitoring, measurement, and reduction technologies for fugitive emissions and line losses, which represent approximately 88% of Utilities Kingston's operational GHG footprint. Many necessary technologies and market mechanisms are still under development and not yet available at scale.
2. Developing dedicated reduction strategies for fugitive emissions is essential before any credible carbon neutrality timeline can be established. Without this foundational work, a 2040 carbon neutrality target remains aspirational rather than grounded in technical and financial reality.
3. Utilities Kingston's 2021-2025 Strategic Plan (Theme 6, Initiative 4) committed to identifying financial resources for the 2027-2030 capital budget and demonstrating a clear pathway to carbon-neutral operations by 2040. These commitments cannot be fully met at this time due to technology and data limitations for fugitive emissions. However, the 80% reduction potential in non-fugitive emissions provides a clear starting point for immediate action while longer-term strategies for fugitive emissions and line losses are developed.

Strategic opportunities

Based on JLR's key findings and high-level CRM roadmap, Utilities Kingston has identified three strategic opportunities. These opportunities incorporate the consultant's CRM implementation timeline framework of immediate (2025), near-term (2026-2029), medium-term (2030-2035), and long-term (2036-2040) actions to support a phased approach aligned with capital and strategic planning cycles.

Opportunity 1: Implementing non-fugitive emissions reductions

Non-fugitive emissions, while a smaller portion of the overall GHG footprint, present clearer and more immediate opportunities for reduction. These emissions are easier to

measure and are linked to well-established technologies and practices, including fleet electrification, building retrofits, and renewable energy deployment. The CRM analysis suggests that up to 80% of non-fugitive emissions could be reduced by 2040, supported by an estimated capital investment of $50 million to $100 million above business-as-usual spending. This estimate is based on the consultant's high-level roadmap of candidate CRM measures and assumes widespread deployment of specific capital projects. Further validation is required to confirm feasibility, cost-effectiveness, timing, and alignment with broader City-led transition efforts.

- **2025-2030 Focus:** Refine the cost and scope of immediate (2025) and near-term (2026-2029) candidate CRM projects and establish internal GHG reduction targets based on approved actions to inform capital planning for the 2027-2029 budget cycle.
- **Post 2030 direction:** Reassess medium-term (2030-2035) and long-term (2036-2040) candidate CRMs, and use updated analyses to verify achievable emissions reductions by 2040 with more precise cost projections. Feasibility, priorities, and timing will be re-evaluated as technologies mature, costs evolve, and regulatory requirements shift.

Enabling actions

- **Electrify and upgrade the vehicle fleet:** Transition to electric and hybrid vehicles where feasible, aligning with fleet replacement cycles and operational needs.
- **Decarbonize buildings and facilities:** Improve building energy performance through efficiency upgrades and fuel switching, such as retrofitting HVAC systems and adopting electric heat pumps.
- **Deploy on-site renewable energy:** Explore opportunities to install solar PV and energy storage to reduce emissions and increase energy resilience.
- **Improve energy and process efficiency:** Assess operations for opportunities to optimize energy and water use through equipment upgrades, process adjustments, and best practices.

Opportunity 2: Establishing a fugitive emissions management program

Fugitive emissions make up the largest share of Utilities Kingston's operational GHG footprint. These emissions are difficult to measure and many currently lack proven reduction solutions. However, there is an opportunity to build a foundation for long-term reductions by improving data collection and quality, advancing pilot projects, and developing a costed emissions reduction strategy. This work will support more informed

decision-making and help determine a realistic carbon neutrality timeline as technologies and mitigation options mature.

- **2025-2030 Focus:** Target improved monitoring and data collection, conduct targeted pilot projects, and develop a costed emissions reduction strategy.
- **Post 2030 direction:** Use the developed emissions strategy to guide future decision-making and inform the timeline for achieving carbon neutrality as viable technologies and cost expectations become clearer.

Enabling Actions

- **Enhance monitoring and measurement:** Address data gaps and improve data quality by identifying priority locations for advanced metering and detection technologies, with an initial focus on fugitive sources.
- **Partner on research and pilot projects:** Collaborate with technology providers and academic institutions to test emerging solutions for fugitive emissions and electricity line loss monitoring and mitigation.
- **Develop a costed strategy for reduction:** Use findings from pilot projects and improved monitoring data to build a technically sound, financially informed strategy.

Opportunity 3: Continuous improvement of the GHG inventory

A reliable and comprehensive GHG inventory is essential for setting credible targets, tracking progress, and supporting well-informed investment decisions. This opportunity focuses on improving inventory practices, particularly for non-fugitive emissions, and strengthening systems to ensure consistent, comparable, and transparent reporting. As inventory practices advance, Utilities Kingston may also explore including select Scope 3 emissions in future reporting, beginning with sources that are easier to quantify or closely connected to its operations.

Coordinating with the City will also be important, as there are areas where operational responsibilities and associated emissions overlap between the two organizations. Ensuring that inventory boundaries are clearly defined and mutually understood will help avoid double-counting, align CRM strategies, and ensure that efforts to reduce emissions are complementary and mutually reinforcing.

- **2025-2030 Focus:** Address data gaps identified in the 2018 baseline inventory, continue to align reporting with established standards, and initiate formal GHG inventory reporting.
- **Post 2030 direction:** Maintain regular GHG inventory verification and use updated inventory data to refine climate targets and support long-term planning.

Enabling actions

- **Enhance GHG accounting methods:** Continue to align Utilities Kingston's GHG inventory with recognized standards such as ISO 14064 and the GHG Protocol to enhance consistency and reliability.
- **Improve data systems and coverage:** Enhance internal processes for tracking emissions and energy use across operations. Expand data collection efforts to improve accuracy, especially in areas not currently well covered.
- **Institutionalize reporting and verification:** Establish a formal inventory reporting cycle with potential third-party review, to support internal decision-making, progress tracking, and transparency.
- **Strengthen coordination with the City**: Continue collaborating with City staff to clarify responsibilities for how emissions are tracked and reported, and how emissions reductions are attributed in areas where operational boundaries overlap.

Investment planning and financial considerations

Investment timing and scale will depend on technical feasibility and careful financial planning. Utilities Kingston must balance climate goals with operational needs, working closely with the City to determine how costs will be allocated. The City will ultimately determine how climate investments are funded, considering options such as ratepayer contributions, reserve funds, or external funding support. Utilities Kingston will support this process by providing the analysis and input needed to ensure that funding decisions align with operational priorities and evolving regulatory requirements.

Key financial considerations include:

- **Non-fugitive emissions investment:** Reducing non-fugitive emissions may require $50 to $100 million in capital investment above business-as-usual spending by 2040. While many measures are expected to yield operational savings, each will require detailed evaluation and cost-benefit analysis to determine feasibility and potential financial implications.
- **Fugitive emissions early-stage investment:** Early-stage investments will be needed to improve monitoring, data quality, and develop pilot projects. The consultant's analysis suggests an annual budget of approximately $205,000 may be needed to support these initial efforts. Large-scale pilot projects could require multi-million dollar funding depending on their scope and technology involved.
- **Funding and partnerships:** Provincial and federal funding programs, technology partnerships, proceeds from Utilities Kingston's operations, and the

City's Environmental Reserve Fund could help offset costs and reduce ratepayer impact.

- **Capital planning integration:** Effective climate investment depends on aligning emissions reduction efforts with existing capital planning and asset management processes. Coordinating timing, funding sources, and feasibility assessments ensures resources are used efficiently and opportunities are implemented strategically.

Getting started

Successfully implementing Pillar 1 requires a practical approach that balances climate goals with operational realities and available resources. Three key factors will guide Utilities Kingston's implementation:

- **Phased implementation:** Prioritize non-fugitive emissions reductions with proven technologies and positive business cases to generate early momentum, while building the foundation for fugitive emissions reductions through ongoing investment in monitoring, research, and pilot projects.
- **Integrated planning:** Align emissions reduction efforts with existing capital and asset management processes to ensure coordination, optimize resource use, and deliver long-term value.
- **Adaptive management:** Regularly track progress, review outcomes, and adjust plans as fugitive and non-fugitive emission technologies mature and new reduction opportunities emerge.

Pillar 2: Supporting Climate Action

The success of the City's carbon-neutral vision depends on more than municipal leadership, it requires active engagement from every resident, business, and community partner. Research indicates that by 2040, actions taken by utility customers could reduce nearly twice as many GHG emissions as those achieved through clean energy supply. Utilities Kingston understands that empowering customers is fundamental to driving meaningful climate progress.

While customers increasingly seek ways to reduce their carbon footprint, they face multiple interconnected challenges: financial barriers to adopting new technologies and retrofits, difficulty identifying which actions will have meaningful impact, and systemic obstacles in infrastructure, regulations, and market structures that can impede climate action. Pillar 2 responds to these challenges by identifying data-informed, high-impact opportunities for Utilities Kingston to support and accelerate customer-led climate action. Refer to Appendix B for supporting details.

Strategic opportunities

Utilities Kingston is dedicated to empowering customers to drive meaningful change in the transition to a low-carbon future. This section focuses on three strategic opportunities: supporting energy efficiency and water conservation, empowering customers through education and tools, and modernizing energy services. Together, these efforts position Utilities Kingston to play a vital role in accelerating community-wide emissions reductions.

Opportunity 1: Support our customers with energy efficiency and water conservation programs

Customer actions are among the most effective ways to drive decarbonization. Energy efficiency and water conservation programs can reduce emissions, lower utility bills, and alleviate system constraints, helping to avoid or defer the need for new infrastructure. These efforts contribute to local, regional, and provincial climate goals and accelerate customer adoption of low-carbon technologies.

Key focus areas of the City's CLP include reducing emissions from home heating, which accounts for 48% of Kingston's energy sector emissions, and supporting customers in reducing natural gas usage. Beyond traditional energy efficiency measures, demand response programs, which have been historically focused on managing peak electricity demand, are now expanding to help manage natural gas demand, providing potential co-benefits for both the utility system and customers.

The province's Save on Energy program currently offers incentives to help customers save electricity and improve energy performance. As this program evolves, there are opportunities to better coordinate electricity and natural gas incentives. This coordinated approach would make it easier for customers to access incentives for both electricity and natural gas efficiency improvements, helping accelerate Kingston's progress toward its climate goals.

Enabling actions:

- **Leverage multi-utility model for integrated conservation programs:** Coordinate electricity and natural gas conservation initiatives to maximize customer benefits and program effectiveness, taking advantage of Utilities Kingston's unique position as both an electricity and natural gas distributor.
- **Advocate for federal and provincial conservation programs:** Securing additional government funding and enhancing Utilities Kingston's role in program delivery will strengthen local conservation initiatives and expand customer support options.

- **Pursue new funding opportunities and partnerships:** Building strategic partnerships and identifying new funding sources will support wider adoption of low-carbon solutions while making programs more accessible to all customers.
- **Explore demand response pilot programs:** Developing innovative demand response programs can help balance energy supply and demand while providing valuable benefits for both utility systems and participating customers.
- **Develop new financing tools:** Creating accessible financing options will help reduce upfront costs for customers, increasing program participation and expanding the reach of conservation initiatives.

Opportunity 2: Empower our customers through education and tools

For decades, Utilities Kingston has been a trusted leader in empowering customers to make informed, sustainable choices through education, resources, and one-on-one energy advising. As the energy transition accelerates, customer expectations are evolving, presenting new opportunities for Utilities Kingston to expand its offerings and coordinate with the City to increase participation in the City's CLP initiatives.

The increasing digitization of utility data and availability of high-impact, low-cost tools offer significant opportunities to empower customers. These tools can help customers control and optimize energy use in their homes, leading to the adoption of more energy-efficient behaviours and technologies. Research consistently shows that informed customers are more likely to adopt sustainable practices, benefiting both the environment and their household utility costs.

Enabling actions:

- **Evolve the current portfolio of web-based resources and tools to meet changing customer needs and expectations:** Building on real-time data initiatives like the Itron AMI 2.0 smart meter deployment and Green Button data integration, continue updating web-based resources to enable customers to have access to relevant, up-to-date information and enhanced data tools that aid them in making sustainable choices.
- **Enhance customers' experience with their bill with data and tips related to climate action and incentive programs:** Enhancing billing experience with data and tips connects customers more directly with their climate action efforts, helping them see the impact of their actions.
- **Provide internal climate change training programs to improve the overall climate literacy of our employees:** Internal climate literacy training fosters a knowledgeable workforce ready to support customers and drive sustainable practices.

- **Coordinate customer education and tools with the City to accelerate uptake:** Coordinating customer education with the City aligns messaging and programs, leading to more effective outreach and increased uptake.

Opportunity 3: Continue to modernize and innovate energy services

The electrification of transportation and building heating is central to the City's CLP climate goals, but it presents significant challenges for grid capacity and infrastructure. Research shows that optimizing the integration of electric vehicles (EVs) and heat pumps will be critical, as these technologies significantly alter daily energy demand patterns and require new approaches to managing electrical systems.

While grid planning responsibility lies primarily with provincial authorities, Utilities Kingston is uniquely positioned to bridge the gap between municipal climate goals and provincial energy planning. Utilities Kingston's expertise in both electricity and natural gas systems enables integrated planning essential for managing the pace of electrification and maintaining system reliability.

Utilities Kingston is proactively preparing for a more distributed energy future where customers generate, store, and manage their own energy. This transition requires new approaches to grid management that balance climate goals with system reliability and affordability for all customers.

Enabling actions:

- **Support the City in local and regional energy planning processes and contribute to provincial and federal energy planning:** Supporting energy planning processes ensures that local, regional, and provincial policies are aligned with our customers' needs and climate goals.
- **Pursue integrated planning opportunities between natural gas and electric utilities:** Long-term integrated planning between natural gas and electricity is crucial for maintaining the safety, reliability, and affordability of our energy systems while advancing climate action.
- **Facilitate EV infrastructure and heat pump deployment by studying the impact on the electricity and natural gas systems:** Studying the impact of EV infrastructure and heat pump deployment will ensure that demands and system capacities are understood and optimized in preparation for increased electrification.
- **Explore innovative grid management technologies:** Building on ongoing projects such as the smart meter rollout, explore smart grid technology and operating systems that can better integrate customer-owned energy resources,

manage increased electricity demand, and support the transition to low-carbon energy while maintaining reliable service.

Getting started

Utilities Kingston's approach to supporting customer climate action will focus on three key areas:

- **Building on proven success:** Start with approaches that have already worked well for customers. New programs could be assessed based on experience, resources, and ability to deliver reliable results. This practical approach helps ensure climate initiatives strengthen rather than strain existing services.
- **Equitable program development:** Ensure climate programs are accessible and affordable for all customers. Consider impacts on different customer groups and fair cost distribution to create programs that benefit all customers.
- **Customer-centred design:** Understand customer needs through ongoing engagement with diverse customer groups. Use this input to shape initiatives that deliver real value.

Pillar 3: Exploring Low-Carbon Business Ventures

The transition to a low-carbon economy represents both a challenge and an unprecedented opportunity for utilities. As Ontario's electricity demand is projected to more than double by 2050 and new policy frameworks emerge to support clean energy adoption, Utilities Kingston recognizes the potential to create innovative business ventures that generate economic value and support Kingston’s climate goals.

Emerging technologies and shifting market dynamics are reshaping the utility landscape. Operating across multiple utility sectors puts Utilities Kingston in a unique position to advance low-carbon solutions. In 2023, Utilities Kingston partnered with the Smith School of Business at Queen’s University to explore innovative climate initiatives, with eight MBA teams developing proposals for low-carbon business opportunities. Building on this foundation and drawing from industry-leading practices, Pillar 3 identifies strategic ventures that align with Utilities Kingston's operational strengths and climate objectives. Refer to Appendix C for supporting details.

Strategic opportunities

Utilities Kingston evaluated nine potential low-carbon business ventures using key criteria such as feasibility, cost, and climate impact. Of these, five were identified as

high-priority opportunities that align well with the organization’s strengths and mandate. Two additional ventures show longer-term potential and will be monitored as technologies and market conditions evolve. Two others were assessed but are not currently considered viable due to limitations in demonstrated impact and technological or market maturity.

High priority opportunities

A comprehensive evaluation identified five lower-carbon business venture opportunities for near-term exploration based on strategic fit, financial viability, and climate impact. These ventures leverage existing infrastructure and expertise, support Utilities Kingston's mandate, and demonstrate strong market potential. While additional opportunities were assessed, these five emerged as high priorities due to their unique combination of feasibility, impact, and alignment with the City's CLP.

EV charging services

As EV adoption accelerates, a comprehensive charging infrastructure becomes critical. Utilities Kingston can leverage its expertise and existing infrastructure to develop charging solutions across public, commercial, and residential sectors. This opportunity aligns with federal zero-emission vehicle (ZEV) targets while supporting grid optimization and sustainable transportation.

Potential approaches

- Develop strategic public charging networks across Kingston.
- Support private site hosts with turnkey installation and maintenance services.
- Offer residential customers accessible solutions through rental and financing programs.

Key implementation considerations

- Evaluate revenue models and expected charger utilization levels.
- Build partnerships with technology providers and site hosts.
- Phase deployment to match EV adoption rates.

Heat pump programs

Heat pumps offer an efficient pathway to reduce building emissions while maintaining customer comfort. Building on Utilities Kingston's successful appliance rental business, comprehensive heat pump programs could help overcome adoption barriers through flexible ownership and financing options.

Potential approaches

- Launch equipment rental programs with maintenance options.
- Offer on-bill financing to reduce upfront costs.
- Develop direct purchase options with installation support.

Key implementation considerations

- Assess grid capacity for electrification impacts.
- Build contractor networks and technical expertise.
- Structure programs to maintain affordability.

Energy-as-a-Service

By eliminating upfront costs and technical complexity, Energy-as-a-Service (EaaS) models can accelerate the adoption of efficiency measures across Kingston. EaaS allows customers to access energy upgrades through subscription-style services, where equipment is owned, operated, and maintained by a third party. For example, a high-efficiency boiler could be installed at no upfront cost to the customer, with an EaaS provider recovering its investment through shared energy savings. The customer benefits from upgraded equipment and stable utility costs, while the provider earns a return on the avoided energy use. This mature market offers proven approaches that complement Utilities Kingston's existing conservation programs.

Potential approaches

- Partner with established service providers.
- Develop internal project management capabilities.
- Create flexible financing solutions.

Key implementation considerations

- Focus on projects with clear economic returns.
- Build technical expertise gradually.
- Start with pilot projects to validate models.

Renewable natural gas

Renewable natural gas (RNG) represents an opportunity to reduce emissions from natural gas distribution while leveraging existing infrastructure. RNG is produced from organic waste sources such as landfills, wastewater, and agricultural operations, and can be used as a like-for-like low-carbon alternative to conventional natural gas.

Growing carbon markets and government incentives are improving project economics, creating opportunities through both direct investment and long-term supply contracts.

Potential approaches

- Support local RNG project development.
- Explore regional production opportunities.
- Secure strategic supply agreements.

Key implementation considerations

- Assess infrastructure requirements.
- Monitor policy and market developments.
- Build on lessons learned from previous initiatives.

Energy storage systems

As electricity demand grows, energy storage becomes increasingly vital for grid stability and renewable energy integration. Battery systems can provide value across utility, commercial, and residential applications while supporting electrification and peak management.

Potential approaches

- Deploy utility-scale systems for grid services.
- Develop commercial customer programs.
- Create residential storage solutions.

Key implementation considerations

- Evaluate revenue stacking opportunities.
- Build operational capabilities.
- Start with pilot-scale deployments.

Future opportunities

While not immediate priorities, two additional low-carbon ventures show promise for future consideration as markets and technologies mature.

Low-carbon district energy systems

Potential approaches:

- Identify potential districts suitable for system development.
- Explore ownership and operating models.
- Evaluate renewable energy integration opportunities.

Hydrogen production

Potential approaches:

- Monitor technology developments and market evolution.
- Explore demonstration project opportunities.
- Assess integration with existing gas infrastructure.

Additional evaluated approaches

Through the opportunity assessment process, Utilities Kingston also examined carbon capture utilization and afforestation carbon credits. While these approaches have attracted attention in climate discussions, current evidence raises concerns about their effectiveness and market integrity. Recent studies indicate challenges with verification of actual emissions reductions, and many projects have struggled to deliver promised benefits despite significant investment. These approaches may be reconsidered if technologies advance and market frameworks strengthen, but they do not currently present viable opportunities for meaningful climate action.

Getting started

Three key principles will help guide Utilities Kingston's approach to developing these ventures:

- **Structured development process:** Apply a standardized, stage-gate approach to guide project development, with clear checkpoints at each phase to assess feasibility, alignment, and risk. Build in off-ramps to pause or exit initiatives that no longer meet strategic, technical, or financial criteria, supporting disciplined and evidence-based decision-making.
- **Strategic monitoring:** Focus on priority ventures while actively tracking market and policy developments to inform timing and identify emerging opportunities. This ensures resources are directed where they can have the greatest impact.
- **Partnership development:** Success requires working with technology providers and innovation partners to access expertise and share costs. These relationships help validate new approaches while managing implementation risks.

Pillar 4: Climate-Informed Planning

Infrastructure is the backbone of community resilience. Climate change is fundamentally reshaping how critical systems are designed, maintained and operated. Rising temperatures, more extreme weather, and heavier rainfall pose significant risks to Kingston's infrastructure and essential services, with the potential for cascading impacts across interconnected systems.

As the City works towards its carbon-neutral vision, an infrastructure gap continues to widen between current system capacities and the capabilities needed to withstand future climate conditions. Recognizing that planning decisions made today will have profound implications for future generations, Utilities Kingston is committed to a proactive approach that strengthens infrastructure, manages climate risks, and supports long-term financial sustainability. Utilities Kingston's approach is informed by the principles of climate mitigation, adaptation, and resilience (see Pillar 4 Appendix D for definitions and context).

Strategic opportunities

Pillar 4 focuses on integrating climate resilience into Utilities Kingston's planning and decision-making processes. Building on organizational strengths and emerging risks, key opportunities have been identified to embed climate considerations into strategic planning, asset management, and capital planning. These opportunities, with corresponding enabling actions, support a proactive and adaptive approach to climate-informed infrastructure resilience.

Opportunity 1: Strategic planning

For decades, Utilities Kingston has prioritized climate risk management and resilience in its operations and strategic planning. As climate impacts intensify and regulations continue to evolve, planning processes must adapt to address increasingly complex challenges. Events like the 1998 ice storm underscore the value of proactive, forward-looking strategies. By embedding climate considerations into high-level planning, Utilities Kingston can ensure that climate risks and opportunities are systematically addressed across the organization.

Enabling actions:

- **Strategic plan integration:** Utilities Kingston's next strategic plan cycle presents a key opportunity to embed ESG priorities into long-term organizational strategy. Building on its foundational ESG framework and materiality assessment, the utility can formalize climate-related objectives, align resource planning with resilience and decarbonization goals, and define measurable ESG performance

indicators. Using the UN Sustainable Development Goals (UNSDGs) as a reporting lens would further support transparency and align the strategy with global sustainability standards.

- **Enhanced enterprise risk management (ERM):** Climate change introduces both physical risks from extreme weather and transition risks from evolving regulations and technologies. By expanding ERM to evaluate these risks through detailed scenario analysis, Utilities Kingston can better understand potential impacts across strategic and operational objectives. This broader perspective supports more informed decisions about resource allocation and adaptation priorities, especially for critical infrastructure and services.
- **Enterprise climate adaptation planning:** Evolving adaptation planning from individual departmental efforts to a coordinated, organization-wide strategy. Building on Utilities Kingston's emergency preparedness and asset management foundations, this approach enables the utility to identify and prioritize climate risks across all service areas, aligning actions with the ERM program to support consistent, coordinated, and cost-effective responses.

Opportunity 2: Asset management

Asset management is core to ensuring Utilities Kingston's infrastructure operates reliably for over 120,000 customers across multiple utility services. With more than 25,000 components spanning 1,000 kilometres of linear assets, climate change introduces significant new challenges. Rising temperatures, more intense storms, and shifting weather patterns accelerate wear and strain maintenance efforts. By integrating climate considerations into asset management, Utilities Kingston can safeguard essential services while making smart, forward-looking investments that benefit customers now and into the future.

Enabling actions:

- **Climate-informed governance:** Asset management requires input from diverse perspectives to balance service, cost, and risk effectively. Bringing together expertise from operations, maintenance, climate action and asset renewal teams enables better infrastructure decisions. Utilities Kingston's recent merger of asset management and climate action functions demonstrates this collaborative approach, helping to embed climate resilience into planning.
- **Level of service planning:** As climate impacts intensify, maintaining consistent service levels becomes more challenging. Infrastructure may reach capacity sooner than expected or face new risks from system interdependencies. Evaluating how climate change affects service capabilities helps Utilities Kingston identify vulnerabilities and adapt operations to protect critical services. This

includes planning for increased maintenance demands and system stress caused by extreme temperatures and weather events.

- **Climate-integrated risk management**: Traditional risk assessments prioritize asset renewal based on condition and criticality. Expanding this approach through climate vulnerability and risk assessments allows Utilities Kingston to evaluate how climate hazards, such as extreme heat, storms, and flooding, affect infrastructure performance and service delivery. A climate vulnerability and risk assessment (CVRA) framework considers exposure, sensitivity, and adaptive capacity, providing a robust basis for identifying high-risk systems and prioritizing investments.

Opportunity 3: Capital planning

Capital planning guides major infrastructure investments that will serve the City for decades to come. By incorporating climate considerations into these early planning stages, Utilities Kingston can develop infrastructure that is more resilient to climate impacts while avoiding costly retrofits in the future. This forward-looking approach ensures long-term reliability and maximizes the value of infrastructure investment.

Enabling actions:

- **Climate-resilient master planning:** Long-term infrastructure planning offers a key opportunity to integrate climate considerations into infrastructure investments. By embedding climate mitigation and adaptation criteria into decision-making and using scenario analysis, sensitivity testing, and stress testing, Utilities Kingston can assess the emissions impacts of preferred solutions, evaluate their vulnerability to future climate hazards, and ensure infrastructure remains adaptable over time, all while supporting sustainable community growth.
- **Project-level integration:** Applying a climate lens during project planning enables Utilities Kingston to assess how infrastructure projects contribute to GHG mitigation and climate resilience. Starting with a simple screening tool and evolving to more detailed analysis for higher-risk projects, this approach ensures climate risks and opportunities are considered early.
- **Development standards:** Technical standards for new infrastructure can support climate resilience goals. While Utilities Kingston has limited influence over some aspects of the development review process, it plays a key role in setting utility design requirements. By working with developers and the City to enhance these standards and applying a climate lens to general requirements, Utilities Kingston can help ensure new developments contribute to long-term system resilience and align with broader climate goals.

Getting started

Success in climate-informed planning will require attention to three key areas:

- **Building strategic redundancy:** Validate that existing resilience objectives adequately reflect climate risks and ensure emergency preparedness plans and backup systems are designed to respond to climate stresses.
- **Integrating with existing processes:** Embed climate considerations into established planning frameworks rather than creating parallel processes, leveraging upcoming strategic plan updates and master planning cycles.
- **Testing through pilot implementation:** Test new climate integration approaches through pilot projects, starting with water and wastewater asset renewal decisions to refine methods before broader implementation.

Implementation

Guiding principles

The transition from climate strategy to meaningful action requires thoughtful planning and coordinated execution. Following CALP approval, Utilities Kingston staff will develop a comprehensive implementation plan guided by five key principles:

- **Shareholder accountability:** Climate initiatives will fulfill Utilities Kingston's Strategic Plan commitment to its sole shareholder while advancing ESG priorities, ensuring climate action supports both municipal goals and responsible utility governance.
- **Service excellence:** Climate initiatives will be designed to enhance rather than compete with Utilities Kingston's core mandate of providing safe, reliable, and affordable utility services.
- **Strategic resource management:** Implementation will prioritize initiatives that deliver the highest climate impact relative to required resources, recognizing both staffing and financial constraints.
- **Customer focus:** Initiatives will be evaluated for their value to ratepayers, balancing climate benefits with equity and affordability.
- **Regulatory leadership:** Utilities Kingston will work within current regulatory frameworks while actively engaging with policymakers to shape the evolving utility sector response to climate change.

Implementation steps

Implementation will be phased and guided by the established principles, with each opportunity evaluated systematically. This includes assessing resource needs, identifying potential partnerships and funding sources, and considering regulatory and operational implications.

Experience shows that a phased implementation approach is essential for complex initiatives like the CALP. This measured approach supports testing and validation through pilot projects, learning and adjustment based on experience, allows flexibility for emerging technologies, and helps manage resource constraints.

Four key actions will move the CALP from planning to implementation:

1. **Build an implementation team:** Bring together expertise from across the organization to support coordination and knowledge sharing. This initial team will draw on existing internal resources where possible, while identifying any additional capacity or capabilities needed as the CALP work progresses.
2. **Develop a detailed implementation plan:** Define specific actions, timelines, and resource needs for each pillar.
3. **Create tracking and reporting systems:** Establish monitoring frameworks to measure progress and support data-informed decisions. Preliminary performance indicators are outlined in Section 7.3, with more detailed tracking frameworks to be developed during implementation.
4. **Launch pilot projects:** Use targeted initiatives to test new approaches, validate concepts, and guide broader implementation.

Performance monitoring

A comprehensive monitoring framework is essential to track progress, ensure accountability, and inform strategic decisions across the CALP's pillars. This data-informed approach will allow Utilities Kingston to adapt and refine initiatives based on measurable outcomes.

Performance monitoring can be focused across four key areas:

1. **Operational performance:** Tracking emissions reductions and operational efficiency improvements across facilities and infrastructure. These metrics help evaluate the effectiveness of internal climate initiatives and identify areas requiring additional focus.
2. **Customer program impact:** Measuring the success of customer climate programs through participation rates, energy savings, and customer satisfaction

will be essential. Key indicators such as the number of customers participating in energy and water conservation programs and total savings achieved through conservation initiatives can help ensure these programs are delivering meaningful value.

3. **Business venture development:** Assessing progress on low-carbon business ventures through environmental impact and business performance indicators will be crucial. Metrics like EV charging station utilization rates and customer adoption of new low-carbon technologies can guide investment decisions and evaluate each venture's contribution to climate goals.
4. **Infrastructure resilience:** Tracking how climate considerations are integrated into infrastructure planning and management. Key indicators could include the percentage of capital projects incorporating climate risk assessments and infrastructure performance during extreme weather events.

Regular tracking and reporting will enable Utilities Kingston to monitor progress, identify and respond to gaps, demonstrate value to stakeholders, inform planning and investment decisions, and ensure transparency. Refer to Appendix E for example performance metrics that could be used to track progress on climate initiatives.

Funding climate action leadership

Current funding landscape

The transition to a low-carbon future requires strategic funding approaches that balance climate impact with ratepayer equity and affordability. While government funding programs offer valuable opportunities through initiatives like Natural Resources Canada's Zero Emission Vehicle Infrastructure Program (ZEVIP), Smart Renewables and Electrification Pathways Program (SREP), the Green Municipal Fund, and the Disaster Mitigation and Adaptation Fund, these resources often shift with political priorities and can quickly become oversubscribed.

While these funding opportunities can provide substantial support for climate initiatives, to fully leverage these opportunities, organizations must also account for the staff time and resources required to track programs, prepare applications, and meet reporting obligations.

At the provincial level, conservation and demand management programs present key opportunities to advance climate goals. Advocating for expanded programs in Kingston's region could increase incentives for customers pursuing energy efficiency improvements and electrification of building heat. Complementing these government initiatives, industry partnerships, and innovative financing models like on-bill financing

can help make clean energy technologies more accessible and accelerate implementation.

For Utilities Kingston, CALP implementation will require close attention to funding opportunities while ensuring that utility services remain fair and cost-effective. Success will depend on blending diverse funding streams and maintaining the capacity to act on emerging opportunities.

Climate Action Leadership Reserve Fund

As part of its 2021-2025 Strategic Plan, Utilities Kingston committed to exploring a dedicated Climate Action Leadership Reserve Fund to support future climate initiatives. This section outlines funding approaches and key considerations for moving forward.

Currently, all proceeds from Utilities Kingston, including those from the appliance rental business and natural gas utility, are transferred to the City. The City allocates these proceeds across various reserve funds, including the City's Environmental Reserve Fund, based on its own financial planning and governance processes. Since 2003, Utilities Kingston's appliance rental proceeds alone have contributed between $250,000 and $1 million annually to the City's Environmental Reserve Fund, totalling more than $13 million to date.

Across North America, many jurisdictions have created dedicated climate reserve funds to help finance their climate goals. While some utilities have adopted rate-based approaches (e.g., Minneapolis' $1/month per household levy to fund its Climate Equity Plan), these models can present equity concerns if not carefully designed.

Rather than pursuing new rate-based charges, Utilities Kingston may be able to support a more equitable model by exploring the use of existing or future proceeds from its operations, such as the appliance rental business or potential new lower-carbon ventures, to support climate initiatives that directly benefit utility customers.

In partnership with the City, Utilities Kingston could:

- **Collaborate with the City:** To explore directing a portion of Utilities Kingston's proceeds towards a dedicated Utilities Kingston Climate Action Leadership Reserve Fund that supports climate initiatives benefiting ratepayers.
- **Work with the City to optimize the City's Environmental Reserve Fund:** By helping to align its management with City and ratepayer priorities and maximize its impact on ratepayer climate initiatives when possible.
- **Establish a new reserve fund using future proceeds from lower-carbon business ventures:** Providing a long-term, self-sustaining funding source for climate action without increasing costs to ratepayers.

Ultimately, decisions about how climate initiatives are funded fall under the City's authority. Utilities Kingston will continue to support this process by identifying funding needs and providing analysis to help guide investment decisions. While final decisions rest with the City, Utilities Kingston sees strong potential for operational proceeds to help advance carbon neutrality goals and is committed to working in partnership with the City on innovative, community-focused funding approaches.

Conclusion

Utilities Kingston's CALP sets a clear path for advancing climate goals while maintaining the organization's commitment to safe, reliable, and affordable services. Grounded in four strategic pillars, the plan responds to both immediate and long-term climate challenges with actionable solutions that support Kingston's vision for a carbon-neutral future.

Achieving this vision will require sustained collaboration among governments, regulators, customers, and community partners. By balancing climate impact with affordability and exploring strategic funding mechanisms such as a dedicated Climate Action Leadership Reserve Fund, the plan provides a practical, financially responsible approach to climate action.

With this foundation in place, Utilities Kingston is ready to move forward from planning to implementation, advancing the CALP through informed investment, strategic partnerships, and integrated operational planning.

Appendix A: Pillar 1 – Reducing Operational GHG Emissions

Overview

This appendix provides supporting detail for Pillar 1 of the Climate Action Leadership Plan (CALP), which focuses on assessing Utilities Kingston's operational GHG emissions reduction potential. It outlines the shareholder commitments that prompted the development of Pillar 1, summarizes key findings from the emissions inventory and carbon reduction analysis, and highlights the challenges and opportunities related to fugitive and non-fugitive emissions.

Shareholder commitment and strategic context

Utilities Kingston's 2021-2025 Strategic Plan, under Theme 6, Initiative 4, includes the following commitment:

"Develop and obtain approval of a Utilities Kingston Climate Action Leadership Plan by the end of 2025. This plan will identify the financial resources required in the 2027-2030 capital budget to achieve carbon-neutral operations by 2040."

This initiative reflects three key commitments made to Utilities Kingston's shareholders:

1. Deliver a Climate Action Leadership Plan by the end of 2025.
2. Identify the financial resources required in the 2027-2030 capital budget to support carbon neutrality.
3. Demonstrate a clear pathway toward carbon-neutral operations by 2040 through planning and resource identification.

Advancing the commitment through Pillar 1

Utilities Kingston has delivered on the first commitment: preparing a Climate Action Leadership Plan. However, Pillar 1's GHG inventory and carbon reduction analysis revealed that Utilities Kingston's largest emissions sources, primarily fugitive emissions, lack clear mitigation options. At this stage, there is no viable pathway to achieve carbon-neutral operations without significant reliance on carbon offsets. As a result, capital budget needs cannot yet be fully defined.

Despite these challenges, Pillar 1 provides a foundation for near-term investment planning by distinguishing between emissions that can be addressed with known technologies (i.e., non-fugitive emissions) and those requiring further analysis and innovation (i.e., fugitive emissions and line losses).

Study scope and methodology

The development of Pillar 1 included the following activities by Utilities Kingston's consultant, J.L. Richards & Associates Ltd. (JLR):

- A jurisdictional scan of decarbonization actions completed by similar utility companies to assess industry trends towards climate action planning, specifically including technological and innovative initiatives and climate targets.
- A holistic accounting of Utilities Kingston's emissions including the development of a baseline year to compare against future inventories and "present-day" emissions inventory to complete a more current assessment.
- Carbon reduction measures (CRMs) were developed based on industry experience and research material found within the jurisdictional scan. These measures included high-level cost estimates, utility savings, and carbon emission savings.

Emissions factors

Emission factors from the 2023 National Inventory Report were applied to calculate carbon dioxide equivalent (CO_2e) as follows:

- Electricity: 0.030 kg CO_2e/kWh (2018)
- Natural Gas: 1.921 kg CO_2e/m^3 (2018)

Fugitive emissions analysis

Utilities Kingston’s operational GHG emissions include several types of gases, each with different global warming potential (GWP). GWP is a measure of how much heat a GHG traps in the atmosphere relative to carbon dioxide (CO_2), which has a GWP of 1. Methane (CH_4) has a GWP of 28, and nitrous oxide (N_2O) has a GWP of 265, according to the 100-year values published by the Intergovernmental Panel on Climate Change (IPCC). These differences mean that even small volumes of high-GWP gases can contribute significantly to overall emissions when expressed as carbon dioxide equivalent (CO_2e).

This section outlines the major sources of fugitive emissions in Utilities Kingston’s operations and the methodologies used to estimate them. Emissions were calculated by JLR using emission factors from the 2023 National Inventory Report and reflect both directly measured data and theoretical calculations where direct measurement is not possible.

Methane emissions

The primary contributors to fugitive methane emissions in Utilities Kingston's operations are losses from the natural gas distribution system and incomplete combustion of biogas at the Ravensview and Cataraqui Bay Wastewater Treatment Plants. These sources differ in scale and nature, but together shape Utilities Kingston's overall methane emissions profile.

With a GWP 28 times higher than carbon dioxide, even small methane losses result in large emissions when expressed as carbon dioxide equivalent. Improving monitoring and measurement of these emissions is a key priority to support actionable reduction strategies and to establish reliable baselines for tracking progress over time.

Fugitive methane emissions from the natural gas system were calculated following Ontario Regulation 390/18. Losses can occur through several pathways, including pipeline leaks, third-party damage, pressure regulation activities, and venting during flaring or pipeline blowdowns.

Biogas produced at the Ravensview and Cataraqui Bay Wastewater Treatment Plants is either flared, combusted in boilers, or used for cogeneration. While biogas combustion is generally considered carbon neutral (as it results from anaerobic digestion), incomplete combustion can release residual methane into the atmosphere. Combustion efficiency varies by application: 96% for flaring, 98% for boilers, and 99.5% for turbines. Although this source represents a smaller share of Utilities Kingston's total methane emissions, it remains an important area for monitoring and potential improvement.

Nitrous oxide emissions

Nitrous oxide is a by-product from the nitrifying process that removes ammonia from sewage during secondary treatment. This process is necessary to achieve effluent compliance limits for ammonia as mandated by the Ministry of Environment, Conservation and Parks (MECP). Calculations are based on average daily flow and nitrogen content in influent and effluent. Ravensview and Cataraqui Bay Wastewater Treatment Plants use biological aeration filter (BAF) processes that are likely better with respect to nitrous oxide emissions compared to conventional treatment methods.

Sulphur hexafluoride from electrical equipment

Sulphur hexafluoride (SF_6) is an insulating gas in electrical equipment such as circuit breakers and switchgear that leaks into the environment. Utilities Kingston's SF_6 emissions are calculated based on the Independent Electricity System Operator's (IESO) reported provincial SF_6 emissions and Utilities Kingston's proportional share based on line losses.

Carbon reduction measures, costs and GHG savings

CRMs were developed by JLR for major end-uses identified from Utilities Kingston's operations and grouped into categories spanning building conservation, fleet decarbonization, renewable energy systems, and efficiency improvements across all utility operations. Carbon offsets were also included to balance out remaining emissions and achieve carbon neutrality. For each CRM, high-level estimates were developed for capital costs, utility savings, GHG savings and estimated measure lifetimes.

The analysis identified potential to reduce up to 80% of non-fugitive emissions by 2040 using commercially available solutions, requiring capital investments of $50 to $100 million above business-as-usual spending. The reduction potential of fugitive emissions remains to be determined due to data collection and technology readiness challenges.

Based on the lifecycle cost and GHG reduction, the marginal abatement cost (MAC) for each CRM was calculated. Figure 3 illustrates the MAC curve providing a comparative view of cost-effectiveness across CRMs for reducing GHG emissions.

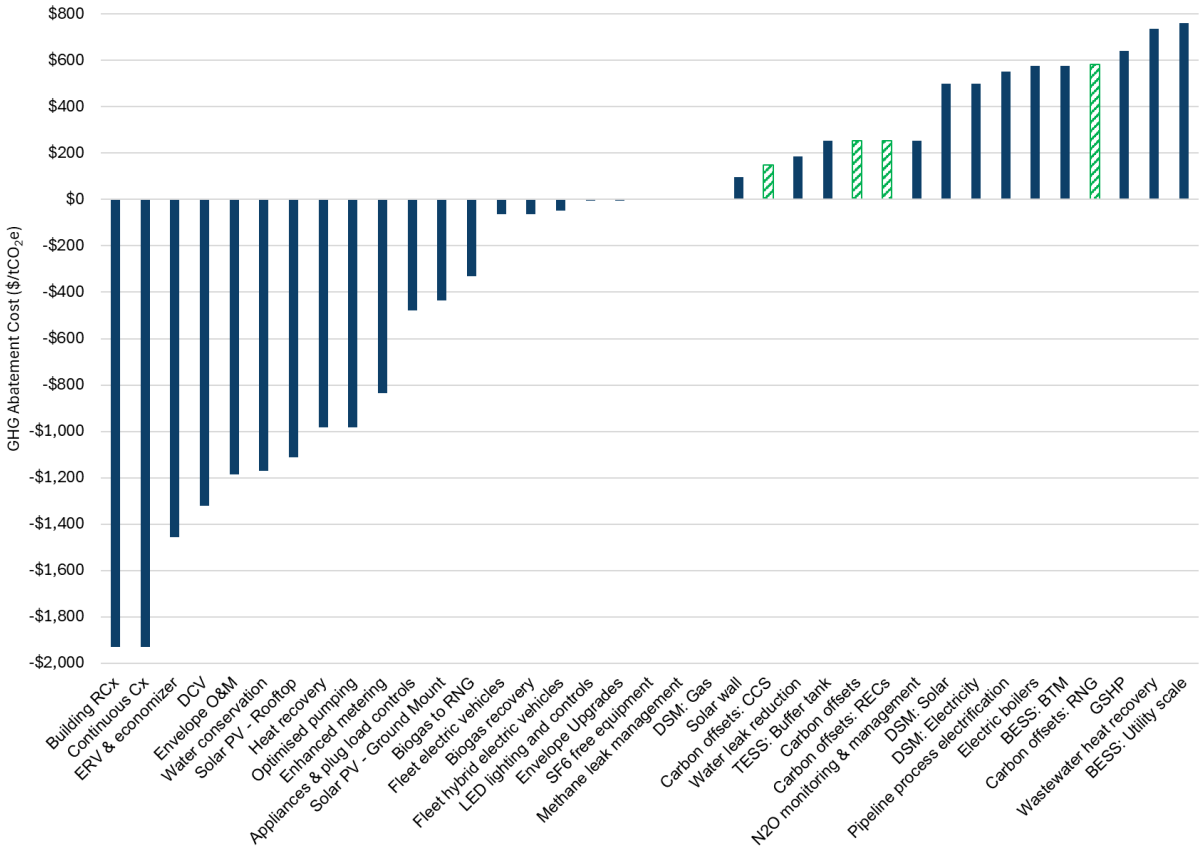

Figure 3: Marginal abatement costs for carbon reduction measures.[1]

[1] J.L.Richards & Associates Ltd., Utilities Kingston Climate Action Leadership Plan: Pillar 1 – Reducing GHG Emissions, 2025.

Implementation guidance and timeline

The following presents general guidance from the consultant's assessment on how to prioritize investment in the proposed CRMs:

- Best practices for achieving net-zero carbon emissions prioritize actions in the following order: first, avoid emissions through energy conservation, energy efficiency, fuel switching, and renewable energy generation; then, use Renewable Energy Certificates (RECs) if needed; and finally, rely on non-RECs carbon offsets only as a last resort.
- CRMs with the lowest MAC should be implemented first as they provide the fastest return on investment and typically have lower implementation costs.
- From a return on capital investment, it is desirable to implement all CRMs with a MAC that is less than $\$0/tCO_2e$.
- CRMs that have a MAC that is greater than $\$0/tCO_2e$ but still less than the price of a high-quality carbon offset should be implemented before purchasing offsets, as the CRMs will eventually provide a return on investment compared to the continuous costs of purchasing offsets. Investments in CRMs also have less of the risks associated with carbon offsets, including price volatility, additionality and persistence.

The implementation of the measures was decided by categorizing CRMs as either immediate, near-term, medium-term, or long-term:

- **Immediate (2025):** CRMs that are categorized as immediate measures can be implemented quickly with little to no additional cost or planning, as they rely on existing staff and resources to implement.
- **Near-term (2026-2029)**: CRMs that are categorized as near-term are still relatively easy and cost-effective to implement, but require some additional lead time due to the need for additional planning and procurement.
- **Medium-term (2030-2035):** CRMs that are categorized as medium-term will generally require more planning, including potentially feasibility analysis and engineering design. Many of these measures will need to be undertaken when equipment reaches end of life, such as major HVAC and building envelope upgrades, which means that the timeline for implementation of specific projects is dependent on the condition and remaining useful life of existing assets.
- **Long-term (2036-2040):** CRMs that are categorized as long-term include measures that are delayed due to the technology being in development or an early stage of adoption.

Appendix B: Pillar 2 – Supporting Climate Action

Overview

This appendix provides supporting details for Pillar 2 of the Climate Action Leadership Plan (CALP). It includes an overview of how Pillar 2 aligns with the City's Climate Leadership Plan (CLP) objectives, examples of leading climate action initiatives from other utilities, and key systemic barriers and opportunities. These elements help explain the development of Pillar 2 strategies and their potential implementation.

Alignment with City of Kingston Climate Leadership Plan

Utilities Kingston's Pillar 2 strategy supports the City's CLP by advancing targeted opportunities and enabling actions that align with the City's climate priorities. Table 6 demonstrates how each Pillar 2 opportunity contributes to the City's CLP objectives by linking enabling actions to measurable climate outcomes.

Table 6 – Pillar 2 alignment with the City's Climate Leadership Plan

City CLP Objective	Pillar 2 opportunity	Enabling actions	Expected outcomes
Objective 1: Accelerate local production of renewable and low-carbon energy & energy storage	Opportunities 1, 2, and 3	· Support local and regional energy planning · Explore decentralized energy systems · Pursue integrated utility planning · Investigate local renewable energy opportunities	· Expand local renewable energy generation · Enhance grid flexibility and resilience · Enable energy storage and demand-side management
Objective 2: Support Kingston residents to invest in low-carbon retrofits for their homes	Opportunities 1, 2, and 3	· Advocate for conservation programs · Pursue funding · Develop new financing tools · Enhance customer education on retrofits · Provide internal climate training · Support integrated energy planning	· Increase financial incentives · Make energy efficiency upgrades accessible · Expand customer support and education on retrofits · Optimize grid integration of heat pumps

City CLP Objective	Pillar 2 opportunity	Enabling actions	Expected outcomes
Objective 3: Partner with Kingston businesses to retrofit and fuel-switch existing commercial buildings	Opportunities 1 and 3	· Support local energy planning · Pursue integrated utility planning · Explore decentralized energy systems · Study electrification and heat pump impacts	· Facilitate commercial building decarbonization · Support energy system transformation · Explore innovative low-carbon technologies
Objective 8: Transition to electric- and renewably-powered vehicles	Opportunities 2 and 3	· Support local and regional energy planning · Enhance customer education on EVs · Study EV infrastructure and impacts	· Prepare energy systems for electrification · Enable EV adoption · Optimize grid integration of EVs

Strategic context and system barriers

Utilities Kingston operates within a complex regulatory, technical, and economic landscape that shapes its ability to support community climate action. Several key barriers influence the design and implementation of Pillar 2 strategies:

Regulatory & policy uncertainty

Ontario lacks a clear, coordinated policy framework to guide utilities through the energy transition. Regulations were designed for centralized energy systems and have not yet evolved to fully support decarbonization, distributed energy, or customer-driven solutions. The absence of long-term regulatory certainty makes it difficult for utilities to plan and invest in low-carbon infrastructure, conservation programs, and emerging technologies.

Coordinated decarbonization and the energy transition

Decarbonization and electrification are advancing rapidly, but without integrated planning between the electric grid and natural gas system, the transition risks becoming inefficient, costly, and inequitable. Utilities must carefully balance grid expansion, demand-side management, and the strategic phase-out of fossil fuel infrastructure to avoid stranded assets and ensure affordable energy access for all ratepayers.

Currently, there is no clear provincial strategy for aligning electrification efforts with gas system planning, leaving utilities without guidance on when and how to shift from

natural gas to electricity. Without a coordinated approach, costs could fall disproportionately on vulnerable customers, those least able to afford fuel-switching upgrades, while maintaining parallel gas and electricity infrastructure could lead to unnecessary expenses for all ratepayers.

A well-planned transition requires phased electrification strategies, demand management programs, and equitable cost-sharing mechanisms to ensure that decarbonization is efficient, coordinated, and fair.

Grid capacity & electrification demands

Like other municipalities across Ontario, Kingston will need to significantly expand its energy system to support electrification, but infrastructure upgrades require long planning and approval timelines. Provincially, the Independent Electricity System Operator (IESO) projects that Ontario's grid must more than double in capacity by 2050, requiring investments in the hundreds of billions. However, local distribution networks across the province, including Kingston's system, face additional challenges, such as capacity constraints, aging infrastructure, and the need to coordinate system upgrades with projected growth. Without a phased approach, both provincial and local grid constraints could slow the transition, making it difficult for municipalities to meet increasing demand from building electrification, industrial decarbonization, and transportation electrification.

Distributed energy resources & grid integration

As more customers install rooftop solar, battery storage, and EV chargers, the grid must adapt to bi-directional energy flows. However, traditional distribution systems were designed for one-way power delivery, meaning new grid management tools and regulatory frameworks will be needed to fully integrate distributed energy resources (DERs) and flexible demand-side resources. Kingston Hydro is exploring the transition toward distribution system operator (DSO) capabilities with the Ontario Energy Board (OEB) to better manage these evolving grid challenges, which may support future customer climate programs and low-carbon business ventures.

Conservation and demand management evolution

Conservation and demand management (CDM) programs are a key tool for reducing emissions and managing costs. The RBC Climate Action Institute estimates that by 2040, conservation could meet 20% of Ontario's electricity demand growth, saving ratepayers $500 million annually in avoided generation costs. However, unlocking this potential requires significant investment. The IESO projects $6.25 billion will be needed between 2023 and 2035 for program delivery, capability building, and marketing.

Stakeholders have been calling for changes to address funding gaps and regulatory misalignment with previous CDM frameworks, advocating for expanded programs and better coordination between electricity and natural gas conservation efforts. In response, post-2024, a new enduring Demand Side Management (eDSM) model is being implemented by the IESO and its partners, including Kingston Hydro. This tailored approach prioritizes collaboration, adaptability, and measurable outcomes to reduce peak energy demand and support climate goals. Kingston Hydro will leverage Stream 1 funding starting in 2025 and Stream 2 funding in 2026 for localized program management and customer-centric service delivery. The three-year funding period enables sustainable program administration and increased collaboration between system operators and customers while addressing both provincial and local energy challenges. This new enduring model is part of a longer 12-year commitment to addressing both provincial and localized system needs.

Low-carbon fuel transition

While low-carbon fuels like renewable natural gas (RNG) and hydrogen are emerging solutions, their availability and infrastructure remain limited. Ontario has no binding targets for RNG and only a nascent hydrogen strategy, creating uncertainty about how these fuels will fit into long-term decarbonization efforts.

Social equity and affordability

Projected rate increases,17% for residential, 21% for commercial, and 26% for industrial customers by 2035, will make affordability a growing concern. Low-income customers face greater barriers to adopting energy efficiency and electrification solutions, meaning programs must be designed to support accessibility and equitable participation.

Leading examples in climate action

Utilities across North America are implementing innovative strategies to help customers reduce emissions, improve energy efficiency, and transition to cleaner energy sources. While operating under different regulatory frameworks and market conditions, these programs demonstrate how utilities can drive meaningful climate action while maintaining reliability and affordability. Each example offers insights that can inform Utilities Kingston’s approach to customer-focused climate action.

Opportunity 1: Energy efficiency and water conservation

Programs that reduce energy and water consumption are among the most cost-effective climate actions. Utilities are developing incentives, financing programs, and direct service offerings to help customers adopt efficiency measures.

- **Washington Gas - Smart Energy Rewards Program:** A demand response initiative that helps customers reduce natural gas consumption during peak periods by adjusting thermostat settings during high-demand hours to reduce strain on gas supply and lower GHG emissions.
- **Énergir - Efficient Construction and Renovation Program:** Provides targeted incentives for building energy efficiency improvements beyond standard requirements. Encourages projects to be 5% more efficient than the National Energy Code and focuses on thermal envelope improvements to reduce heating demand.
- **New Jersey Natural Gas - SAVEGREEN Program:** A comprehensive energy efficiency initiative that removes barriers for customers. Offers no-cost home energy checkups and efficiency kits with 0% financing for efficiency upgrades. Includes a moderate-income weatherization program for underserved customers.

Opportunity 2: Customer education and tools

Providing customers with better information and decision-making tools helps increase adoption of clean energy solutions.

- **Con Edison - Hosting Capacity Maps for Distributed Energy Resources (DERs):** An Interactive mapping tool that helps customers and developers identify optimal locations for solar, battery storage, and other DERs. Improves grid transparency by showing where new projects can connect and helps streamline interconnection decisions.
- **Saint John Energy - Home Heat Saver**: Uses thermal imaging technology to help homeowners see where their buildings lose heat and target efficiency upgrades. No-cost program offered in partnership with MyHEAT and Natural Resources Canada. Helps customers reduce heating costs and improve home comfort.
- **PG&E - Energy Management Tool Lending Library:** Allows customers to borrow professional-grade energy assessment tools to analyze their energy use. Free program to support DIY efficiency projects that includes guidance on using tools effectively for energy reduction.

Opportunity 3: Modernizing and innovating energy services

Utilities are expanding EV infrastructure, piloting district energy systems, and integrating distributed energy solutions to support electrification and grid decarbonization.

- **Nova Scotia Power - EV Fast-Charging Network:** Developed a coast-to-coast network of Level 3 fast chargers to accelerate EV adoption. Provides 30-minute

fast charging to improve convenience for drivers. Enables grid impact studies on EV charging patterns.

- **Halifax Water - Cogswell District Energy System:** Deploying an ambient temperature district energy system that integrates wastewater treatment with energy production. Uses treated effluent to provide low-carbon heating to support urban redevelopment with sustainable infrastructure.
- **Saint John Energy - Heat Pump Rental Program:** Breaks down financial barriers by offering affordable monthly heat pump rentals with maintenance included. Expands access to low-carbon heating for all ratepayers. Rentals start at $52 per month, lowering upfront costs.
- **Enbridge Sustain - Integrated Energy Solutions:** A comprehensive, behind-the-meter energy transformation service for customers. Focuses on geothermal, hybrid heating, solar, and EV charging and supports multi-unit and community-scale projects.

Key takeaways from leading examples

Across North America, utilities are finding creative ways to support customers in climate action and the energy transition. While each operates in a unique regulatory environment, several key themes emerge that can inform Utilities Kingston's approach:

- **Make low-carbon solutions accessible:** Financial incentives, low-cost rental models, and direct assistance programs help reduce barriers to participation.
- **Go beyond technology:** Offer guidance and support. Successful programs include education, financing, and long-term customer engagement, not just new equipment.
- **Adapt to local contexts:** Programs should be flexible enough to address local challenges and customer needs.
- **Integrate education, incentives, and infrastructure**: The most effective strategies combine technology deployment, customer education, and financing mechanisms.

These insights help shape Pillar 2's approach by reinforcing the importance of practical, customer-focused strategies that reflect emerging best practices.

Customer-centric engagement

For climate action initiatives to be successful and widely adopted, utilities must actively support, inform, and engage customers throughout the energy transition. Research by Ernst & Young across 18 global markets found that 81% of customers look to their

energy providers first when considering new energy solutions. Customers increasingly seek tools, incentives, and personalized guidance to help them understand the financial and environmental impact of new technologies.

However, experience has shown that technology alone does not drive behaviour change. For example, smart metering rollouts have demonstrated that simply deploying new systems is not enough; customers need clear, tailored information to make informed decisions about their energy use. To bridge this gap, utilities are redefining customer engagement strategies to move from passive service providers to active energy partners.

- **Toronto Hydro - Climate advisory services:** Toronto Hydro is developing a climate advisory model to provide customers with personalized planning support for building electrification, solar installation, and energy efficiency upgrades. This builds on years of Conservation and Demand Management (CDM) experience and aims to make low-carbon solutions more accessible.
- **Xcel Energy - Transforming customer engagement:** Xcel Energy overhauled its customer approach over four years, shifting from commodity-based service delivery to personalized energy coaching and smart home integration. The goal was to help customers navigate their energy choices through proactive engagement and interactive tools.
- **Alectra - Engaging customers on grid modernization:** To support grid modernization investments, Alectra developed customer engagement workbooks to gather feedback on infrastructure priorities. This approach helped build public support for system upgrades and ensured that customer concerns and needs were reflected in decision-making.

As Utilities Kingston advances its climate action strategy, balancing expanded service offerings with affordability will be critical. Success depends on understanding and reducing barriers to customer participation, whether through clearer education, targeted incentives, or simplified adoption pathways. Effective engagement is not just about providing information; it is about making climate action practical, affordable, and accessible for all customers.

Appendix C: Pillar 3 – Exploring Low-Carbon Business Ventures

Overview

Pillar 3 explores opportunities for Utilities Kingston to develop lower-carbon business ventures that align with its core mandate while advancing Kingston's climate goals. As the utility sector evolves, many utilities are expanding their role beyond traditional service delivery to support electrification, energy efficiency, and low-carbon fuel alternatives.

This appendix outlines how these business ventures align with the City's Climate Leadership Plan (CLP), details the evaluation process used to assess alignment with Utilities Kingston's strategic objectives, and highlights top-ranked opportunities that could support Kingston's energy transition.

Through targeted business ventures, Utilities Kingston can help customers reduce emissions, improve energy resilience, and create new revenue streams that sustain affordable and reliable utility services.

Alignment with City of Kingston Climate Leadership Plan

Pillar 3 supports the City's CLP by identifying business ventures that reduce emissions, enhance energy efficiency, and expand clean energy access. Unlike other climate initiatives that may focus more on policy or infrastructure upgrades, these ventures present market-driven pathways to achieving Kingston's climate goals while ensuring economic sustainability for Utilities Kingston. Table 7 outlines which Pillar 3 opportunities align with the City's CLP objectives, including potential approaches and expected outcomes.

Table 7 – Pillar 3 alignment with the City's Climate Leadership Plan

City CLP Objective	Relevant Pillar 3 opportunity	Potential approaches	Expected outcomes
Objective 2: Support Kingston residents to invest in low-carbon retrofits for their homes	Heat pump programs, Energy-as-a-Service	Utility-led financing, rental models, demand aggregation for bulk procurement	Increased adoption of efficient heating systems, reduced building-sector emissions, and lower long-term energy costs
Objective 3: Partner with businesses to retrofit and fuel-switch existing commercial buildings	Energy-as-a-Service, district energy systems	Performance-based contracting, shared savings models, infrastructure co-development	Large-scale commercial energy efficiency improvements and reduced reliance on fossil fuel-based heating
Objective 6: Produce renewable natural gas locally from waste sources and encourage adoption of other low-carbon fuels	Renewable natural gas, hydrogen production	Waste-to-energy agreements, grid integration studies, co-investment with industry	Reduced methane emissions, circular economy benefits, and transition to cleaner fuel alternatives
Objective 8: Transition to electric and renewably powered transportation	EV charging services	Utility-owned and third-party charging networks, smart charging incentives, fleet electrification partnerships	Increased EV adoption, improved charging accessibility, and optimized grid integration for transportation electrification
Objective 9: Support carbon sequestration and natural climate solutions	Carbon capture utilization, afforestation carbon credits	Research partnerships, voluntary offset programs, integration with regional carbon markets	Increased offsetting of residual emissions, enhanced local ecosystem resilience, and compliance with evolving climate regulations

Opportunity assessment

Utilities Kingston used a structured, four-step process to evaluate and prioritize potential low-carbon business ventures based on strategic alignment, financial viability, feasibility, and climate impact. This assessment ensures that investments align with Utilities Kingston's mandate while supporting Kingston's climate goals.

1. **Initial research:** Conducted a literature review and jurisdictional scan to identify market trends and emerging technologies. This phase also included input from the Smith School of Business and interviews with industry experts to better understand feasibility, risks, and business models.
2. **Pre-assessment**: The CALP project team conducted an initial ranking of opportunities based on feasibility, potential impact, and alignment with Kingston's climate goals.
3. **Stakeholder input**: Held two workshops with Utilities Kingston staff and City representatives to refine rankings and validate key considerations.
4. **Final ranking**: Opportunities were scored and prioritized based on six evaluation criteria, ensuring that the highest-ranked options offer both climate and business value.

Rating & ranking rationale

Each opportunity was first rated across six evaluation criteria: cost, profit potential, feasibility, climate impact, CLP alignment, and Utilities Kingston alignment. Higher ratings indicate stronger alignment or performance in these key areas.

Opportunities were then ranked based on their overall ratings, with Utilities Kingston alignment used as a tiebreaker in cases where total scores were equal, such as EV Charging Services and Heat Pump Programs. This approach ensures that the most strategically relevant opportunities receive priority consideration.

Table 8 presents the final ranking, summarizing the investment requirements, challenges, and strategic advantages of each opportunity.

Table 8: Pillar 3 low-carbon business venture opportunity assessment summary

Rank	Opportunity	Cost	Profit potential	Feasibility	Climate Impact	CLP alignment	Utilities Kingston alignment	Rationale
1	EV charging services	$$	Moderate	Moderate	High	High	High	Moderate investment required with existing infrastructure. Revenue potential limited by current low charging demand. Technically feasible with clear climate benefits and strong alignment with City and utility goals.
2	Heat pump programs	$$	High	Moderate	High	High	Moderate	Leverages existing rental business model. Strong revenue potential through various service models. Moderate implementation challenges due to grid capacity and customer awareness. Significant climate impact with some operational constraints.
3	Energy-as-a-Service	$$$	High	Moderate	High	High	High	Requires significant investment and technical expertise. Mature market with strong revenue potential. Moderate implementation complexity. Substantial climate impact through large-scale efficiency improvements. Strong alignment with utility and City objectives.
4	Renewable natural gas	$$$	Moderate	Moderate	High	High	High	Substantial investment needed. Moderate revenue potential constrained by feedstock availability. Technically feasible with significant climate benefits. Strong alignment with local waste-to-energy objectives.

Rank	Opportunity	Cost	Profit potential	Feasibility	Climate Impact	CLP alignment	Utilities Kingston alignment	Rationale
5	Energy storage systems	$$$	Moderate	Moderate	High	High	High	Significant capital investment required. Moderate revenue potential through grid services. Complex market rules create implementation challenges. Critical for renewable energy integration with strong strategic alignment.
6	Low-carbon district energy	$$$	Low	Low	High	Moderate	Moderate	Extremely high capital costs. Limited revenue potential. Complex implementation with long-term payback. Significant climate impact despite challenges. Partial alignment with City and utility objectives.
7	Hydrogen production	$$$	Low	Low	Moderate	Moderate	Moderate	High investment with uncertain returns. Emerging technology with limited current market. Significant technical and regulatory barriers. Moderate climate impact and strategic alignment.
8	Afforestation credits	$$	Low	Moderate	Moderate	Moderate	Low	Moderate investment with minimal revenue potential. Limited climate impact. Partial alignment with City objectives. Low strategic fit for utility operations.
9	Carbon capture utilization	$$$	Low	Low	Moderate	Moderate	Low	Extremely high investment with uncertain returns. Significant technological and market barriers. Moderate climate impact with minimal strategic alignment.

Limitations of current assessment

While this assessment provides a structured evaluation of low-carbon business opportunities, several limitations should be acknowledged:

- **Market and policy uncertainty**: Emerging technologies and regulatory frameworks are evolving, which may impact feasibility and investment potential over time.
- **Data availability**: The analysis relied on data available at the time, meaning recent market shifts, policy changes, or technological advancements may not be fully reflected.
- **Subjectivity in scoring**: While the rating and ranking system was systematic, some qualitative judgments were necessary, particularly when assessing feasibility and alignment with Utilities Kingston's mandate.
- **Time constraints**: The evaluation was conducted within a defined timeframe, limiting the ability to explore long-term risks, funding mechanisms, and emerging opportunities in detail.

Future refinements should incorporate updated market research, additional stakeholder engagement, and ongoing policy developments to ensure that investment decisions remain relevant and strategically sound.

Top-ranked opportunities

The following opportunities stand out for their strategic value, feasibility, and potential impact. Each summary highlights key benefits, challenges, and why it ranks as a priority for Utilities Kingston.

1. Electric vehicle (EV) charging services

Strategic value: With transportation as Kingston's largest source of emissions, expanding EV charging infrastructure is a critical intervention. This opportunity goes beyond infrastructure installation; it positions Utilities Kingston as a key enabler of transportation electrification, leveraging its electrical distribution expertise to support grid optimization and EV adoption.

Implementation challenges:

- **Current demand is low**: Public charging utilization remains limited in Kingston, potentially affecting revenue generation.
- **Government funding uncertainty:** The financial model may rely on grants, incentives, or partnerships, which are subject to policy changes.

- **Variable installation costs:** Site-specific factors (e.g., power availability, permitting) can increase costs and complexity.

Why it is a top-ranked opportunity: Despite these challenges, the long-term market outlook is strong, with increasing EV adoption, regulatory support, and customer demand. Utilities Kingston has a unique advantage in developing charging solutions that integrate with local grid management strategies.

2. Heat pump programs

Strategic value: With buildings accounting for a major share of Kingston's emissions, heat pump programs present a high-impact opportunity for decarbonizing residential and commercial energy use. Utilities Kingston can build on its existing rental business model to offer heat pump installations, financing options, and hybrid heating solutions.

Implementation challenges:

- **Grid capacity constraints:** Widespread heat pump adoption could strain the local grid, requiring infrastructure planning.
- **Customer education needed**: Many property owners are unfamiliar with heat pump technology, which could slow adoption.
- **Diverse installation conditions:** Building type and existing heating systems impact feasibility and program scalability.

Why it is a top-ranked opportunity: Heat pumps provide one of the most cost-effective pathways for building sector decarbonization, and Utilities Kingston can play a leadership role in driving market adoption while mitigating grid impacts through smart planning.

3. Energy-as-a-Service (EaaS)

Strategic value: EaaS is an emerging business model that removes financial and technical barriers for energy efficiency upgrades. It enables large-scale retrofits, demand management, and smart energy solutions, making it a powerful tool for deep carbon reductions across residential, commercial, and industrial sectors.

Implementation challenges:

- **High capital requirements:** EaaS models require significant upfront investment, which may be a barrier to scaling.
- **Complex contract structures:** Long-term agreements involve legal, financial, and operational considerations.

- **Market variability:** The business case depends on energy savings, which can fluctuate based on pricing and policy changes.

Why it is a top-ranked opportunity: Despite its complexities, EaaS presents an opportunity for Utilities Kingston to generate new revenue streams while enabling energy efficiency at scale. It is widely used in global markets and aligns well with decarbonization policies.

4. Renewable natural gas (RNG)

Strategic value: RNG provides a low-carbon alternative to conventional natural gas, supporting Kingston's waste-to-energy and circular economy goals. Utilities Kingston could explore partnerships with local waste processors and industry stakeholders to integrate RNG into the existing gas network.

Implementation challenges:

- **High production costs:** RNG production is capital-intensive, requiring significant infrastructure investment.
- **Feedstock availability:** The viability of RNG depends on access to organic waste sources.
- **Policy and market uncertainty:** Ontario does not yet have strong RNG adoption targets or incentives.

Why it is a top-ranked opportunity: RNG aligns with existing infrastructure and long-term decarbonization goals. While barriers exist, Utilities Kingston can position itself for future market opportunities as the regulatory environment evolves.

5. Energy storage systems

Strategic value: As Kingston transitions to higher renewable energy integration, energy storage will play a critical role in grid reliability and flexibility. Storage can support peak demand management, distributed energy resources (DERs), and resilience planning.

Implementation challenges:

- **High capital investment:** Battery storage and other storage technologies require significant upfront costs.
- **Regulatory barriers:** Ontario's market rules and grid regulations may not fully support distributed storage.
- **Market uncertainties:** Storage revenue models are still evolving, particularly for municipal utilities.

Why it is a top-ranked opportunity: Despite regulatory hurdles, storage is key to enabling Kingston's long-term energy transition. Utilities Kingston can explore pilot projects, partnerships, and evolving business models to gain a first-mover advantage.

Lower-ranked opportunities

While the following opportunities did not score as high, they still represent potential future considerations. A reason for their lower ranking is noted:

- **Low-carbon district energy:** Requires high capital investment and anchor customers to be viable.
- **Hydrogen production**: Market and infrastructure uncertainties limit short-term feasibility.
- **Afforestation carbon credits**: Minimal direct revenue for Utilities Kingston, though it provides climate benefits.
- **Carbon capture utilization**: High costs, technical barriers, and an unclear business model for a municipal utility.

Appendix D: Pillar 4 – Climate-Informed Planning

Overview

Pillar 4 of the Climate Action Leadership Plan (CALP) focuses on integrating climate considerations into Utilities Kingston's planning processes to enhance resilience, sustainability, and long-term service reliability. While some climate adaptation and mitigation efforts are already in place, Pillar 4 establishes a structured approach to systematically incorporate climate risks and opportunities across high-impact planning activities. This appendix details how climate resilience is embedded in decision-making, how it aligns with the City's Climate Leadership Plan (CLP), and key financial and infrastructure considerations that support implementation.

Alignment with City of Kingston Climate Leadership Plan

Pillar 4 supports Objective 10 of the City's CLP, which emphasizes proactively managing climate-related impacts to municipal critical infrastructure and services while supporting businesses and community organizations in reducing their climate risks. Through targeted planning strategies, Utilities Kingston helps advance adaptation goals by incorporating climate considerations into infrastructure decisions, emergency preparedness, and risk assessment frameworks. Table 9 outlines how each Pillar 4 opportunity aligns with the City's CLP Objective 10, including key approaches and expected outcomes.

Table 9 – Pillar 4 alignment with the City's Climate Leadership Plan's Objective 10

Relevant Pillar 4 opportunity	Key approaches	Expected outcomes
Strategic Planning	· Embed climate into Strategic Plan using ESG framework · Enhance ERM with climate scenario analysis · Develop comprehensive adaptation strategies	· Strategic positioning for energy transition · Market leadership through climate readiness · Transformed business model resilience
Asset Management	· Establish climate-informed governance structure · Apply climate lens to Levels of Service · Conduct Climate Vulnerability and Risk Assessments (CVRA)	· Optimized infrastructure lifecycle planning · Climate-resilient service delivery · Cost-effective adaptation investments

Relevant Pillar 4 opportunity	Key approaches	Expected outcomes
Capital Planning	· Integrate climate considerations into master planning · Apply climate lens to project planning · Update development standards and technical requirements	· Infrastructure designed for future conditions · Reduced risk of stranded assets · Strategic system redundancy and flexibility

Kingston's changing climate

Projected climate trends

Kingston is already experiencing the impacts of climate change, with notable shifts in temperature, precipitation, and extreme weather patterns. These changes present significant challenges for Utilities Kingston, affecting infrastructure resilience, operational reliability, and long-term planning. Climate projections indicate that these trends will continue and intensify over the coming decades, requiring proactive adaptation and mitigation strategies to manage risks and maintain service reliability.

Table 10 presents climate trends and projections that are based on the City's CLP, which provides a science-based assessment of expected climate impacts on municipal infrastructure and services.

Table 10 – Climate trends and projections

Climate variable	Baseline (1976-2005)	Projected (2080s)	Change from baseline
Hot days (≥30°C per year)	6 days	48 days	8x increase
Cold days (≤-15°C per year)	28 days	7 days	75% decrease
1-hour storm intensity	42 mm/hr	52 mm/hr	22% increase
Max rainfall (5-day period)	65 mm	75 mm	15% increase
Wind gusts (>90 km/hr)	0.6 per year	0.7 per year	15% increase
Lightning activity	No data	+50%	50% increase
Wildfire area burned (Ontario/Quebec)	0.20%	0.55%	2.5x increase
Freeze-thaw cycles per year	67.6	55.8	17% decrease

Climate risks and implications for Utilities Kingston

These projections underscore the growing climate risks facing Kingston, reinforcing the need for climate-resilient infrastructure, enhanced risk management strategies, and integrated planning approaches to adapt to a changing environment.

The City's CLP identifies priority climate risks and vulnerabilities across sectors. For Utilities Kingston, these risks have direct implications for water, wastewater, electricity, and natural gas services. Key climate risks include:

- **Increased risk of combined sewer overflows (CSOs)**: More intense rainfall and higher stormwater volumes could overwhelm wastewater treatment and stormwater systems, increasing overflow events and requiring capacity upgrades.
- **Infrastructure damage from riverbank erosion**: Increased erosion and shoreline destabilization may threaten water intake facilities, pipelines, and other critical assets.
- **Power supply interruptions**: More frequent and severe storms could disrupt electricity distribution, affecting service reliability for customers and impacting water and wastewater operations.
- **Rising energy demand for cooling:** Extended heatwaves will drive higher peak electricity demand, necessitating grid capacity planning and demand-side management strategies.
- **Drought conditions impacting water supply:** Reduced soil moisture and prolonged dry spells could impact water availability, particularly for customers relying on wells in rural areas.
- **Basement and urban flooding risks:** Increased precipitation intensity may cause more frequent urban flooding, overwhelming local drainage and wastewater infrastructure.
- **Higher emergency response demands:** Climate-driven infrastructure disruptions could lead to increased reliance on emergency response systems and contingency planning.

These risks highlight the urgency of integrating climate considerations into Utilities Kingston's planning frameworks, ensuring investments align with future climate conditions and support continued service reliability.

Costing the impacts of climate change

The financial implications of climate change on infrastructure investment and operational resilience are substantial. According to the Financial Accountability Office of Ontario (FAO), climate-related infrastructure costs could rise by approximately 8% per degree Celsius of warming, amounting to billions of dollars in additional expenditures. Municipalities, which own the majority of public infrastructure, are projected to bear a disproportionate share of these costs.

For Utilities Kingston, infrastructure adaptation will require ongoing investments in combined sewer separation, electrical system hardening, grid modernization, and emergency preparedness. Leveraging funding mechanisms such as the federal Disaster Mitigation and Adaptation Fund (DMAF) and municipal infrastructure grants will be essential to offset costs and ensure sustainable investment strategies.

Climate action: mitigation, adaptation, and resilience

As Utilities Kingston advances Pillar 4, success depends on prioritizing actions that balance mitigation, adaptation, and resilience. Integrating these elements enables Utilities Kingston to identify and prioritize initiatives delivering multiple benefits while avoiding maladaptation, which means actions that address immediate concerns but create larger issues over time. This balanced approach safeguards infrastructure, supports customer needs, and advances the City's climate goals in a practical and sustainable way.

- **Mitigation:** Addresses the root cause of climate change by reducing GHG emissions through conservation, enhanced energy efficiency, renewable energy adoption, and optimized operations. These efforts can yield immediate cost savings and limit future climate impacts. Without strong mitigation, climate effects will intensify, increasing the difficulty and cost of adaptation.
- **Adaptation:** Prepares infrastructure and operations for climate impacts already locked in due to past emissions. Strengthening vulnerable assets against extreme weather, flooding, and temperature fluctuations reduces service interruptions and costly emergency responses.
- **Resilience:** Results from the combined effects of mitigation and adaptation, creating systems that withstand and rapidly recover from climate disruptions. For example, energy-efficient cooling systems reduce emissions while helping critical infrastructure remain operational during extreme heat, protecting both service delivery and long-term reliability.

Tools and frameworks for implementation

Effective climate-informed planning requires incorporating multiple perspectives - financial, regulatory, and operational - into decision-making. Applying a climate lens raises awareness of both risks and opportunities, ensuring that programs, projects, and policies consider potential climate impacts.

Key tools that facilitate climate-informed planning include:

- **Climate lens frameworks**: Infrastructure Canada's Climate Lens and the Clean Air Partnership's Municipal Climate Lens help organizations evaluate both emissions impacts and climate resilience in infrastructure projects.
- **Climate change risk assessments**: The PIEVC Protocol provides a structured approach for assessing infrastructure vulnerabilities while maintaining alignment with ISO 31000:2018 risk management practices.
- **Climate adaptation planning frameworks**: ICLEI's Building Adaptive & Resilient Communities (BARC) program and Electricity Canada's Guide to Adaptation Planning support organizations in developing structured adaptation strategies.
- **Environmental, social, and governance (ESG) frameworks**: ESG frameworks integrate climate considerations into governance and strategic planning, ensuring transparent reporting on climate risk management.

Together, these tools provide a structured approach to evaluating climate risks and implementing resilience measures, helping organizations translate climate considerations into practical planning and operational strategies.

Infrastructure redundancy and stakeholder trust

Climate events can disrupt critical utility services, making infrastructure redundancy a key component of climate resilience. By ensuring backup systems and alternate pathways for service delivery, Utilities Kingston can safeguard reliability during climate-related disruptions while reinforcing public confidence in its ability to manage risks effectively.

A well-integrated redundancy strategy strengthens Utilities Kingston's ability to:

- Maintain service during extreme weather conditions and power disruptions.
- Support critical infrastructure during simultaneous climate events.
- Reduce downtime and accelerate recovery after climate-related failures.

Utilities Kingston has already incorporated redundancy into its core processes through regulatory requirements and voluntary programs. Existing initiatives that support resilience include:

- Quality Management System standards for water infrastructure.
- Risk assessments for water and wastewater systems.
- Mutual aid agreements with industry partners.
- Regular testing of backup systems and response procedures.

Building climate resilience is an ongoing process. To further strengthen Utilities Kingston's ability to manage climate risks, additional actions include:

- **Integrating redundancy into long-term capital planning**: Ensuring that redundancy considerations are embedded in future infrastructure investments to reduce climate vulnerability.
- **Enhancing emergency backup systems**: Expanding energy storage solutions and decentralized generation to improve system flexibility and ensure service continuity.
- **Strengthening cross-sector coordination**: Collaborating with municipal emergency management and regional partners to align redundancy efforts with broader climate adaptation strategies.
- **Developing a redundancy performance framework**: Establishing metrics to assess redundancy effectiveness and guide future investments in resilience.

By advancing these opportunities, Utilities Kingston can further integrate climate resilience into its operations while reinforcing stakeholder confidence in its ability to manage climate-related disruptions effectively.

Case studies in climate integration

Leading organizations provide valuable examples of successfully embedding climate considerations into planning processes. The following cases demonstrate different approaches to this challenge, from integrating climate into ERM to revising Levels of Service frameworks and stress-testing infrastructure plans. While each organization operates in its own unique context, these examples offer practical insights for strengthening climate resilience through systematic integration into planning processes.

Toronto Hydro

Approach: Embedding climate risk in enterprise risk management

Key actions: Integrates climate into core risk categories rather than treating it separately. Uses scenario analysis for both transition risks (future energy scenarios) and physical risks (vulnerability assessments). Defines time horizons: quarterly (immediate concerns), 2029 (rate periods), and 2040 (net zero targets).

Halton Hills

Approach: Integrating climate change with levels of service

Key actions: Combined climate and asset management functions to embed climate into service level frameworks. Used a workshop process to document existing commitments, assess climate impacts, and develop adaptation strategies. A pilot project on recreational facilities demonstrated practical climate integration.

City of Ottawa

Approach: Infrastructure master plan

Key actions: Integrated climate into infrastructure planning with scenario modelling. Water system modelling projected a 10% increase in outdoor water demand due to climate change. Wastewater planning stress-tested systems against extreme storm events (1-in-700-year storms) to identify vulnerabilities and prioritize investments.

Appendix E: Example performance metrics

This appendix presents potential key performance indicators (KPIs) that could be used to track progress on climate initiatives. These metrics are aligned with each strategic pillar and designed to be specific, measurable, and actionable while supporting the City's broader climate objectives. Utilities Kingston can select and adapt appropriate metrics based on organizational priorities and resources.

Table 11: Pillar 1 – Reducing operational GHG emissions

Metric	Description	Target/Goal	Data Source
Annual GHG emissions (tCO2e)	Measures emissions from operations and fleet	X% reduction by 2030	Utility reports
Energy efficiency improvements at facilities	Tracks upgrades and retrofits to reduce emissions	Annual progress towards efficiency targets	Infrastructure reports
Renewable energy adoption	Measures integration of renewable sources into operations	X MW of renewable energy by 2030	Energy procurement data

Table 12: Pillar 2 - Supporting climate action

Metric	Description	Target/Goal	Data Source
Customer participation in energy efficiency programs	Tracks engagement in incentive and education programs	Increase participation by X%	Program enrollment data
Customer adoption of electrification technologies	Measures uptake of heat pumps, EVs, and energy-efficient appliances	X% increase in customer adoption rates	Customer surveys and installation reports

Table 13: Pillar 3 - Low-carbon business ventures

Metric	Description	Target/Goal	Data Source
Revenue from low-carbon ventures	Evaluates financial viability of business models	X$ revenue per year	Financial reports
Number of low-carbon business initiatives launched	Tracks diversification into sustainable service offerings	X new ventures piloted by 2030	Business development reports

Table 14: Pillar 4 - Climate-informed planning

Metric	Description	Target/Goal	Data Source
% of assets with climate risk assessments	Tracks integration of climate risk considerations in asset management	100% of critical assets by 2035	Risk management reports
Climate resilience measures implemented	Evaluates adaptation strategies in capital projects	X% of new projects incorporate climate resilience	Capital planning documents

Table 15: Monitoring and reporting

Metric	Description	Target/Goal	Data Source
Annual CALP progress reporting completed	Ensures regular tracking and transparency	Published annually	Internal reporting systems
Stakeholder engagement sessions held	Measures collaboration with community and industry partners	X sessions per year	Public engagement reports