

Peel Region's Energy conservation and demand management plan

July 01, 2024




Peel Region Energy Conservation and Demand Management Plan in compliance with Ontario Regulation 25/23

Approval

Peel Region's 2024 Energy Conservation and Demand Management Plan has been completed in accordance with Electricity Act 1998, Ontario Regulation 25/23, Broader Public Sector Reporting: Energy Reporting and Conservation and Demand Management Plan and hereby meets all the requirements of the regulation. Peel is deeply committed to achieving the targets outlined in this plan. Our collective efforts towards these objectives are crucial not only for our organization's success but also for our broader societal and environmental responsibilities.

Approved by:

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Date: 2024-05-27

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1 Purpose Statement

Peel Region has developed the 2024 Energy Conservation and Demand Management Plan (ECDMP) in compliance with Ontario Regulation (O. Reg) 25/23, under the Electricity Act, 1998, which requires Broader Public Sector organizations to develop an Energy Conservation and Demand Management plan and update it every five years. This updated plan reports on the following:

- Results of the energy conservation measures and activities from the previous plan period (2019 - 2023);
- Current and proposed conservation measures for energy conservation and demand management, and;
- The expected results from the future measures for the future five years (2024 - 2028).

This updated plan continues to build on experience gained in the energy conservation and demand management over the past five years. Moreover, it aligns with Peel's Corporate Climate Change Master Plan that has a target of 45 per cent reduction in corporate greenhouse gases below 2010 baseline by 2030. A comprehensive overview of the Climate Change Master plan is provided in Section 4 of this plan.

2 About Peel Region

Peel Region works with residents and partners to create a healthy, safe, and connected community for life for more than 1.5 million people and 200,000 businesses in the cities of Brampton and Mississauga and the Town of Caledon. Peel delivers a wide range of resident focused services across the region. This includes paramedic services, health programs, long-term care and services for seniors, childcare support, garbage collection and recycling, water and water treatment, road maintenance, financial help, housing, and shelter.

Climate change has been a Council and organizational priority for the Region, leading to continuous efforts over the past decade to implement climate change and energy management measures. These initiatives are designed to enhance energy performance and reduce greenhouse gas (GHG) emissions across Peel's operations.

The Office of Climate Change and Energy Management

The Office of Climate Change and Energy Management (OCCEM) is a Division within the Region's Corporate Services Department and works collaboratively with all other departments to develop solutions for reducing GHG emissions and adapting to climate change impacts. A core service of OCCEM is to enable integration and effective implementation of climate change and energy management measures into policy design, capital planning and decision-making processes to position Peel Region as a responsive and accountable leader in climate action.

3 Overview of annual energy consumption

The table below provides an overview of the corporate energy consumption corresponding to Peel's services for the year 2023.

Table 1: 2023 Energy consumption per Regional service

Regional Services	Electricity (kWh)	Natural Gas (m ³)
Administrative offices - Headquarters	8,193,129	588,914
Cultural Facilities	1,201,433	82,967
Long Term Care	11,168,857	1,574,968
Paramedics	3,840,442	413,134
Public Health	165,562	17,103
Child Care	30,868	12,279
Housing	73,380,756	8,085,280
Police	14,767,740	1,066,603
Traffic Lights, Signals & Beacons	1,047,146	-
Works Yards	3,405,531	767,390
Waste	9,595,996	456,869
Wastewater	99,275,493	1,890,102
Water	188,946,022	960,087
Total	415,018,975	15,915,695

Being responsible for managing the fourth largest Water and Wastewater system in Canada, Water and Wastewater services exhibit the highest electricity consumption, constituting a substantial 69% of the total electricity consumed.

Conversely, housing has the highest natural gas consumption, representing 51% of the total natural gas usage across the Region.

3.1 Energy Management and Budgeting Tools

Peel uses a comprehensive suite of software solutions to track energy data, manage billing processes, maintain billing database and prepare an annual energy budget and forecast. These software tools play a vital role in accurately monitoring energy consumption, streamlining billing procedures, and ensuring the integrity of billing

records. The following sub-sections describe the energy software employed by the Region.

3.1.1 Energy Insight

Energy Insight is a web-based application that consolidates data, ranging from real-time metered data to annual emissions reports, into an easily accessible and presentation-ready format. Through Energy Performance Dashboards, it offers internal users comparisons between actual utility costs and budgets, energy consumption versus forecasts, GHG emissions, energy intensities, trends, benchmarking, energy analytics, and the comparative performance of similar facilities.

Figure 1: Overview of Annual Electricity Consumption; budget and baseline

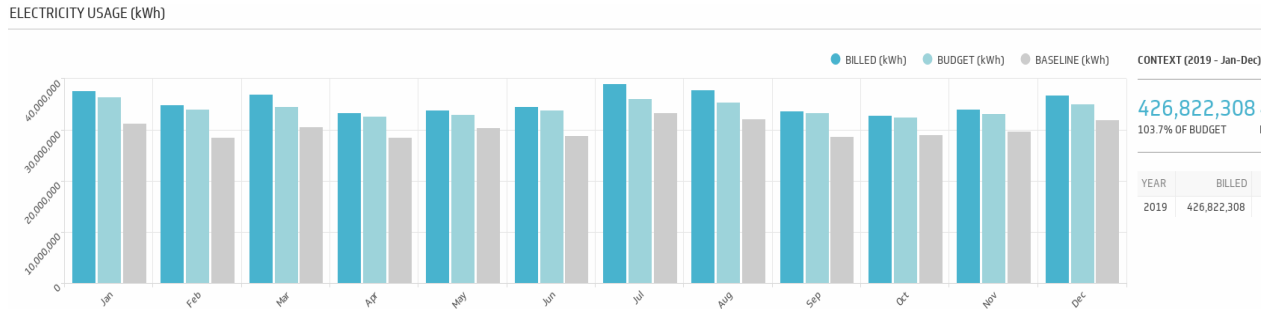
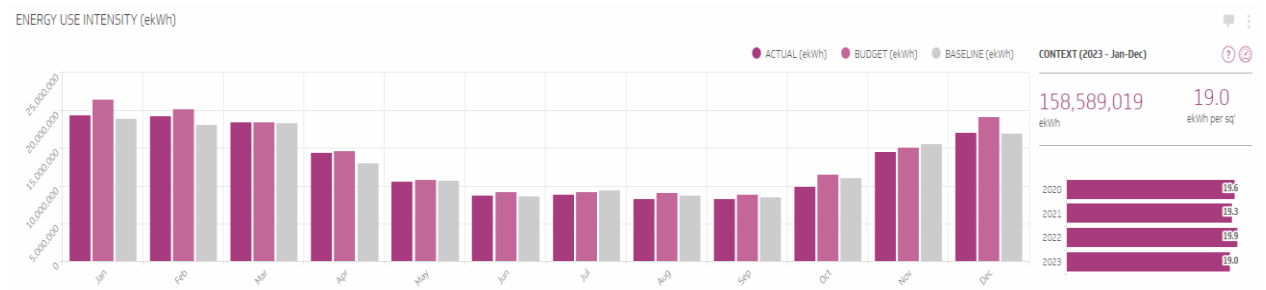
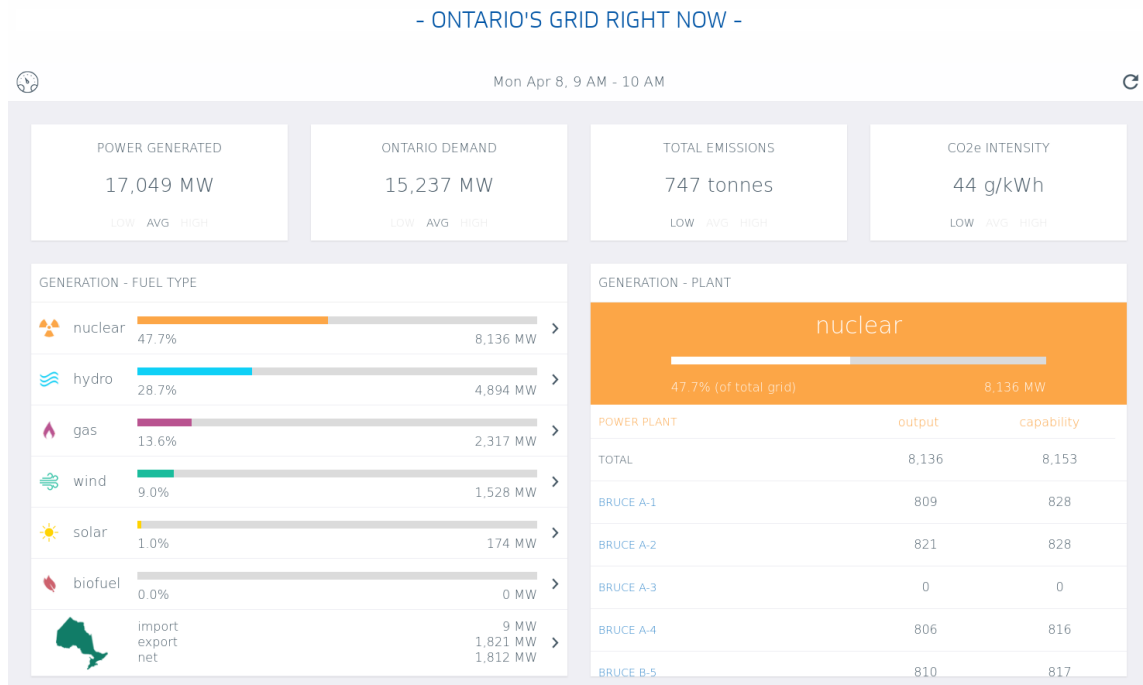


Figure 2: Overview of Annual Energy Use Intensity; budget and baseline



Furthermore, Energy Insight also offers real-time insight into Ontario's power sources and grid cleanliness through Gridwatch. This tool enables Peel to track Ontario's electricity grid hour-by-hour and plant-by-plant using the most current and reliable data available. Additionally, it provides valuable information on total carbon emissions, carbon intensity, breakdowns of total generation by fuel type, and features an interactive map displaying all power plant locations across the province.

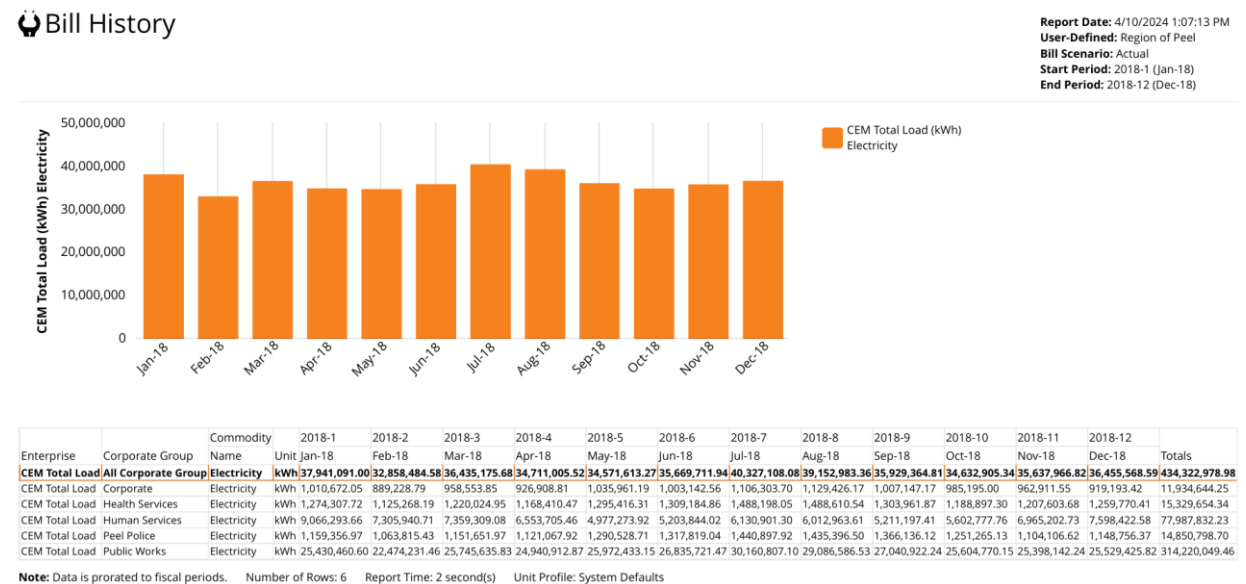
Figure 3: Ontario's real-time grid data



3.1.2 Energy Hippo

Energy Hippo is a powerful energy management database that seamlessly integrates vital components such as billing information, Hourly Ontario Energy Price (HOEP), weather data, utility rates, and real-time metering data, facilitating compliance with regulatory requirements. Moreover, Energy Hippo can generate comprehensive reports, thus allowing to track utility usage and costs over multiple years and across various locations with ease.

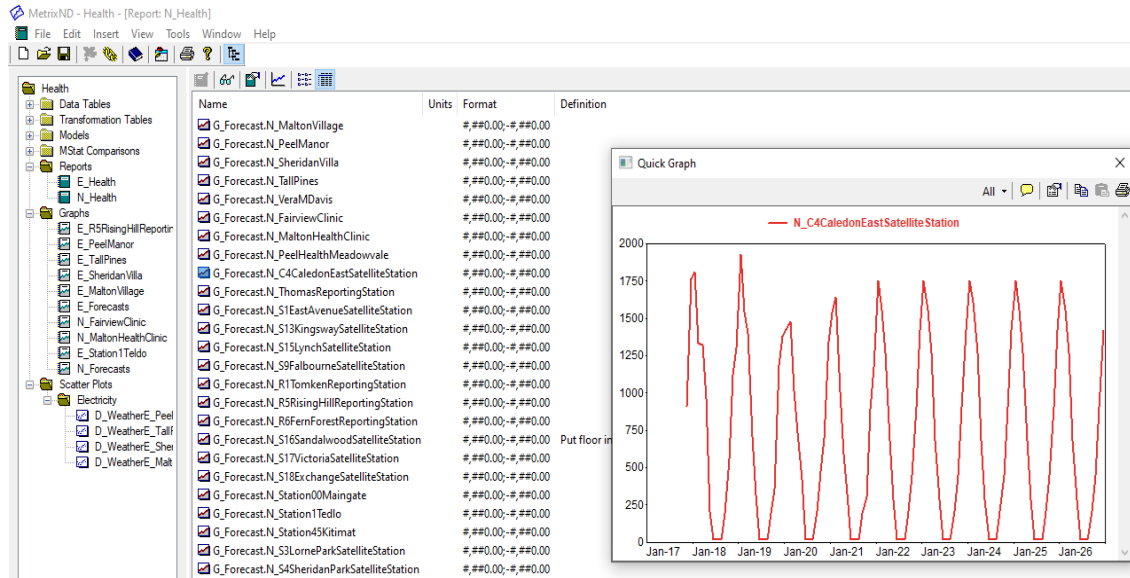
Figure 4: Bill History Report: Annual Electricity Consumption of all Regional buildings



3.1.3 Itron Metrix ND

Energy budgeting is an essential component of resource allocation for energy-saving initiatives, enabling organizations to prioritize investments and achieve cost savings. Peel utilizes Itron Metrix ND for energy consumption forecasting, which helps in preparing energy budgets as well as procurement. This tool provides a range of forecasting methods, enabling Peel to efficiently evaluate alternative models and select the most effective one to get accurate results.

Figure 5: Itron Metrix ND for Energy budgeting

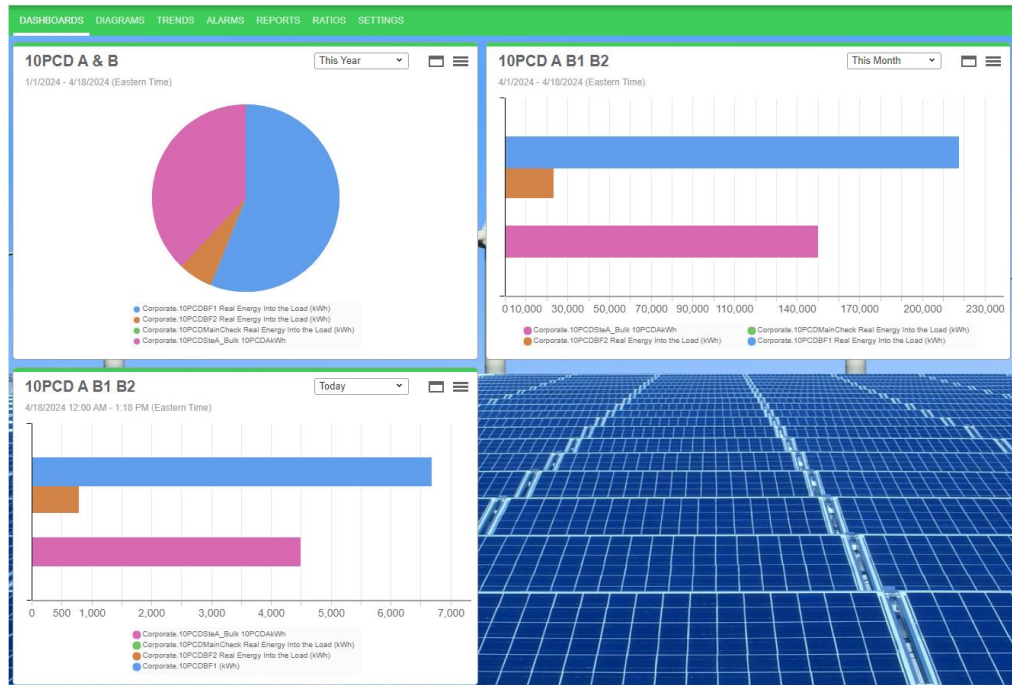


3.1.4 Schneider PME

Schneider Electric's Power Monitoring Expert (PME) software stands out as a vital resource for Peel Region's energy management objectives. With its robust suite of features, PME offers a holistic approach to optimizing energy consumption and ensuring the reliability of Peel's power systems. By tracking and analyzing energy usage patterns, PME empowers Peel to pinpoint areas for efficiency enhancement, leading to cost savings and operational improvements. Additionally, PME's power management tools enable efficient distribution and load balancing, aligning with Peel's objectives of reducing energy costs and enhancing overall efficiency.

Additionally, PME's advanced alarm and event management features facilitate proactive identification and resolution of power-related issues, minimizing disruptions and downtime. Compatible with various hardware and communication protocols, PME seamlessly integrates with Peel's existing infrastructure, enabling centralized monitoring and control for enhanced operational efficiency.

Figure 6: Dashboard showing energy consumption of Corporate HQ



4 Corporate Climate Change Master Plan

In 2019, Peel Region declared a climate emergency and approved a corporate Climate Change Master Plan (CCMP) that has a 10-year planning horizon. The Master Plan aims to achieve the following five outcomes by 2030:

- **Reduce emissions:** Corporate GHG emissions are reduced by 45% by 2030 relative to 2010 levels
- **Be prepared:** A safe, secure, and connected community is provided by ensuring Regional services and assets are more resilient to extreme weather events and future climate conditions
- **Build capacity:** Climate change is considered in all decision-making through organization-wide climate literacy, planning, and accountability
- **Invest:** Innovative and sustainable approaches are used to finance action on climate change
- **Monitor and Report:** Progress on addressing Regionally-funded climate change work is consistently reported, available, and widely understood

The primary outcomes of CCMP are to “Reduce Emissions” and “Be Prepared,” which reflect the imperative to mitigate and adapt to the effects of climate change. The remaining three outcomes are supportive to the primary outcomes and will enable success through actions to “Build Capacity”, “Invest”, and “Monitor and Report”.

The CCMP provides details on what solutions should be acted upon to achieve these outcomes. To align with the CCMP reduce emissions outcome and 2030 target, this updated energy conservation and demand management plan uses 2010 as a baseline to track progress of Peel’s energy consumption.

The CCMP is comprised of 20 actions and 66 activities, setting the direction for how Peel will lead by example through the management of Regional assets, infrastructure, and services in a changing climate over this decade. The master plan also substantiates influence necessary to support the community as it transforms in response to climate change.

5 Net Zero Emissions New Construction Policy and Standard

In 2022, Peel Region's Corporate Net Zero Emissions New Construction Standard and Policy was approved, which ensures all new corporate buildings and major renovations will have no net operational GHG emissions. Thus, ensuring no new GHG emissions are added to the corporate inventory due to these buildings.

Recognizing that buildings contribute significantly to Peel's corporate emissions, the NZE standard is a pivotal component in achieving Peel's 2030 emissions reduction target and potential long-term target of Net-Zero emissions, establishing a low carbon pathway for a sustainable and thriving future for Peel residents and businesses.

5.1 Overview of the Policy

The Net Zero Emissions New Construction Policy establishes a framework that prioritizes green building practices and mandates GHG emissions and energy performance for all new constructions and major renovations of buildings owned by Peel Region. This policy aims to significantly reduce carbon emissions, promote energy efficiency, and enhance overall environmental performance across Peel's building portfolio.

The Policy sets out the background, position statement, guiding principles, scope, broad requirements, and internal stakeholder responsibilities associated with the NZE Building Standard for New Construction.

5.2 Overview of the Standard

The Net Zero Emissions New Construction Standard is a comprehensive set of guidelines and requirements designed to ensure that all new regional buildings and facilities achieve Net-Zero carbon emissions. It builds upon the basic principles of the Canada Green Building Council (CAGBC) Zero Carbon Building (ZCB) design certification and incorporates additional measures to elevate environmental and operational standards. These measures include:

- Promoting decarbonization through non-combustion-based heating systems,
- Requiring a Thermal Energy Demand Intensity (TEDI) target for enhanced energy efficiency and thermal comfort,
- Conducting rigorous airtightness testing before occupancy,
- Implementing energy sub-metering for all energy end-uses exceeding 10% of total consumption,
- Adhering to best building commissioning practices, and

- Requiring climate risk assessment and ensuring resilience to key climate change hazards

6 Energy and Emissions Management Plan - Affordable Housing

Through 2022/2023, Peel Region has undertaken an innovative approach to advance energy and emissions management practices by developing a portfolio-specific Energy and Emissions Management Plan (EEMP) for Peel Housing Corporation (PHC) and Regional Housing Services (RHS), which includes 130+ existing and future assets responsible for 17,000+ tonnes of CO₂e emissions. The EEMP for affordable housing is currently pending final approval from Council through the budget approval process.

The EEMP and modeling tool marks a significant first step of integrating decarbonization projects and costs with the existing State of Good Repair (SOGR) capital budget and planning processes. The recommended Best Value Scenario in the Plan classifies buildings into five (5) decarbonization areas:

- Holistic Building Retrofits
- Retrofit in Bundles
- Enhanced SOGR
- Decommissioning for redevelopment
- New Construction

This plan also sets a sub-target for GHG reductions for PHC and RHS, which is 49% emissions reduction by 2030 related to decarbonization of buildings; and a proposed longer-term outlook to net zero for affordable housing by 2050. The sub-target ladders up Peel's overall 2030 corporate target and is key to meeting that target. The graph below shows a decarbonization trajectory for the Best Value Scenario.

Figure 7: Decarbonization Trajectory for the Best Value Scenario

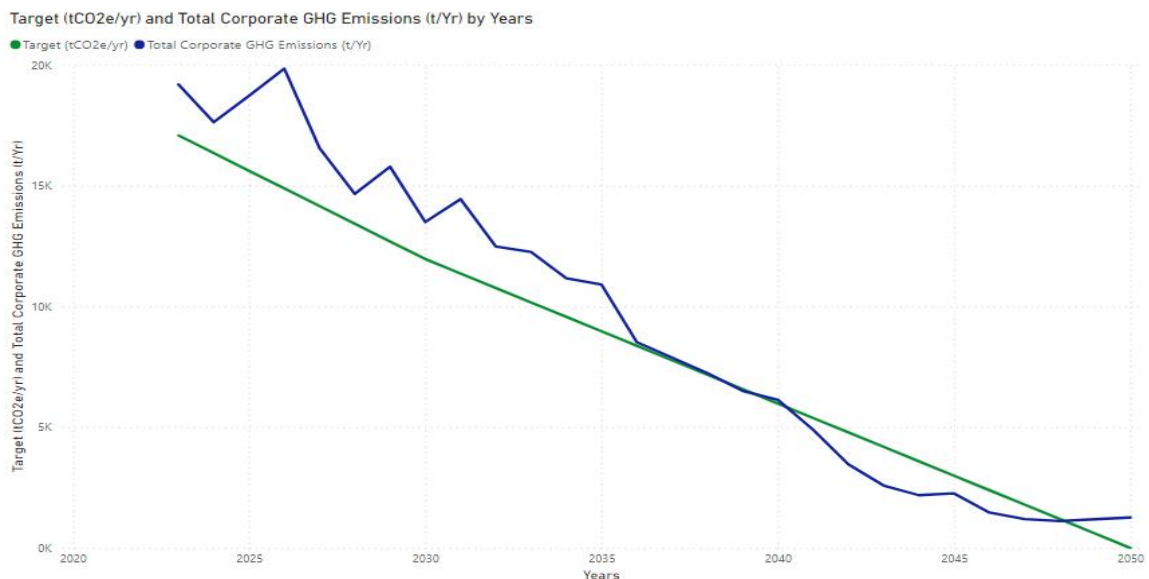
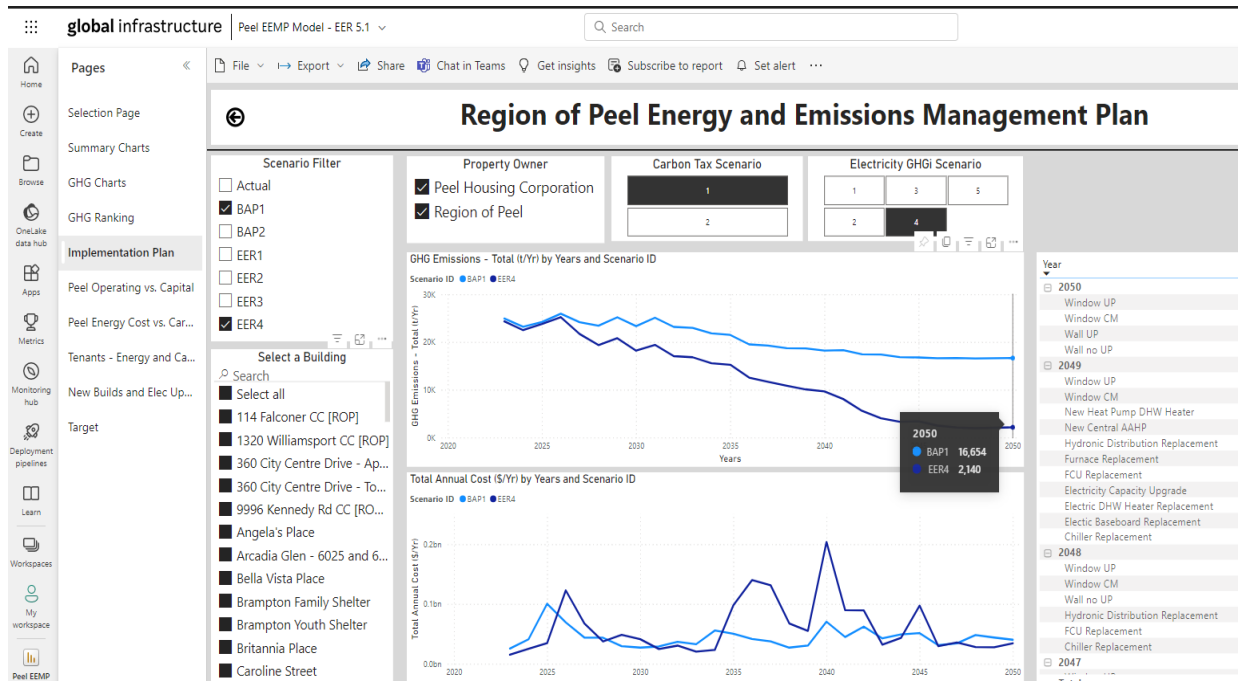


Figure 8: Implementation Plan from the Power BI Tool



This modeling tool provides Peel with the capability to do annual tracking of performance against the selected Best Value Scenario and based on these results, the plan and its implementation will be updated on an annual basis. Moreover, this plan emphasizes a balance between reducing GHG emissions and managing costs, spread over time to ensure financial stability and minimize disruption to PHC and RHS occupants. This iterative approach reflects a commitment to addressing the complexities of emissions reduction within Peel's housing portfolio, laying a foundation for broader implementation of the CCMP across diverse program areas.

This is a proactive approach of integrating the asset management and decarbonization programs on a large scale which can be replicated at other Peel program areas. Peel is actively working to develop EEMP for other program areas such as Long-Term Care and Public works, mentioned later in this plan in Section 11.1.3.

7 Electric Vehicle charging stations Policy and Standard

Peel Region's first Electric Vehicle (EV) charging station installations were completed in 2017. The stations were open for employee and public use and made available at no cost to encourage early EV adoption in the community as a measure to address the broader climate crisis.

However, as more EV chargers were installed and usership needs diversified, a policy was developed and approved in 2021 to manage existing EV infrastructure and assess future demand.

7.1 Overview of the Policy and the Standard

The Policy sets out the terms of use and outlines internal stakeholder responsibilities to effectively manage existing and future installations of electric vehicle charging stations on Peel Region's properties.

The Standard describes minimum requirements and specifications for EV charging station hardware, networking and management platforms, and customer support services provided at buildings and spaces owned and/or operated by the Peel Region.

Moreover, to support the Electric Vehicle Charging Station Management Policy, a procedure was developed to include detailed methodologies, processes, and Peel Region employee responsibilities associated with:

- Setting usage fees;
- Collecting and appropriating revenues;
- Handling user inquiries and complaints;
- Evaluating the installation/expansion of charging infrastructure
- Maintaining existing charging stations; and,
- Assigning access to fleet vehicles

Currently, Peel Region is effectively managing over 100 charging stations, each with availability tailored to its intended users, including the fleet, staff, and the general public.

8 Raising awareness on climate change

OCCEM has organized many impactful events in the past to educate Peel employees and engage community members in raising awareness about the issues surrounding climate change. These include:

Embodied Carbon

This event focused on introducing the concept of embodied carbon to Peel employees with responsibilities for managing Regional assets and infrastructure associated with embodied carbon. It also shared insights on how the building sector could minimize these emissions and highlighted some of the first steps Peel is already taking to reduce embodied carbon.

Cooking with Christine

This live cooking class featuring simple plant-based recipes provided Peel employees some climate friendly tips and ways to reduce food waste. The session focused on simple ways to reduce our impact on the environment and improve your health with nutritious and easy recipes.

Geothermal Technology for heating and cooling

This event provided valuable insights into the applications of geothermal technology and showcased compelling case studies. It provided Peel employees with responsibilities for facility management and affordable housing construction an opportunity to learn about successful projects that have implemented this innovative

technology, highlighting the significant results that can be achieved through this technology.

Coping with Climate Anxiety

Peel hosted a panel of experts in person at Human Resources Departmental Annual Town Hall. A climate psychologist discussed the emerging issues related to climate anxiety particularly among young people and ways to cope. This was followed by an urban ecologist who presented compelling evidence on the mental benefits of spending time in nature.

Heat Resiliency

In this event, experts from Peel Public Health, the University of Toronto School of Cities, and Action Canada shared insights to Peel employees into what can be done to increase resiliency as climate change increases extreme heat risks. Information was shared on Peel's Heat Warning Notification Program, ways to improve heat and policy recommendations to heat-proof community and affordable housing in Canada.

Circular Economy

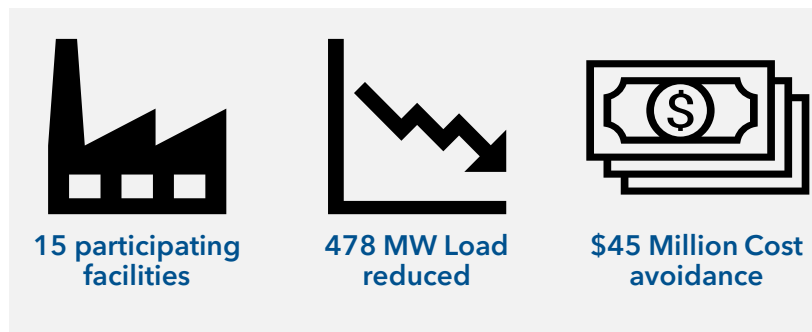
Peel's Waste Management Division, in collaboration with OCCEM, hosted a virtual event to present Peel's Roadmap to a Circular Economy to its employees. This event highlighted how the goals, objectives, and recommended actions of the Roadmap will allow Peel to move towards a circular economy.

Climate Change Financing

An all-day symposium was organized for Peel's finance employees in collaboration with Peel's Finance Department to increase awareness on the implications, costs, and opportunities within the financial sector to adapt to and mitigate climate change.

9 Industrial Conservation Initiative program

Peel Region is an active participant of the Industrial Conservation Initiative (ICI) program, which incentivizes eligible industrial and commercial customers to reduce their demand during peak periods. A total of **15 Regional facilities** have participated in the ICI program from 2019 to 2023. Over this time period, Peel has derived cost benefit from billing optimization as well as load shifting.

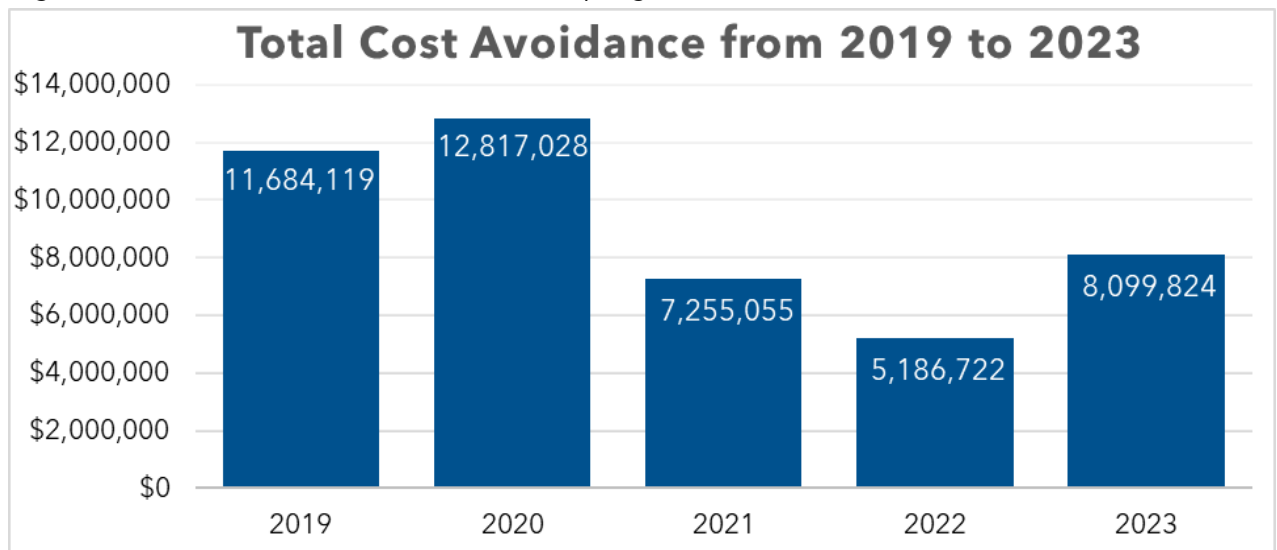


Between 2019 and 2023, Peel Region was able to make a substantial shift of **478 MW** peak load among participating facilities. The Arthur P. Kennedy Water Treatment Plant,

which is one of the world's largest water treatment facilities, contributed 153.64 MW to this shift, accounting for approximately 32% of the total load shift during the same period. Similarly, the Lorne Park Water Treatment Plant, contributed 76.62 MW, which represents around 16% of the total load shift from 2019 to 2023. The remaining 52% was distributed among other participating facilities.

The chart below shows the cost avoidance for each year spanning from 2019 to 2023. Notably, four wastewater treatment plants are the significant contributors, collectively accounting for approximately 73% of the total cost avoidance of **\$45 million** during this period. This underscores the substantial impact of these plants on Peel's overall cost-saving efforts over the specified timeframe.

Figure 9: Total cost avoidance from the ICI program (2019-2023)



As demand management involves strategically shifting or reducing peak demand during periods that coincide with the electricity grid's peak load, it leads to substantial cost savings by avoiding utility peak demand charges. Recognizing the effectiveness of this approach, Peel Region is committed to ongoing participation in the ICI program. Additionally, Peel will explore opportunities to include more eligible sites in this program to further optimize cost savings.

10 Results from the implementation of Energy conservation projects (2019-2023)

Over the past five years, Peel has implemented various retrofit projects at its facilities, leading to significant advancements in operational efficiency and cost savings. The following section highlights results from all the implemented projects and total renewable energy generation from 2019 to 2023.



ELECTRICITY SAVINGS

29,005 MWh



NATURAL GAS SAVINGS

2,259,076 m3



RENEWABLE ENERGY GENERATION

44,706 MWh

10.1 Energy Savings from the implemented projects

The table below summarizes total energy savings from the implemented projects, notable projects and their associated energy and cost savings achieved from 2019 to 2023.

Table 2: Cumulative Energy savings and Cost avoidance from the implemented projects

Portfolio	Total Electricity Savings (MWh)	Total Natural Gas Savings (m3)	Total Energy savings (eMWh)	Total Energy Cost avoidance (\$)
Long Term Care	2,857.55	689,485.35	10,131.62	612,598.77
Offices	4,139.11	359,372.00	7,930.49	648,322.39
Paramedics	371.91	213,559.00	2,624.96	125,923.08
Peel Living (Affordable Housing)	9,763.87	895,707.80	19,213.59	1,567,379.52
Peel Police	2,487.03	-	2,487.03	313,101.03
Public Works	2,703.16	100,952.00	3,768.20	376,051.28
Wastewater	4,437.50	-	4,437.50	558,652.36
Water	2,245.37	-	2,245.37	282,677.56
Total	29,005.51	2,259,076.15	52,838.76	4,484,705.99

The tables below highlight top projects contributing to electricity and natural gas savings respectively.

Energy Conservation and Demand Management Plan | 2024

Table 3: Top projects contributing to Electricity savings

Project Name	Project details	Annual Electricity Savings (MWh)	Annual Energy Cost Avoidance (\$)
Lighting Retrofit - Various locations	Upgrading the existing fluorescent lighting to LED	5,246.71	660,734.18
High Performance New Construction - Police 11 Division	Major renovation of the building	354.00	44,580.28
Heating controls - Chelsea Gardens	Optimize building operations by implementing advanced heating controls	286.72	36,107.51
Decanter Controls Upgrade - Clarkson WWTP	Downsize 350 HP motor to 200 HP Totally Enclosed Fan Cooled Motor and install 200HP VFD for better controls	180.00	22,667.94
Chiller Replacement - Derrybrae Place	Replacement of 125-ton constant-speed centrifugal chiller with a more energy efficient chiller	156.90	19,758.89
Voltage Optimization Device Installation - Springfield Gardens "A"	Installation of Voltage optimization device to reduce voltage to allowable minimum level	131.02	16,499.74

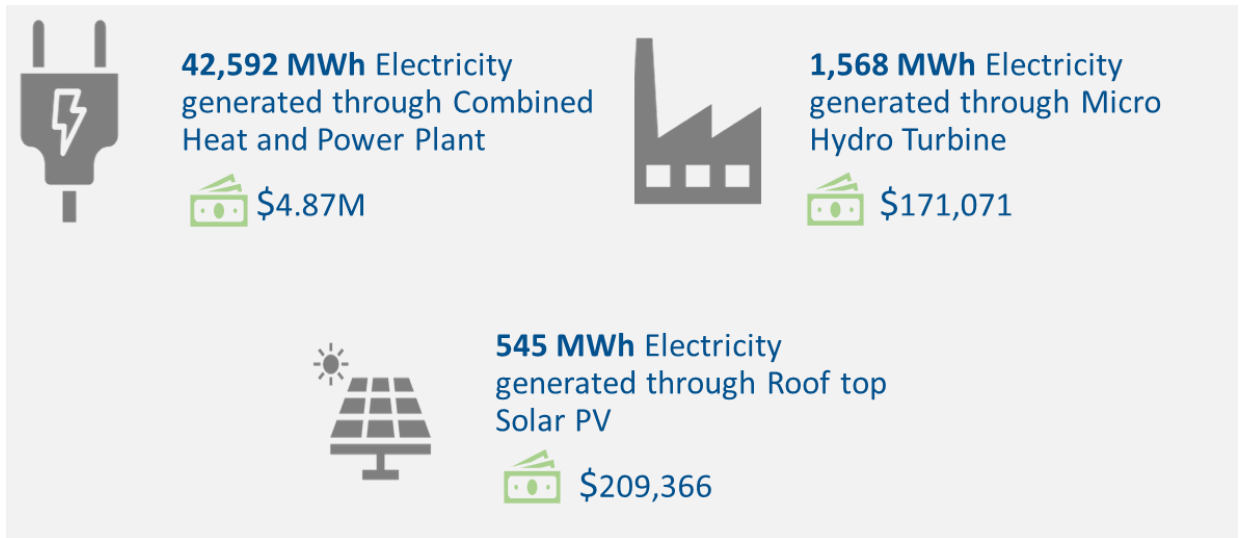
Table 4: Top projects contributing to Natural gas savings

Project Name	Project details	Annual Natural Gas Savings (m3)	Annual Energy Cost Avoidance (\$)
Snow Melting System Optimization - Headquarters Suite B	Optimize the operation of Snow melting system by implementing controls	71,804	27,124.86
Make Up Air Unit Replacement - Peel Youth Village	Ventilation - Condensing MUA unit upgrade	54,150	20,455.84
Recommissioning - Tall Pines	Recommissioning of the building	51,759	19,552.61
Domestic Hot Water Boiler Replacement - Confederation Place	Replacement of heat exchangers to DHW boilers to decouple heating and DHW systems	51,432	19,429.08

Project Name	Project details	Annual Natural Gas Savings (m3)	Annual Energy Cost Avoidance (\$)
Recommissioning - Malton Village	Recommissioning of the building	50,000	18,888.13

10.2 Renewable energy generation

Over the past five years, Peel Region has generated **44,706 MWh** of electricity that is enough electricity to power 4,143 homes for a year.



The *Combined Heat and Power (CHP)* plant at the Clarkson Wastewater Treatment Plant in Mississauga generated **42,592 MWh** of electricity from 2019 to 2023 and cost savings of **\$4.87M**.

Moreover, the *Micro Hydro Turbine* at the Clarkson Wastewater Treatment Plant in Mississauga generated **1,568 MWh** of electricity from 2019 to 2023 and cost savings of **\$171,071**.

Over the past five years, the roof top *Solar PV* installations at several Peel buildings have generated nearly **545 MWh** of electricity and received FIT (Feed-in-tariff) contract payouts of **\$209,366**.

11 Future initiatives (2024-2028)

11.1 Standards, Policies and Plans

The following section provides an overview of the strategic initiatives for the next five years pertaining to renewable energy and other climate change mitigation efforts.

11.1.1 Renewable Energy Strategy

Peel Region is actively working towards developing a Renewable Energy Strategy aimed at:

- Identifying feasible targets for generating and sourcing zero carbon energy
- Defining Peel Region's decision-making criteria (Eg. risk appetite, internal rate of return)
- Identifying Peel's critical services and priority sites where on-site energy generation and storage should be evaluated to inform business continuity planning
- Establishing roles for Regional divisions and programs in the implementation of projects including viable ownership models
- Outlining a phased approach to support renewable energy proliferation in the community

Ultimately, implementation of this strategy through investments in energy generation, storage, and asset management will enhance Peel's resilience to fluctuations in:

- Energy cost
- Electricity grid capacity
- Availability of clean electricity
- Extreme weather events causing power outages leading to service disruptions

11.1.2 Net Zero Emissions Building Retrofit Standard

The development of a Net Zero Emissions (NZE) Building Retrofit standard commenced in 2022, and, when approved and implemented, will address operating emissions in all existing occupied and unoccupied buildings owned by the region. This is a critical part of Peel's decarbonization path as the buildings are responsible for ~40% of all Peel's GHG emissions.

The standard will propose various compliance paths and the common requirement for any retrofit is anticipated to be fuel switching and use of heat pumps. This technology offers significant energy efficiency improvements and can be used for most building heating, ventilation, and air conditioning (HVAC) applications.

Other energy efficiency measures of the NZE Building Retrofit standard will include building envelope improvements, lighting, and appliance upgrades. The standard will also suggest on-site renewable generation where sufficient roof space is available.

Overall, the standard will enable significant on-site decarbonization of building operation through electrification and energy efficiency improvements.

The standard will be accompanied by a policy and implementation guide to ensure adoption within the organization and ease of implementation.

11.1.3 Energy and Emissions Management Plan - Public works and Long-Term Care

Building on the success of the EEMP for affordable housing, Peel Region is actively working to develop a similar plan for Public Works and Long-Term Care portfolios. The EEMP will follow the high-level principles laid out in the Climate Change Master Plan and will become a program-area specific pathway for decarbonization and energy management.

Public works

The department’s GHG inventory will be evaluated, based on which decarbonization and energy improvement opportunities will be identified and thereafter an EEMP will be developed sequentially for each division with operating emissions within Public Works. The plan will also propose a viable path to meet the decarbonization sub-target, identify specific measures, and evaluate their energy, GHG emission and financial impacts.

Long Term Care (LTC)

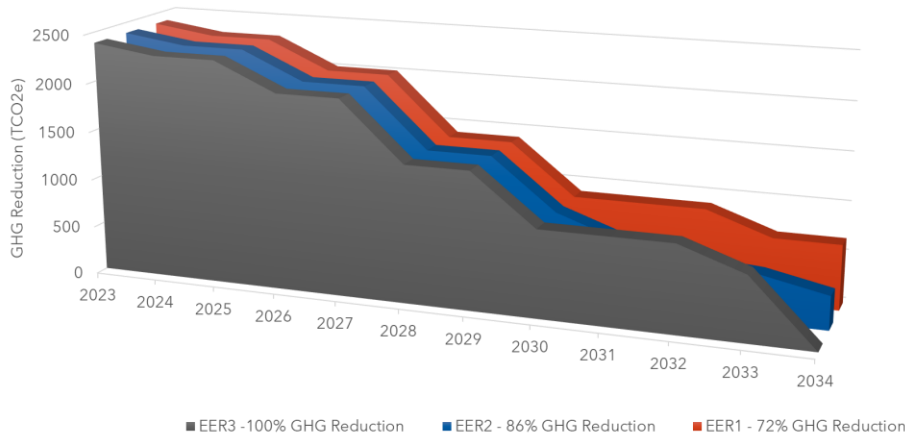
Development of the LTC EEMP was initiated in early 2024 and is close to completion. Peel’s LTC portfolio contributes 2,390 tons of annual GHG emissions to the total corporate GHG emissions profile. The LTC EEMP is in alignment with Peel’s Assets Capital Plans and the principles of maintaining a state of good repair.

The proposed LTC EEMP explores three distinct scenarios: EER1, EER2, and EER3. In EER1, energy conservation measures have been bundled to achieve a 72% reduction in GHG emissions and 40% reduction in energy usage by 2035. On the other hand, EER3 is designed to achieve an impressive 100% reduction in GHG emissions and 49% reduction in energy usage by 2035. Peel is currently reviewing risks and opportunities to advance EER3 and achieve Net-Zero emissions for this portfolio by 2035.

The LTC EEMP includes a range of strategies, such as deep mechanical systems retrofits, envelope retrofits, and the integration of renewable energy sources like solar photovoltaic (PV) systems. Notably, the proposed Solar PV system is set to generate about 1,550 MWh of Energy contributing significantly to Peel’s climate change objectives.

Figure 10: Long-Term Care Energy and Emission Management Plan

**Long-Term Care Facilities
Energy & Emission Reduction Plan**



11.1.4 Training

As part of ongoing efforts to educate Peel staff and support decarbonization of regional assets, Peel is actively working to organize training sessions aimed at optimizing building operations and equipping staff with the necessary knowledge and skills to achieve Net-Zero emissions targets. Through these comprehensive training sessions, Peel employees will gain insights into sustainable practices, energy-efficient technologies, and carbon reduction strategies tailored to their respective roles and responsibilities.

By empowering the organization with the tools and resources needed to make informed decisions and take decisive action, Peel is laying the foundation for a successful transition to a Net-Zero emissions future.

11.2 Upcoming Projects

Peel Region is focused on implementing innovative solutions to reduce carbon emissions and enhance energy efficiency across its operations and achieve the Climate Change Master Plan's 2030 GHG reduction target. In direct alignment with the CCMP, the following sub-sections provide an overview of planned measures for the next five years, including Net Zero Emissions New Construction, low carbon initiatives, and energy management projects.

11.2.1 Net Zero Emissions New construction Projects

Peel's New Construction projects, outlined below, integrate a range of low-carbon measures to comply with the NZE New Construction Policy and Standard. Notably, some projects are being designed to achieve Net-Zero energy status, with solar PV systems sized to meet 100% of the building's energy demand.

Table 5: Overview of New Construction projects

Key Performance Indicators	Affordable Housing - High rise 1	Affordable Housing - High rise 2	Paramedics	Operational Yard	Police Operations
Potential GHG emissions offset (TCO ₂ e/yr)	204	287.2	241-280	116-148	54
Potential Energy Consumption Avoidance (MWh/yr)	1,203	1,464	1,117-2,317	944-1,747	1,805
EUI (kWh/m ²)	103	82	120-0	124.5-0	215.8
TEDI (kWh/m ² *yr)	29	27	23.5	33.6	30.3
Potential Renewable energy generation (% of Building Energy Use)	5%	5%	5% to 100%	5% to 100%	6%

11.2.2 Net Zero Emissions Low Carbon Retrofit Projects

In alignment with Peel’s Climate Change Master Plan, this section outlines upcoming and in progress net zero emissions low carbon retrofit projects, which will be completed over the next five years through a combination of single retrofit, bundled retrofit, and holistic projects.

State of Good Repair and Bundled Retrofit Projects

The table below highlights single and bundled retrofit projects, illustrating a comprehensive approach to decarbonization. Single retrofit (or SOGR) projects involve replacing existing equipment reaching the end of its lifecycle with newer, more energy efficient low carbon technologies whereas bundled retrofit projects involve multiple retrofit measures that are bundled together and executed simultaneously to optimize use of resources and minimize disruptions to the building occupants. For example, replacing a boiler, Make Up Air unit and Fan coil units all within one building and at the same time.

These projects encompass a range of measures, including installation of air source heat pumps (ASHP) to replace conventional space heating systems, while also incorporating cooling capabilities, domestic hot water enhancements, and improved ventilation through make-up air systems. Additional measures include building envelope improvements, which directly impact energy use and indoor air quality.

Table 6: Upcoming and in progress Single and Bundled Retrofit Projects

Portfolio	Single Retrofit		Bundled Retrofit	
	Annual Energy Savings (eMWh)	Annual GHG Avoidance (TCO ₂ e)	Annual Energy Savings (eMWh)	Annual GHG Avoidance (TCO ₂ e)
Affordable Housing - High rise	10,946	2,579	7,740	1,560
Affordable Housing - Shelter	-	-	770	222
Affordable Housing - Townhouse	37	12	-	-
Long term Care	481	112	-	-
Total	11,464	2,703	8,510	1,782

Furthermore, OCCEM is supporting six retrofit projects for affordable housing buildings by providing subject matter expertise. These buildings fall under a private social housing portfolio not directly owned by Peel and are projected to result in an annual energy savings of 9,939 MWh and a reduction of 2,230 TCO₂e in GHG emissions. Funding for these projects will be partially sourced from Canada Mortgage and

Housing Corporation's (CMHC) National Housing Co-Investment Funding Program, which mandates a demonstration of at least 25% in energy and GHG savings. However, preliminary studies indicate potential savings well beyond these requirements, ranging from 75-80%.

Holistic Projects

The following section outlines upcoming holistic projects, focusing on comprehensive retrofits of existing buildings. These projects aim to optimize energy performance and reduce emissions through comprehensive upgrades. This holistic approach ensures that the retrofit measures address the building as a whole and maximize cost efficiencies by consolidating multiple retrofit measures into a single project.

Table 7: Upcoming Holistic Retrofit Projects

Portfolio	Annual Energy Savings (eMWh)	Annual GHG avoidance (TCO _{2e})	Annual Energy Cost Avoidance (\$)
Affordable Housing - Low rise	1,823	316	92,977
Affordable Housing - High rise	2,940	466	161,700
Long-Term Care	7,039	2,026	245,000
Total	11,802	2,808	499,677

In addition to the projects mentioned in the Table 7, Peel is implementing comprehensive upgrades at one of its townhouses, which was in a very poor condition and required extensive upgrades. Measures such as increased air tightness, triple glazing, heat recovery ventilation, and external insulation of limited faces of exterior walls will be implemented. This project will not only result in greater energy and GHG savings but also provide valuable insights and can be used as a benchmark project for future low carbon retrofit of Peel's townhouse portfolio.

11.2.3 Energy Management Projects

Over the next five years, Peel's energy management initiatives will focus on implementing innovative projects aimed at reducing energy consumption and costs, while also aligning with the CCMP outcomes and target.

One of the primary projects within these initiatives involves implementing baseboard heating controls to manage the energy consumption of baseboard heater-driven space heating in several affordable housing buildings. The control strategy will include temperature sensing and automated thermal comfort management to achieve at least 15% energy savings annually, as demonstrated in a successful pilot project conducted in 2019 at one affordable housing building. The pilot project showcased the potential for expansion to other buildings, highlighting the significant energy and cost savings achievable over the life cycle of baseboard heating systems.

Based on the projected installation at seven selected sites, it is anticipated that annual energy savings from reduced electricity consumption will be **144.2 MWh**, and result in a cost savings of **\$2.1 million** over 20 years.

11.2.4 Metering Infrastructure upgrade

Peel Region has developed a 5-year plan to replace the existing aging energy metering assets to avoid future metering issues, while maintaining the accuracy of the energy data. The plan prioritizes the replacement of approximately 76 main meters over the 5-year period, with 20 meters already replaced and 56 remaining to be addressed in the coming years. Currently, a review is underway to potentially expedite the installation timeline from 5 years to 2-3 years.

In addition to the energy meter replacement plan, Peel is making significant strides in installing main meters and sub-meters tailored to site redevelopment projects. These meters will monitor various electrical and mechanical loads, facilitating energy conservation and demand management efforts.

12 Glossary of Terms

ASHP: Air source heat pump. It is a heating and cooling system that utilizes outdoor air as a heat source in winter and a heat sink in summer. It extracts heat from the outdoor air and transfers it indoors during the heating season and reverses the process during the cooling season to remove heat from indoor spaces and release it outdoors.

Carbon dioxide (CO₂): A gas found in the Earth's atmosphere and is a result of many natural and human activities. Carbon dioxide is a notable greenhouse gas.

CHP: Combined Heat and Power. A process where electricity is generated using a fuel source (e.g.: RNG) and any useful heat energy resulting from this step is captured and used (i.e.: for heating). This allows for more efficient use of the fuel source.

DHW: Domestic Hot Water. Any potable water used for domestic purposes (i.e., consumption and hygiene), excluding heating and commercial practices.

eMWh: An equivalent Megawatt hour (e-MWh) is the conversion of a unit of energy to a common unit to better compare different types of energy sources. Example: Converting a cubic meter of natural gas to an equivalent Megawatt hour measure to compare to electricity usage in Megawatt hours. Conversion factor: (1m³=0.01055MWh).

EUI: Energy Use Intensity, a measurement that shows a building's energy use as a function of its size or other characteristics.

FIT: Feed-in Tariff. A policy mechanism that aims to encourage investment in renewable energies.

GA: Global Adjustment. It is a component which covers the cost of building new electricity infrastructure, maintaining, and refurbishing existing generation resources and covers the cost of delivering conservation programs to ensure adequate electricity supply over the long term in the province of Ontario.

GHG: Greenhouse Gas. These gases absorb and radiate heat energy easily and help maintain the Earth's temperature. If emitted in excess quantities, they can have negative impacts to the Earth's climate.

Hourly Ontario Energy Price (HOEP): It is the average of the twelve market clearing prices set in each hour.

HP: Horsepower. A unit of measurement of power.

HVAC: Heating, Ventilation, and Air Conditioning.

ICI: Industrial Conservation Initiative. A program which incentivizes eligible industrial and commercial customers to reduce their demand during peak periods to help the

province defer the need for investments in new electricity infrastructure that would otherwise be needed.

kW: Kilowatt. A unit of electrical power.

kWh: Kilowatt hour. A unit of electrical energy.

LED: Light-emitting diodes. Consume considerably less energy than most conventional light sources, while achieving similar or better lighting performance.

MUA: Make-up Air Unit. An air handler that conditions 100% outside air.

MW: Megawatt (equal to 1,000 kilowatts). A unit of electrical power.

MWh: Megawatt hour (equal to 1,000 kilowatt hours). A unit of electrical energy.

NG: Natural gas. A fossil fuel which consists primarily of methane.

NZE: Net Zero Emissions, also referred as carbon neutral is defined as a state of not emitting greenhouse gas emissions or offsetting the emissions by undertaking actions such as tree planting or employing technologies that can capture carbon before it is released into the air.

Renewable Energy: Energy derived from natural resources that are replenished on a human timescale, such as sunlight, wind, rain, tides, waves, and geothermal heat.

Solar PV: Solar Photovoltaics. A system which captures energy from sunlight to generate electricity.

TCO_{2e}: Greenhouse gas emissions expressed as equivalent tons of carbon dioxide (CO₂) emissions.

Thermal Energy Demand Intensity: Also referred as TEDI, it is the annual heating energy demand for space conditioning and conditioning of ventilation air.

VFD: Variable Frequency Drive. A type of motor controller that drives an electric motor by varying the frequency and voltage of its power supply.

Wastewater: Any water that has been exposed to human activity. This includes water from the sanitary sewers, storm sewers, surface runoff, etc. and requires treatment at an appropriate facility.

WWTP: Water and Wastewater Treatment plant. A facility which improves the quality of water to specifications for its intended use.

ZCB: Zero Carbon building. A building that is designed, constructed, and operates to produce net zero carbon emissions over its entire life cycle, typically achieved through energy efficiency measures and renewable energy sources.